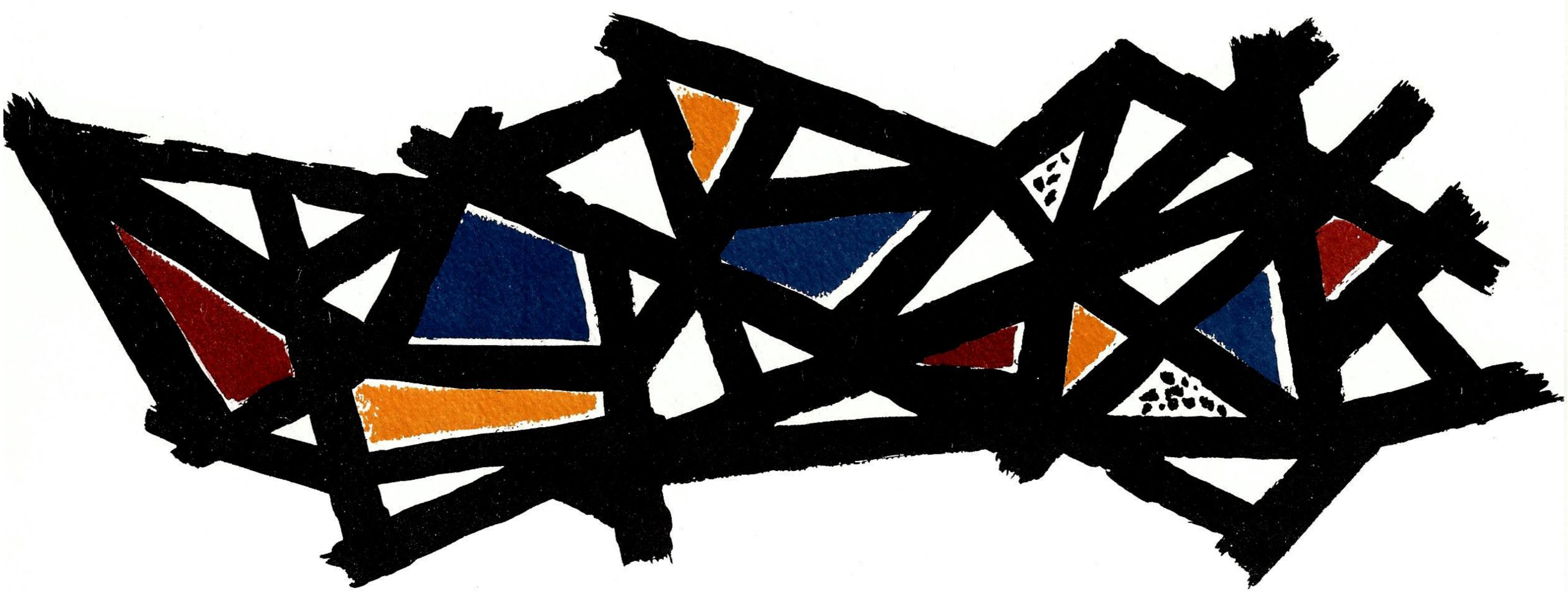
ELA TOWNSHIP SOILS



UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Conservation Service

in cooperation with

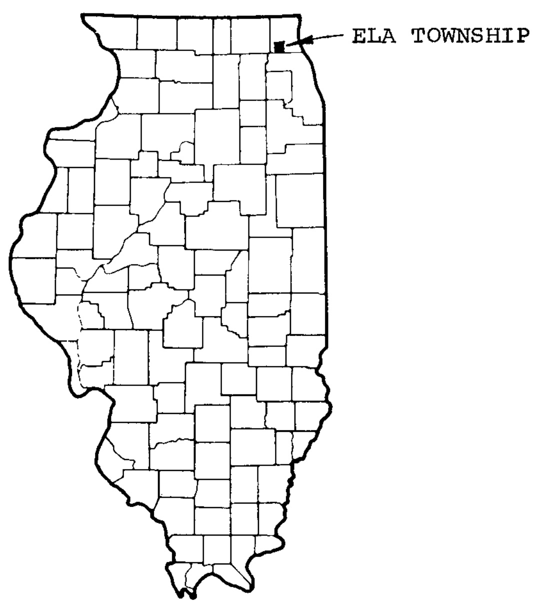
ELA AREA PLANNING BOARD

LAKE COUNTY REGIONAL PLANNING COMMISSION

LAKE COUNTY HEALTH DEPARTMENT

UNIVERSITY OF ILLINOIS AGRICULTURAL EXPERIMENT STATION

Issued 1961



LOCATION IN ILLINOIS

SOIL SURVEY OF ELA TOWNSHIP, LAKE COUNTY, ILLINOIS

Soils surveyed by Raymond L. Newbury, Lester J. Bushue, Emil E. Kubalek and John E. Paschke, Soil Conservation Service.

Field correlation by Lindo J. Bartelli, Soil Conservation Service, and Herman L. Wascher, University of Illinois Agricultural Experiment Station.

Report by Raymond L. Newbury, Lester J. Bushue, Emil E. Kubalek, Victor G. Link and John E. Paschke under the supervision of Lindo J. Bartelli, Soil Conservation Service.1/

Cover and art work for section headings by Robert Haymen, Lake County Regional Planning Commission.

The information in this release is based on investigations restricted principally to Ela Township. When the soil survey is complete for Lake County, the soils of Ela Township will be classified with the soils of the entire county and with the additional information that will then be available, some revision of soil names may be expedient.

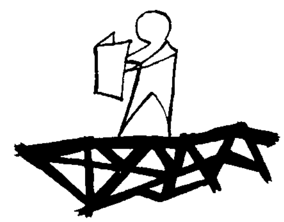
1/ Acknowledgment is due to Elmer E. Offerman, Francis Cleveland and Minott Silliman, Jr., of the Soil Conservation Service, John R. Quay and Robert C. Morris of the Lake County Regional Planning Commission, and John Morris of the Lake County Health Department for their contribution.

CONTENTS

See the back pages of this book for soil maps and legends.

CHAPTER I

INTRODUCTION



This report provides information about the soils of Ela Township, Lake County, Illinois. The information will be of interest and can be of help to many people who work with or have a concern about soils and soil materials.

In preparation for this report, soil scientists first walked over all of the land in Ela Township. They dug holes to a depth of five feet in order to examine and classify the soils. They also measured the degree of slope and evaluated soil erosion and wetness characteristics. The information was recorded on aerial photographs from which cartographers prepared the soil maps in the back of this report. Subsequently, each of the soils was described in the field.

All data obtained during field and laboratory studies of the soils were assembled and reviewed and selections made for inclusion in the report.

Soil interpretations were made based on research data and experience with the soils. These comprise the greater portion of this report and will be of more interest to most readers than the technical information included.

Field work was completed during 1960 and, unless otherwise stated, all information in this report refers to the conditions at that time.

HOW TO USE THE SOIL REPORT

Different readers will be interested in different parts of the report; however, for best comprehension, the information should be examined in the following sequence:

Examine the Soil Map

It is advisable for most readers to first examine the soil map in the back of the report. It shows the location and extent of the various soils.

To help locate a particular farm or tract of land, the cultural features such as roads, railroads, towns and farm houses will be helpful. Section boundaries, section numbers, and physical features such as streams, lakes, and ponds will also help.

After location is made, it will be found that any sizeable land area will have a number of different soil areas delineated. Each of these soil areas is referred to as a soil mapping unit and contains a symbol. The symbol on the map is the tool to be used throughout this report to help in locating desired information. All symbols appearing on the soil map are defined on the legend which accompanies the map.

It must be recognized that the boundaries between many soils are not sharp and that one soil tends to grade into another.

Study the Soil

After finding the symbols on any tract of land, turn to the appropriate soil descriptions. The table of contents will assist in finding the pages on which the description of a given soil occurs. Each soil description includes general statements about the soil type, a profile description of the soil by layers, and specific statements for each of the mapping units.

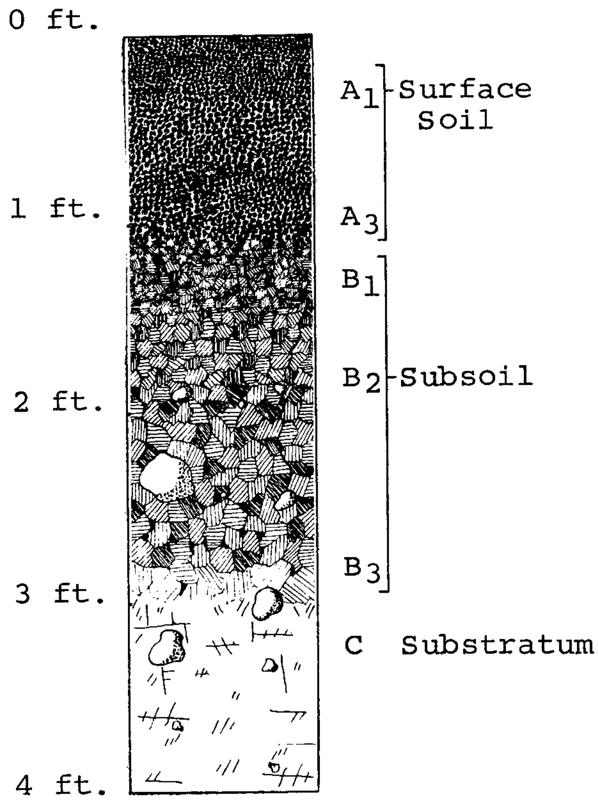


Figure 1. A schematic profile of Corwin loam showing the relationship and depth of the various horizons.

The soil profile is described by using a sketch similar to that in Figure 1. A soil profile has different layers or horizons, each of which can be described in terms of color, texture, structure, thickness and other characteristics. The major horizons are commonly named surface soil, subsoil, and substratum. However, within the major horizons, further subdivisions are made and are designated as A_1, B_1, B_3, etc. rather than with names. Some soils will have more horizons or fewer horizons than those given in the example in Figure 1.

In studying the soil descriptions, it should be understood that there are ranges in the properties and those given are most typical for the soils in Ela Township.

The soils were classified using a national system of classification. Those readers interested in the scheme of classification are referred to that section of this report.

Refer to the Soil Interpretations

Soil interpretations are made to aid in the understanding of how soils can be expected to react under a particular use and treatment. Past experience and study reveals that soil behavior differs from one soil to another.

Different kinds of interpretations are possible. In this report, interpretations are presented by general areas of interest such as agriculture, water management, wildlife, vegetative adaptability, engineering and land use planning. If data presented is taken from a specific study, the reference is given.

In making certain of the interpretations, it is recognized that a number of soils will react similarly. Therefore, several soil mapping units can be placed together into interpretive groups. No one grouping of the soils will serve all phases of interpretation; therefore, different groupings have been made. A key to the placement of all mapping units into the different interpretive groupings is found at the end of this report.

The section on soil management for agriculture brings together that interpretive information about the soils which is most relevant to the production of agricultural crops. Capability interpretations are made to point out the degree and kind of limitations the various soils have when used for agricultural purposes. Estimated crop yields are given. Information on the adaptability of various crops to different soils is also given.

The wildlife section presents that information about soils and water management which relates to wildlife habitat and the growing of food and cover plants for wildlife.

The section on non-agricultural plant materials compares the soils with respect to their capacity to provide adequate nutrients, water, air, and anchorage to trees, shrubs, and grasses. Only plants most often considered for use in landscape plantings are considered.

The water management section brings together that information which deals with the management of water within or over the soil. Irrigation and agricultural drainage guides present information on the feasibility, design, or function of irrigation and drainage installations. Soil landscape factors affecting surface water runoff or flooding hazard are discussed.

The engineering section provides information for making predictions concerning engineering properties of the soils. These interpretations are supplemented by data which has been collected as a result of laboratory studies.

The section on land use planning rates each soil mapping unit with respect to the limitations it presents for a given land use. The categories of land use considered are agricultural, residential, industrial, transportational, and recreational.

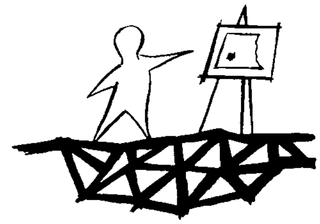
The soil maps and descriptions are somewhat generalized and, therefore, the data and interpretations need to be considered in a somewhat general way also. The information should be used only as a preliminary to more detailed study when specific information is wanted on the in-place condition of the soil material at a particular site. This is especially true in the consideration of the engineering properties of the soil as they may affect a structure's design and construction.

CHAPTER II

GENERAL NATURE OF ELA TOWNSHIP

Location

Ela Township is in the southwestern part of Lake County which is the northeastern most county in Illinois (Figure 2). The Township covers an area six miles square. Lake Zurich, the largest community, is 34 miles northwest of the Chicago loop.



Physiography

The Township lies within the physiographic division known as the Wheaton Morainic Country. As a result of recent glaciation, the land surface displays a typical example of "Kame and Kettle" topography in which small knobby hills and swampy depressions are combined in a highly irregular pattern.

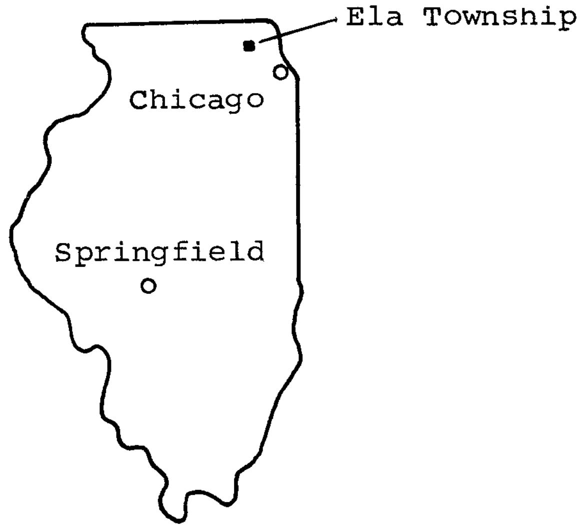


Figure 2. Location of Ela Township

The surface drainage pattern is not well developed. Numerous depressions tend to collect the surface runoff from adjacent slopes. Approximately the western one-third of the Township lies within the Fox River watershed and the remaining two-thirds lies in the watershed of the Des Plaines River. Lake Zurich, the only lake of any size, is a natural lake. Most other smaller lakes and ponds have been constructed.

Elevations range from about 910 feet above mean sea level in the north-west one-quarter of Section 4 to about 710 feet where the branches of Indian Creek leave the Township to the east.

Geology[1/]

During 1960, a reconnaissance geologic investigation was conducted in Ela Township at which time a series of borings ranging from twenty to fifty feet in depth were made at nine representative sites. Geologic literature was also studied.

The underlying bedrock is dolomite or dolomitic limestone of Silurian Age. No exposures of the bedrock were observed in Ela Township and rock was not encountered in any of the borings. The literature indicates that the bedrock lies between 150 and 300 feet below the surface.

Overlying the bedrock is a highly varied succession of materials which were deposited by continental ice sheets during the Glacial Ages (Pleistocene Epoch). These materials consist of coarse, cobbly gravels deposited by glacial meltwater, silty and clayey materials deposited by the glacial ice itself and uniform clayey materials deposited in shallow glacial lakes.

The predominant material encountered in the borings was a silty and clayey glacial till. Coarser textured glacial outwash deposits occur and are most common in the eastern and northeastern part of the township. An area of clayey lakebed deposits occurs in the east central part of the township.

The knolls in the "Kame and Kettle" topography in some places contain coarse gravelly materials. The depressions very often contain peat and muck deposits.

Climate[2/]

The climate of Ela Township can be best described by the following information pertaining to Lake County.

Lake County, at the northeastern corner of Illinois, lies adjacent to the western shore of Lake Michigan. Terrain is somewhat rolling in the west-central part of the county, rising to above 900 feet and sloping steadily to Lake Michigan which averages about 580 feet above mean sea level. A large portion of Fox Lake lies in the northwestern corner of the county.

The climate of Lake County is principally continental but is modified to some extent by Lake Michigan. During the warm season, there is frequently a lake breeze that reduces daytime temperatures as much as 10 degrees or more below temperatures farther inland. With light breezes, this effect only reaches a few miles into the county. In the winter, winds from the lake may bring relatively mild air to the county producing temperatures of perhaps 20 or 30 degrees above those resulting from northwesterly winds.

[1/] The information on geology is based on a report prepared by L. Pierard, Geologist, of the Soil Conservation Service.

[2/] The information on climate was prepared by R. W. Harms, Illinois State Climatologist, U. S. Weather Bureau.

Although the lake influence is greatest near the shore, comparisons between the mean annual temperatures of Antioch and Waukegan indicate less than one-half degree difference. Waukegan is slightly warmer because of the lake influence.

The lake influence also contributes appreciably to the moisture and cloudiness of the county, primarily the result of gradual upslope of terrain to the west. The average sunshine in summer is about 69 percent of that possible, and in winter about 45 percent.

Available county records from Antioch and Waukegan indicate maximum temperatures have reached 108 degrees in the summer and dropped to -24 degrees in the winter. Maximum monthly temperature averages about 58 degrees in the county compared with 38 degrees for the minimum monthly average. At Chicago Midway Airport, slightly south of the county, temperatures of 90 degrees or above occur about 26 days annually and temperatures below 32 degrees occur about 124 days annually. On an average, there are 7 days with minimum temperatures of zero or below each winter. At Waukegan, the average date of the last freeze in the spring is May 9 and the average date of the first freeze in the fall is October 11, giving an average growing season of about 154 days.

Around the Chicago area, the average depth of frost penetration is about 30 inches in the winter, with a maximum depth penetration to about 53 inches.

The annual precipitation for the county averages 32.3 inches. A fall of about 17 inches occurs during the growing season, May through September, which is an average of about 8-tenths of an inch per week and approximately 53 percent of the average annual total. The summer rainfall is practically all of the local shower type and, although drought conditions sometimes prevail, precipitation is ordinarily ample for the needs of vegetation. May and June are most generally the wettest months, each averaging almost 4 inches of rainfall with February being the driest at 1.4 inches. On the average, measurable precipitation falls on about one day in three. The greatest monthly total recorded was 10.62 inches in September 1945, and the least only a trace in October 1952. At Chicago Midway Airport, an average of 37 thunderstorm days occurs each year, mostly in the summer months. Spring and summer thunderstorm activity in northeastern Illinois is frequently accompanied by strong, gusty winds and, on occasion, hail or tornadoes.

In Lake County for any 24-hour period, a 3.6 inch rainfall may be expected to occur on the average of once each five years, a 4.4 inch rainfall once each 10 years, and a 7.2 inch rainfall once each 50 years.[1/] January is the month of greatest snowfall with the heaviest snows generally occurring in the hillier inland sections of the county. Extended periods of cold weather during the winter months often cause snow cover to remain for a considerable length of time.

Although Illinois ranks tenth in the United States in the number of tornadoes, only a few have occurred in Lake County in the past 40 years. Most of the tornadoes occur in the central and southern portions of the state. Chicago has been struck by tornadoes on seven occasions, five causing only comparatively small losses.

[1/] Taken from Technical Letter No. 1 (Rainfall Frequencies) Illinois State Water Survey - 1959. Huff, F. A. and Neil, J. C.

Most of the hail damage in this part of Illinois occurs in the spring and summer months between the hours of 2 and 8 p. m. As with tornadoes, the frequency of occurrence of hail is greatest in the south and central portions of the state. However, approximately 2 hail storms can be expected to occur at a given location in Lake County per year. Many of these storms are not damaging to crops or property as it is only on rare occasions that large-sized hail occurs.

Cultural Character

Ela Township, along with the entire county, is changing rapidly in its cultural character. It was originally developed by farmers for agricultural enterprises. More recently, especially since World War II, farm land is being converted to other uses, particularly residential areas.

Though the land area in farms is decreasing, agriculture is still of importance and presently is still a major land use. The type of agriculture is changing however. Dairy farming was once the predominant farm enterprise because of location with respect to the Chicago fluid milk market. Today, dairy farms are fewer in number and have been replaced to some extent by cash grain farms. High value specialty crops as truck crops and landscape planting stock are also being grown. One orchard of considerable size is located southwest of Lake Zurich.

The principal expanding land use development is for residential purposes. The greater part of the land, being so developed, is for estate type homesites greater than one acre in size. Small lot subdivisions, at present, are not very extensive and are mainly within or in close proximity to Lake Zurich and Forest Lake. The great majority of homes are constructed as year round, permanent residences and many are occupied by people who commute to larger urban centers to the east and southeast.

Lake Zurich is the only community of any size in the township which offers a concentration of shopping, business and service facilities. The Village of Lake Zurich is the only development serviced by a system of sanitary sewers. Industrial enterprises are few in number and expansion is limited at the present time. Recreational facilities such as boating, fishing, swimming, hunting, camping, golfing and picnicing, though not all in Ela Township, are to be found within Lake County.

Transportation facilities are considered good. The township is transected by U. S. Highway 12 and State Highways 22, 63 and 53. Many of the other roads have a black top surface. The Elgin, Joliet and Eastern Railroad provides freight service within the township. The Chicago and Northwestern Railway provides freight and passenger service from Barrington, which is in the extreme southwest corner of the township. Air transportation facilities, though not available within the township, are accessible within a relatively short distance.

In the township agricultural, residential, transportational, and to some extent, industrial and recreational facilities are intermingled and tend to compete with one another for land use. The trend in land use change can be exemplified by referring to Table 3. Land use figures for Lake County are given and may or may not conform to rate of change for Ela Township. Ela Township population figures are also given.

TABLE 1.--TEMPERATURE AND PRECIPITATION, LAKE COUNTY, ILLINOIS[1/]

Month	TEMPERATURE				PRECIPITATION			
	Average Daily Maximum	Average Daily Minimum	Highest (30 year record)	Lowest (30 year record)	Average Monthly Total	One Year In 10 Will Have: Less Than	One Year In 10 Will Have: More Than	Mean Monthly Snowfall
					Inches	Inches	Inches	
January	32	15	64	-23	2.0	.7	3.0	8.5
February	34	17	66	-24	1.4	.3	2.4	5.8
March	43	26	83	-14	2.7	1.2	3.8	6.7
April	56	36	92	11	2.9	1.2	5.5	1.3
May	67	45	95	26	3.9	1.2	6.4	.1
June	77	56	105	32	3.9	2.1	6.1	0
July	83	61	108	41	2.8	.8	5.4	0
August	82	60	101	40	3.0	1.1	8.0	0
September	74	53	103	27	3.3	1.0	8.4	0
October	63	42	89	11	2.0	.3	4.7	.1
November	47	30	80	-5	2.4	.8	4.9	2.3
December	34	19	66	-20	2.0	.6	2.9	5.9
Year	58	38	108	-24	32.3	22.2	41.9	30.3

[1/] All data from Lake County, Illinois, records (Antioch, 1902-22, 41-52; Waukegan 1923-52).

TABLE 2.--PROBABILITIES OF LAST FREEZING TEMPERATURES IN SPRING AND FIRST IN FALL

Lake County, Illinois[1/]

PROBABILITY	DATES FOR GIVEN PROBABILITY AND TEMPERATURE				
	16°F.	20°F.	24°F.	28°F.	32°F.
Spring					
1 year in 10 later than:	April 1	April 14	April 21	May 8	May 24
2 years in 10 later than:	March 26	April 7	April 15	May 3	May 19
5 years in 10 later than:	March 16	March 26	April 4	April 23	May 5
Fall					
1 year in 10 earlier than:	November 6	October 28	October 20	October 8	September 23
2 years in 10 earlier than:	November 10	November 3	October 26	October 14	September 30
5 years in 10 earlier than:	November 23	November 14	November 5	October 25	October 11

[1/]All data from Waukegan, Lake County, Illinois; furnished as of March 1961 by R. W. Harms, Illinois State Climatologist, U. S. Weather Bureau.

TABLE 3.--LAND USE AND POPULATION

	1930	1940	1945	1950	1955	1960	1975[1]
Lake County[2]							
Land Use (acres)							
(a) Agricultural	--	--	194,926	173,100	151,567	139,127	104,935
(b) Non-Agricultural	--	--	97,554	119,380	140,913	153,353	187,545
(c) County Total	--	--	292,480	292,480	292,480	292,480	292,480
Ela Township[3]							
Population	1,306	1,826	--	3,593	--	8,325	

[1]1975 land use prediction of the 1958 Conservation Needs Inventory by the U. S. Department of Agriculture.

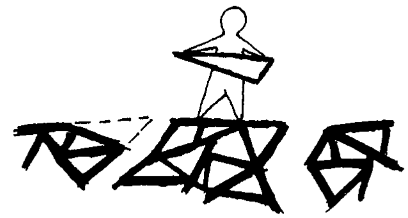
[2]Lake County land use for the years 1945 through 1960 as reported by the U. S. Department of Commerce, Bureau of Census.

[3]Ela Township population according to information provided by the Lake County Regional Planning Commission.

CHAPTER III

GENERALIZED SOIL AREAS

In traveling over the township or any sizeable portion of it, it becomes noticeable that the general soil landscape of one area will differ from that in another area. Some differences are very obvious such as the steepness and length of slopes, the degree of wetness and concentration of wet areas, and the kind of natural vegetation. Beyond these more obvious features, there are less easily noticed soil landscape characteristics.



By using the detailed soil maps, it was possible to draw out general areas which have a relatively uniform pattern of recurring soils. Such a map is called a generalized soil map and the delineations are referred to as general soil areas. These areas are described in terms of their general character and the soils which predominate in them. Such a map is useful to those who want a general impression of the soil landscape and want to compare broad areas within the township.

There are eight different general soil areas in Ela Township. Their approximate location and extent are shown on the general soil map and each of the areas is briefly described in the map legend. Further description and general interpretive statements for each of the areas follow:

General Soil Area 1

<u>Houghton-Otter-Sawmill Association</u>

Areas of this association are scattered over the township and exist in relatively small bodies. The areas occur on floodplains or as depressions in the uplands. The majority of the areas contain muck of which the Houghton soils are most prevalent. Along Indian and Buffalo Creeks in the eastern portions of the township, the soils are predominantly alluvial with Otter and Sawmill being the most extensive. The majority of all the areas are swampy or have water tables within three feet of the surface during most of the year. Those few areas which have been artificially drained are subject to seasonal high water tables. All areas are subjected to flooding or ponding during periods of intense rainfall.

Agriculturally, these areas have little value in their naturally wet state. However, after adequate drainage and/or protection from flooding, they become suited for certain crops, especially most truck and row crops.

Many of the soils in these areas because of low load-bearing capacity and wetness, present serious limitations for all types of construction. The muck soils for some uses require excavation, followed by replacement with mineral soil materials. Septic tank installations normally will prove unsatisfactory.

Wildlife, especially aquatic species, tend to be attracted to these areas due to the accessibility of water. Certain of the areas have potential for dug ponds but investigation of each site is needed.

General Soil Area 2

Symerton-Corwin Association

These areas are principally undulating to nearly level. The soils are dark colored and were formed from medium textured glacial deposits most of which have an underlying silty clay loam glacial till within five feet. Symerton, Andres and Corwin soils cover seventy to eighty-five percent of the landscape in these areas. The remaining fifteen to thirty percent of these areas contain soils such as Pella, moderately fine substratum, and Peotone which occupy the lower points in the landscape and are subject to a seasonal high water table, local overflow or ponding. A major portion of these low-lying soils have been artificially drained with agricultural tile.

Agriculturally, these areas are well adapted for most agricultural crops and can be safely used for such if relatively simple, soil and water management practices are used.

The upland portion of the soil landscape presents no serious limitations to urban development or the installation of transportation facilities. Septic tanks will normally function satisfactorily if installations are adequately designed and installed. The low-lying sites present problems mainly related to wetness which need to be recognized. It is well to avoid most types of construction or septic tank installation in these low areas unless adequate water management is provided for.

In general, the soil landscape presents no serious limitation to most types of recreation, although for some, it may not be the most desirable because of the lack of relief. Pond construction without on-site investigation is risky because coarse material may be within five feet from the surface.

General Soil Area 3

Tuscola-Grays Association

These areas are primarily undulating to gently rolling. The soils were formed from medium-textured glacial deposits, most of which are underlain by silty clay loam glacial till within a depth of five feet. Eighty to ninety percent of the areas are made up of light-colored soils of the uplands, such as Tuscola, moderately fine substratum and Grays. The remaining ten to twenty percent consists of level to depressional soils such as Pella, moderately fine substratum, which occurs in the lower parts of the landscape. Many of the low-lying soil areas have been artificially drained but still are subject to a seasonal high water table and runoff, from adjacent sloping areas.

Agriculturally, these general soil areas are moderately well adapted for cropping. Relatively intense erosion and water management practices are needed for sustained productivity.

There are no serious limitations for urban development or installation of transportation facilities over most of the upland areas. Septic tanks can normally be expected to function satisfactorily if cut sand fills are avoided and if adequate design and installation are obtained. The low-lying areas present problems related to wetness. Adequate methods of water management are needed for most types of construction within these low areas. Septic tanks may give trouble due to seasonal high water tables.

Many types of recreation are readily adapted to these areas. Construction of ponds should not be attempted without on-site investigation.

General Soil Area 4

Elliott-Martinton Association

Nearly level dark colored soils formed from silty clay loam glacial till or lakebed deposits predominate in these areas. Minor areas have silty clay till deeper but within a depth of five feet. Sixty-five to eighty percent of the areas are made up of upland soils such as Elliott or Martinton. Low-lying soils such as Pella, moderately fine substratum, Peotone or Bonpas occur in the remaining twenty to thirty-five percent of the areas and, for the most part, have been artificially drained. However, they are subject to seasonal high water tables and tend to receive some surface runoff water from upland areas.

Agriculturally, these areas are well adapted for most agricultural crops and can be used for such if relatively simple erosion and water management practices are used. Maintaining adequate drainage is of primary importance.

These areas present limitations to urban development which need to be recognized. It is mainly the wetness characteristics of the landscape which needs adequate attention. Generally, septic tank systems are apt to prove faulty, especially during the wet seasons of the year.

Those types of recreation which can utilize the low relief and can tolerate seasonal wetness are adapted to these areas. Normally, constructed ponds can be expected to hold water but each proposed pond site should be investigated before construction.

General Soil Area 5

Varna-Elliott Association

These areas are undulating or gently sloping. The soils are dark colored and were formed from silty clay loam glacial till. Eighty to ninety percent of the areas consist of upland soils such as Varna and Elliott. The other ten to twenty percent are low-lying soils such as Pella, moderately fine substratum, Peotone or Ashkum. For the most part, these low-lying areas are artificially drained but are still subject to occasional high water tables and tend to receive surface runoff water.

These areas are moderately well suited for cropping. Relatively intense soil and water management practices are needed in order to maintain productivity.

There are moderate limitations to urban development and the installation of transportation facilities which need to be recognized over much of the upland areas. Over much of the upland, septic tank systems may function providing installations are adequate. The low-lying areas present wetness problems which need adequate water management treatment.

Some forms of recreation are easily adapted to these general soil areas. Pond sites occur but investigation of each site is needed.

General Soil Area 6

Morley-Beecher Association

These areas are primarily undulating to gently rolling. Eighty to ninety percent of the areas are light colored soils such as Morley, Markham and Beecher which occur on the upland and have developed in silty clay loam glacial materials. Ten to twenty percent of the area are low-lying soils such as Pella, moderately fine substratum, Ashkum or Peotone which tend to receive surface water runoff from adjacent slopes. A high proportion of these low-lying soils have agricultural tile drainage systems installed.

These areas are moderately well suited for cropping. Relatively intense soil and water management practices are needed in order to maintain the soil.

There are some limitations in these areas for urban developments and transportation facilities. The topography often requires considerable cut and fill operations. Septic tanks may function in the majority of the soils in upland areas providing installations are adequately installed. The low-lying areas have seasonal wetness problems which need to be recognized and overcome.

These areas are readily adapted to many forms of recreation. There are potential pond sites but each will need investigation by experienced personnel.

General Soil Area 7

Blount-Morley Association

These areas are principally undulating to nearly level. Most of the soils are light colored and were developed in silty clay loam glacial till. Minor amounts of dark colored soils are included which developed in silty clay till or are underlain with silty clay till below a depth of four feet. Eighty to ninety percent of the areas are upland soils such as the Blount, Beecher or Morley soils which have a degree of wetness which is generally hard to remove. The remaining ten to twenty percent of the areas contain low-lying soils such as Pella, moderately fine substratum, Peotone or Ashkum which tend to receive runoff water from adjoining sloping land. Agricultural drainage systems are installed over many of the areas.

These areas are only moderately well adapted to cropping. Water management is the greatest problem as the soils tend to remain wet during wet seasons.

For urban development and construction of transportation facilities, wetness is a problem that is hard to overcome. Septic tank systems normally do not function adequately.

Certain forms of recreation are adapted to these general soil areas. Pond sites occur but investigation of each site is needed.

General Soil Area 8

Morley-Varna Association

These areas are primarily gently rolling to hilly. The soils are mixed light and dark colored and the majority were formed from silty clay loam glacial till. Included are minor areas of soils which are underlain by silty clay material at a depth of about four feet. Eighty-five to ninety-five percent of the areas are upland soils such as Morley, Markham or Varna. The remaining five to fifteen percent are low-lying or depressional soils such as Ashkum, Peotone or Pella, moderately fine substratum, some of which have been drained artificially and all of which tend to receive surface runoff from adjacent slopes.

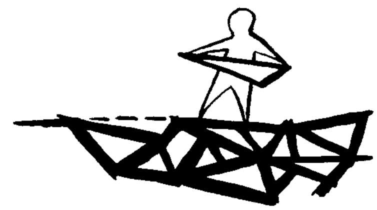
These soils are not well suited to crops. If used as such they require limited row cropping with the intensive use of soil and water management practices.

Urban development and transportation facilities have limitations. Steepness of slopes may be restricting. Septic tanks may function in the majority of the soils of the upland areas providing adequate design is followed.

Many types of recreation are adaptable to these general soil areas. Good pond sites occur but investigation of each site is needed.

CHAPTER IV

SOIL FORMATION AND CLASSIFICATION



"Soil may be broadly defined as the unconsolidated surface layer of the earth in which plants grow. "A Soil" may be defined as an individual three-dimensional body on the earth's surface which can be distinguished from unlike adjacent bodies.

The soil at any one location has internal and external characteristics that can be identified and defined within reasonable ranges of expression. The soil at another location will have characteristics which may be very similar or very different. Each soil has its own unique set of characteristics. The characteristics which distinguish one soil and, thereby, separate it from another soil are the result of the combined influence of living organisms and climate acting on parent material as conditioned by relief over a period of time. These forces are known as the soil forming factors.

Soil Formation

The nature of the soil at any one place is the product of all the soil-forming factors working together. Different soils are formed when the soil-forming factors vary in their degree of influence of each from place to place. Each may vary independently from the other. As a result, there may be hundreds of different soils in an area as large as a state or as few as two or three on a 160-acre farm. The different soils that result from the various combinations of soil-forming factors are not scattered at random across the landscape. Within a geographic area each soil tends to occur in a pattern with other soils. In Ela Township, the five soil-forming factors have combined to form many recognizable soils which are grouped into twenty nine soil series.

Parent Material

The soils of Ela Township have developed from three major kinds of parent material. These are glacial deposits, stream deposits, and organic deposits. Of the three, glacial materials are the most extensive and more soils have formed from them than from stream laid or organic deposits.

The glacial materials in Ela Township and the surrounding area were deposited during the Cary substage of the Wisconsin glaciation. They occur as a complex pattern of till and outwash with some lake-laid material. Varying thicknesses of the outwash, usually stratified, frequently occur as an overburden on the till, which is unstratified. Wind deposited silty materials, called loess, are a minor parent material in Ela Township. The loess ranges up to two feet in thickness in places and overlies other parent material. In normally developed soils in this area, less than one-half of the solum has developed in loess. The underlying unweathered drift is calcareous and has a wide range in texture.

The major portion of this drift ranges in texture from loam to silty clay with occasional thin layers or small areas of gravel, sand, and clay. The drift may be leached of calcium carbonates in its upper part. The coarser materials tend to be leached most deeply. The soils developed in the drift are considered to be relatively young. However, they exhibit recognizable profile development.

The parent material for the alluvial soils in Ela Township is primarily medium and moderately fine textured recent stream sediments. At one time much of the material existed as surface horizons of soils at higher elevations and, as such, was leached of carbonates and was silty in texture. Since the erosion process is not entirely selective, the silt was mixed with small amounts of gravel, sand, and clay before being redeposited. Differences in the various layers are due primarily to varying amounts of organic matter, different kinds and degrees of structure, and some thin layers of contrasting texture due to stratification during its deposition. Two textural separations are made in the alluvial parent material in Ela Township. The Otter series is developed in loam and silt loam sediments and the Sawmill is developed in silty clay loam sediments. Alluvial soils,because of their youthfulness, lack well-developed genetic horizons.

The organic deposits formed from the accumulated remains of water tolerant reed and sedge vegetation. Two kinds of organic deposits are recognized and separated. Houghton muck is formed from organic deposits at least 39 inches deep and are now neutral to slightly acid in reaction. Rollin muck is formed in organic deposits which are underlain by marl or some other calcareous mineral material at a depth of 12 to 38 inches.

Relief

Ela Township lies in the Wheaton Morainal Country in the Great Lakes section of the Central Lowland Province (6). The level to steep topography is complex in detail and has a pronounced effect on the natural drainage features of the area.

Relief influences soil formation by its effect on the air and water relationships in the soil and also by its effect on the degree of erosion. Soils of the low areas with little relief are usually poorly drained and erosion has had little or no effect on soil development. Siltation often occurs on the soils in these areas. In the uplands where the topography is rolling, the soils are usually moderately well or well drained. Surface water runoff has removed varying amounts of surface soil material.

Poorly drained soils of the level and depressional areas in Ela Township have extremely dark surface horizons, gray and mottled subsoils and weakly developed soil horizons. The well drained soils on the rolling ridge tops in contrast, have browner colors throughout and the subsoils are only slightly mottled. The soil horizons are also more distinct. On steep slopes, where runoff has been rapid and geologic erosion has nearly kept pace with soil formation, the soils are thin and have only weak horizonation.

Poorly drained soils may grade to well drained soils over a distance of a few feet or many rods. Intermediate drainage conditions resulting from the effects of relief are common. In some places the texture of the parent material may override the slope influence in determining natural drainage of some soils. Finer textures restrict drainage. When the texture of the parent material varies as widely as it does in Ela Township, it is not unusual to find moderately well drained soils on nearly level areas and somewhat poorly drained soils on sloping areas.

Vegetation

Ela Township is located on the northeast edge of the great central prairies of the North American Continent. Some of the soils have developed under the influence of grasses and others under the influence of trees with minor amounts developed under both kinds of vegetation.

The soils that developed under grasses are classified into three Great Soil Groups: Brunizems, Humic Gleys, and Bog Soils. The Brunizems are characterized by a thick, dark surface horizon and a brown mottled subsoil. They are usually mildly acid in the surface and subsoil. Soil development has progressed to the stage where the B horizon is significantly higher in clay content than the A horizon. The Humic Gley soils also have a thick dark surface horizon but the subsoil colors are gray and olive gray in contrast to the brown colors that predominate in the Brunizem soils. The Humic Gley soils have formed under the influence of a high water table and greatly restricted internal drainage. Because of this restricted drainage, much less water has percolated through the soil profile and, consequently, only a small amount of clay has been translocated from the A to the B horizon. Profile development has been slight and leaching of carbonates has been slow; therefore, the subsoil usually is neutral to alkaline in reaction. The Bog soils have thick, black, fibrous, muck and peaty muck layers that are neutral to calcareous in reaction. The calcareous mucks have marl deposits at depths of 12 to 39 inches.

The soils developed under forest vegetation in Ela Township belong to the Gray-Brown Podzolic great soil group. They have relatively light colored A_1 horizons which are low in organic matter, medium acid and medium textured. They have lighter colored intensely leached A_2 horizons below the A_1. The B horizons of these soils are medium acid, very low in organic matter, and are grayish brown in color with yellowish brown mottles. They have accumulated clay from the A_1 and A_2 horizons and therefore are finer textured.

The boundary between soils developed under a grass vegetation and those developed under a forest vegetation is generally not sharply defined. Climate is one factor which determines the type of native vegetation for a given area. The climate is not considered to have been stable for Ela Township during the period of soil formation. There were periods when it was more humid and moist than average and, during these times, the forest invaded the prairie. During drier times, the forests receded and prairie grasses again dominated. As a result, the soils in this vegetative tension zone have characteristics related to both types of vegetation.

The native vegetation for the prairie areas of Ela Township was mainly big bluestem (Andropogon furcatus), little bluestem (Andropogon scorparius), and indian grass (Sporghastrum nutans) on the better drained areas. Slough grass (Spartina pectinata) and switch grass (Panicum virgratum) predominated in the more poorly drained areas. The native forest species were mainly mixed oak and hickory with some elm, ash, black walnut, basswood and soft and hard maple.

The Alluvial soils of Ela Township are dark colored, relatively youthful soils that have not yet developed any significant characteristics resulting from the influence of vegetation as a soil-forming factor.

Their dark color is mostly inherited from their parent material which washed from the surface horizons of dark soils occurring at higher elevations.

Climate

Although climate has been a relatively uniform influence on soil formation this influence has played an important part in soil formation across Ela Township. The general climate is of the continental type, modified some by the nearness of Lake Michigan. This type of climate is characterized by warm humid summers and cold winters.

The most important direct effects of climate on soil formation are on the weathering of rocks and the alternation of parent material. In Ela Township, the net climatic effect on soil formation has in general caused (a) leaching of the calcium carbonate from the A and B horizons, (b) slight to moderate removal of bases from the A and B horizons and replacement by equivalent amounts of hydrogen, (c) slight to moderate removal of iron and aluminum from the sola and a proportionate increase in silicon and (d) moderate amounts of fine clay formation and accumulation in the B horizons (22).

Indirectly, the climate has influenced soil formation by affecting (a) the type of vegetation growing on the soils, (b) freezing and thawing action, (c) wetting and drying action, (d) the amount of erosion on sloping soils, (e) soil temperature and (f) the amount and distribution of rainfall.

Time

Time is a necessary factor for the development of all soils from parent materials. It has been estimated from radiocarbon dating that the Cary drift was deposited from 13,000 to 14,000 years ago. One cannot make any useful statement in terms of years however, regarding the general rate of soil formation. The age of a soil is judged by the degree of horizonation of its profile. Youthful soils generally have weak or indistinct horizons with only slight differences in texture, mineralogy, chemistry, or structure. In contrast, older soils have distinct genetic horizons with evident boundaries and observable differences in characteristics between the horizons.

The degree of horizon development is largely dependent on the amount of water percolating through the soil and by the rate of weathering of the minerals. Usually, the more water that has percolated through the soil, the more distinct are the horizons. The rate of weathering is related to the kind of minerals and the climate. Weathering of the soil minerals is more rapid in a warm humid climate than in a cool dry climate.

The Alluvial and Bog soils of Ela Township are young because they occur in areas which have received fresh, recent deposits of parent material and they have not had time to develop distinct horizons. The Chatsworth soil, a Regosol, is young because it occurs on steep slopes where geologic erosion has kept pace with horizon development. The Humic Gley soils are young because they have had a high water table which restricts water percolation. The Brunizem and Gray-Brown Podzolic soils which have formed on the Cary glacial drift have the greatest degree of horizonation of any of the soils of Ela Township. They are relatively youthful soils, however, when compared to soils which have formed in older geologic deposits and which have developed more distinct horizons.

Soil Classification

Soils may be grouped in different ways to show their relationship to one another. The national system of soil classification used here is one that is based on natural soil properties such as color, texture and thickness of horizons and kinds and amounts of minerals present in the soil. This kind of grouping is referred to as a natural system of soil classification.

The smallest unit in the natural classification of soils is the soil type. It includes soils that have essentially the same kind, thickness and arrangements of horizons. The soil type is often further subdivided into phases to show additional land features significant to agricultural use such as differences in slope, wetness conditions, and degree of erosion.

A soil series is a group of soil types that differ only in the texture of the surface soil and the kinds of layers below the solum. Soil series are usually named for a geographic location near the place where they were first identified or mapped.

Soil series that have common major profile features are classified into great soil groups. All soil series within a great soil group have the same number and kinds of principal horizons in the same sequence but the horizons may vary in thickness or the degree of development. The great soil groups that occur in Ela Township are (a) Gray-Brown Podzolic soils, (b) Brunizems, (c) Humic Gleys, (d) Bog soils, (e) Alluvial Soils and (f) Regosols. The soil series which have been influenced by both grass and forest vegetation have some properties common to both the Gray-Brown Podzolic and Brunizem great soil groups are are considered to be intergrading from one to the other. Table 4 places the soils of Ela Township into appropriate great soil groups. The soil descriptions in Chapter V are also in alphabetical sequence under the appropriate great soil group heading.

TABLE 4.--CLASSIFICATION OF SOIL SERIES BY GREAT SOIL GROUPS

GREAT SOIL GROUP	SERIES
Gray-Brown Podzolic Soils	Blount Del Rey Morley Tuscola
Gray-Brown Podzolic Soils intergrading to Brunizems	Beecher Frankfort Grays Markham Wauconda
Brunizems	Andres Corwin Elliott Gilmer LaRose Martinton Odell Swygert Symerton Varna
Humic Gleys	Ashkum Bonpas Harpster Pella Peotone
Bog Soils	Houghton Rollin
Alluvial Soils	Otter Sawmill
Regosols intergrading to Gray-Brown Podzolic Soils	Chatsworth

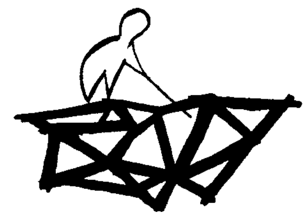
TABLE 5.--SOILS OF ELA TOWNSHIP, LAKE COUNTY, SHOWING NATURAL DRAINAGE AND PARENT MATERIAL RELATIONSHIPS WITHIN GREAT SOIL GROUPS

PARENT MATERIAL	GREAT SOIL GROUPS											
	Regosols Intergrading to Gray-Brown Podzolic Soils	Gray-Brown Podzolic Soils		Gray-Brown Podzolic Soils Intergrading to Brunizems		Brunizems			Humic Gleys		Alluvial Soils	Bog Soils
	Variable Drainage	Well or Moderately Well Drained	Imperfectly Drained	Well or Moderately Well Drained	Imperfectly Drained	Well Drained	Moderately Well Drained	Imperfectly Drained	Poorly Drained	Very Poorly Drained	Poorly Drained	Very Poorly Drained
Wisconsin Age (Cary) silty clay glacial till having no more than 20 inches of loamy overburden. (More than 1/3 of the B horizon has developed from the silty clay till.)	Chatsworth				Frankfort			Swygert				
Wisconsin Age (Cary) silty clay glacial till having greater than 20 inches of loamy overburden. (More than 2/3 of the B horizon has developed from the loamy overburden.)					Wauconda, fine substratum	Symerton, fine substratum	Symerton, fine substratum	Andres, fine substratum				
Wisconsin Age (Cary) silty clay loam glacial till having no more than 20 inches of loamy overburden. (More than 1/3 of the B horizon has developed from the silty clay loam till.)	Chatsworth	Morley	Blount	Markham	Beecher	Varna	Varna	Elliott	Ashkum	Peotone		
Wisconsin Age (Cary) silty clay loam glacial till having greater than 20 inches of loamy overburden. (More than 2/3 of the B horizon has developed from the loamy overburden.)		Tuscola moderately fine sub-stratum		Grays, moderately fine substratum	Wauconda, moderately fine substratum	Symerton	Symerton	Andres	Pella, moderately fine substratum	Peotone		
Wisconsin Age (Cary) loam glacial till. (Solum thickness is less than 24 inches.)						LaRose						
Wisconsin Age (Cary) loam glacial till. (Solum thickness is 24 to 40 inches.)							Corwin	Odell				
Silty clay loam, water deposited lakebed material.		Del Rey, brown subsoil variant					Gilmer	Martinton	Bonpas			
Silt loam to gravelly sandy loam water deposited material, occasionally containing strata of sand or gravel. (Solum thickness is 24 to 40 inches.)		Tuscola		Grays	Wauconda	Symerton, loamy substratum	Symerton, loamy substratum	Andres, loamy substratum	[1] Pella Harpster	Peotone		
Silt loam to loam recent alluvium, occasionally containing strata of muck and coarser or finer textured material.											Otter	
Silty clay loam recent alluvium, occasionally containing strata of silt loam or loam material.											Sawmill	
Organic deposits, neutral to slightly acid, more than 39 inches deep.												Houghton
Organic deposits, alkaline, 12 to 39 inches deep and underlain by marl.												Rollin

[1] Harpster is calcareous throughout the profile whereas Dunham is not.

CHAPTER V

SOIL DESCRIPTIONS



One hundred nineteen different soils were mapped in Ela Township. The soil mapping units are described in detail. The system of soil classification used by soil scientists is discussed in the preceeding chapter entitled "Soil Formation and Classification." In using the profile descriptions of the soils, it must be recognized that each is characterized by a range of properties and the descriptions portray the characteristics that are most typical.

A brief descriptive statement is provided for each of the Great Soil Groups and for the soil series. A profile is described in technical terms for each soil type and a drawing is presented to aid in obtaining a concept of what the soil is like. In addition, each soil mapping unit is discussed. In order to obtain a complete knowledge of a soil, it is necessary to study a description of the appropriate Great Soil Group, soil series, soil type, and soil mapping unit.

A few areas have been disturbed by earth-moving equipment to the point where it was impossible to entirely classify the units. These areas have been designated as "borrow areas" and "made land" and are discussed at the end of the chapter.

Gray-Brown Podzolic Soils

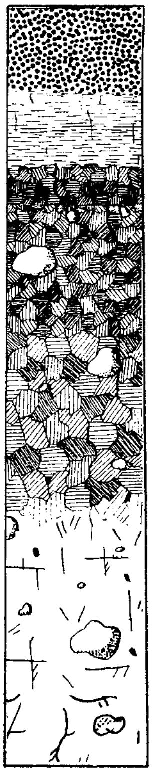
The Gray-Brown Podzolic soils were developed under a forest of deciduous trees. In the natural state, these soils have a thin dark upper A horizon and a grayish leached lower A horizon; clay-enriched B horizons that are grayish brown throughout or mottled gray, yellow, and brown in the upper and/or lower part; and C horizons composed of material weathered to a slight degree and usually like that from which the upper horizons have developed.

The Ela Township soils that are classified as Gray-Brown Podzolic soils are the Blount series, the Del Ray, brown subsoil variant, the Morley series and the Tuscola series.

Blount Series

The soils of the Blount series are deep, light colored, Gray-Brown Podzolic soils that have developed from Wisconsin Age silty clay loam textured glacial till. They are naturally imperfectly drained, have slow permeability and have moderate moisture holding capacity.

Typical Profile--Blount Silt Loam



A_1	(0-5")	Very dark grayish brown (10YR 3/2)1/ friable silt loam with weak fine granular structure. Slightly acid to neutral.
A_2	(5-10")	Brown (10YR 5/3) friable silt loam with weak medium platy structure, slightly acid.
B_1	(10-13")	Dark grayish brown (10YR 4/2) firm silty clay loam with few fine faint yellowish brown (10YR 5/4) mottles. Moderate fine subangular blocky structure. Slightly acid.
B_2	(13-29")	Dark grayish brown (10YR 4/2) firm heavy silty clay loam with common fine faint yellowish brown (10YR 5/6) mottles. Moderate fine to medium angular blocky structure, medium acid.
B_3	(29-32")	Dark grayish brown (2.5Y 4/2) firm heavy silty clay loam with common medium distinct yellowish brown (10YR 5/6) mottles. Moderate medium angular blocky structure. Slightly acid to neutral.
C	(32-60")	Grayish brown (2.5Y 5/2) firm silty clay loam with many fine distinct yellowish brown (10YR 5/6 and 10YR 5/8) mottles. Massive. Calcareous.

Mapping Units

23A Blount silt loam, 0 to 2 percent slopes. The profile of this mapping unit is similar to the typical one described. In some areas, the A_1 and A_2 horizons are mixed because of cultivation. Small areas of the Beecher and Ashkum soils are inclusions because they were impractical to delineate on the soil maps.

23B Blount silt loam, 2 to 4 percent slopes. The typical profile described is representative of this mapping unit; however, some areas have been cultivated which has caused mixing of the A_1 and A_2 horizons. In some of the areas, small spots of the Morley or Ashkum soils or moderately eroded spots are inclusions.

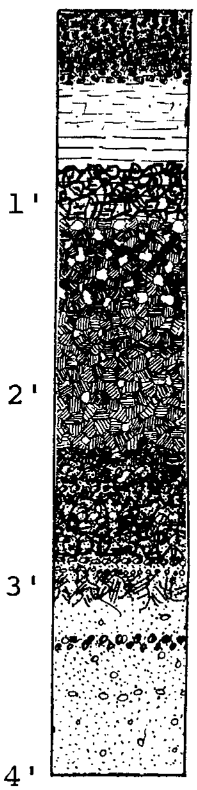
23B2 Blount silt loam, 2 to 4 percent slopes, moderately eroded. The soil of this mapping unit differs from the typical profile described in that the A_1 and A_2 horizons are mixed with a small amount of B horizon material to form a 6 to 8 inch plow layer. The depth to the C horizon is 24 to 28 inches in most cases. Small areas of the Morley or Beecher and spots that are severely or slightly eroded are inclusions that were not practical to delineate on the soil map.

1/ This symbol and others like it refer to Munsell color notations and are for moist soil.

Del Rey, Brown Subsoil Variant

The Del Rey, brown subsoil variant are deep, light colored Gray-Brown Podzolic soils that have developed from silty clay loam glacial outwash or lakebed sediments of Wisconsin Age. They are naturally moderately well drained, have moderately slow permeability and have high moisture-holding capacity.

Typical Profile--Del Rey Silt Loam, brown subsoil variant.



A_1	(0-4")	Very dark brown (10YR 2/2) friable silt loam with moderate fine granular structure. Slightly acid.
A_2	(4-10")	Brown (10YR 5/3) friable silt loam with weak fine platy structure. Slightly acid.
B_1	(10-14")	Yellowish brown (10YR 5/4) firm silty clay loam with moderate fine subangular blocky structure. Medium acid.
B_{21}	(14-26")	Brown (10YR 4/3) firm light silty clay loam with moderate fine subangular blocky structure. Medium acid.
B_{22}	(26-36")	Dark grayish brown (10YR 4/2) very firm light silty clay with few fine faint yellowish brown (10YR 5/4) mottles. Moderate fine angular blocky structure. Slightly acid.
B_3	(36-40")	Dark grayish brown (10YR 4/2) firm heavy silty clay loam with common medium distinct yellowish brown (10YR 5/6) mottles. Neutral in reaction.
C	(40-60")	Grayish brown (2.5Y 5/2) firm silty clay loam with many medium distinct yellowish brown (10YR 5/6) mottles. Moderate medium angular blocky structure grading to massive but tending to fracture along horizontal planes. Calcareous.

Mapping Units

192B Del Rey silt loam, brown subsoil variant, 2 to 4 percent slopes. The soil of this mapping unit is similar to the typical profile described. The A_1 and A_2 horizons are mixed in some areas due to agricultural cultivation. Small unmapped areas of the Morley or Tuscola, moderately fine substratum soils are inclusions. Small areas that are moderately eroded are inclusions.

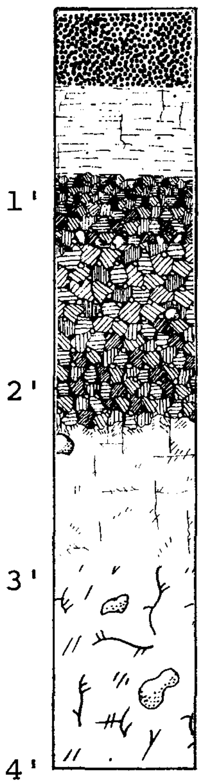
192C Del Rey silt loam, brown subsoil variant, 4 to 7 percent slopes. The soil of this mapping unit is similar to the typical profile described. The A_1 and A_2 horizons are mixed in some areas due to agricultural cultivation. Small unmapped areas of the Morley or Tuscola, moderately fine substratum soils are inclusions. Small areas that are moderately eroded are inclusions.

192C2 Del Rey silt loam, brown subsoil variant, 4 to 7 percent slopes, moderately eroded. The soil of this mapping unit differs from the typical profile described in that the A_1 and A_2 horizons are mixed with a small amount of the B horizon material. Also, the depth to the C horizon is 28 to 34 inches in most cases. Small unmapped areas of the Morley and Tuscola, moderately fine substratum soils are inclusions. Small areas that are severely eroded are inclusions.

Morley Series

The soils of the Morley series are deep, light colored, Gray-Brown Podzolic soils that have developed from silty clay loam textured glacial till of Wisconsin Age. They are naturally moderately well drained and have moderately slow permeability and moderate moisture-holding capacity.

Typical Profile--Morley Silt Loam



A_1	(0-4")	Very dark brown (10YR 2/2 very friable silt loam with weak fine granular structure. Slightly acid.
A_2	(4-10")	Grayish brown (10YR 5/2) very friable silt loam with weak medium platy structure. Slightly acid.
B_1	(10-13")	Brown (10YR 5/3) friable light silty clay loam with moderate fine subangular blocky structure. Slightly acid.
B_{21}	(13-19")	Dark yellowish brown (10YR 4/4) firm silty clay loam with moderate fine subangular blocky structure. Medium acid.
B_{22}	(19-25")	Brown (10YR 4/3) very firm heavy silty clay loam with few fine distinct yellowish brown (10YR 5/6) mottles. Moderate fine angular blocky structure. Medium acid. Many stones present.
B_3	(25-29")	Dark grayish brown (2.5Y 4/2) very firm silty clay loam with many fine distinct light olive brown (2.5Y 5/6) mottles. Moderate medium angular blocky structure. Slightly acid.
C	(29-60")	Grayish brown (2.5Y 5/2) firm silty clay loam with many fine distinct yellowish brown (10YR 5/6) mottles. Weak medium angular blocky structure grading to massive at about 4 feet. Calcareous.

Mapping Units

194B <u>Morley silt loam, 2 to 4 percent slopes</u>. The soil of this mapping unit is similar to the profile described. In areas being cultivated, the A_1 and A_2 horizons are mixed. In some of the areas, spots of Blount, Markham or Tuscola, moderately fine substratum soils and spots that are moderately eroded are inclusions because they were too small to separate on the soil maps.

194B2 <u>Morley silt loam, 2 to 4 percent slopes, moderately eroded</u>. Because of erosion, a 6 to 8 inch plow layer has mixed the A_1, A_2 with a small amount of B horizon material. The depth to the C horizon is 24 to 28 inches in most cases. Small unmapped areas of the Blount, Markham or Tuscola, moderately fine substratum soils are inclusions. Small spots that are severely or slightly eroded are inclusions.

194C <u>Morley silt loam, 4 to 7 percent slopes</u>. This mapping unit has a soil similar to the typical profile described. Due to agricultural cultivation in some areas, the A_1 and A_2 horizons are mixed. Small areas of Tuscola, moderately fine substratum and Markham and small moderately eroded areas are inclusions because they were not practical to show on the soil map.

194C2 Morley silt loam, 4 to 7 percent slopes, moderately eroded. The upper layers of this soil are not so thick as those of the profile described. The depth to the C horizon is about 24 to 28 inches. Because of erosion, plowing has mixed small amounts of the B horizon with the remaining A horizons. In some of the areas, spots of Markham and Tuscola, moderately fine substratum soils and spots that are slightly or severely eroded are inclusions because they were impractical to separate on the soil maps.

194C3 Morley soils, 4 to 7 percent slopes, severely eroded. Because of erosion, the plow layer of this soil consists mainly of subsoil material and the depth to the C horizon is only about 18 to 24 inches. In some of the areas spots of the Markham and Tuscola, moderately fine substratum soils or spots that are only moderately eroded have been included because they were not practical to separate on the soil maps.

194D Morley silt loam, 7 to 12 percent slopes. The soil of this mapping unit is similar to the typical profile described except in some areas the A_1 and A_2 horizons are mixed due to agricultural cultivation. Small unmapped areas of the Markham soils and small moderately eroded areas are inclusions.

194D2 Morley silt loam, 7 to 12 percent slopes, moderately eroded. In this mapping unit, the soil differs from the profile described because as a result of erosion, the A horizons have been mixed with small amounts of B horizon material during plowing. The depth to the C horizon is about 24 to 28 inches. Inclusions of spots of the Markham soils and small areas that are severely or slightly eroded are made because they were too small to delineate on the soil maps.

194D3 Morley soils, 7 to 12 percent slopes, severely eroded. The soil of this mapping unit differs from the typical profile described in that much of the A horizons have been removed through erosion. Considerable B horizon material has become incorporated into the agricultural plow layer and the depth to the C horizon is 18 to 24 inches in most cases. Small unmapped areas of the Chatsworth soils are inclusions. Small areas that are moderately eroded are inclusions.

194E Morley silt loam, 12 to 18 percent slopes. The soil of this mapping unit is similar to the typical profile described. Due to agricultural cultivation in a few areas, the A_1 and A_2 horizons are mixed. Small unmapped areas of the Markham soils and spots that are moderately eroded are inclusions.

194E2 Morley silt loam, 12 to 18 percent slopes, moderately eroded. The depth to the C horizon is 24 to 28 inches in most areas of this mapping unit. Erosion has removed some of the upper layers so that the plow layer is made up of a mixture of the A_1, A_2 and a small amount of the B horizons. Spots of the Markham soils and spots that are severely or slightly eroded are included because they were too small to delineate on the maps.

194E3 Morley soils, 12 to 18 percent slopes, severely eroded. The soil of this mapping unit is different than the typical profile described because much of the A horizons have been eroded away. Considerable subsoil material has been incorporated into the plow layer and the depth to the C horizon is about 18 to 24 inches. Spots that are moderately eroded and spots of Chatsworth soils are inclusions because they were too small to map out.

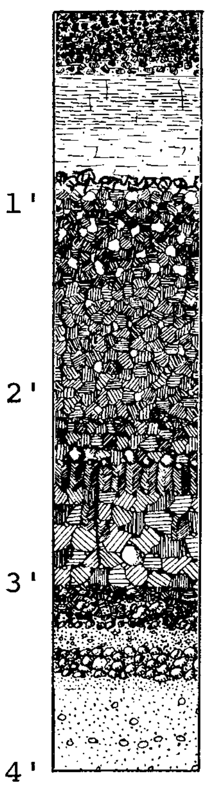
194F Morley silt loam, 18 to 30 percent slopes. The soil of this mapping unit is similar to the typical profile described. Small unmapped areas of the Chatsworth soils are inclusions. Small areas that are moderately eroded are inclusions.

194F2 Morley silt loam, 18 to 30 percent slopes, moderately eroded. The soil of this mapping unit differs from the typical profile described in that the A_1 and A_2 horizons are thinner. Also, the depth to the C horizon is 24 to 28 inches in most cases. Small unmapped areas of the Chatsworth soils or spots that are severely eroded or slightly eroded are inclusions that were impractical to separate on the soil maps.

Tuscola Series

The soils of the Tuscola series are deep, light colored, Gray-Brown Podzolic soils that have developed from stratified, medium textured, glacial outwash deposits of Wisconsin Age. They are naturally moderately well to well drained, have moderate permeability and have a high moisture-holding capacity.

Typical Profile--Tuscola Silt Loam



A_1	(0-4")	Very dark brown (10YR 2/2) friable silt loam with moderate fine granular structure. Slightly acid.
A_2	(4-10")	Dark grayish brown (10YR 4/2) friable silt loam with weak medium platy structure. Slightly acid.
B_1	(10-13")	Brown (10YR 4/3) firm gritty light silty clay loam with moderate fine subangular blocky structure. Slightly acid.
B_{21}	(13-20")	Dark brown (10YR 4/3) firm gritty silty clay loam with moderate fine subangular blocky structure. Slightly acid.
B_{22}	(20-31")	Dark brown (10YR 4/3) firm pebbly clay loam with few fine distinct yellowish brown (10YR 5/6) mottles. Moderate medium subangular blocky structure. Slightly acid.
B_3	(31-35")	Dark grayish brown (10YR 4/2) firm sandy clay loam with common fine distinct yellowish brown (10YR 5/6) mottles. Moderate medium subangular blocky structure. Neutral in reaction.
C	(35-60")	Dark grayish brown (10YR 4/2) friable stratified sandy loam and loam with common fine distinct yellowish brown (10YR 5/6) mottles. Massive. Calcareous.

Mapping Units

696B Tuscola silt loam, 2 to 4 percent slopes. The soil of this mapping unit is similar to the typical profile described. Due to agricultural cultivation in areas, the A_1 and A_2 horizons are mixed. Small unmapped areas of the Grays, Tuscola, moderately fine substratum or Wauconda soils are inclusions. Small areas that are moderately eroded are inclusions.

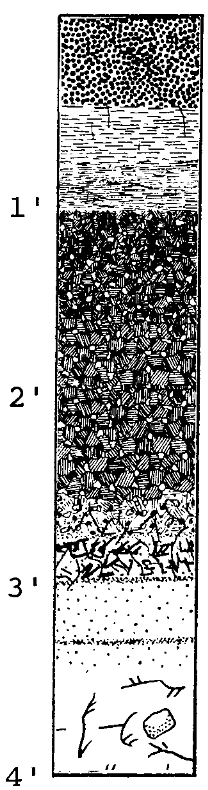
696C2 Tuscola silt loam, 4 to 7 percent slopes, moderately eroded. The soil of this mapping unit differs from the typical profile described in that the A_1 and A_2 horizons are mixed with a small amount of B horizon material. Small unmapped areas of the Grays, Tuscola, moderately fine substratum or Grays, moderately fine substratum are inclusions. Small areas that are severely eroded or slightly eroded are included.

696C3 Tuscola soils, 4 to 7 percent slopes, severely eroded. The soil of this mapping unit differs from the typical profile described in that much of the A horizons have been removed. Considerable B horizon material has become incorporated into the agricultural plow layer. Small unmapped areas of the Tuscola, moderately fine substratum, Grays or Grays, moderately fine substratum soils are inclusions. Small areas that are moderately eroded are inclusions.

696E Tuscola silt loam, 12 to 18 percent slopes. The soil of this mapping unit is similar to the typical profile described. Small unmapped areas having less than 12 percent slopes are inclusions.

The Tuscola, moderately fine substratum soils are deep, light colored, Gray-Brown Podzolic soils that have developed from 24 to 60 inches of medium textured glacial drift overlying silty clay loam glacial till of Wisconsin Age. They are naturally moderately well drained, have moderate to moderately slow permeability and have a high moisture-holding capacity.

Typical Profile--Tuscola Silt Loam, moderately fine substratum



A_1	(0-5")	Very dark brown (10YR 2/2) friable silt loam with moderate fine granular structure. Slightly acid.
A_2	(5-11")	Brown (10YR 5/3) friable silt loam with weak fine platy structure. Slightly acid.
B_1	(11-17")	Dark brown (10YR 4/3) firm clay loam with moderate fine subangular blocky structure. Slightly acid.
B_{21}	(17-25")	Dark brown (10YR 4/3) firm gritty silty clay loam with moderate medium subangular blocky structure. Slightly acid.
B_{22}	(25-32")	Dark grayish brown (10YR 4/2) firm silty clay loam with few fine distinct yellowish brown (10YR 5/6) mottles. Moderate medium angular blocky structure. Medium acid.
B_3	(32-37")	Grayish brown (10YR 5/2) firm silty clay loam with many medium distinct yellowish brown (10YR 5/6) mottles. Moderate medium angular blocky structure. Neutral in reaction.
C	(37-53")	Grayish brown (2.5Y 5/2) friable stratified silt loam and loam with many medium distinct yellowish brown (10YR 5/6) mottles. Massive. Calcareous
D	(53-60")	Grayish brown (2.5Y 5/2) firm silty clay loam with many medium distinct yellowish brown (10YR 5/6) mottles. Massive. Calcareous.

Mapping Units

449B Tuscola silt loam, moderately fine substratum, 2 to 4 percent slopes. The soil of this mapping unit is similar to the profile described except in some areas the A_1 and A_2 horizons are mixed due to agricultural cultivation. In some areas there are inclusions of spots of the Morley, Grays, moderately fine substratum or Markham soils or spots which are moderately eroded because they were too small to delineate on the soil maps.

449C2 Tuscola silt loam, moderately fine substratum, 4 to 7 percent slopes, moderately eroded. The soil of this unit differs from the described profile because erosion has removed some of the upper horizons. The plow layer consists of A_1, A_2 and some B horizon material. As it was impractical to map spots of the Morley, Grays, moderately fine substratum, or Markham soils, they are inclusions in some areas. Small spots that are severely or slightly eroded are also inclusions.

449C3 Tuscola soils, moderately fine substratum, 4 to 7 percent slopes, severely eroded. Erosion has removed much of the A horizons whereby considerable B horizon material is incorporated into the plow layer. Small unmapped areas of the Morley, Markham of Grays, moderately fine substratum soils are inclusions. Also, spots that are moderately eroded are inclusions.

449D2 Tuscola silt loam, moderately fine substratum, 7 to 12 percent slopes, moderately eroded. The soil of this mapping unit differs from the typical profile described in that the A_1 and A_2 horizons are mixed with a small amount of the B horizon material. Small unmapped areas of the Morley, Grays, moderately fine substratum or Markham soils are inclusions. Small areas that are severely eroded or slightly eroded are inclusions.

449D3 Tuscola soils, moderately fine substratum, 7 to 12 percent slopes, severely eroded. The soil of this mapping unit differs from the typical profile described in that much of the A horizons have been removed. Considerable B horizon material has become incorporated into the agricultural plow layer. Small unmapped areas of the Morley, Grays, moderately fine substratum or Markham soils are inclusions. Small areas that are moderately eroded are inclusions.

Gray-Brown Podzolic Soils Intergrading to Brunizems

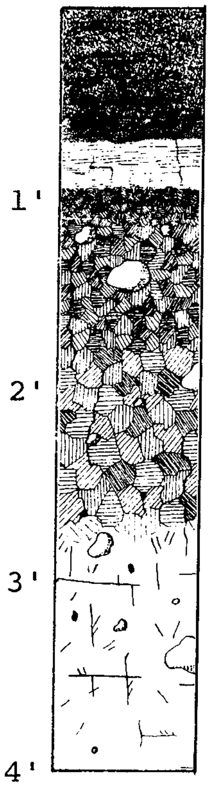
The Gray-Brown Podzolic soils intergrading to Brunizems were developed under both deciduous forest and prairie grass vegetation. In the natural state, these soils have a relatively thick dark upper A horizon and a grayish, leached lower A horizon. They have a clay enriched B horizon that is grayish brown throughout or mottled gray and yellowish brown in the upper and/or lower part. The C horizon is composed of material weathered to a slight degree and usually like that from which the upper horizons have developed.

The soil series in Ela Township that are classified as Gray-Brown Podzolic soils intergrading to Brunizems are Beecher, Frankfort, Grays, Markham and Wauconda.

Beecher Series

The soils of the Beecher series are deep, moderately dark colored Gray-Brown Podzolic soils intergrading to the Brunizems that have developed from Wisconsin Age silty clay loam textured glacial till. They are naturally imperfectly drained, have moderately slow permeability and have moderate moisture-holding capacity.

Typical Profile--Beecher Silt Loam



A_1	(0-9")	Very dark gray (10YR 3/1) friable silt loam with moderate fine granular structure. Slightly acid.
A_2	(9-11")	Dark gray (10YR 4/1) friable silt loam with weak medium platy structure breaking to moderate very fine subangular blocky structure. Medium acid.
B_1	(11-14")	Very dark grayish brown (10YR 3/2) firm silty clay loam with few fine faint brown (10YR 4/3) mottles. Moderate very fine subangular blocky structure. Medium acid.
B_2	(14-27")	Dark grayish brown (2.5Y 4/2) firm light silty clay with common fine distinct yellowish brown (10YR 5/6) mottles. Moderate medium angular blocky structure. Neutral in reaction.
B_3	(27-31")	Dark grayish brown (2.5Y 4/2) firm light silty clay with many fine distinct yellowish brown (10YR 5/4) mottles. Moderate medium angular blocky structure. Neutral in reaction.
C	(31-60")	Grayish brown (2.5Y 5/2) firm silty clay loam with many medium distinct yellowish brown (10YR 5/6) mottles. Weak medium angular blocky structure grading to massive at about 4 feet. Calcareous.

Mapping Units

298B Beecher silt loam, 2 to 4 percent slopes. The profile described is representative of the soil for this mapping unit except in some areas agricultural cultivation has mixed the A_1 and A_2 horizons. Spots of the Elliott, Blount or Ashkum soils were too small to be separated on the maps and are inclusions. Spots that are moderately eroded are also inclusions.

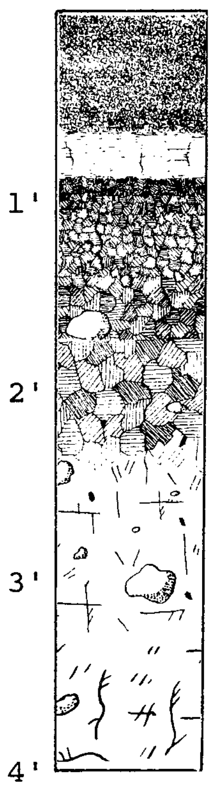
298C Beecher silt loam, 4 to 7 percent slopes. The soil of this unit is similar to the typical profile described. In some areas, however, the A_1 and A_2 horizons have been mixed during plowing. Small unmapped areas of the Elliott, Markham or Blount soils and spots that are moderately eroded are inclusions because they were impractical to delineate on the soil maps.

298C2 Beecher silt loam, 4 to 7 percent slopes, moderately eroded. Erosion has caused this mapping unit to differ from the described profile in that small amounts of B horizon material have been incorporated into the plow layer and the depth to the C horizon is 24 to 28 inches. Spots of the Markham, Blount or Elliott soils and spots that are severely or slightly eroded are inclusions in some areas because they were too small to delineate on the soil maps.

Frankfort Series

The soils of the Frankfort series are moderately dark colored, Gray-Brown Podzolic soils intergrading to Brunizems that have developed from Wisconsin Age silty clay glacial till. They are naturally imperfectly drained, have slow permeability and have moderate moisture-holding capacity.

Typical Profile--Frankfort Silt Loam



A_1	(0-8")	Very dark gray (10YR 3/1) friable silt loam with moderate fine granular structure. Slightly acid.
A_2	(8-12")	Dark gray (10YR 4/1) friable silt loam with moderate fine granular to subangular blocky structure. Slightly acid.
B_1	(12-18")	Very dark grayish brown (2.5Y 3/2) firm silty clay loam with few fine faint olive brown (2.5Y 4/4) mottles. Moderate fine subangular blocky structure. Slightly acid.
B_2	(18-26")	Dark grayish brown (2.5Y 4/2) very firm silty clay with many fine distinct light olive brown (2.5Y 5/6) mottles. Moderate fine angular blocky structure. Neutral in reaction.
C	(26-60")	Grayish brown (2.5Y 5/2) very firm silty clay with many fine faint olive brown (2.5Y 4/4) mottles. Weak medium angular blocky structure grading to massive at about 3½ feet. Calcareous.

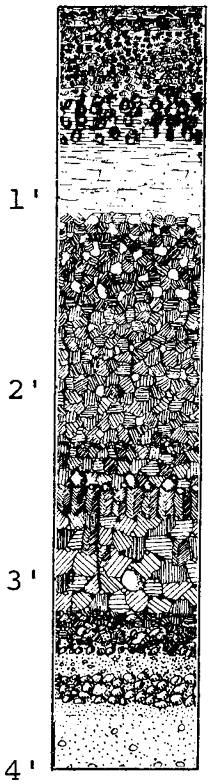
Mapping Units

320B Frankfort silt loam, 2 to 4 percent slopes. The soil of this mapping unit is similar to the typical profile described. Small areas that are moderately eroded are inclusions.

Grays Series

The soils of the Grays series are moderately dark colored, Gray-Brown Podzolic soils intergrading toward Brunizems that have developed from stratified, medium textured, glacial outwash deposits of Wisconsin Age. They are naturally moderately well to well drained, have moderate permeability and have a high moisture-holding capacity.

Typical Profile--Grays Silt Loam



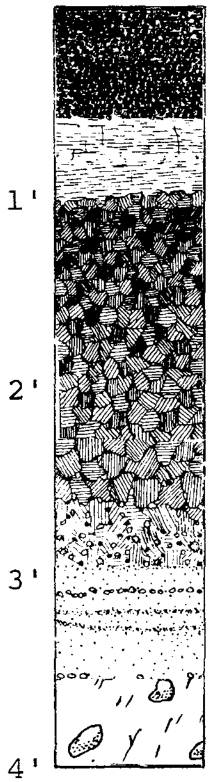
A_1	(0-8")	Very dark brown (10YR 2/2) friable silt loam with weak fine granular structure. Slightly acid.
A_2	(8-11")	Dark grayish brown (10YR 4/2) friable silt loam with weak coarse platy structure. Slightly acid.
B_1	(11-14")	Dark brown (10YR 3/3) firm gritty silty clay loam with moderate very fine subangular blocky structure. Slightly acid.
B_2	(14-33")	Dark brown (10YR 4/3) firm clay loam with moderate fine subangular blocky structure. Slightly acid.
C	(33-60")	Brown (10YR 5/3) friable stratified loam and pebbly sandy loam. Massive. Calcareous.

Mapping Units

698B Grays silt loam, 2 to 4 percent slopes. The soils of this mapping unit are similar to the typical profile described. In some areas, the A_1 and A_2 horizons are mixed due to agricultural cultivation. Small unmapped areas of the Tuscola, Wauconda, or Half Day series are inclusions. Small areas that are moderately eroded are also inclusions.

Grays, moderately fine substratum soils are deep, moderately dark colored, Gray-Brown Podzolic soils intergrading toward Brunizems that have developed from 24 to 60 inches of medium textured glacial drift overlying silty clay loam glacial till of Wisconsin Age. They are naturally moderately well drained, have moderate to moderately slow permeability and have a high moisture-holding capacity.

Typical Profile--Grays Silt Loam, moderately fine substratum



Ap	(0-7")	Very dark brown (10YR 2/2) friable silt loam with weak fine granular structure. Slightly acid.
A_2	(7-10")	Dark grayish brown (10YR 4/2) friable silt loam with weak fine granular structure. Slightly acid.
B_1	(10-13")	Brown (10YR 4/3) firm gritty silty clay loam with moderate fine subangular blocky structure. Slightly acid.
B_{21}	(13-22")	Brown (10YR 4/3) firm silty clay loam with moderate fine subangular blocky structure. Slightly acid.
B_{22}	(22-30")	Dark grayish brown (10YR 4/2) firm clay loam with few fine faint yellowish brown (10YR 5/4) mottles. Moderate fine subangular blocky structure. Slightly acid.
C	(30-44")	Grayish brown (10YR 5/2) friable stratified loamy and sandy loam with many fine distinct yellowish brown (10YR 5/6) mottles. Massive. Calcareous.
D	(44-60")	Dark grayish brown (2.5Y 4/2) firm silty clay loam with few fine distinct yellowish brown (10YR 5/6) mottles. Massive. Calcareous.

Mapping Units

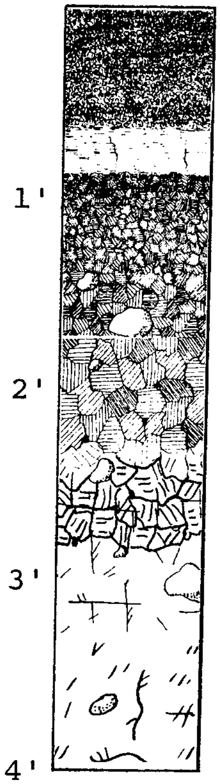
450B Grays silt loam, moderately fine substratum, 2 to 4 percent slopes. The soils of this mapping unit are similar to the typical profile described. In some areas, the A_1 and A_2 horizons are mixed due to cultivation. Small unmapped areas of the Markham, Tuscola, moderately fine substratum or Wauconda moderately fine substratum soils and spots that are moderately eroded are inclusions.

450C2 Grays silt loam, moderately fine substratum, 4 to 7 percent slopes, moderately eroded. The soils of this mapping unit differ from the typical profile described in that the A_1 and A_2 horizons are mixed with a small amount of the B horizon material. Small unmapped areas of the Tuscola, moderately fine substratum, Markham and Wauconda, moderately fine substratum soils are inclusions. Small areas that are severely eroded or slightly eroded are inclusions also.

Markham Series

The soils of the Markham series are deep, moderately dark colored, Gray-Brown Podzolic soils intergrading to Brunizems that have developed from Wisconsin Age silty clay loam glacial till. They are naturally moderately well drained, have moderately slow permeability and have moderate moisture-holding capacity.

Typical Profile--Markham Silt Loam



Horizon	Depth	Description
A_1	(0-8")	Very dark brown (10YR 2/2) very friable silt loam with moderate fine granular structure. Slightly acid.
A_2	(8-11")	Dark grayish brown (10YR 4/2) friable silt loam with moderate fine granular structure. Slightly acid.
B_1	(11-14")	Brown (10YR 4/3) firm silty clay loam with moderate very fine granular structure. Slightly acid.
B_{21}	(14-26")	Brown (10YR 4/3) firm heavy silty clay loam with moderate fine angular blocky structure. Slightly acid.
B_{22}	(26-32")	Dark grayish brown (10YR 4/2) firm heavy silty clay loam with few fine faint yellowish brown (10YR 5/6) mottles. Strong medium angular blocky structure. Slightly acid.
B_3	(32-34")	Dark grayish brown (10YR 4/2) firm silty clay loam with few fine faint yellowish brown (10YR 5/6) mottles. Moderate medium angular blocky structure. Neutral in reaction.
C	(34-60")	Dark grayish brown (2.5Y 4/2) firm silty clay loam with common fine distinct yellowish brown (10YR 5/6) mottles. Weak medium angular blocky structure grading to massive at about 42 inches. Calcareous.

Mapping Units

531B Markham silt loam, 2 to 4 percent slopes. The profile described is representative of the soils of this unit except in some areas, plowing has caused mixing of the A_1 and A_2 horizons. Spots of the Beecher, Morley or Varna soils and spots that are moderately eroded are inclusions in some areas because they were impractical to delineate on the soil maps.

531B2 Markham silt loam, 2 to 4 percent slopes, moderately eroded. Erosion has removed some of the A horizon and plowing has incorporated a small amount of the B horizon into the plow layer. Also, the depth to the C horizon is 24 to 28 inches in most cases. Small unmapped areas of the Beecher, Morley or Varna soils and spots that are severely or slightly eroded are included because they are too small to be shown on the soil maps.

531C Markham silt loam, 4 to 7 percent slopes. The soils of this mapping unit are similar to the typical profile described. In some areas, there is mixing of the A_1 and A_2 horizons due to plowing. Where small areas of Morley or Varna soils and spots that are moderately eroded were impractical to separate on the maps, they have become inclusions.

531C2 Markham silt loam, 4 to 7 percent slopes, moderately eroded. Erosion has caused this unit to differ from the profile described in that a small amount of the B horizon has been incorporated into the plow layer and the depth to the C horizon is commonly 24 to

28 inches. Spots of the Morley and Varna soils and spots that are severely or slightly eroded are included because they were too small to show on the soil maps.

531D Markham silt loam, 7 to 12 percent slopes. The soils of this mapping unit are similar to the described profile; however, in some areas, the A_1 and A_2 horizons are mixed because of cultivation. Inclusions of spots of the Morley and Varna soils and spots that are moderately eroded are made because they were impractical to map out.

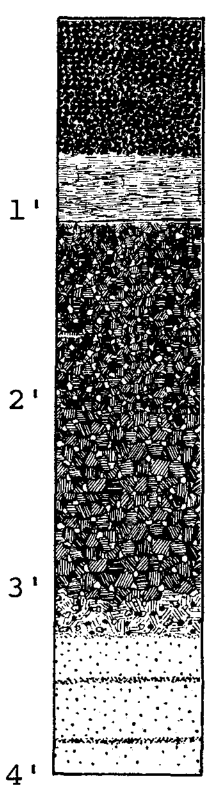
531D2 . Markham silt loam, 7 to 12 percent slopes, moderately eroded. The soils of this mapping unit differ from the typical profile described in that the A_1 and A_2 horizons are mixed with a small amount of B horizon material. Also, the depth to the C horizon is 24 to 28 inches in most cases. Small unmapped areas of the Morley or Varna soils are inclusions. Small areas that are severely eroded or slightly eroded are inclusions.

531E2 Markham silt loam, 12 to 18 percent slopes, moderately eroded. The soils of this mapping unit differ from the typical profile described in that the A_1 and A_2 horizons are mixed with a small amount of B horizon material. Also, the depth to the C horizon is 24 to 28 inches in most cases. Small unmapped areas of the Morley or Chatsworth soils are inclusions. Small areas that are severely eroded or slightly eroded are inclusions.

Wauconda Series

The soils of the Wauconda series are deep, moderately dark colored, Gray-Brown Podzolic soils intergrading to the Brunizems. They developed from stratified medium textured, glacial outwash deposits of Wisconsin Age. They are naturally imperfectly drained, have moderate permeability and have a high moisture-holding capacity.

Typical Profile--Wauconda Silt Loam



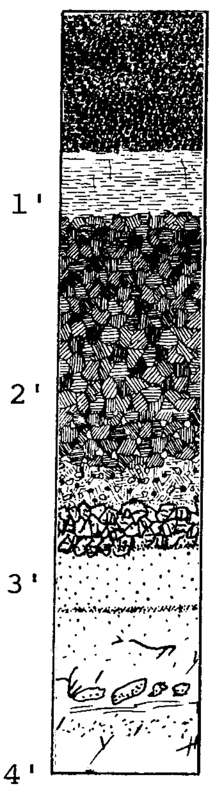
A_1	(0-8")	Very dark brown (10YR 2/2) friable silt loam with moderate fine granular structure. Slightly acid.
A_2	(8-12")	Dark grayish brown (10YR 4/2) friable silt loam with weak fine platy structure. Slightly acid.
B_1	(12-15")	Very dark grayish brown (10YR 3/2) firm silty clay loam with few fine faint yellowish brown (10YR 5/4) mottles. Moderate very fine subangular blocky structure. Slightly acid.
B_2	(15-30")	Dark grayish brown (2.5Y 4/3) firm gritty silty clay loam with common fine distinct yellowish brown (10YR 5/6) mottles. Moderate medium subangular blocky structure. Slightly acid.
B_3	(30-35")	Dark grayish brown (2.5Y 4/2) firm clay loam with common medium distinct yellowish brown (10YR 5/6) mottles. Moderate medium angular blocky structure. Neutral in reaction.
C	(35-60")	Dark grayish brown (2.5Y 4/3) friable stratified sandy loam, loam and silt loam with many medium distinct yellowish brown (10YR 5/6) mottles. Massive. Calcareous.

Mapping Units

697B Wauconda silt loam, 2 to 4 percent slopes. The soils of this mapping unit are represented by the typical profile except in some areas the A_1 and A_2 horizons have been mixed by cultivation. Small spots of the Grays, Andres, loamy substratum, and Wauconda, moderately fine substratum soils or spots of moderate erosion are included in some areas because they were too small to show on the soil maps.

Wauconda, moderately fine substratum soils are deep, moderately dark colored, Gray-Brown Podzolic soils intergrading to Brunizems that have developed in 24 to 60 inches of medium-textured glacial drift (usually stratified) which overlies silty clay loam Wisconsin Age glacial till. They are naturally imperfectly drained, have moderate permeability and have a high moisture-holding capacity.

Typical Profile--Wauconda Silt Loam, moderately fine substratum



A_1	(0-8")	Black (10YR 2/1) friable silt loam with moderate fine granular structure. Slightly acid.
A_2	(8-13")	Grayish brown (10YR 5/2) friable silt loam with weak fine platy structure. Slightly acid.
B_1	(13-17")	Grayish brown (2.5Y 5/2) firm silty clay loam with few medium faint yellowish brown (10YR 5/4) mottles. Moderate fine subangular blocky structure. Slightly acid.
B_2	(17-32")	Grayish brown (2.5Y 5/2) firm silty clay loam with many medium distinct yellowish brown (10YR 5/8) mottles. Moderate fine subangular blocky structure. Slightly acid.
B_3	(32-36")	Grayish brown (2.5Y 5/2) firm silty clay loam with many medium distinct yellowish brown (10YR 5/8) mottles. Weak medium angular blocky structure. Neutral in reaction.
C	(36-55")	Grayish brown (2.5Y 5/2) friable silt loam and loam stratified with many medium distinct yellowish brown (10YR 5/8) mottles. Massive. Calcareous.
D	(55-60")	Light brownish gray (2.5Y 6/2) firm silty clay loam with many medium distinct yellowish brown (10YR 5/6) mottles. Massive. Calcareous.

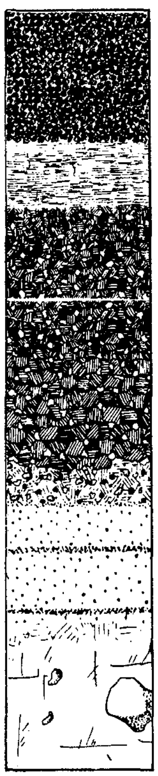
Mapping Units

502A Wauconda silt loam, moderately fine substratum, 0 to 2 percent slopes. The typical profile represents the soil of this mapping unit. In some areas, the A_1 and A_2 are mixed due to plowing. Spots of the Andres, Beecher and Pella, moderately fine substratum soils are inclusions as they were too small to map out.

502B <u>Wauconda silt loam, moderately fine substratum, 2 to 4 percent slopes</u>. The soils of this unit are similar to the typical profile described except in some areas, the A horizons are mixed because of cultivation. Small areas of the Andres, Beecher and Pella, moderately fine substratum, soils are inclusions because they were impractical to show on the soil map. Spots that are moderately eroded are also inclusions.

Wauconda, fine substratum soils include the deep, moderately dark colored, Gray-Brown Podzolic soils intergrading to Brunizems that have developed in 24 to 60 inches of medium textured glacial drift (usually stratified) overlying silty clay Wisconsin Age glacial till. Volo soils are naturally imperfectly drained and have moderate permeability in the solum but the underlying silty clay has slow permeability. They have a high moisture holding capacity.

Typical Profile--Wauconda Silt Loam, fine substratum



A_1	(0-9")	Very dark gray (10YR 3/1) friable silt loam with moderate fine granular structure. Slightly acid.
A_2	(9-13")	Dark gray (10YR 4/1) friable gritty silt loam with weak fine platy structure. Slightly acid.
B_1	(13-18")	Very dark grayish brown (10YR 3/2) firm clay loam with few fine faint brown (10YR 4/3) mottles. Moderate fine subangular blocky structure. Slightly acid.
B_2	(18-28")	Olive brown (2.5Y 4/4) firm clay loam with few fine faint yellowish brown (10YR 5/4) mottles. Moderate medium subangular blocky structure. Slightly acid.
B_3	(28-31")	Grayish brown (2.5Y 5/2) firm silty clay loam with few fine distinct yellowish brown (10YR 5/6) mottles. Moderate medium angular blocky structure. Slightly acid.
C	(31-40")	Light grayish brown (2.5Y 6/3) friable stratified silt loam, loam and sandy loam with many fine distinct brownish yellow (10YR 6/6) mottles. Massive. Calcareous.
D	(40-60")	Grayish brown (2.5Y 5/2) very firm silty clay with many fine distinct light olive brown (2.5Y 5/6) mottles. Massive. Calcareous.

Mapping Units

357B <u>Wauconda silt loam, fine substratum, 2 to 4 percent slopes</u>. The typical profile is representative of the soils of this mapping unit. Spots of the Frankfort soils and small areas that are moderately eroded are inclusions.

357C <u>Wauconda silt loam, fine substratum, 4 to 7 percent slopes.</u> The soils of this mapping unit are similar to the profile described. In some areas, there are spots of the Andres, fine substratum soils or small areas that are moderately eroded that are inclusions because they were impractical to separate on the soil map.

Brunizems

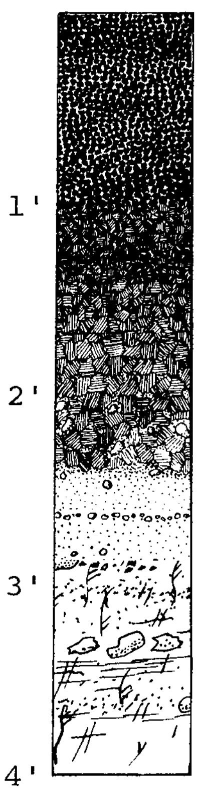
The Brunizems were developed under tall prairie grass vegetation. In the natural state, they have dark colored A horizons which are high in organic matter; clay enriched B horizons that are grayish brown throughout or mottled with gray and yellowish brown in the upper and/or lower part; and C horizons composed of material weathered only to a slight degree and usually like that from which the upper horizons have developed.

The soil series classified as Bruni. .ns are Andres, Corwin, Elliott, Gilmer, LaRose, Martinton, Odell, Swygert, Symerton and Varna.

Andres Series

The soils of the Andres series are deep, dark colored, Brunizems developed in 24 to 60 inches of medium textured glacial drift (usually stratified) overlying silty clay loam Wisconsin Age glacial till. They are naturally imperfectly drained, have moderate permeability and a high moisture-holding capacity.

Typical Profile--Andres Silt Loam



A_1	(0-12")	Black (10YR 2/1) friable silt loam with moderate very fine granular structure. Slightly acid.
A_3	(12-14")	Very dark brown (10YR 2/2) friable silt loam with moderate fine granular structure. Slightly acid.
B_1	(14-17")	Very dark grayish brown (10YR 3/2) firm silty clay loam with few fine faint brown (10YR 4/3) mottles. Moderate very fine subangular blocky structure. Slightly acid.
B_2	(17-26")	Dark grayish brown (2.5Y 4/2) firm clay loam with many fine distinct yellowish brown (10YR 5/6) mottles. Moderate fine subangular blocky structure. Slightly acid.
B_3	(26-32")	Olive (5Y 5/3) firm clay loam with many fine distinct yellowish brown (10YR 5/8) mottles. Moderate medium subangular blocky structure. Neutral in reaction.
C	(32-46")	Olive (5Y 5/3) friable loam and sandy loam (stratified) with many fine distinct yellowish brown (10YR 5/8) mottles. Weak medium angular blocky structure. Calcareous.
D	(46-60")	Grayish brown (2.5Y 5/2) firm silty clay loam with many medium distinct yellowish brown (10YR 5/6) mottles. Massive. Calcareous.

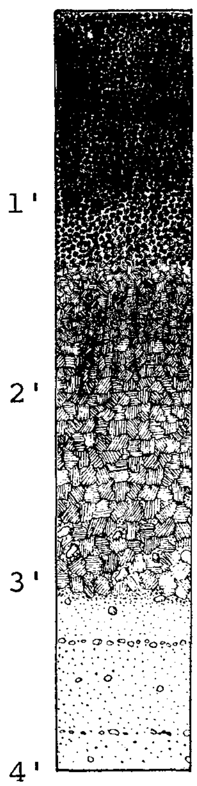
Mapping Units

293A Andres silt loam, 0 to 2 percent slopes. The profile described is representative of the soils in this mapping unit. Small areas of Elliott, Pella, moderately fine substratum and Andres, loamy substratum are inclusions because they were too small to be shown on the soil map. A few spots that have recent deposition are also included.

293B Andres silt loam, 2 to 4 percent slopes. The soils of this mapping unit are similar to the profile described. Small areas of Elliott, Symerton and Andres, loamy substratum, are included because they were impractical to delineate on the map.

The Andres, loamy substratum soils are deep, dark colored, Brunizems developed from stratified, medium textured, Wisconsin Age, glacial outwash deposits. They are naturally imperfectly drained, have moderate permeability and a high moisture-holding capacity.

Typical Profile--Andres, loamy substratum



A_1 (0-9") Black (10YR 2/1) friable silt loam with moderate fine granular structure. Slightly acid.

A_3 (9-13") Very dark brown (10YR 2/2) friable silt loam with moderate fine granular structure. Slightly acid.

B_1 (13-16") Very dark grayish brown (2.5Y 3/2) firm silty clay loam with few fine faint olive brown (2.5Y 4/4) mottles. Moderate very fine subangular blocky structure. Slightly acid.

B_2 (16-35") Dark grayish brown (2.5Y 4/2) firm gritty silty clay loam with many fine distinct yellowish brown (10YR 5/6) mottles. Moderate fine subangular blocky structure. Slightly acid to neutral in reaction.

C (35-60") Dark grayish brown (2.5Y 4/2) friable stratified sandy loam, loam, silt loam, and thin layers of sand, gravelly loam and clay loam with many medium prominent yellowish brown (10YR 5/6) mottles. Massive. Calcareous.

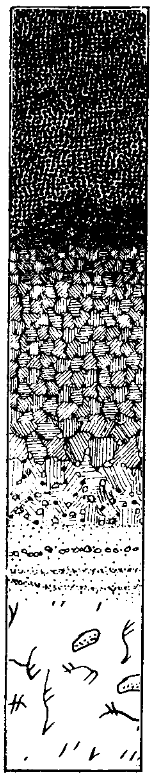
Mapping Units

442A Andres silt loam, loamy substratum, 0 to 2 percent slopes. The soil of this mapping is represented by the profile described. Small areas of Symerton, loamy substratum and Pella and small gently sloping areas are inclusions.

442B Andres silt loam, loamy substratum, 2 to 4 percent slopes. The typical profile described is representative of the soils of this mapping unit. It was impractical to delineate some small areas of Symerton, loamy substratum and Wauconda soils and some small moderately eroded areas.

The Andres, fine substratum soils includes deep, dark colored Brunizems developed in 24 to 60 inches of medium textured glacial drift (usually stratified) underlain with silty clay, Wisconsin Age, glacial till. They are naturally imperfectly drained, have moderate permeability in the solum but the underlying silty clay has slow permeability. They have high moisture-holding capacity.

Typical Profile--Andres Silt Loam, fine substratum



A_1	(0-9")	Black (10YR 2/1) friable silt loam with moderate fine granular structure. Medium acid.
A_3	(9-12")	Very dark gray (10YR 3/1) friable silt loam with moderate fine granular structure. Medium acid.
B_1	(12-16")	Very dark grayish brown (10YR 3/2) firm gritty silty clay loam with common fine distinct yellowish brown (10YR 5/4) mottles. Moderate fine subangular blocky structure. Medium acid.
B_2	(16-32")	Dark grayish brown (2.5Y 4/2) firm gritty silty clay loam with many fine distinct yellowish brown (10YR 5/6) mottles. Moderate medium subangular blocky structure. Medium to slightly acid.
C	(32-36")	Dark grayish brown (2.5Y 4/2) friable loam with many pebbles. Many medium distinct yellowish brown (10YR 5/6) mottles. Weak medium angular blocky structure. Neutral in reaction.
D	(36-60")	Grayish brown (2.5Y 5/2) firm silty clay with many fine distinct yellowish brown (10YR 5/4) mottles. Weak coarse angular blocky grading to massive at about 4 feet. Calcareous.

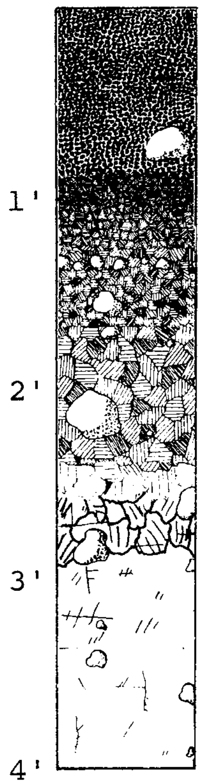
Mapping Units

295B Andres silt loam, fine substratum, 2 to 4 percent slopes. The soils of this mapping unit are represented by the described profile. Small areas of Symerton, fine substratum and Andres are inclusions.

Corwin Series

The soils of the Corwin series are deep, dark colored Brunizems that developed from loam or silt loam glacial drift of Wisconsin Age. They are naturally moderately well drained, have moderate permeability and a high moisture-holding capacity.

Typical Profile--Corwin Loam



A_1 (0-8") Very dark brown (10YR 2/2) friable loam with moderate fine granular structure. Slightly acid.

A_3 (8-11") Dark brown (10YR 3/3) friable gritty silt loam with moderate fine granular structure. Slightly acid.

B_1 (11-14") Dark brown (10YR 3/3) firm gritty silty clay loam with moderate very fine subangular blocky structure. Slightly acid.

B_{21} (14-28") Brown (10YR 4/3) firm gritty silty clay loam with moderate fine subangular blocky structure. Slightly acid.

B_{22} (28-32") Dark grayish brown (10YR 4/2) firm gritty silty clay loam with common fine distinct yellowish brown (10YR 5/6) mottles. Moderate medium subangular blocky structure. Slightly acid.

B_3 (32-34") Grayish brown (10YR 5/2) firm gritty silty clay loam with common fine distinct yellowish brown (10YR 5/6) mottles. Moderate medium angular blocky structure. Neutral in reaction.

C (34-60") Brown (10YR 4/3) friable loam with common fine distinct yellowish brown (10YR 5/6) mottles. Massive. Calcareous.

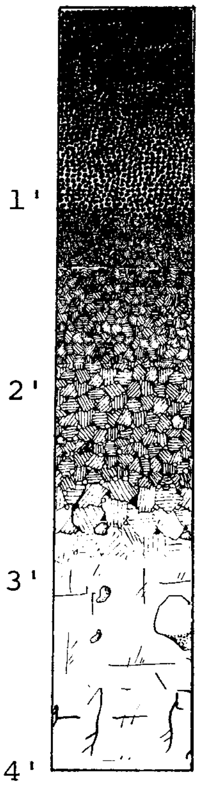
Mapping Units

495B Corwin loam, 2 to 4 percent slopes. The typical profile is representative of this soil mapping unit. Small areas of Odell, Pella and Symerton and small moderately eroded areas are inclusions.

Elliott Series

The Elliott series includes the deep, dark colored Brunizems that developed from Wisconsin Age silty clay loam glacial till. They are naturally imperfectly drained, have moderately slow permeability and have a high moisture-holding capacity.

Typical Profile--Elliott Silt Loam



A_1	(0-10")	Very dark brown (10YR 2/2) friable silt loam. Moderate fine granular structure. Slightly acid to neutral in reaction.
A_3	(10-12")	Very dark grayish brown (10YR 3/2) friable silt loam. Moderate fine granular structure. Slightly acid to neutral in reaction.
B_1	(12-15")	Dark grayish brown (10YR 4/2) firm silty clay loam with few fine distinct yellowish brown (10YR 5/6) mottles. Moderate fine subangular blocky structure. Slightly acid.
B_2	(15-28")	Dark grayish brown (10YR 4/2) firm silty clay loam with few fine distinct yellowish brown (10YR 5/6) mottles. Strong fine subangular blocky structure. Slightly acid.
B_3	(28-31")	Dark grayish brown (2.5Y 4/2) firm silty clay loam with many fine distinct yellowish brown (10YR 5/6) mottles. Moderate medium angular blocky structure. Neutral in reaction.
C	(31-60")	Grayish brown (2.5Y 5/2) firm silty clay loam with many fine distinct yellowish brown (10YR 5/4) mottles. Weak medium angular blocky structure grading to massive at 48 inches. Calcareous.

Mapping Units

146A Elliott silt loam, 0 to 2 percent slopes. The typical profile is representative of the soils of this mapping unit. Small areas of the Andres, Pella, moderately fine substratum and Ashkum soils and small gently sloping areas are inclusions that were impractical to separate on the soil maps.

146B Elliott silt loam, 2 to 4 percent slopes. The typical profile described above is representative of the soils of this mapping unit. Small areas of Andres, Pella, moderately fine substratum and Ashkum and small moderately eroded areas are inclusions.

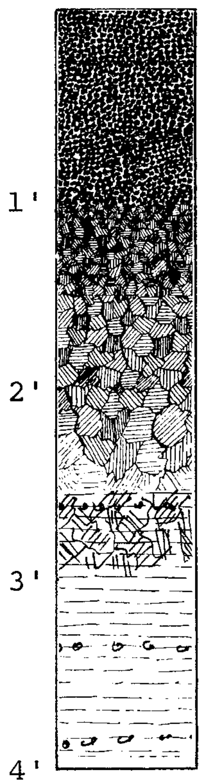
146B2 Elliott silt loam, 2 to 4 percent slopes, moderately eroded. The soils of this mapping unit differ from the typical profile in that they have been eroded and the plow layer now has a small amount of B horizon incorporated into it. Small areas of Andres, Pella, moderately fine substratum and Ashkum and small areas only slightly eroded are inclusions.

146B+ Elliott silt loam, overwashed, 2 to 4 percent slopes. These soils differ from the profile described because 8 to 20 inches of silty overwash has been deposited over the original soil. Small areas of Andres, Pella, moderately fine substratum and Ashkum and small areas without overwash are inclusions.

Gilmer Series

The Gilmer series includes the deep, dark colored Brunizems that developed from silty clay loam glacial outwash or lakebed sediments of Wisconsin Age. They are naturally moderately well drained, have moderately slow permeability and high moisture-holding capacity.

Typical Profile--Gilmer Silt Loam



A_1 (0-9") Very dark brown (10YR 2/2) friable silt loam with moderate fine granular structure. Slightly acid.

A_3 (9-13") Very dark grayish brown (10YR 3/2) friable silt loam with moderately fine granular structure. Slightly acid.

B_1 (13-17") Very dark grayish brown (10YR 3/2) firm silty clay loam with moderate very fine subangular blocky structure. Slightly acid.

B_{21} (17-28") Brown (10YR 4/3) firm gritty silty clay loam with moderate fine subangular blocky structure. Medium acid.

B_{22} (28-33") Dark grayish brown (10YR 4/2) firm silty clay loam with few fine faint yellowish brown (10YR 5/6) mottles. Moderate fine angular blocky structure. Medium acid.

B_3 (33-38") Olive brown (2.5Y 4/4) firm heavy silty clay loam with common fine distinct yellowish brown (10YR 5/6) mottles. Moderate fine angular blocky structure. Neutral in reaction.

C (38-60") Light olive brown (2.5Y 5/4) firm silty clay loam with common fine distinct yellowish brown (10YR 5/6) mottles. Massive, but tending to fracture on horizontal planes. Calcareous.

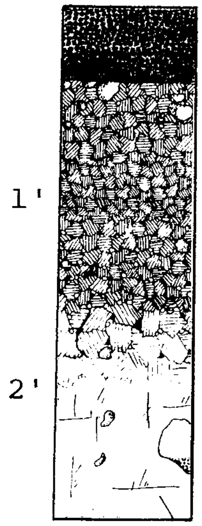
Mapping Units

341B <u>Gilmer silt loam, 2 to 4 percent slopes</u>. The typical profile represents the soils of this mapping unit. Small areas of Martinton and Bonpas and small moderately eroded areas are inclusions.

LaRose Series

The LaRose series includes the dark colored, deep Brunizems that developed from loam or silt loam, Wisconsin Age glacial till. They are naturally well drained, moderately permeable and have a high moisture-holding capacity.

Typical Profile--LaRose Silt Loam



Ap (0-6") Very dark grayish brown (10YR 3/2) friable gritty silt loam with mixing of the B horizon. Weak fine granular structure. Slightly acid.

B_2 (6-18") Dark yellowish brown (10YR 4/4) firm gritty silty clay loam. Moderate fine subangular blocky structure. Slightly acid.

C (18-60") Yellowish brown (10YR 5/4) friable loam. Massive. Calcareous.

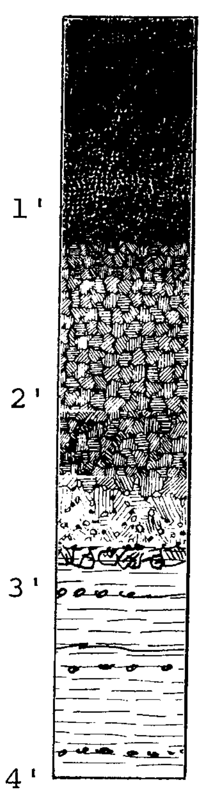
Mapping Units

60D3 <u>LaRose soils, 7 to 12 percent slopes, severely eroded</u>. Erosion has removed most of the A horizon of these soils so that the plow layer (Ap) consists of considerable B horizon material. The typical profile is representative of the soil in this mapping unit. Small areas having 12 to 18 percent slopes are inclusions because they were not practical to delineate on the soil maps.

Martinton Series

The soils of the Martinton series are deep, dark colored Brunizems that have developed from silty clay loam glacial lakebed sediments of Wisconsin Age. They are naturally imperfectly drained, have moderately slow permeability and have a high moisture-holding capacity.

Typical Profile--Martinton Silt Loam



A_1 (0-10") Black (10YR 2/1) friable silt loam. Moderate fine granular structure. Slightly acid.

A_3 (10-13") Very dark grayish brown (10YR 3/2) friable silt loam. Moderate very fine subangular blocky structure. Slightly acid.

B_1 (13-16") Dark grayish brown (10YR 4/2) firm silty clay loam with few fine faint yellowish brown (10YR 5/4) mottles. Moderate fine subangular blocky structure. Slightly acid.

B_2 (16-30") Dark grayish brown (10YR 4/2) firm silty clay loam with many medium faint yellowish brown (10YR 5/6) mottles. Moderate fine angular blocky structure. Slightly acid.

B_3 (30-34") Grayish brown (10YR 5/2) firm silty clay loam with many medium faint yellowish brown (10YR 5/6) mottles. Moderate medium angular blocky structure. Neutral in reaction.

C (34-60") Grayish brown (10YR 5/2) firm silty clay loam with many medium faint yellowish brown (10YR 5/6) mottles. Massive but tending to fracture along horizontal planes. Calcareous.

Mapping Units

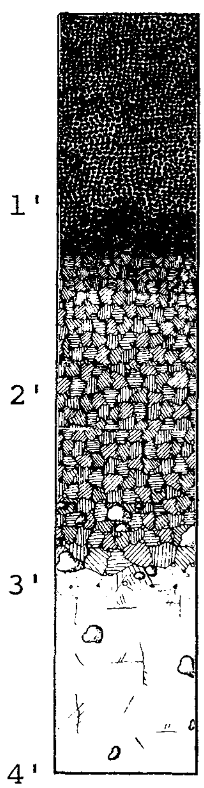
189A Martinton silt loam, 0 to 2 percent slopes. The typical profile is representative of the soils of this mapping unit. Small areas of Bonpas soils are inclusions because they were too small to delineate on the soil maps.

189B Martinton silt loam, 2 to 4 percent slopes. The soils of this mapping unit are similar to the typical profile described. Small areas of Bonpas or Gilmer and small moderately eroded areas are inclusions.

Odell Series

The Odell series includes deep, dark colored Brunizems developed from loam to silt loam glacial drift of Wisconsin Age. They are naturally imperfectly drained, have moderate permeability and a high moisture-holding capacity.

Typical Profile--Odell Loam



A_1	(0-9")	Black (10YR 2/1) friable loam with moderate fine granular structure. Neutral in reaction.
A_3	(9-13")	Black (10YR 2/1) friable gritty silt loam with moderate fine granular structure. Slightly acid.
B_1	(13-16")	Very dark grayish brown (10YR 3/2) firm silty clay loam with medium fine subangular blocky structure. Slightly acid.
B_2	(16-29")	Dark grayish brown (2.5Y 4/2) firm silty clay loam with common fine distinct yellowish brown (10YR 5/6) mottles. Moderate fine subangular blocky structure. Slightly acid.
B_3	(29-33")	Grayish brown (2.5Y 5/2) firm gritty silty clay loam with common fine distinct yellowish brown (10YR 5/6) mottles. Moderate medium angular blocky structure. Neutral in reaction.
C	(33-60")	Brown (10YR 5/3) friable loam with medium distinct yellowish brown (10YR 5/8) mottles. Massive. Calcareous.

Mapping Units

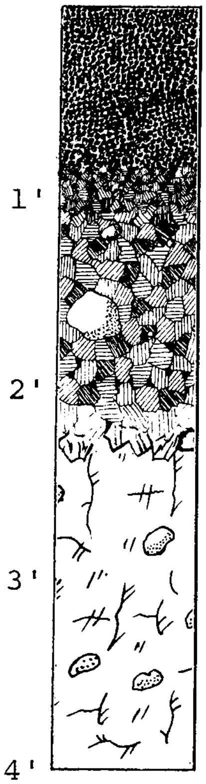
490A Odell loam, 0 to 2 percent slopes. The soils of this mapping unit are represented by the described profile. Small areas of Pella, Corwin and Andres soils are included because they were too small to be separated.

490B Odell loam, 2 to 4 percent slopes. The typical profile is representative of the soils of this mapping unit. Small inclusions of Corwin, Pella and Andres soils and moderately eroded areas occur where separation was impractical.

Swygert Series

The soils of the Swygert series are dark colored Brunizems developed from silty clay glacial drift of Wisconsin Age. They are naturally imperfectly drained, have slow permeability and moderate moisture-holding capacity.

Typical Profile--Swygert Silt Loam



A_1 (0-8") Black (10YR 2/1) friable silt loam with moderate fine granular structure. Slightly acid to neutral in reaction.

A_3 (8-11") Very dark brown (10YR 2/2) friable heavy silt loam with moderate very fine subangular blocky structure. Slightly acid to neutral in reaction.

B_1 (11-13") Very dark grayish brown (10YR 3/2) firm silty clay loam with moderate fine subangular blocky structure. Slightly acid.

B_2 (13-29") Dark grayish brown (2.5Y 4/2) very firm silty clay with common fine distinct light olive brown (2.5Y 5/4 to 5/6) mottles. Moderate medium angular blocky structure. Slightly acid.

C (29-60") Grayish brown (2.5Y 5/2) very firm silty clay with many fine distinct olive gray (5Y 4/2) and light olive gray (2.5Y 5/6) mottles. Weak medium angular blocky structure grading to massive at about 3½ feet. Calcareous.

Mapping Units

91B <u>Swygert silt loam, 2 to 4 percent slopes</u>. The soils of this mapping unit are represented by the typical profile described. Small areas of Andres, fine substratum and Elliott soils and small moderately eroded areas are inclusions.

91C <u>Swygert silt loam, 4 to 7 percent slopes</u>. The described profile is representative of these soils. Inclusions are Andres, fine substratum and Elliott soils. Small moderately eroded areas are also included.

91C2 <u>Swygert silt loam, 4 to 7 percent slopes, moderately eroded</u>. Erosion has caused these soils to differ from the profile described. The plow layer has a small amount of B horizon material incorporated into it and the depth to the C horizon is about 24 to 28 inches. Small areas of Andres, fine substratum and Elliott soils and small severely or slightly eroded areas are inclusions.

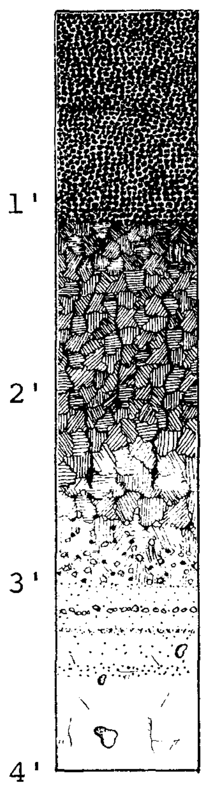
91D2 <u>Swygert silt loam, 7 to 12 percent slopes, moderately eroded</u>. The plow layer of these soils has some of the B horizon material mixed with the remaining A horizon. These soils also differ from the profile described in that the depth to the C horizon is about 24 to 28 inches. Small areas of Elliott soils and small severely or slightly eroded areas are inclusions.

91D3 Swygert soils, 7 to 12 percent slopes, severely eroded. Erosion has removed most of the A horizon of these soils. They differ from the profile described in that the plow layer consists of considerable B horizon material and the depth to the C horizon is about 18 to 24 inches. There are some inclusions of Elliott soils and less eroded areas which were impractical to separate.

Symerton Series

The Symerton series includes the deep, dark colored Brunizems developed in 24 to 60 inches of medium textured glacial drift (usually stratified), underlain by silty clay loam, Wisconsin Age glacial till. They are naturally moderately well drained, have moderate permeability and high moisture-holding capacity.

Typical Profile--Symerton Silt Loam



A_1	(0-9")	Very dark brown (10YR 2/2) friable silt loam with moderate fine granular structure. Slightly acid.
A_3	(9-11")	Very dark brown (10YR 2/2) firm heavy silt loam with moderate fine granular structure. Medium acid.
B_1	(11-15")	Dark brown (10YR 3/3) firm light silty clay loam with moderate very fine subangular blocky structure. Medium acid.
B_2	(15-28")	Dark brown (10YR 4/3) firm silty clay loam with moderate fine subangular blocky structure. Slightly acid.
B_3	(28-30")	Dark grayish brown (10YR 4/2) firm silty clay loam with few fine faint yellowish brown (10YR 5/4) mottles. Moderate fine subangular blocky structure. Neutral in reaction.
C	(30-44")	Brown (10YR 5/3) friable gritty silt loam with few fine faint yellowish brown (10YR 5/6) mottles. Weak medium angular blocky structure. Calcareous.
D	(44-60")	Dark grayish brown (2.5Y 4/2) firm silty clay loam with few fine distinct yellowish brown (10YR 5/6) mottles. Massive. Calcareous.

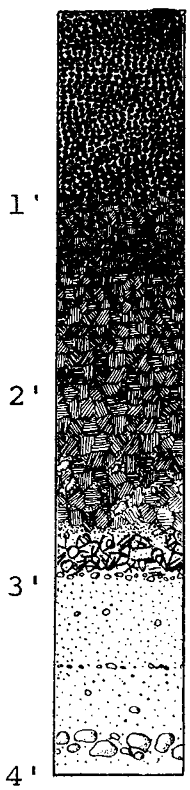
Mapping Units

294B Symerton silt loam, 2 to 4 percent slopes. The soils of this mapping unit are represented by the profile described. Small areas of Andres, Symerton, loamy substratum and Elliott soils and small moderately eroded areas are inclusions.

294C2 Symerton silt loam, 4 to 7 percent slopes, moderately eroded. The soils of this mapping unit differ from the typical profile in that a small amount of B horizon is incorporated into a 6 to 8 inch plow layer. Small areas of Varna, Symerton, loamy substratum and Grays, moderately fine substratum soils and small severely or slightly eroded areas are inclusions.

Symerton, loamy substratum includes the deep, dark colored Brunizems that developed from stratified, medium textured, Wisconsin Age glacial outwash deposits. They are naturally moderately well drained, have moderate permeability and a high moisture-holding capacity.

Typical Profile--Symerton Silt Loam, loamy substratum



A_1	(0-8")	Very dark brown (10YR 2/2) friable silt loam with moderate fine granular structure. Slightly acid.
A_3	(8-11")	Very dark grayish brown (10YR 3/2) friable silt loam with moderate fine granular structure. Slightly acid.
B_1	(11-14")	Dark brown (10YR 3/3) firm gritty silty clay loam with moderate very fine subangular blocky structure. Slightly acid.
B_{21}	(14-29")	Brown (10YR 4/3) firm silty clay loam with moderate fine subangular blocky structure. Slightly acid.
B_{22}	(29-33")	Dark grayish brown (10YR 4/2) firm clay loam with few fine faint yellowish brown (10YR 5/4) mottles. Moderate fine angular blocky structure. Neutral in reaction.
B_3	(33-37")	Brown (10YR 5/3) firm silty clay loam with a few fine faint yellowish brown (10YR 5/6) mottles. Moderate medium angular blocky structure. Neutral in reaction.
C	(37-60")	Dark grayish brown (10YR 4/2) friable stratified sandy loam, loam, silt loam and thin layers of sand, gravelly loam and clay loam with many medium distinct yellowish brown (10YR 5/6) mottles. Massive. Calcareous.

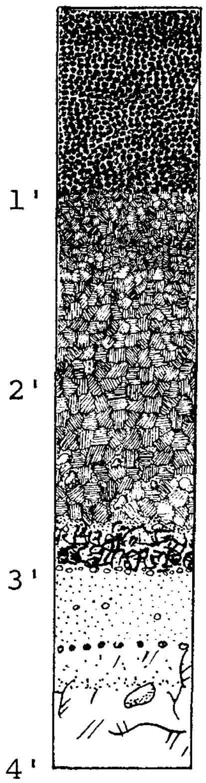
Mapping Units

443B Symerton silt loam, loamy substratum, 2 to 4 percent slopes. The typical profile described is representative of the soil for this mapping unit. Small areas of Andres, loamy substratum and Symerton and small moderately eroded areas are inclusions too small to show on the soil map.

443C2 Symerton silt loam, loamy substratum, 4 to 7 percent slopes, moderately eroded. The soils of this mapping unit differ from the typical profile in that small amounts of B horizon have been mixed into the plow layer. Variable erosion has made small inclusions of slightly and severely eroded areas necessary. Other inclusions are Symerton and Grays.

Symerton, fine substratum soils include deep, dark colored Brunizems developed from 24 to 60 inches of medium textured (usually stratified) glacial drift over silty clay glacial till of Wisconsin Age. They are naturally moderately well drained and moderately permeable in the solum but the underlying silty clay till has slow permeability. They have high moisture-holding capacity.

Typical Profile--Symerton Silt Loam, fine substratum



A_1	(0-11")	Black (10YR 2/1) friable silt loam with moderate fine granular structure. Slightly acid.
A_3	(11-13")	Very dark brown (10YR 2/2) friable silt loam with moderate fine granular structure. Slightly acid.
B_1	(13-16")	Dark brown (10YR 3/3) firm silty clay loam with moderate very fine subangular blocky structure. Slightly acid.
B_2	(16-36")	Brown (10YR 4/3) firm gritty silty clay loam with moderate fine subangular structure. Medium acid.
B_3	(36-38")	Dark grayish brown (10YR 4/2) firm clay loam with common fine distinct (10YR 5/8) mottles. Moderate medium angular blocky structure. Neutral in reaction.
C	(38-44")	Dark grayish brown (10YR 4/2) friable heavy loam with common fine distinct yellowish brown (10YR 5/8) mottles. Massive. Calcareous.
D	(44-60")	Grayish brown (2.5Y 5/2) very firm silty clay with common fine distinct olive brown (2.5Y 4/4) mottles. Massive. Calcareous.

Mapping Units

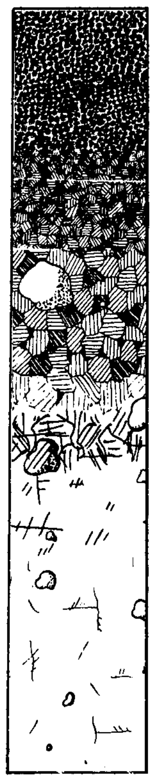
448B Symerton silt loam, fine substratum, 2 to 4 percent slopes. The soils of this mapping unit are represented by the typical profile. Small areas of Andres, fine substratum are inclusions.

448C2 Symerton silt loam, fine substratum, 4 to 7 percent slopes, moderately eroded. These soils differ from the typical profile as erosion has removed some of the A horizon and some B horizon has been incorporated into the plow layer. Small areas of Andres, fine substratum and Swygert are inclusions.

Varna Series

The Varna series includes the deep, dark colored Brunizems developed from Wisconsin Age silty clay loam glacial till. They are naturally moderately well drained, have moderately slow permeability and moderate moisture-holding capacity.

Typical Profile--Varna Silt Loam



A_1	(0-8")	Very dark brown (10YR 2/2) friable silt loam with moderate fine granular structure. Slightly acid.
A_3	(8-10")	Very dark brown (10YR 2/2) friable light silty clay loam with moderate fine granular structure. Slightly to medium acid.
B_1	(10-13")	Dark brown (10YR 3/3) firm silty clay loam with moderate very fine subangular blocky structure. Medium acid.
B_{21}	(13-20")	Dark yellowish brown (10YR 4/4) firm heavy silty clay loam with moderate fine subangular blocky structure. Moderately acid.
B_{22}	(20-30")	Dark grayish brown (10YR 4/2) firm heavy silty clay loam with a few fine faint yellowish brown (10YR 5/4) mottles. Moderate fine angular blocky structure. Slightly acid to neutral in reaction.
C	(30-60")	Dark grayish brown (2.5Y 4/2) firm silty clay loam with common fine distinct yellowish brown (10YR 5/6) mottles. Weak medium angular blocky structure grading to massive at about 4 feet. Calcareous.

Mapping Units

223B Varna silt loam, 2 to 4 percent slopes. The soils of this mapping unit are represented by the typical profile described. In mapping, it was necessary to include small areas of Elliott, Symerton and Ashkum soils. Small areas with moderate erosion are also included.

223B2 Varna silt loam, 2 to 4 percent slopes, moderately eroded. These soils differ from the typical profile in that erosion has removed considerable amounts of the upper layers. The plow layer includes a small amount of B horizon material and the depth to the C horizon is about 24 to 28 inches. Small areas of Elliott, Ashkum and Symerton soils and small slightly or severely eroded areas are inclusions.

223C Varna silt loam, 4 to 7 percent slopes. The typical profile represents the soils of this mapping unit. Some small areas of Elliott, Ashkum and Markham soils are included. There are also minor inclusions of moderately eroded soils.

223C2 Varna silt loam, 4 to 7 percent slopes, moderately eroded. The soils of this mapping unit differ from the typical profile in that erosion has removed considerable surface soil and the plow layer contains some subsoil. The depth to the C horizon is about 24 to 28 inches. Small areas of Elliott, Markham and Symerton soils and small slightly or severely eroded areas are inclusions which were not practical to separate.

223C3 Varna soils, 4 to 7 percent slopes, severely eroded. Erosion has altered these soils so that they differ from the typical profile. The plow layer contains considerable B horizon material and the depth to the C horizon is about 18 to 24 inches. On the soil maps, some small areas of Elliott, Markham and Symerton soils and some small moderately eroded areas are inclusions.

223D2 Varna silt loam, 7 to 12 percent slopes, moderately eroded. The soils of this mapping unit differ from the typical profile in that the plow layer has a small amount of subsoil mixed with the remaining surface soil. Also, the depth to the C horizon is about 24 to 28 inches. Small unmappable areas of the Markham, Symerton and Elliott soils are inclusions. Small severely or slightly eroded areas are also inclusions.

223D3 Varna soils, 7 to 12 percent slopes, severely eroded. Removal of much of the A horizon by erosion causes the soils to differ from the profile described. The plow layer contains considerable amounts of B horizon material and the depth to the C horizon is about 18 to 24 inches. Small areas of Markham, Symerton and Elliott soils and small moderately eroded areas are inclusions.

223E2 Varna silt loam, 12 to 18 percent slopes, moderately eroded. The soil of this mapping unit differs from the described profile. Due to erosion, the plow layer contains small amounts of subsoil material and the depth to the C horizon is about 24 to 28 inches. Small areas of Markham and Symerton soils and small slightly or severely eroded areas are inclusions.

223E3 Varna soils, 12 to 18 percent slopes, severely eroded. Erosion has caused these soils to differ from the described profile. Plowing has caused considerable subsoil material to be mixed with the remaining surface soil. The depth to the C horizon is about 16 to 20 inches. Small areas of Chatsworth, Markham and Symerton soils are inclusions. Some small areas are moderately eroded.

Humic Gleys

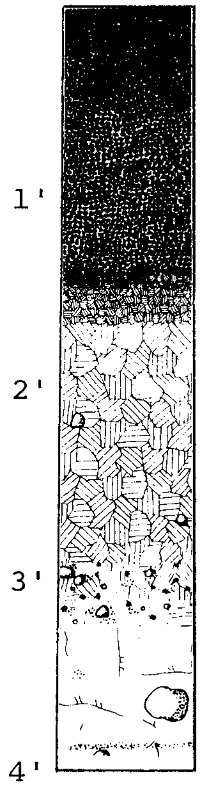
The Humic Gley soils are deep soils with dark, high organic matter content A horizons and dull or drab colored B horizons. They were developed under water tolerant grass and sedge vegetation in flat or depressional areas which naturally were very wet.

The Ela Township soils classified as Humic Gleys are Ashkum, Bonpas, Harpster, Pella and Peotone.

Ashkum Series

The Ashkum series includes the deep, dark colored Humic Gley soils that developed from Wisconsin Age silty clay loam glacial till. They are naturally poorly drained, have moderately slow permeability and high moisture-holding capacity.

Typical Profile--Ashkum Silty Clay Loam



A_1	(0-11")	Black (2.5Y 2/0) friable silty clay loam with moderate fine granular structure. Neutral in reaction.
A_3	(11-14")	Black (2.5Y 2/0) firm silty clay loam with moderate very fine subangular blocky structure. Neutral in reaction.
Bg_1	(14-17")	Very dark gray (5Y 3/1) firm silty clay loam with common fine distinct light olive brown (2.5Y 5/6) mottles. Moderate very fine subangular blocky structure. Neutral in reaction.
Bg_2	(17-33")	Olive gray (5Y 4/2) firm silty clay loam with many medium prominent yellowish brown (10YR 5/6 and 5/8) mottles. Weak medium angular blocky structure. Neutral in reaction.
C	(33-60")	Grayish brown (2.5Y 5/2) firm silty clay loam with common medium distinct yellowish brown (10YR 5/6) mottles. Weak coarse angular blocky structure grading to massive at about 4 feet. Calcareous.

Mapping Units

232A <u>Ashkum silty clay loam, 0 to 2 percent slopes</u>. The soils of this mapping unit are similar to the profile described. This unit has been reasonably well drained by agricultural drainage systems. Small unmappable areas of the Peotone, Harpster and Pella, moderately fine substratum soils and small areas having recent silty overwash are inclusions which were too small to show on the soil maps.

232A+ <u>Ashkum silt loam, overwash, 0 to 2 percent slopes</u>. This mapping unit has had 8 to 20 inches of dark silt loam deposited over the typical soil as described. It has been reasonably well drained with artificial drainage systems. Included in some areas are spots of the Peotone, Harpster and Pella, moderately fine substratum soils which are too small to show on the soil maps.

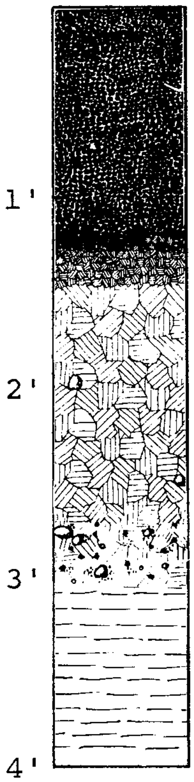
232B <u>Ashkum silty clay loam, 2 to 4 percent slopes</u>. This soil is similar to the profile described. It has been reasonably well drained by agricultural drainage systems. Small unmappable areas of the Harpster and Pella, moderately fine substratum soils are inclusions.

232B+ <u>Ashkum silt loam, overwash, 2 to 4 percent slopes</u>. The soil of this mapping unit differs from the typical profile in that 8 to 20 inches of dark silt loam overwash occurs on the original soil. It has been reasonably well drained for agricultural production. Small unmappable areas of the Harpster and Pella, moderately fine substratum soils are inclusions which were impractical to show on the soil maps.

Bonpas Series

The soils of the Bonpas series are deep, dark colored Humic Gley soils that developed from silty clay loam glacial lakebed or outwash sediments of Wisconsin Age. They are naturally poorly drained. They have moderately slow permeability and a high moisture-holding capacity.

Typical Profile--Bonpas Silty Clay Loam



A_1	(0-11")	Black (2.5Y 2/0) friable silty clay loam with moderate fine granular structure. Neutral in reaction.
A_3	(11-14")	Black (2.5Y 2/0) firm silty clay loam with moderate to very fine subangular blocky structure. Neutral in reaction.
Bg_1	(14-17")	Very dark grayish brown (2.5Y 3/2) firm silty clay loam with few fine distinct brown (10YR 4/3) mottles. Moderate fine subangular blocky structure. Neutral in reaction.
Bg_2	(17-34")	Olive gray (5Y 5/2) firm heavy silty clay loam with common fine distinct yellowish brown (10YR 5/6) mottles. Moderate medium angular blocky structure. Neutral in reaction.
C	(34-60")	Light olive gray (5Y 6/2) firm silty clay loam with many medium distinct yellowish brown (10YR 5/6) mottles. Weak medium angular blocky grading to massive. Calcareous.

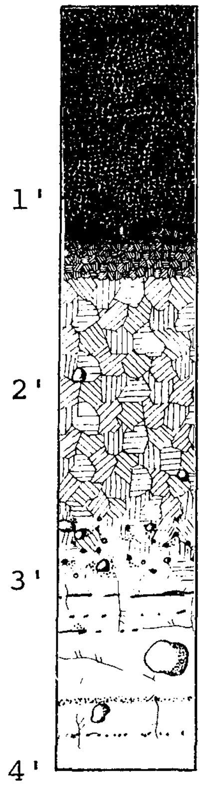
Mapping Units

126 <u>Bonpas silty clay loam</u>. The soils of this mapping unit are as described in the above profile and occur on level to nearly level topography. They have been drained. Small unmappable areas of the Peotone, Pella, moderately fine substratum and Harpster soils are inclusions which were impractical to show on the soil maps.

Harpster Series

The soils of the Harpster series are deep, dark colored Humic Gley soils that developed from medium to moderately coarse textured Wisconsin Age glacial drift. They developed in areas where snail shells have accumulated and made the soil calcareous. Harpster soils are naturally poorly drained, have moderate permeability and a high moisture-holding capacity.

Typical Profile--Harpster Silty Clay Loam



A_1 (0-15") Black (2.5Y 2/0) friable silty clay loam with moderate fine granular structure. Calcareous.

Bg_1 (15-20") Olive gray (5Y 4/2) firm gritty silty clay loam with yellowish brown (10YR 5/6) mottles. Moderate medium subangular blocky structure. Calcareous.

Bg_2 (20-36") Olive gray (5Y 5/2) firm silty clay loam with yellowish brown (10YR 5/6) mottles. Moderate medium angular blocky structure. Calcareous.

C (36-60") Olive gray (5Y 4/2) friable stratified silt loam, loam, sandy loam and sands with yellowish brown (10YR 5/4 and 5/6) mottles. Massive. Calcareous.

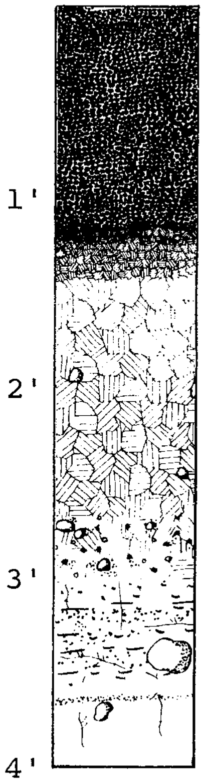
Mapping Units

67A Harpster silty clay loam, 0 to 2 percent slopes. The soils of this mapping unit are similar to the typical profile described. They have been artificially drained. Small unmappable areas of the Pella, moderately fine substratum and Pella and small areas having recent silty deposition over the typical profile are inclusions that were impractical to show on the soil maps.

67B Harpster silty clay loam, 2 to 4 percent slopes. The typical profile is representative of this mapping unit. The areas have been drained with agricultural drainage systems. Spots of the Pella and Pella, moderately fine substratum soils are inclusions that are too small to be shown on the soil maps.

Harpster complex includes Harpster loam and Harpster silt loam. Because of similarity of the two soils except for surface texture, only one profile description is inserted, that of Harpster loam.

Typical Profile--Harpster Loam



A_1	(0-12")	Black (2.5Y 2/0) friable loam with moderate fine granular structure. Calcareous.
A_3	(12-15")	Black (10YR 2/1) friable loam with moderate medium granular structure. Calcareous.
B_1	(15-20")	Dark grayish brown (2.5Y 4/2) friable heavy loam with many fine distinct light olive brown (2.5Y 5/6) mottles. Weak medium subangular blocky structure. Calcareous.
B_2	(20-32")	Grayish brown (2.5Y 5/2) friable light clay loam with many fine distinct light olive brown (2.5Y 5/6) mottles. Weak medium subangular blocky structure. Calcareous.
C	(32-42")	Dark gray (5Y 4/1) friable pebbly sandy loam with common fine prominent yellowish brown (10YR 5/6) mottles. Massive. Calcareous.
D	(42-60")	Olive gray (5Y 5/2) firm silty clay loam with many medium distinct yellowish brown (10YR 5/8) mottles. Massive. Calcareous.

Mapping Units

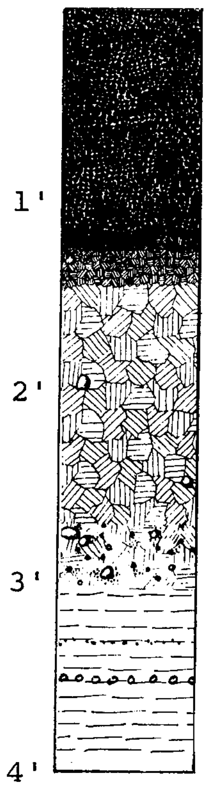
347A Harpster complex, 0 to 2 percent slopes. The soils of this mapping unit are similar to the described profile except as surface texture varies to silt loam. They have been drained. Spots of the Pella and Pella, moderately fine substratum soils and small areas having recent silty overwash over the normal soil are inclusions which were impractical to show on the soil maps.

347B Harpster complex, 2 to 4 percent slopes. The typical profile is representative of these soils except as surface texture varies to silt loam. They have been artificially drained. Small unmappable areas of the Pella and Pella, moderately fine substratum soils are inclusions in some areas.

Pella Series

The Pella soils include the deep, dark colored Humic Gley soils that developed from stratified, medium textured, glacial outwash deposits of Wisconsin Age. They are naturally poorly drained, have moderate permeability and a high moisture-holding capacity.

Typical Profile--Pella Silty Clay Loam



A_1 (0-18") Black (2.5Y 2/0) friable silty clay loam with moderate fine granular structure. Neutral in reaction.

Bg_1 (18-23") Very dark gray (2.5Y 3/0) firm silty clay loam with few fine faint very dark grayish brown (2.5Y 3/2) mottles. Moderate fine subangular blocky structure. Neutral in reaction.

Bg_2 (23-36") Grayish brown (2.5Y 5/2) firm gritty silty clay loam with many medium distinct yellowish brown (10YR 5/6) mottles. Moderate medium angular blocky structure. Neutral in reaction.

C (36-60") Grayish brown (2.5Y 5/2) friable stratified silt loam, loam, sandy loam and thin layers of sand, gravelly loam and clay loam with many medium distinct yellowish brown (10YR 5/8) mottles. Massive. Calcareous.

Mapping Units

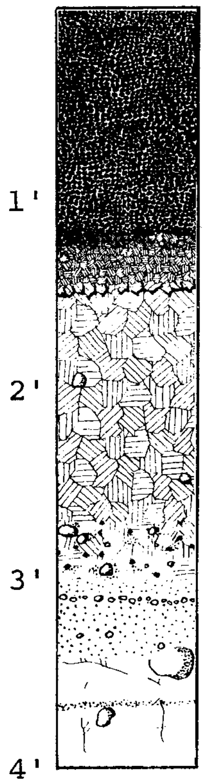
153A <u>Pella silty clay loam, 0 to 2 percent slopes</u>. The soils of this unit are as the profile described. These soils have been artificially drained for agricultural production. Spots of the Harpster, Peotone or Pella, moderately fine substratum soils and small areas that have slight erosion or areas of recent silty overwash are inclusions which are in some delineations because they were too small to show on the soil maps.

153A+ <u>Pella silt loam, overwash, 0 to 2 percent slopes</u>. The soils of this unit differ from the profile described in that 8 to 20 inches of recent silt loam deposits overlie the normal soil. These soils have been artificially drained for agricultural production. Small areas of the Peotone, Harpster and Pella, moderately fine substratum soils may be inclusions.

153B <u>Pella silty clay loam, 2 to 4 percent slopes</u>. These soils are similar to the profile described and have been drained for agricultural production. Small unmappable areas of the Peotone, Harpster and Pella, moderately fine substratum soils and spots that are slightly eroded are included in some areas because they were not practical to show on the soil maps.

The Pella, moderately fine substratum soils are deep, dark colored Humic Gley soils. They developed in 24 to 60 inches of medium textured glacial drift (usually stratified) which is underlain by silty clay loam, Wisconsin Age glacial till. Reddick soils are naturally poorly drained, have moderate to moderately slow permeability and a high moisture-holding capacity.

Typical Profile--Pella Silty Clay Loam, moderately fine substratum



A_1	(0-12")	Black (2.5Y 2/0) friable silty clay loam with moderate fine granular structure. Neutral in reaction.
A_3	(12-16")	Black (2.5Y 2/0) firm silty clay loam with moderate very fine subangular blocky structure. Neutral in reaction.
Bg_1	(16-20")	Black (5Y 2/2) firm silty clay loam with few fine faint olive (5Y 4/4) mottles. Moderate fine subangular blocky structure. Neutral in reaction.
Bg_2	(20-33")	Olive gray (5Y 4/2) firm silty clay loam with many fine distinct light olive brown (2.5Y 5/6) mottles. Moderate medium angular blocky structure. Neutral in reaction.
C	(33-52")	Olive gray (5Y 5/2) friable pebbly clay loam and loam (stratified) with many medium distinct yellowish brown (10YR 5/6) mottles. Massive. Calcareous.
D	(52-60")	Dark grayish brown (2.5Y 4/2) firm silty clay loam with few fine faint light olive brown (2.5Y 5/4) mottles. Massive. Calcareous.

Mapping Units

594A Pella silty clay loam, moderately fine substratum, 0 to 2 percent slopes. The soils of this mapping unit are about as the typical profile described. They have been drained by agricultural drainage systems. Small unmappable areas of the Peotone, Pella or Ashkum soils are inclusions. Small spots that have up to 8 inches of overwash material are also included in some areas.

594A+ Pella silt loam, moderately fine substratum, 0 to 2 percent slopes. There are 8 to 20 inches of dark silt loam deposition overlying the normal soil as described. This unit has had artificial drainage systems installed. Small unmappable areas of the Peotone, Ashkum and Pella soils are inclusions which were not practical to separate on the maps.

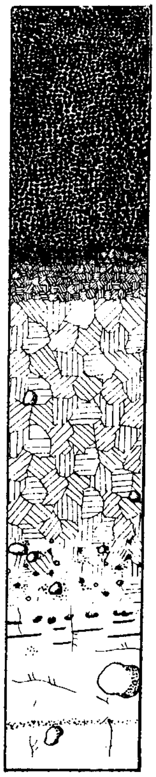
594B Pella silty clay loam, moderately fine substratum, 2 to 4 percent slopes. The profile described is representative of these soils. The areas are drained artificially. Unmappable spots of the Peotone, Ashkum and Pella soils are inclusions because of their small size.

594B+ Pella silt loam, moderately fine substratum overwash, 2 to 4 percent slopes. The soils of this mapping unit differ from the described profile in that 8 to 20 inches of recent dark colored silt loam overlie the normal soil. Agricultural drainage systems are installed. Spots of the Pella, Ashkum or Peotone series and small areas having less than 8 inches of recent overwash are inclusions in some areas because it was impractical to separate them on the soil maps.

Peotone Series

The Peotone series includes the deep, dark colored Humic Gleys that developed from medium to moderately fine textured Wisconsin Age glacial drift. These soils are naturally very poorly drained and occur in depressional areas which are nearly level. They have moderately slow permeability and a high moisture-holding capacity.

Typical Profile--Peotone Silty Clay Loam



A_1 (0-13") Black (2.5Y 2/0) friable silty clay loam with moderate fine granular structure. Neutral in reaction.

A_3 (13-15") Black (2.5Y 2/0) friable silty clay loam with moderate very fine angular blocky structure. Neutral in reaction.

Bg_1 (15-20") Very dark gray (5Y 3/1) firm silty clay loam with few fine distinct light olive brown (2.5Y 5/4) mottles. Moderate fine angular blocky structure. Neutral in reaction.

Bg_2 (20-40") Dark gray (5Y 4/1) firm silty clay loam with few medium distinct light olive brown (2.5Y 5/4) mottles. Moderate grading to weak medium angular blocky structure. Neutral in reaction.

C (40-60") Gray (5Y 5/1) firm silty clay loam with few medium distinct light olive brown (2.5Y 5/4 and 5/6) mottles. Massive. Calcareous.

Mapping Units

330 <u>Peotone silty clay loam</u>. The profile of these soils is similar to that described and the soils occur on level topography. They have been reasonably well drained. Spots of the Pella, Pella, moderately fine substratum, Harpster or Bonpas soils and small areas of recent silty overwash are included in some areas because they were too small to show on the soil maps.

330+ <u>Peotone silt loam, overwash</u>. The soils of this mapping unit differ from the typical because 8 to 20 inches of dark silt loam overwash is over the normal soil. They have been reasonably well drained with artificial drainage systems. Spots of the Pella, Pella, moderately fine substratum, Harpster, or Bonpas soils are inclusions in some areas. Small areas having less than 8 inches of overwash will also occur within some of these mapping units.

W330 <u>Peotone silty clay loam, wet</u>. The typical profile is similar to the profile of the soils of this mapping unit. A water table is within 3 feet of the surface most of the year. Small unmappable areas of the Pella, Pella, moderately fine substratum, Harpster or Bonpas soils are inclusions because they were too small to delineate on the soil maps.

W330+ Peotone silt loam, overwash, wet. There are 8 to 20 inches of recent dark colored silt loam deposition over the normal soil as described. A water table is within 3 feet of the surface most of the year. Spots of the Pella, Pella, moderately fine substratum, Harpster or Bonpas soils and small areas having less than 8 inches of overwash are inclusions which could not be separated on the soil maps.

330 Peotone silty clay loam, marshy. The typical profile is representative of the soils of this mapping unit. They have ponded water over them throughout a great part of each year and usually support a swamp grass or cattail vegetation. In some areas, small unmappable spots of the Houghton or Harpster soils are inclusions which could not be shown on the maps.

Bog Soils

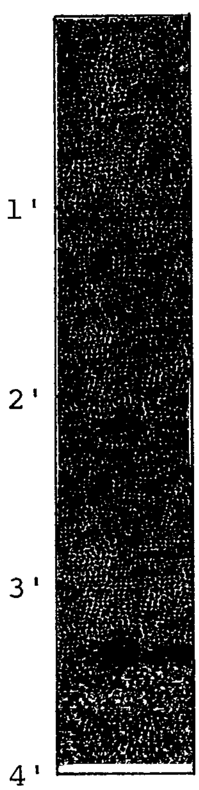
The Bog soils are formed in dark colored organic deposits composed of residues of reed and sedge vegetations. These are deep muck soils except in some areas where marl underlies the muck at depths of 12 to 39 inches.

The soils classified as Bog soils are Houghton and Rollin.

Houghton Series

The soils of the Houghton series are deep, dark colored Bog soils which occur in level depressional areas in morainic topography. They formed from decayed swamp grasses, reeds and sedges. They have a very high water-holding capacity and naturally are very poorly drained.

Typical Profile--Houghton Muck



Ip (0-8") Black (2.5Y 2/0) very friable silty muck with moderate very fine granular structure. Neutral in reaction.

I (8-24") Black (2.5Y 2/0) very friable muck with weak medium granular structure. Neutral in reaction.

II (24-36") Black (10YR 2/1) very friable muck with few poorly defined plant fibers. Weak medium granular to massive structure. Neutral in reaction.

III (36-60") Black (10YR 2/1) very friable peaty muck with many well defined dark yellowish brown (10YR 4/4) fibers. Massive. Neutral in reaction.

Mapping Units

103 Houghton muck, drained. The profile of the soils of this unit is similar to the profile described. This soil has been drained so that the water table is below 3 feet during most of the year. Some of the areas are subject to seasonably high water tables and to temporary ponding. Some small areas and the perimeter of some large areas have up to 8 inches of silt loam deposition on the surface. Small unmappable areas of calcareous muck and areas that are wet are included because they were too small to separate on the soil maps.

103+ Houghton soils, silty overwash, drained. This soil has 8 to 20 inches of recent dark colored silt loam deposits over the typical soil as described. This soil has been drained so that the water table is below 3 feet during most of the year; however, some of the areas are subject to seasonal high water tables and to temporary ponding. Small unmappable areas that are wet or have over 20 inches of recent deposition are included because they were impractical to show on the maps.

W103 Houghton muck, wet. The soil of this mapping unit is similar to the profile described. It has a watertable within 3 feet of the surface throughout most of the year and is subject to temporary ponding. Some small areas and the perimeter of some large areas have up to 8 inches of dark colored deposition over the normal soil. Small areas of calcareous muck are inclusions.

W103+ Houghton soils, silty overwash, wet. This soil differs from the typical profile in that 8 to 20 inches of dark silt loam have been deposited on the surface. The areas have a water table within 3 feet of the surface throughout most of the year and are subject to temporary ponding.

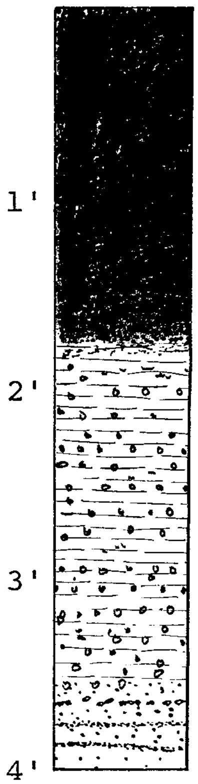
103 Houghton muck, marshy. The soil of this unit is about as described, however, it is under water throughout most of the year. Some small areas and the perimeter of some large areas have up to 8 inches of dark silt loam deposition on the surface. Areas of calcareous muck too small to show on the maps are included.

103+ Houghton soils, marshy. These areas differ from the described soil by having 8 to 20 inches of recent dark colored silt loam deposition. Water stands on this soil throughout most of the year.

Rollin Series

The Rollin series includes the Bog soils which have 12 to 39 inches of dark colored muck overlying marl or calcareous marl-like material. These soils occur in level depressional areas and formed from decayed swamp grass, reed and sedge vegetation. Rollin is naturally poorly drained and is calcareous throughout the soil.

Typical Profile--Rollin Muck



Ip (0-8") Black (2.5Y 2/0) very friable silty muck with moderate very fine granular structure. Calcareous with some shell fragments.

II (8-20") Black (2.5Y 2/0) very friable muck with moderate fine granular structure. Calcareous with shell fragments.

III (20-34") Light gray (2.5Y 7/2) marl that is very shelly. Massive. Highly calcareous.

IV (34-60") Olive gray (5Y 5/2) marl that is very shelly. Massive. Highly calcareous.

Mapping Units

312+ Rollin soils, silty overwash. This soil differs from the typical profile in that 8 to 20 inches of recent dark colored silt loam has been deposited over the normal soil. This soil is drained whereby the water table is below 3 feet during most of the year. The areas are subject to seasonably high water tables and to temporary ponding.

312 Rollin muck, marshy. The soil of this mapping unit is similar to the typical profile. It has water standing on the surface most of the year. Small unmappable areas have up to 8 inches of dark colored deposition on the surface and small areas of non-calcareous muck are included because it was impractical to show them on the soil maps.

Alluvial Soils

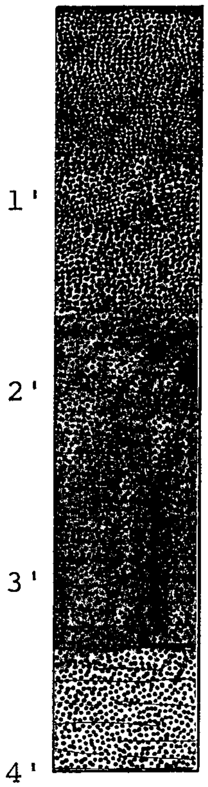
The Alluvial soils in Ela Township are deep, dark colored, poorly drained soils occurring on level flood plains of the larger streams. The soils have formed in relatively recent stream deposits. Horizon development is weak.

The soils classified as Alluvial soils are Otter and Sawmill.

Otter Series

The soils of the Otter series are deep, dark colored Alluvial soils that occur on stream flood plains. They are naturally poorly drained, have moderate permeability and a high moisture-holding capacity. The Otter soils developed from medium-textured water-deposited sediments.

Typical Profile--Otter Silt Loam



I (0-20") Black (10YR 2/1) friable silt loam with moderate fine granular structure. Neutral in reaction.

II (20-40") Black (2.5Y 2/0) friable light silty clay loam stratified with silt loam and loam and having few fine distinct dark yellowish brown (10YR 4/4) mottles. Weak fine subangular blocky structure. Neutral in reaction.

III (40-60") Dark gray (2.5Y 3/0 to 4/0) friable heavy silt loam stratified with sandy loam and silty clay loam and having common medium prominent yellowish brown (10YR 5/6) mottles. Massive. Neutral in reaction.

Mapping Units

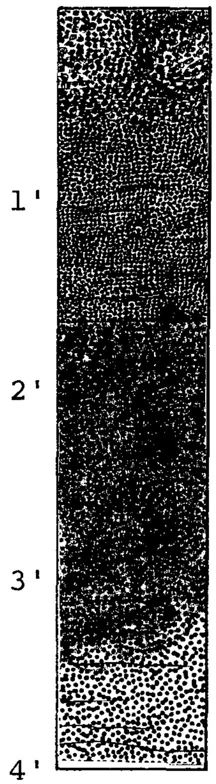
76 Otter silt loam. The soils of this mapping unit are level and are represented by the typical profile. They have a water table below 3 feet during most of the year; however, they are subject to flooding. Spots of the Houghton or Sawmill soils and spots with higher water tables are included because they were too small to show on the soil maps.

W76 Otter silt loam, wet. The typical profile described is representative of the soils of this mapping unit. They are level and have a water table above 3 feet during most of the year. They are subject to flooding. Small unmappable areas of the Houghton and Sawmill soils are inclusions in some areas.

Sawmill Series

The Sawmill series includes the deep, dark colored Alluvial soils that developed from moderately fine sediments. They occur on the level flood plains of the larger streams. They are naturally poorly drained, have moderate permeability and a high moisture-holding capacity.

Typical Profile--Sawmill Silty Clay Loam



I (0-12") Black (10YR 2/1) friable silty clay loam with moderate fine granular structure. Neutral in reaction.

II (12-44") Black (10YR 2/1) friable silty clay loam with strata of silt loam and having common medium distinct dark yellowish brown (10YR 4/4) mottles. Weak fine subangular blocky structure. Neutral in reaction.

III (44-60") Very dark gray (5Y 3/1) firm silty clay loam with loamy strata and having common medium distinct yellowish brown (10YR 5/4) mottles. Massive. Neutral in reaction.

Mapping Units

107 Sawmill silty clay loam. The soil of this mapping unit is similar to the typical profile. It has a water table below 3 feet during most of the year; however, it is subject to flooding. Small spots of the Otter and Peotone soils and spots having higher water tables are inclusions which were impractical to show on the soil maps.

W107 Sawmill silty clay loam, wet. This is a level mapping unit which has a soil similar to the described profile. It has a water table above 3 feet and is subject to frequent flooding. Small unmappable spots of the Otter and Peotone soils are included in some areas because they were too small to show on the soil maps.

Regosols Intergrading to Gray-Brown Podzolic Soils

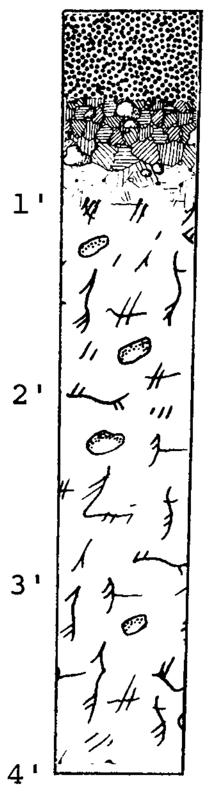
The Regosols intergrading to the Gray-Brown Podzolic soils have in the natural state thin, light to moderately dark A horizons and thin, weakly developed B horizons. They have C horizons composed of material weathered to a slight degree and usually like that from which the upper horizons have developed.

The Chatsworth soils are classified as Regosols intergrading to Gray-Brown Podzolic soils.

Chatsworth Series

The soils of the Chatsworth series are light colored and developed from Wisconsin Age silty clay loam to silty clay glacial till. They are strongly sloping to very steep upland soils occurring on morainic topography. Chatsworth has moderately slow to slow permeability and low moisture-holding capacity.

Typical Profile--Chatsworth Silt Loam



A_1 (0-5") Very dark grayish brown (10YR 3/1) friable, heavy silt loam with moderate fine granular structure. Neutral in reaction.

B (5-9") Brown (10YR 4/3) firm silty clay loam with weak fine subangular blocky structure. Calcareous.

C (9-60") Grayish brown (10YR 5/2) firm silty clay loam with common fine distinct yellowish brown (10YR 5/6) mottles. Weak medium angular blocky structure becoming massive at about 2 feet. Calcareous.

Mapping Units

241D2 Chatsworth silt loam, 7 to 12 percent slopes, moderately eroded. The soils of this mapping unit differ from the described profile in that the A and B horizons are mixed into the agricultural plow layer. In some areas, there are spots of the Morley, Markham or Frankfort soils included because they were too small to show on the soil maps. Small spots that are severely eroded and have exposed C horizon material are also inclusions.

241F2 Chatsworth silt loam, 18 to 30 percent slopes, moderately eroded. The soils of this mapping unit are similar to the profile described. Spots of the Morley series and spots having the calcareous C horizon exposed on the surface are inclusions that were not able to be shown on the soil maps.

241G2 Chatsworth silt loam, 30 to 50 percent slopes, moderately eroded. The typical profile is representative of the soils of this mapping unit. Small areas having the A and B horizons removed are inclusions which could not be shown on the maps.

A few land areas have been so altered by man's activities that it is not possible to classify the areas into units of the soil classification system. Two mapping units are used to designate these areas and are described as follows:

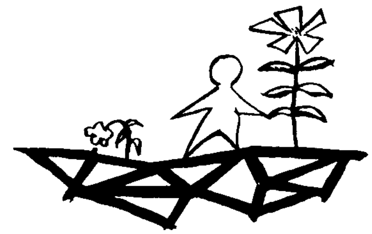
Md Made Land. Areas of this soil mapping unit have varying depts of hauled-in material. Many of the areas are low-lying which indicates that the fill was placed over such soils as the Ashkum, Peotone and Reddick. Much of the fill is quite clayey soil material which indicates that it was moved from other areas. Occasionally, stone, broken concrete, and other trash materials are also incorporated.

Br Borrow Areas. Areas of this mapping unit have been stripped of all recognizable natural soils. Indications are that three or more feet of soil material was removed. The material which has been exposed is primarily calcareous silty clay loam glacial till.

CHAPTER VI

AGRICULTURAL SOIL INTERPRETATIONS

This chapter provides interpretive information about the soils of Ela Township for agricultural use. Soil capability is discussed followed by the management groups which describe the soil management characteristics and suitability of all the soils. Crop yield estimates are given for those soils that are suited for the four major crops of corn, soybeans, wheat and oats. The soils are rated also as to their adaptability to crops.



Soil Capability

The agricultural enterprises of Ela Township are dependent upon the use of soils and the continuing capability of the soils to produce the many types of crops and plants that are adapted to the area.

Soil scientists who mapped and studied the soils of Ela Township have recorded the differences in the agricultural capabilities and use potentials of the various kinds of soil. This information about the soil and land characteristics is directly related to: (a) soil adaptability for agricultural use; (b) production potentials; (c) risks of soil deterioration by sustained and/or intense cropping; and (d) soil management requirements for sustained productivity.

Many of the soil characteristics which affect the limitation for land use are of a permanent nature. These characteristics include slope, soil texture, soil depth, effects of past erosion, permeability and water-holding capacity. As any one of these characteristics becomes unfavorable to agriculture, the limitation to land use is a continuing one. Other soil characteristics are not considered permanent if it is physically and economically feasible to make improvement and remove the limitation to land use. Such characteristics are the presence of excess water and the hazards of flooding or overflow. As these hazards are overcome, continuing limitations may still exist due to unfavorable permanent soil characteristics.

All of the land in Ela Township has been classified into eight capability classes. The degree of risk of soil damage and the consequent degree of limitations of use become progressively greater from Class I through Class VIII. In Class I are the soils that have few limitations, the widest range of use and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. Soils in Class VIII have no agricultural use and are best suited for wildlife, water impounding and recreational purposes.

In addition, groupings are made to indicate the kind of risk or hazard involved. The soils in Ela Township are classified into subclasses based on hazards of erosion or wetness. The subclass is indicated by adding a small letter, e or w, to the class numeral, for example IIe. The letter "e" shows that the main limitation is risk of erosion, "w" means that water in or on the soil will interfere with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage).

On the basis of similar soil characteristics, the soils are also placed into capability units which are called management groups in this report. Thus, a management group contains soils that are alike enough to be suited to the same crops and pasture plants, to require similar management and have similar productivity and other responses to management.

Following are descriptions of the classes, subclasses, and management groups that occur in Ela Township.

Class I. Soils that have few limitations that restrict use. It is very good land that can be cultivated safely with ordinary good farming methods. The management groups in this class are:

Management Group 1. Deep, dark colored silty soils of the uplands.

Management Group 2. Deep, dark colored lowland soils.

Class II. Soils that have some limitations that reduce the choice of plants or require moderate conservation practices.

Subclass II e. Soils subject to moderate erosion if they are not protected.

Management Group 3. Undulating to gently rolling dark colored loamy soils of the uplands.

Management Group 4. Undulating to gently rolling moderately light colored loamy soils of the uplands.

Subclass II w. Soils that have moderate limitations because of excess water.

Management Group 5. Nearly level to undulating, deep, dark colored, highly productive, permeable soils.

Management Group 6. Nearly level to undulating, deep, permeable soils. Somewhat limited in productivity because of high lime.

Management Group 7. Undulating, light-colored, loamy soils of the uplands.

Management Group 8. Undulating, darl colored, loamy soils of the uplands.

Class III. Soils that have severe limitations that reduce the choice of plants or require special conservation practices or both.

Subclass III e. Soils subject to severe erosion if they are cultivated and not protected.

Management Group 9. Gently rolling to rolling loamy soils of the uplands.

Management Group 10. Gently rolling, dark colored, slowly permeable, loamy soils of the uplands.

Subclass III w. Soils that have severe limitations because of excess water.

Management Group 11. Level, deep, organic soils.

Management Group 12. Undulating soils of the uplands.

Class IV. Soils that have very severe limitations that restrict the choice of plants, require very careful management, or both.

Subclass IV e. Soils subject to very severe erosion if they are cultivated and not protected.

Management Group 13. Gently rolling to hilly, loamy soils of the uplands.

Class V. Soils not likely to erode that have other limitations, impractical to remove without major reclamation, that limit their use largely to pasture, woodland or wildlife food and cover.

Subclass V w. Soils that are too wet for cultivation, drainage or protection not feasible.

Management Group 14. Level, poorly drained mineral and organic soils of depression areas or flood plains.

Class VI. Soils that have severe limitations that make them generally unsuitable for cultivation and that limit their use largely to pasture, woodland or wildlife food and cover.

Subclass VI e. Soils severely limited chiefly by risk of erosion if protective cover is not maintained.

Management Group 15. Hilly to steep soils of the upland.

Class VII. Soils that have very severe limitations that make them unsuitable for cultivation without major reclamation and that restrict their use largely to grazing, woodland or wildlife.

Subclass VII e. Soils very severely limited chiefly by risk of erosion if protective cover is not maintained.

Management Group 16. Rolling to very steep clayey soils of the uplands.

Class VIII. Miscellaneous land types that have limitations that preclude their use without major reclamation for commercial production of plants and restrict their use to recreation, wildlife, water supply, or aesthetic purposes.

Subclass VIII w. Extremely wet or marshy land.

Management Group 17. Level marshlands.

Management Groups

This section describes the management group soils briefly and gives a list of the soils in the group. In addition, a statement is made about their suitable use and management. Additional information on the agricultural use, soil conservation practices, and management of the soils of Ela Township is available at the Lake County Soil Conservation District or Extension Service Office.

Management Group 1. The soils of this management group are deep, dark colored, silty soils of the upland. They are permeable, highly productive, and level. These soils have few or no limitations and can be cultivated very intensively. The soils of this management group are well suited to crops grown in the township.

Andres silt loam, 0 to 2 percent slopes.
Andres silt loam, loamy substratum, 0 to 2 percent slopes.
Elliott silt loam, 0 to 2 percent slopes.
Martinton silt loam, 0 to 2 percent slopes.
Odell loam, 0 to 2 percent slopes.
Wauconda silt loam, moderately fine substratum, 0 to 2 percent slopes.

Management Group 2. The soils of this management group are deep, dark colored lowland soils. They are permeable, highly productive, adequately drained, level, and are well suited to crops grown in the township.

Bonpas silty clay loam, 0 to 2 percent slopes.
Pella silty clay loam, 0 to 2 percent slopes.

Management Group 3. The soils of this management group are undulating to gently rolling dark colored loamy soils of the upland. They are highly productive and well suited to all crops grown in the area. These soils are slightly susceptible to water erosion and runoff. For intensive cultivation, erosion needs to be controlled by using contour cultivation or terraces.

Andres silt loam, 2 to 4 percent slopes.
Andres silt loam, loamy substratum, 2 to 4 percent slopes.
Andres silt loam, fine substratum, 2 to 4 percent slopes.
Corwin loam, 2 to 4 percent slopes.
Elliott silt loam, 2 to 4 percent slopes.
Elliott silt loam, 2 to 4 percent slopes, moderately eroded.
Elliott silt loam, overwash, 2 to 4 percent slopes.
Gilmer silt loam, 2 to 4 percent slopes.
Martinton silt loam, 2 to 4 percent slopes.
Odell loam, 2 to 4 percent slopes.
Symerton silt loam, 2 to 4 percent slopes.
Symerton silt loam, 4 to 7 percent slopes, moderately eroded.
Symerton silt loam, loamy substratum, 2 to 4 percent slopes.
Symerton silt loam, loamy substratum, 4 to 7 percent slopes, moderately eroded.
Symerton silt loam, fine substratum, 2 to 4 percent slopes.
Varna silt loam, 2 to 4 percent slopes.
Varna silt loam, 2 to 4 percent slopes, moderately eroded.
Varna silt loam, 4 to 7 percent slopes.

Management Group 4. This management group consists of undulating to gently rolling moderately light colored loamy soils of the uplands. They are moderately high to highly productive and well suited to all crops grown in the areas. These soils are very responsive to nitrogenous fertilizers. They have moderate susceptibility to water erosion and runoff. For safe, intensive cultivation, erosion must be controlled by using contour farming practices or terraces.

Del Rey silt loam, brown subsoil variant, 2 to 4 percent slopes.
Grays silt loam, 2 to 4 percent slopes.
Grays silt loam, moderately fine substratum, 2 to 4 percent slopes.
Grays silt loam, moderately fine substratum, 4 to 7 percent slopes, moderately eroded.
Markham silt loam, 2 to 4 percent slopes.
Markham silt loam, 2 to 4 percent slopes, moderately eroded.
Morley silt loam, 2 to 4 percent slopes.
Morley silt loam, 2 to 4 percent slopes, moderately eroded.
Tuscola silt loam, 2 to 4 percent slopes.
Tuscola silt loam, 4 to 7 percent slopes, moderately eroded.
Tuscola silt loam, moderately fine substratum, 2 to 4 percent slopes.
Tuscola silt loam, moderately fine substratum, 4 to 7 percent slopes, moderately eroded.

Management Group 5. The soils of this management group are nearly level to undulating, deep, dark colored, adequately drained, highly productive and permeable. They are well suited to crops grown in the area. These soils have a slight limitation in crop production due to wetness of an overflow or ponding nature. They can be cultivated safely provided some measures are taken to control or remove the hazard of the wetness.

Ashkum silt loam, 0 to 2 percent slopes.
Ashkum silt loam, overwash, 0 to 2 percent slopes.
Ashkum silty clay loam, 2 to 4 percent slopes.
Ashkum silt loam, overwash, 2 to 4 percent slopes.
Otter silt loam.
Pella silt loam, overwash, 0 to 2 percent slopes.
Pella silty clay loam, 2 to 4 percent slopes.
Pella silty clay loam, moderately fine substratum, 0 to 2 percent slopes.
Pella silt loam, moderately fine substratum, overwash, 0 to 2 percent slopes.
Pella silty clay loam, moderately fine substratum, 2 to 4 percent slopes.
Pella silt loam, moderately fine substratum, overwash, 2 to 4 percent slopes.
Peotone silty clay loam.
Peotone silt loam, overwash.
Sawmill silty clay loam.

Management Group 6. The soils of this management group consist of nearly level to undulating, deep, dark colored, adequately drained, moderate to highly productive permeable soils. These soils have a slight limitation due to wetness and because of high lime content require special fertility treatment.

Harpster silty clay loam, 0 to 2 percent slopes.
Harpster silty clay loam, 2 to 4 percent slopes.
Harpster complex, 0 to 2 percent slopes.
Harpster complex, 2 to 4 percent slopes.

Management Group 7. The soils of this management group are light colored, loamy soils of the undulating upland. They have heavy, slowly permeable subsoils. They are moderately high to highly productive, very responsive to nitrogenous fertilizers, and well suited to all crops grown in the area. The soils of this group have a slight limitation due to wetness. In addition, the sloping soils are subject to erosion. For safe intensive cultivation, adequate drainage and erosion control practices must be used.

Beecher silt loam, 2 to 4 percent slopes.
Blount silt loam, 0 to 2 percent slopes.
Blount silt loam, 2 to 4 percent slopes.
Blount silt loam, 2 to 4 percent slopes, moderately eroded.
Wauconda silt loam, 2 to 4 percent slopes.
Wauconda silt loam, moderately fine substratum, 2 to 4 percent slopes.
Wauconda silt loam, fine substratum, 2 to 4 percent slopes.

Management Group 8. This management group consists of undulating, dark colored, loamy soils of the upland. They have slowly permeable subsoils and are excessively wet during the spring months. If properly managed, these soils are well suited for most crops grown in the area. Their adaptability to most truck crops is marginal. Wetness and erosion are hazards which must be controlled through adequate drainage and erosion control practices for safe, intensive cultivation.

Swygert silt loam, 2 to 4 percent slopes.

Management Group 9. The soils of this management group consist of gently rolling to rolling loamy soils of the uplands. These soils are well drained and suited to most crops common to the area. Water erosion is the primary limitation. To provide adequate protection for cultivated crops, erosion must be controlled with terraces, sod crops, sodded waterways, and minimum tillage operation.

Beecher silt loam, 4 to 7 percent slopes.
Beecher silt loam, 4 to 7 percent slopes, moderately eroded.
Del Rey silt loam, brown subsoil variant, 4 to 7 percent slopes.
Del Rey silt loam, brown subsoil variant, 4 to 7 percent slopes, moderately eroded.
Markham silt loam, 4 to 7 percent slopes.
Markham silt loam, 4 to 7 percent slopes, moderately eroded.
Markham silt loam, 7 to 12 percent slopes.
Markham silt loam, 7 to 12 percent slopes, moderately eroded.
Morley silt loam, 4 to 7 percent slopes.
Morley silt loam, 4 to 7 percent slopes, moderately eroded.
Morley silt loam, 7 to 12 percent slopes.
Morley silt loam, 7 to 12 percent slopes, moderately eroded.
Symerton silt loam, fine substratum, 4 to 7 percent slopes, moderately eroded.
Tuscola soils, 4 to 7 percent slopes, severely eroded.
Tuscola soils, moderately fine substratum, 4 to 7 percent slopes, severely eroded.
Tuscola silt loam, moderately fine substratum, 7 to 12 percent slopes, moderately eroded.
Varna silt loam, 4 to 7 percent slopes, moderately eroded.
Varna soils, 4 to 7 percent slopes, severely eroded.
Varna silt loam, 7 to 12 percent slopes, moderately eroded.
Wauconda silt loam, fine substratum, 4 to 7 percent slopes.

Management Group 10. This management group consists of gently rolling, dark colored, loamy soils of the uplands. These soils have slowly permeable subsoils which make them highly susceptible to water erosion. Most crops common to the area are grown on these soils. Terraces, sod waterways and minimum tillage operations are practices needed for safe, intensive cultivation.

Swygert silt loam, 4 to 7 percent slopes.
Swygert silt loam, 4 to 7 percent slopes, moderately eroded.

Management Group 11. The soils of this management group are the level, deep muck soils that are adequately drained for use as cropland. Controls of the water table should be provided in the drainage system to prevent excessive drying which leads to severe wind erosion and excessive subsidence. Short season crops are suggested because crops on muck soils are more subject to frost damage.

Houghton muck, drained.
Houghton soils, silty overwash, drained.

Management Group 12. This management group consists of undulating soils of the upland. They have clayey subsoils that are very slowly permeable. Wetness is a limiting factor during the planting season. Drainage must be provided, when needed, by an open ditch system. The subsoils limit rooting depths and tend to make these soils droughty during the summer months.

Frankfort silt loam, 2 to 4 percent slopes.

Management Group 13. This management group consists of gently rolling to hilly loamy soils of the upland. They are best suited to pasture and trees. If these soils are used for cropland, erosion must be controlled by diversions, sodded waterways, minimum tillage operations, and growing grasses and legumes in the cropping system. Most of these soils are too steep or severely eroded to be terraced effectively.

LaRose soils, 7 to 12 percent slopes, severely eroded.
Markham silt loam, 12 to 18 percent slopes, moderately eroded.
Morley soils, 4 to 7 percent slopes, severely eroded.
Morley soils, 7 to 12 percent slopes, severely eroded.
Morley silt loam, 12 to 18 percent slopes.
Morley silt loam, 12 to 18 percent slopes, moderately eroded.
Swygert silt loam, 7 to 12 percent slopes, moderately eroded.
Tuscola silt loam, 12 to 18 percent slopes.
Tuscola soils, moderately fine substratum, 7 to 12 percent slopes, severely eroded.
Varna soils, 7 to 12 percent slopes, severely eroded.
Varna silt loam, 12 to 18 percent slopes, moderately eroded.

Management Group 14. This management group consists of level, poorly and very poorly drained soils of the flood plains and depressional areas. They are wet, irregularly shaped, subject to flooding, and are best suited for pasture and woodland.

Houghton muck, wet.
Houghton soils, silty overwash, wet.
Otter silt loam, wet.
Peotone silty clay loam, wet.
Peotone silt loam, overwash, wet.
Rollin soils, silty overwash.
Sawmill silty clay loam, wet.

Management Group 15. This management group is made up of hilly to steep loamy soils of the upland. Many of the soils are badly eroded, particularly those that have been used intensively for row crops. They are not suited to cultivation but yields of forage and wood products are good. They are adapted to a wide range of tree species.

Morley soils, 12 to 18 percent slopes, severely eroded.
Morley silt loam, 18 to 30 percent slopes.
Morley silt loam, 18 to 30 percent slopes, moderately eroded.
Swygert soils, 7 to 12 percent slopes, severely eroded.
Varna soils, 12 to 18 percent slopes, severely eroded.

Management Group 16. The soils of this management group are rolling to very steep clayey soils of the upland. Moderate erosion has occurred on these soils and they are best suited for pasture. These soils have shallow rooting depths and are limited in suitability for trees.

Chatsworth silt loam, 7 to 12 percent slopes, moderately eroded.
Chatsworth silt loam, 18 to 30 percent slopes, moderately eroded.
Chatsworth silt loam, 30 to 50 percent slopes, moderately eroded.

Management Group 17. The soils of this management group are the level marsh areas that are too wet to produce a commercial crop. Most of the areas are covered by cattails, willows, sedges, and reeds. Many of the areas may be improved for wildlife use by level ditching or by controlling the water level.

Houghton muck, marshy.
Houghton soils, marshy.
Peotone silty clay loam, marshy.
Rollin muck, marshy.

Crop Yield Estimates

General knowledge and experimental data shows that different soils have different crop yield potentials, even under identical systems of management. The soils of Ela Township have a wide range in their ability to produce corn, soybeans, wheat, and oats. Table 6 gives the estimated yield potentials of these crops for each of the soils. The yields given are based on a high level of soil management as defined in the footnotes to the table. The estimates made are based on yield records (19).

The estimated yields can serve as a basis for making economic evaluations of the land. Farmers, land appraisers, tax assessors and others who are interested in the ability of the soils to produce crops can use the information.

Crop Adaptations

Certain agricultural crops do best on only certain types of soil. Other crops are adapted to a wide range of soil conditions. Table 7 rates the kinds of soil with respect to their suitability for growing various crops. The crops given are those commonly grown or adapted to be grown in Ela Township. Other crops and their adaptability can be estimated by comparison with those which are given. Information on fruit crops is to be found in the "Non-Agricultural Plant Materials" chapter.

The soil types are placed into eight "crop adaptability" soil groupings. The soils that are included in each of the groups are given in the "Index to Grouping of Soil Mapping Units" located at the end of this report.

TABLE 6.--AGRICULTURAL CROP YIELD ESTIMATES[1]

(Yields are those to be expected under a high level of management.[2] Dasnes indicate crop is ordinarily not grown and the soil is not suited for its production.)

SOIL MAPPING UNIT	YIELD ESTIMATE (bu./ac.)				SOIL MAPPING UNIT	YIELD ESTIMATE (bu./ac.)				SOIL MAPPING UNIT	YIELD ESTIMATE (bu./ac.)				SOIL MAPPING UNIT	YIELD ESTIMATE (bu./ac.)			
	Corn	Soy-bean	Wheat	Oats		Corn	Soy-bean	Wheat	Oats		Corn	Soy-bean	Wheat	Oats		Corn	Soy-bean	Wheat	Oats
23A	71	26	27	53	189B	82	33	31	59	241D2	-	-	-	-	449B	78	29	28	49
23B	69	25	26	52	192B	66	25	26	47	241F2	-	-	-	-	449C2	65	25	24	43
23B2	60	20	21	42	192C	63	23	24	45	241G2	-	-	-	-	449C3	60	23	22	39
60D3	54	20	23	36	192C2	57	21	22	41	293A	91	36	35	66	449D2	62	24	23	41
67A	91	36	33	64	194B	66	25	26	47	293B	89	35	34	64	449D3	56	22	21	37
67B	87	34	31	61	194B2	60	23	24	43	294B	92	32	35	63	450B	84	32	34	60
76	95	38	34	66	194C	63	23	24	45	294C2	79	29	31	55	450C2	73	29	30	52
W76	-	-	-	-	194C2	57	21	22	41	295B	82	33	31	59	490A	91	36	35	66
91B	71	28	27	53	194C3	52	19	20	38	298B	74	28	27	53	490B	89	35	34	64
91C	68	27	26	50	194D	60	22	23	43	298C	71	27	26	51	495B	92	32	35	63
91C2	45	18	17	34	194D2	54	20	21	39	298C2	57	21	21	41	502A	82	33	33	61
91D2	42	17	16	31	194D3	49	18	19	36	312+	- - V A R I A B L E - -				502B	80	31	32	60
91D3	-	-	-	-	194E	56	21	22	40	312 \\//	-	-	-	-	531B	73	27	28	53
103	98	39	31	58	194E2	50	19	20	36	320B	56	23	22	45	531B2	67	25	26	48
W103	-	-	-	-	194E3	-	-	-	-	330	87	35	33	62	531C	71	26	27	51
103 \\//	-	-	-	-	194F	-	-	-	-	W330	-	-	-	-	531C2	65	24	25	47
103+	98	39	31	58	194F2	-	-	-	-	330 \\//	-	-	-	-	531D	68	25	26	49
W103+	-	-	-	-	223B	79	28	31	56	330+	87	35	33	62	531D2	62	23	24	45
103+ \\//	-	-	-	-	223B2	72	25	28	52	W330+	-	-	-	-	531E2	58	21	22	42
107	95	38	34	66	223C	76	27	30	54	341B	79	28	31	56	594A	87	35	33	62
W107	-	-	-	-	223C2	69	24	27	50	347A	91	36	33	64	594A+	87	35	33	62
126	87	35	33	62	223C3	63	23	25	45	347B	87	34	31	61	594B	85	34	32	61
146A	84	34	32	60	223D2	66	23	26	47	357B	74	28	27	53	594B+	85	34	32	61
146B+	88	36	33	64	223D3	60	21	24	42	357C	71	27	26	51	696B	78	29	28	49
146B	82	33	31	59	223E2	61	21	24	43	442A	91	36	35	66	696C2	65	25	24	43
146B2	74	30	28	54	223E3	-	-	-	-	442B	89	35	34	64	696C3	60	23	22	39
153A	97	39	34	71	232A	87	35	33	62	443B	92	32	35	63	696E	68	26	25	45
153A+	97	39	34	71	232A+	87	35	33	62	443C2	79	29	31	55	697B	80	31	32	60
153B	95	38	33	70	232B	85	34	32	61	448B	79	28	31	56	698B	84	32	34	60
189A	84	34	32	60	232B+	85	34	32	61	448C2	69	24	27	50					

[1] Yield estimates given are as per the unpublished Technical, Management and Information Note--Soils #10--"Yield Ratings for Illinois Capability Units." (19)

[2] High level of management is defined as maintaining a high level of fertility, maintaining soil tilth and control of erosion. High level of fertility includes (a) for corn--the application of 130 to 140 pounds of nitrogen per acre in the current and previous year contributed by both legume and non-legume sources; 50 to 55 pounds each of equivalent P_2O_5 and K_2O per acre applied or as residual from previous applications; and the equivalent of legume or legume-grass mixture immediately preceding the corn crop; (b) for soybeans and oats--the corresponding requirements are about 70 percent for those given for corn. (Maintaining soil tilth and control of erosion are considered adequate when in accord with rotation and conservation practice recommendations given in the SCS capability unit guide information.)

TABLE 7.--CROP ADAPTABILITY (AGRICULTURAL)[1]

SOIL GROUP (CROP)	SOIL MAPPING UNITS[2]	CROP[3]										
		GRAINS		GRASSES			LEGUMES		TRUCK CROPS			
		Corn Soybean	Oats Wheat	Brome Orchard Kentucky Blue Field Brome	Timothy Fescue Red Top	Reed Canary Tall Fescue Canada Blue	Alfalfa Sweet Clover Red Clover	Ladino Clover Alsike Clover Birdsfoot Trefoil	Carrot Sugar Beet	Asparagus Squash Pumpkin Cabbage	Peas Beans Tomatoes	Melons Strawberries
C1	103|/, 103+|/, 312|/, 330 |/	Unsuited	Unsuited	Unsuited	Unsuited	Unsuited	Unsuited	Unsuited	Unsuited	Unsuited	Unsuited	Unsuited
C2	W76, W103, W103+, W107, W330, W330+	Unsuited	Unsuited	Unsuited	Marginal	Suited	Unsuited	Marginal	Unsuited	Unsuited	Unsuited	Unsuited
C3	103, 103+, 312+	Suited	Marginal	Marginal	Suited	Suited	Marginal	Suited	Suited	Suited	Suited	Unsuited
C4	23A 189A 347B 23B 189B 357B 67A 232A 442A 67B 232A+ 442B 76 232B 490A 107 232B+ 490B 126 293A 502A 146A 293B 502B 146B 295B 594A 146B+ 298B 594A+ 153A 330 594B 153A+ 330+ 594B+ 153B 347A 697B	Suited	Suited	Suited	Suited	Suited	Suited	Suited	Suited	Suited	Suited	Marginal
C5	91B, 320B	Suited	Suited	Suited	Suited	Suited	Suited	Suited	Marginal	Marginal	Marginal	Marginal
C6	294B, 443B, 448B, 449B, 450B, 495B, 696B, 698B	Suited	Suited	Suited	Suited	Marginal	Suited	Suited	Suited	Suited	Suited	Suited
C7	192B, 194B, 223B, 341B, 531B	Suited	Suited	Suited	Suited	Marginal	Suited	Suited	Marginal	Suited	Suited	Suited

1/Ratings: Suited means the specified crops are well adapted to the soil conditions. Marginal means the specified crops are somewhat limited as to their adaptability to the soil conditions. Unsuited means the specified crops are not well adapted to the soil conditions.

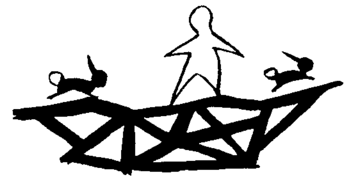
2/Only those soil mapping units which are nearly level to gently sloping and relatively uneroded are given. Other soil mapping units may rate differently so far as crop adaptability; because they are eroded or hazards may exist which will need on site evaluation. (Consult the Lake County Soil Conservation District or Extension Services Offices.)

3/Other crops can be estimated by comparison with those given.

CHAPTER VII

WILDLIFE--SOIL RELATIONSHIP INTERPRETATIONS[1/]

Most forms of wildlife help farmers and rurban land owners by helping control insects, weeds and other noxious pests.



According to McAtee (7), the annual value of Wildlife has been estimated for the Central States of the United States at 14 cents per acre for meat and fur production and 22.6 cents for destruction of harmful insects and other noxious pests.

Studies by Good and Dambach (5) indicate that the beneficial wildlife population on a 100-acre farm with about 1/3 of the fence rows containing woody cover, fifteen acres of protected woods, twenty-five acres of good pasture and the remaining sixty acres in a 4 year rotation with 2 years of meadow would be as follows: (a) several million beneficial insects, (b) over 400 beneficial birds, (c) more than a thousand beneficial small mammals.

In addition to the already-described benefits, game birds and animals provide farmers, rurban land owners and their friends with sport and food during the hunting season. In addition, fur-bearing animals can furnish a cash income from trapping and the sale of hunting rights. The importance of wildlife to the general public is further emphasized by the large number of people who hunt and fish annually. In addition to those who hunt and fish are those people who enjoy seeing, hearing, studying and photographing wildlife. Wildlife is one of the principal attractions responsible for the huge tourist business, fourth largest industry in the country.

Generally speaking, any land area is capable of supporting a certain number of a given kind of wildlife. The factors usually most important in supporting this wildlife are represented in the accompanying diagram (Figure 3) as hurdles over which the animals must climb in order to survive from one spring to the next. The higher the hurdle, the greater its importance in limiting wildlife populations, although this may vary for different wildlife species.

Only a few of these limiting factors can be controlled or modified by man; the species factors are unchangeable as are weather conditions. The effects of predators may be modified to some extent, but there is little evidence that predators are often the important limiting factor. Little can be done about diseases and parasites. Some of man's activities, such as time of plowing, could be changed while others, such as time of mowing meadow crops (one of the most important), cannot be altered very much. The greatest changes can be made in the amount, quality and distribution of food and cover.

1/ Material in this section was developed with assistance from Virgil Hawk, Plant Materials Technician and Robert Lawson, Management Agronomist, Soil Conservation Service.

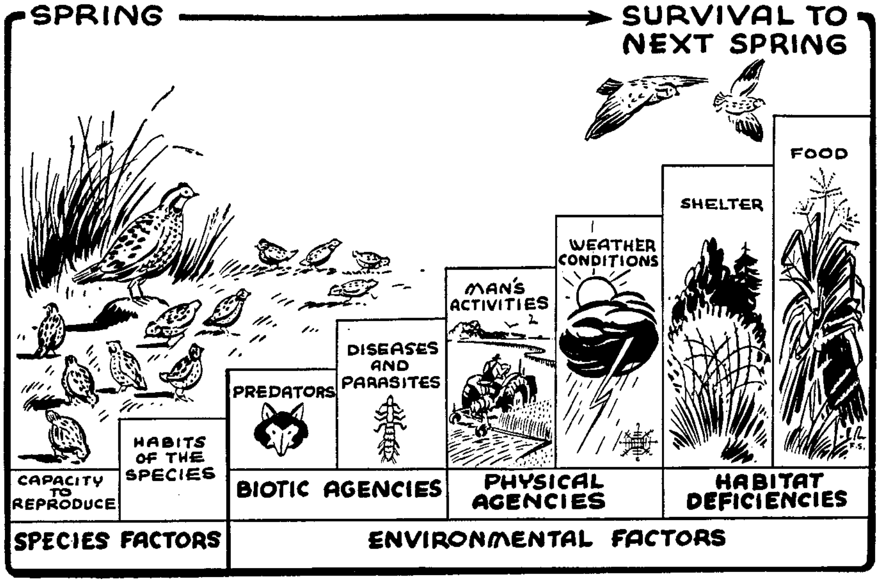


FIGURE 3.--FACTORS AFFECTING SURVIVAL OF WILDLIFE

For effective utilization, food must be plentiful, close to good cover and available in seasons when needed. Winter and early spring are usually the most critical periods. Although modern harvesting methods leave a good deal of waste grain, much of it is far out of the normal range of the wildlife or may be covered by ice and snow making availability a problem. The planting of perrenial food-producing plants close to good cover is one way of insuring available food supplies throughout the year. Leaving a portion of a crop unharvested near good ground cover is also helpful.

Any animal, in order to exist in an area, must have cover. Among other things, cover must provide concealment for nests and young, shade from the hot sun and shelter from chilling rains in summer. It must also provide avenues of escape from enemies. As with food, cover is most critical during winter and early spring. The planting of conifers close to food and water is highly recommended. Control of mowing and burning until after the nesting season is also helpful.

The soils of Ela Township differ greatly in their suitability for food and cover plants. Among the most important factors that affect the suitability is the ability of the soil to permit the development of an adequate root system and provide optimum moisture and plant food. Other significant properties and characteristics of the soil that affect plant site are thickness of surface soil (erosion), slope, soil reaction, depth to water table, permeability and aeration. Other site factors such as position in the landscape, flooding frequency and degree of wetness are important plant selectors in Ela Township.

Table 8 has been arranged to indicate adaptable species of vegetation to the soil groupings and a few of the more common species of wildlife that utilize these vegetative species. Potential soil productivity is rated for each soil group by determining the average site and inherent fertility of the different soils in each group. The animals that are listed are those considered to be most dominant and chiefly of some value as game. Other animals, e. g. skunk, beaver, squirrel, etc., will naturally thrive along with the species listed. Specific problems regarding planting, seed bed preparation, area plantings, etc., should be referred to the local Soil Conservation District or Extension Service office.

TABLE 8.--HERBACEOUS PLANTING GUIDE FOR WILDLIFE HABITAT IMPROVEMENT (16, 20)

WILDLIFE GROUP DESCRIPTION AND SOIL SYMBOL ON MAP	PLANT SPECIES	YEAR ROUND WILDLIFE 1/					MIGRATORY WATERFOWL 1/			REMARKS
		Bobtail Quail	Ring Neck Pheasant	Song Birds	Rabbit	Deer	Muskrat	Geese	Ducks	
Group W_1: Lowland swampy soils having standing water most of the year. Productivity is variable.	Wild Celery							F	F	Plant seeds or tubers in 2-5' of water with slow current.
Soil Map Symbols: 103, 103+, 312, 330	Cattail						FC	F		Self-seeding. Do not encourage in waterfowl areas.
	Wild Rice							FC	FC	Plant in 1/2-3' of moving water.
	Sago Pondweed							F	F	Plant seeds in 1 1/2-3' water. Seeds must be soaked 30 hours before planting and planted within 48 hours.
	Floating Leaf Pondweed							F	F	Seedling material may be shoved into soft bottom soil.
Group W_2: Lowland wet soils having watertables at 1 to 3 feet most of the year, productivity is variable.	Wild Rice							F	F	Plant in 1/2-3' of moving water.
Soil Map Symbols: W76, W103, W103+, W107, W330, W330+	Wild Millet	FC	FC	F			F	FC	FC	Complete water coverage destroys seedlings. Soak seed 24 hours in cold water.
	Reed Canary Grass		C		FC					Too dense to grow with legumes.
	Browntop Millet								F	Matures in 60 days. Seed deteriorates slowly under water.
Group W_3: Drained lowland soils and slowly permeable upland soils which have watertables below 3 feet except during wet seasons, productivity is moderately high to high.	Grains: Browntop Millet								F	Matures in 60 days. Seed deteriorates slowly under water.
Soil Map Symbols:	Grasses: Colonial Bent				F	F				Profuse stolen growth, smothers competitors.
23A, 23B, 23B2, 67A, 67B, 76, 91B	Reed Canary		C		FC					Too dense to grow with legumes.
91C, 91C2, 91D2, 103, 103+, 107, 126	Tall Fescue	C	C	C	FC	F				Clump forming.
153A, 153A+, 153B, 232A, 232A+, 232B, 232B+	Redtop	C	C	C	C					Seldom needed alone. Combines well with Alsike, Ladino and White Clover.
298B, 298C, 298C2, 312+, 320B, 330, 330+	Legumes: Birdsfoot Trefoil				F	F				Persistent legume.
347A, 347B, 594A, 594A+, 594B, 594B+	Alsike Clover & Ladino Clover				F	F				Use heavier seeding ratio in woodland sites.
Group W_4: Moderate to moderately slowly permeable upland soils which have watertables below 3 feet except during wet seasons, productivity is moderately high to high.	Grains: Browntop Millet								F	Matures in 60 days. Seeds deteriorate slowly under water.
Soil Map Symbols:	Grasses: Kentucky Blue	C	C	C	FC					Seldom seeded alone. Volunteers when fertility is high. Seed forming.
146A, 146B, 146B+, 146B2, 189A, 189B	Tall Fescue	C	C	C	FC	F				Clump forming.
293A, 293B, 295B, 357B, 357C, 442A	Redtop	C	C	C	C					Sod forming grass for acid wet soils. Seldom seeded alone.
442B, 490A, 490B, 502A, 502B, 697B	Switchgrass	FC	FC	FC	FC				F	Makes very good cover, effective erosion control.
	Timothy	C	C	FC	FC	F				Usually grows with clover, otherwise needs nitrogen.
	Legumes: Alfalfa	FC	FC		FC	F			F	Grows well in combinations with grasses.
	Birdsfoot Trefoil				F	F				Persistent legume.
	Alsike Clover & Ladino Clover				F	F				Use heavier seeding ratio in woodland sites.

See footnotes at end of table, page -80-

TABLE 8 (CONTINUED) --HERBACEOUS PLANTING GUIDE FOR WILDLIFE HABITAT IMPROVEMENT (16, 20)

WILDLIFE GROUP DESCRIPTION AND SOIL SYMBOL ON MAP	PLANT SPECIES		YEAR ROUND WILDLIFE 1/					MIGRATORY WATERFOWL 1/			REMARKS
			Bobtail Quail	Ring Neck Pheasant	Song Birds	Rabbit	Deer	Muskrat	Geese	Ducks	
Group W_5: Well to moderately well drained soils with good moisture holding capacity, productivity is moderately high. Soil Map Symbols: 60D3 223C 450B 192B 223C2 450C2 192C 223D2 495B 192C2 223E2 531B 194B 294B 531B2 194B2 294C2 531C 194C 341B 531C2 194C2 443B 531D 194D 443C2 531D2 194D2 448B 531E2 194E 448C2 696B 194E2 449B 696C2 194F 449C2 696C3 194F2 449C3 696E 223B 449D2 698B 223B2 449D3	Grains:	Barley		F					F		Winter barley less winter hardy than wheat.
		Buckwheat			F		F			F	Can be planted at a later date than most other crops. Usually out yields most grains on poor acid soils.
		Rye				F	F				Used primarily on sandy and droughty soils.
		Sorghum	F		F					F	Dwarf varieties offer more cover than tall varieties; however, some of the latter are more palatable.
	Grasses:	Kentucky Blue	C	C	C	FC					Seldom seeded alone. Volunteers when fertility is high.
		Smooth Brome	C	C	C	FC	F				Usually seeded with legume. Sod forming.
		Tall Fescue	C	C	C	FC	F				Clump forming.
		Orchard Grass	C	C							May be grown with Alfalfa.
		Redtop	C	C	C	C					Sod forming grass for acid soils. Seldom seeded alone.
		Switchgrass	FC	FC	FC	FC				F	Makes very good cover, effective erosion control.
		Timothy	C	C	FC	FC	F				Usually grows with clover, otherwise needs nitrogen.
	Legumes:	Alfalfa	FC	FC		FC	F			F	Grows well in combination with grasses.
		Ladino Clover & Red Clover			F	F					Use heavier seeding rates in woodland sites.
		Cowpeas	F								If sown alone, sow 1 1/2 bushels per acre.
		Crownvetch				C					Area stabilization.
		Sweet Clover	C	FC							If sown alone, sow 8-10 lbs. per acre.
Group W_6: Upland soils which tend to be droughty during most years, productivity is moderate. Soil Map Symbols: 91D3 223C3 241D2 194C3 223D3 241F2 194D3 223E3 241G2 194E3	Grains:	Rye				F	F				
	Grasses:	Smooth Brome	C	C	C	FC	F				Usually seeded with legume, sod forming.
		Orchard Grass	C	C							May be grown with Alfalfa.
		Switchgrass	FC	C	FC	FC					Makes very good cover.
	Legumes:	Birdsfoot Trefoil				F	F				Persistent legume.
		Crownvetch				C					Critical area stabilization.
		Sweet Clover	C	FC							If sown alone, sow 8-10 lbs. per acre.

1/ Wildlife usage of the various plant species is indicated as follows: F = food, C = cover, FC = food and cover.

CHAPTER VIII

NON-AGRICULTURAL PLANT MATERIALS--SOIL RELATIONSHIPS[1/]

Many people want to live in or near the country away from heavy concentrated centers of population. In most cases, these people live on building sites of a larger size and their attention has been focused on nature.

Many of these people want to become familiar with plant materials which will help them develop their community as an area that is more in harmony with nature.

The forester, plant materials technicial, biologist, etc., realize that certain properties of the soil such as texture, tilth, rooting zone depths, wetness and natural fertility, are useful tools in judging soil as to the species of plants that will grow in suitable abundance. In addition to providing anchorage for plants, the soil must be able to supply the essential plant nutrients to sustain life and growth. Some soils differ markedly in their capacity to provide sound anchorage, sufficient nutrients and proper balance of air and water for any specific species of plant. Likewise, plants vary in their ability to tolerate and grow under different soil conditions. For example, willows can tolerate a high proportion of water in the soil while pines will live in soils containing a relatively small amount of moisture. Reed Canary grass will grow in extremely wet locations and sweet clover will grow on highly eroded, droughty sites. Both plants, however, will do better in soils that are neither saturated nor excessively dry. At one place in northeastern Illinois the owner of a new home was having difficulty growing shade trees. An investigation of the soil indicated that the builder had removed most of the topsoil from the home site, thereby exposing a very compact, wet and unfavorable subsoil that was calcareous. To complicate the situation, the builder had chosen a variety of shade trees that has a deep tap root system and which needs a deep dry soil for optimum growth (2).

The soil survey with interpretations prepared by soil and plant scientists can serve as an effective tool in guiding the proper use of plants in the landscape beautification of suburban areas.

Herbaceous Plants

Certain grasses and legumes are best adapted to certain soil conditions. Table 9 lists the grasses and legumes which are best adapted to the six general groups of soils (6). Seeding mixtures and seeding rates are given for those plant species which are best adapted for various uses. This table is not expected to be all inclusive with regard to herbaceous plant species and seeding rates. Those given can serve as guides as they are commonly available and used.

1/ Portions of this section were developed with assistance from Virgil Hawk, Plant Materials Technician and Robert Lawson, Management Agronomist, Soil Conservation Service.

All of the soil mapping units have been placed into the six general soil groups as per the "Index of Grouping of Soil Mapping Units". On site assistance may be obtained by contacting the local Soil Conservation District and Extension Service Offices.

Shrubs and Vines

Shrub and vine plants will vary in their adaptability to soil conditions. Table 10 gives those shrub and vine plants which are normally best adapted for domestic fruit production and for planting in various kinds of odd areas (16). All of the soil mapping units are grouped into six general groups as given in the "Index to Grouping of Soil Mapping Units".

Trees

Trees will vary in their adaptability to different kinds of soils. Table 11 gives a generalized tree planting guide for the area (16). The trees listed are those which are normally best adapted for the various purposes which are given. All of the soil mapping units are grouped into six general groups as given in the "Index to Grouping of Soil Mapping Units". Figure 4 gives examples of tree shapes as they have been referred to in Table 11.

TABLE 9.--GENERALIZED HERBACEOUS PLANTING GUIDE FOR NON-AGRICULTURAL USES[1]

SOIL GROUP (Herb-aceous)	BRIEF SOIL DESCRIPTION AND SYMBOL ON MAP	LAWNS		GOLF COURSES		PLAYGROUNDS	PARKS	OPEN AREAS FOR PERMANENT VEGETATION
		Partial Shade	Sun	Fairways	Roughs			
H1	Lowland swampy soils having standing water most of the year. Soil Map Symbols: 103, 103+, 312, 330.	NO SPECIES RECOMMENDED OTHER THAN THE NATURAL VEGETATION						
H2	Lowland wet soils having watertables at 1 to 3 feet most of the year. (Productivity of the adapted species will be variable.) Soil Map Symbols: W76, W103, W103+, W107, W330, W330+	NO SPECIES ARE RECOMMENDED						Mixture: 100% Reed Canarygrass Planting rate: Seed 8 to 12 lbs. per acre.
H3	Drained lowland soils and slowly permeable upland soils which have watertables below 3 feet except during wet seasons. (Productivity of the adapted plant species will be moderately high to high.) Soil Map Symbols: 23A 103 232B+ 594A 23B 103+ 298B 594A+ 23B2 107 298C 594B 67A 126 298C2 594B+ 67B 153A 312+ 76 153A+ 320B 91B 153B 330 91C 232A 330+ 91C2 232A+ 347A 91D2 232B 347B	Mixture: 50% Kentucky or Merion Bluegrass, 50% Red Fescue Planting rate: Seed 3 to 4 lbs. of this mixture per 1000 sq. ft.	Mixture: 75% Kentucky or Merion Bluegrass, 10% Colonial Bent, 15% Redtop Planting rate: Seed 2 to 2½ lbs. of this mixture per 1000 sq. ft.	Mixture: 75% Kentucky or Merion Bluegrass, 10% Colonial Bent, 15% Redtop Planting rate: Seed 2½ to 5 lbs. of this mixture per 1000 sq. ft.	Mixture: 80% Reed Canarygrass, 20% Ladino Clover Planting rate: Seed ¼ to ½ lb. of this mixture per 1000 sq. ft.	Mixture: 90% Tall Fescue, 10% Redtop Planting rate: Seed 2½ to 5 lbs. of this mixture per 1000 sq. ft.	Mixture: 20% Birdsfoot Trefoil or Ladino Clover, 80% Tall fescue Planting rate: Seed 1 to 2 lbs. of this mixture per 1000 sq. ft.	Mixture: 80% Reed Canarygrass, 20% Ladino Clover Planting rate: Seed 8 to 10 lbs. per acre. Alternates are: 100% Birdsfoot Trefoil seeded at 5 to 8 lbs. per acre. 100% Alsike Clover seeded at 2 to 4 lbs. per acre. 100% Ladino Clover seeded at 1 to 3 lbs. per acre. 100% White Clover seeded at 1 to 3 lbs. per acre.
H4	Moderate to moderately slowly permeable upland soils which have watertables below 3 feet except during wet seasons. (Productivity of the adapted plant species will be moderately high to high.) Soil Map Symbols: 146A 293A 442B 146B 293B 490A 146B+ 295B 490B 146B2 357B 502A 189A 357C 502B 189B 442A 697B	Mixture: 50% Kentucky or Merion Bluegrass, 50% Red Fescue Planting rate: Seed 3 to 4 lbs. of this mixture per 1000 sq. ft.	Mixture: 80% Kentucky or Merion Bluegrass, 20% Redtop Planting rate: Seed 2 to 2½ lbs. of this mixture per 1000 sq. ft.	Mixture: 90% Kentucky or Merion Bluegrass, 10% Redtop Planting rate: Seed 2½ to 5 lbs. of this mixture per 1000 sq. ft.	Mixture: 80% Tall Fescue, 20% Ladino Clover Planting rate: Seed ¼ to ½ lb. of this mixture per 1000 sq. ft.	Mixture: 100% Tall Fescue Planting rate: Seed 2½ to 5 lbs. of this mixture per 1000 sq. ft.	Mixture: 20% Alfalfa or Birdsfoot Trefoil, 80% Tall Fescue Planting rate: Seed 1 to 2 lbs. of this mixture per 1000 sq. ft.	Mixture: 40% Alfalfa or Birdsfoot Trefoil or Alsike Clover, 60% Timothy Planting rate: Seed 3 to 5 lbs. per acre. Alternates are: 100% Ladino Clover seeded at 1 to 3 lbs. per acre. 100% White Clover seeded at 1 to 3 lbs. per acre. 100% Alfalfa seeded at 8 to 12 lbs. per acre. 100% Birdsfoot Trefoil seeded at 5 to 8 lbs. per acre. 100% Alsike Clover seeded at 2 to 4 lbs. per acre.

See footnotes at end of table, page -84-

TABLE 9 (CONTINUED) --GENERALIZED HERBACEOUS PLANTING GUIDE FOR NON-AGRICULTURAL USES 1/

SOIL GROUP (Herb-aceous)	BRIEF SOIL DESCRIPTION AND SYMBOL ON MAP	LAWNS		GOLF COURSES		PLAYGROUNDS	PARKS	OPEN AREAS FOR PERMANENT VEGETATION
		Partial Shade	Sun	Fairways	Roughs			
H5	Well to moderately well drained soils with good moisture-holding capacity. (Productivity of the adapted plant species will be moderately high.) Soil Map Symbols: 60D3 223C 450B 192B 223C2 450C2 192C 223D2 495B 192C2 223E2 531B 194B 294B 531B2 194B2 294C2 531C 194C 341B 531C2 194C2 443B 531D 194D 443C2 531D2 194D2 448B 531E2 194E 448C2 696B 194E2 449B 696C2 194F 449C2 696C3 194F2 449C3 696E 223B 449D2 698B 223B2 449D3	Mixture: 50% Kentucky or Merion Bluegrass, 50% Red Fescue Planting rate: Seed 3 to 4 lbs. of this mixture per 1000 sq. ft.	Mixture: 100% Kentucky Bluegrass Planting rate: Seed 2 to 2½ lbs. of this mixture per 1000 sq. ft.	Mixture: 90% Kentucky or Merion Bluegrass, 10% Redtop Planting rate: Seed 2½ to 5 lbs. of this mixture per 1000 sq. ft.	Mixture: 20% Redtop, 20% Ladino Clover, 60% Tall Fescue Planting rate: Seed ¼ to ½ lb. of this mixture per 1000 sq. ft.	Mixture: 100% Tall Fescue Planting rate: Seed 1½ to 3 lbs. of this mixture per 1000 sq. ft.	Mixture: 80% Tall Fescue or Smooth Brome, 20% Alfalfa or Ladino Clover or Birdsfoot Trefoil Planting rate: Seed ¼ to ½ lb. of this mixture per 1000 sq. ft.	Mixture: 60% Smooth Brome, 40% Alfalfa Planting rate: Seed 8 to 12 lbs. per acre. Alternates are: 100% Timothy seeded at 3 to 5 lbs. per acre. 100% Birdsfoot Trefoil seeded at 5 to 8 lbs. per acre. 100% Ladino Clover seeded at 1 to 3 lbs. per acre. 100% White Clover seeded at 1 to 3 lbs. per acre. 100% Red Clover seeded at 8 to 12 lbs. per acre. 100% Crown Vetch seeded at 10 to 15 lbs. per acre.
H6	Upland soils which tend to be droughty during most years. (Productivity of the adapted plant species will be moderate.) Soil Map Symbols: 91D3 223D3 194C3 223E3 194D3 241D2 194E3 241F2 223C3 241G2	No species are recommended.	Mixture: 90% Kentucky Bluegrass, 10% Annual Ryegrass Planting rate: Seed 2½ to 3 lbs. of this mixture per 1000 sq. ft.	Mixture: 90% Kentucky Bluegrass 10% Annual Ryegrass Planting rate: Seed 2½ to 3 lbs. of this mixture per 1000 sq. ft.	Mixture: 80% Orchard Grass, 20% Annual Ryegrass Planting rate: Seed 1 to 1½ lbs. of this mixture per 1000 sq. ft.	No species are recommended.	Mixture: 70% Kentucky Bluegrass, 10% Annual Ryegrass, 20% Birdsfoot Trefoil Planting rate: Seed 2 to 3 lbs. of this mixture per 1000 sq. ft.	Mixture: 60% Alfalfa or Birdsfoot Trefoil, 40% Orchard Grass Planting rate: Seed 8 to 12 lbs. per acre. Alternates are: 100% Switchgrass seeded at 15 to 20 lbs. per acre. 100% Crownvetch seeded at 10 to 15 lbs. per acre. 100% Sweet Clover seeded at 10 to 15 lbs. per acre.

1/ Information in this table was developed by Virgil Hawk, Plant Materials Specialist and Robert Lawson, Management Agronomist, Soil Conservation Service. The seeding mixtures and seeding rates which are given are only to serve as guides. Special mixtures and rates may be needed over and above those given.

TABLE 10.--GENERALIZED SHRUB AND VINE PLANTING GUIDE[1]

SOIL GROUP (Shrub)	BRIEF SOIL DESCRIPTION AND SYMBOL ON MAP	PLANT SPECIES	FRUIT PRODUCTION	Hedges	Gullies and Road Cuts	ODD AREAS: Spoil Banks	ODD AREAS: Ground Cover	ODD AREAS: Pond Areas	ODD AREAS: Shelter-belts & Wind-Breaks	ODD AREAS: Stream Banks	ODD AREAS: Wild-life Borders	GROWTH FORM: Height (feet)	GROWTH FORM: Thorny 2/	GROWTH FORM: Thicket 2/	LIGHT TOLERANCE: Sun 2/	LIGHT TOLERANCE: Shade 2/	REMARKS
S1	Lowland swampy soils having standing water most of the year. Soil Map Symbols: 103, 103+, 312, 330	No species recommended other than natural vegetation.															
S2	Lowland wet soils having watertables at 1 to 3 feet most of the year. Soil Map Symbols: W76, W103, W103+, W107, W330, W330+	Shrub: Purple Osier Willow								2x2'		10-15'		x	x		Plant cuttings.
		Silky Dogwood						4x4'		2x2'	4x4'	6-12'		x	x	x	Good border plants.
		Red Osier Dogwood								2x2'		6-10'		x	x	x	Good border plants.
S3	Drained lowland soils which have watertables below 3 feet except during wet seasons. Soil Map Symbols: 67A 153A+ 330+ 67B 153B 347A 76 232A 347B 103 232A+ 594A 103+ 232B 594A+ 107 232B+ 594B 126 312+ 594B+ 153A 330	Shrub: Arrowwood									4x4'	10-12'		x	x	x	Slow growing.
		Coralberry			2x2'						3x3'	4-6'		x	x	x	May spread to pastures.
		Siberian Crabapple						6x6'			6x6'	20-30'		x	x		Good wildlife food.
		High bush Cranberry		2'					4x4'		4x4'	6-10'			x	x	Slow growing.
		Gray Dogwood						3x3'			3x3'	4-8'		x	x		Good food, slow growing.
		Red Osier Dogwood								2x2'		6-10'		x	x	x	Good border plants.
		Silky Dogwood						4x4'		2x2'	4x4'	6-12'		x	x	x	Good border plants.
		Amur Honeysuckle		3'	3x3'			4x4'	4x4'		4x4'	8-16'		x	x	x	Avoid extremely poor sites.
		Tatarean Honeysuckle		2'	3x3'			4x4'	4x4'		4x4'	6-12'		x	x	x	Avoid extremely poor sites.
		Nannyberry						6x6'			6x6'	25-30'			x	x	Slow growing.
		Wild Plum							4x4'		6x6'	10-30'	x	x			Very hardy.
		Multiflora Rose		1'	3x3'			3x3'			3x3'	6-10'	x	x	x		Requires good treatment.
		Purple Osier Willow								2x2'		10-15'		x	x		Plant cuttings.
		Wayfaring Tree									4x4'	6-12'		x	x		Winter food.
		Vine: Moon seed					3x3'								x	x	Fast growing.
		Trumpet Creeper				3x3'	3x3'								x		Fast growing.
		Wild Grape					3x3'										Vigorous.
S4	Slow to moderately permeable upland soils which have water tables below 3 feet except during wet seasons. Soil Map Symbols: 23A 146B2 357B 23B 189A 357C 23B2 189B 442A 91B 293A 442B 91C 293B 490A 91C2 295B 490B 91D2 298B 502A 146A 298C 502B 146B 298C2 697B 146B+ 320B	Shrub: Arrowwood									4x4'	10-12'		x	x	x	Slow growing.
		Coralberry			2x2'						3x3'	4-6'		x	x	x	May spread to pastures.
		Siberian Crabapple						6x6'			6x6'	20-30'		x	x		Good wildlife food.
		High bush Cranberry		2'					4x4'		4x4'	6-10'			x	x	Slow growing.
		Gray Dogwood						3x3'			3x3'	4-8'		x	x		Good food, slow growing.
		Red Osier Dogwood								2x2'		6-10'		x	x	x	Good border plants.
		Silky Dogwood						4x4'		2x2'	4x4'	6-12'		x	x	x	Good border plants.
		Amur Honeysuckle		3'	3x3'			4x4'	4x4'		4x4'	8-16'		x	x	x	Avoid extremely poor sites.
		Tatarean Honeysuckle		2'	3x3'			4x4'	4x4'		4x4'	6-12'		x	x	x	Avoid extremely poor sites.
		Nannyberry						6x6'			6x6'	25-30'			x	x	Slow growing.
		Wild Plum							4x4'		6x6'	10-30'	x	x			Very hardy.
		Multiflora Rose		1'	3x3'			3x3'			3x3'	6-10'	x	x	x		Requires good treatment.
		Purple Osier Willow								2x2'		10-15'		x	x		Plant cuttings.
		Wayfaring Tree									4x4'	6-12'		x	x		Winter food.
		Raspberry	3x8'									4-6'	x		x		Fruit producing.
		Blackberry	3x8'									4-6'	x		x		Fruit producing.
		Vine: Moon seed					3x3'								x	x	Fast growing.
		Trumpet Creeper				3x3'	3x3'								x		Fast growing.
		Wild Grape					3x3'										Vigorous.

See footnote at end of table, page -86-

TABLE 10 (CONTINUED)--GENERALIZED SHRUB AND VINE PLANTING GUIDE 1/

SOIL GROUP (Shrub)	BRIEF SOIL DESCRIPTION AND SYMBOL ON MAP	PLANT SPECIES	FRUIT PRODUCTION	Hedges	Gullies and Road Cuts	ODD AREAS: Spoil Banks	ODD AREAS: Ground Cover	ODD AREAS: Pond Areas	ODD AREAS: Shelter-belts & Wind-Breaks	ODD AREAS: Stream Banks	ODD AREAS: Wild-life Borders	GROWTH FORM: Height (feet)	GROWTH FORM: Thorny 2/	GROWTH FORM: Thicket 2/	LIGHT TOLERANCE: Sun 2/	LIGHT TOLERANCE: Shade 2/	REMARKS
S5	Well to moderately well	Shrub: Blackhaw						4x4'			4x4'	15-20'			x	x	Slow growing.
	drained soils with good	Manchu cherry									3x3'	3-6'		x	x	x	Stands little competition.
	moisture-holding capacity.	Coralberry			2x2'						3x3'	4-6'		x	x	x	May spread to pastures.
	Soil Map Symbols:	Siberian Crabapple						6x6'			6x6'	20-30'		x	x	x	Good wildlife food.
	60D3 223D2 450C2	High bush Cranberry							4x4'		4x4'	6-10'			x	x	Slow growing.
	194B 223E2 495B	Gray Dogwood						3x3'			3x3'	4-8'		x	x		Good food, slow growing.
	194B2 294B 531B	Red Osier Dogwood								2x2'		6-10'		x	x	x	Good border plants.
	194C 294C2 531B2	Greystem Dogwood						4x4'			4x4'	8-12'		x	x		Produces abundant fruit.
	194C2 341B 531C	Rough Leaf Dogwood						4x4'			4x4'	8-12'		x	x		Good border plants.
	194D 443B 531C2	Silky Dogwood						4x4'		2x2'	4x4'	6-12'		x	x	x	Good border plants.
	194D2 443C2 531D	American Hazelnut		2'				4x4'			4x4'	8-10'		x	x		Hybrid produces best nuts.
	194E 448B 531D2	Amur Honeysuckle		3'	3x3'			4x4'	4x4'		4x4'	8-16'		x	x	x	Avoid extremely poor sites.
	194E2 448C2 531E2	Tatarean Honeysuckle		2'	3x3'			4x4'	4x4'		4x4'	6-12'		x	x	x	Avoid extremely poor sites.
	194F 449B 696B	Indigobush			3x3'	3x3'	3x3'					4-20'			x	x	Good erosion control.
	194F2 449C2 696C2	Nannyberry						6x6'			6x6'	25-30'			x	x	Slow growing.
	223B 449C3 696C3	Autumn Olive		•				4x4'			4x4'	8-14'		x	x	x	
	223B2 449D2 696E	Wild Plum							4x4'		6x6'	10-30'	x	x			Very hardy.
	223C 449D3 698B	Multiflora Rose		1'	3x3'			3x3'			3x3'	6-10'	x	x	x		Requires good treatment.
	223C2 450B	Rugosa Rose			2x2'							4-6'	x	x	x		Not for living fence.
		Raspberry	3x8'									4-6'	x		x		Fruit producing.
		Blackberry	3x8'									4-6'	x		x		Fruit producing.
		Currant	4x8'									2-4'			x		Fruit producing.
		Vine: Virginbower													x		Vigorous climbing vine.
		Trumpet Creeper				3x3'	3x3'										Fast growing.
		Wild Grape					3x3'										Vigorous.
		Trailing Raspberry															
		Memorial Rose															
		American Bittersweet					3x3'				3x3'			x	x	x	Injurious to trees.
		Tame Grape	9x9'												x		Fruit producing.
S6	Upland soils which tend	Shrub: Blackhaw						4x4'			4x4'	15-20'			x	x	Slow growing.
	to be droughty during	Manchu Cherry									3x3'	3-6'		x	x	x	Stands little competition.
	most of the year.	Rough Leaf Dogwood						4x4'			4x4'	8-12'		x	x		Good border plants.
	Soil Map Symbols:	American Hazelnut		2'				4x4'			4x4'	8-10'		x	x		Hybrid produces best nuts.
	91D3 223C3 241D2	Indigobush			3x3'	3x3'	3x3'					4-20'			x	x	Good erosion control.
	194C3 223D3 241F2	Russian Olive							4x4'			12-20'	x	x	x	x	Very hardy.
	194D3 223E3 241G2	Wild Plum							4x4'		6x6'	10-30'	x	x			Very hardy.
	194E3	Rugosa Rose			2x2'							4-6'	x	x	x		Not for living fence.
		Ninebaile							4x4'			12-20'			x	x	Gregarious.
		Staghorn Sumac									6x6'	25-30'		x	x	x	Sprouts persistently from roots.
		Smooth Sumac				6x6'					6x6'	10-30'			x		

1/ Information in this table was developed by Virgil Hawk, Plant Materials Specialist and Robert Lawson, Management Agronomist, Soil Conservation Service.

2/ X in column indicates column heading describing plant characteristic or light tolerance.

FIGURE 4. TREE SHAPE

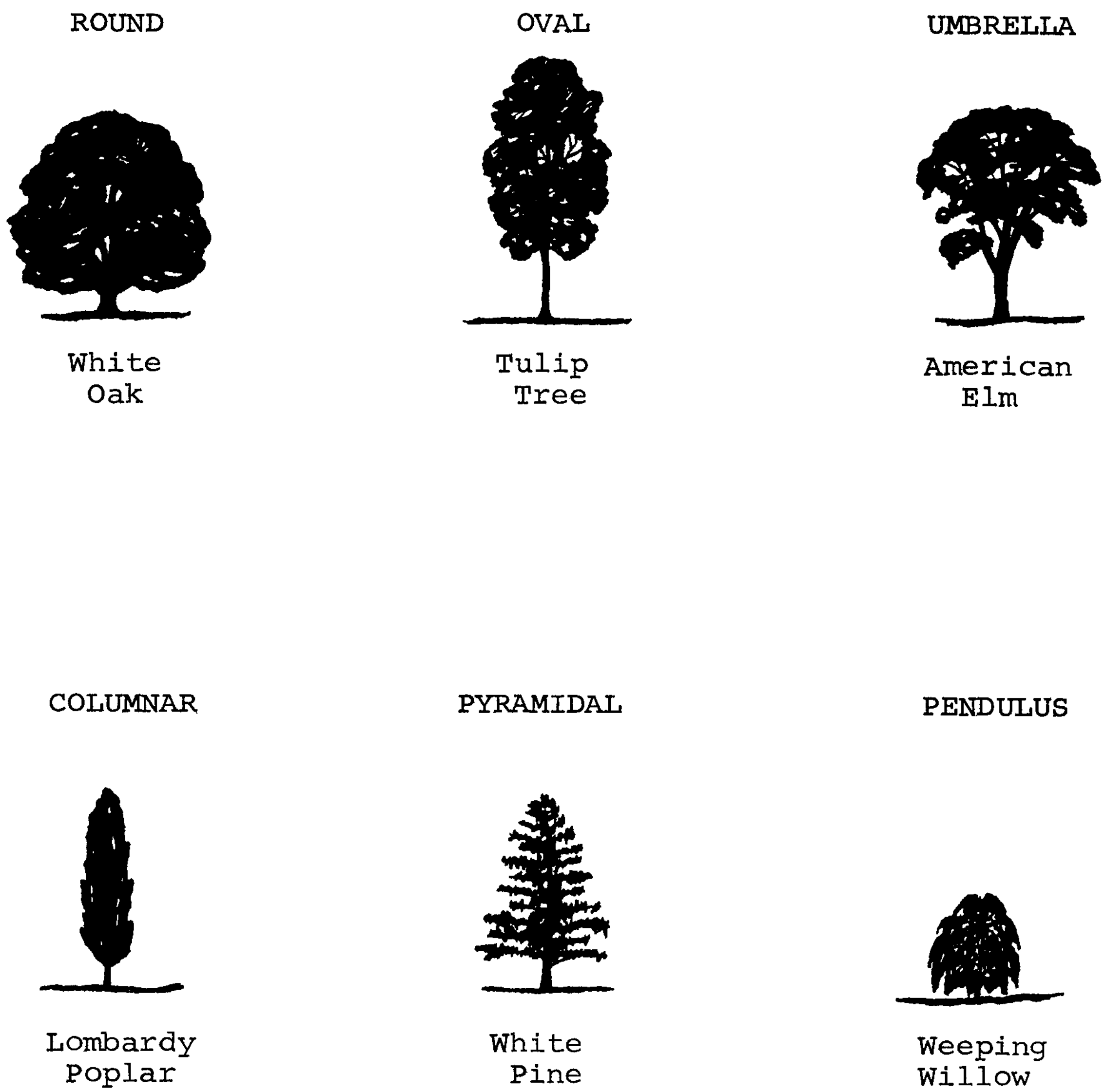


TABLE 11.--GENERALIZED TREE PLANTING GUIDE[1/]

SOIL GROUP (Trees)	BRIEF SOIL DESCRIPTION AND SYMBOL ON MAP	PLANTING TREES FOR FOREST: Sheltered Coves, North & East Slopes, Dissected Topography	PLANTING TREES FOR FOREST: Exposed Ridges, South & West Slopes, Flat Open Terrain	FRUIT TREES	TREES FOR ORNAMENTAL PLANTING: SHADE TREES	TREES FOR ORNAMENTAL PLANTING: STREET TREES	TREES FOR ORNAMENTAL PLANTING: LAWN TREES	TREES FOR ORNAMENTAL PLANTING: HEDGES, SCREENS AND WINDBREAKS	EXPOSURE FOR ORNAMENTAL TREES ONLY
T1	Well to moderately well drained upland soils with moderate permeability. Soil Map Symbols: 60D3 449D2 294B 449D3 294C 450B 443B 450C2 443C2 495B 448B 696B 448C2 696C2 449B 696C3 449C2 696E 449C3 698B	White Oak (LR) Red Oak (LR) Black Walnut (LO) Osage Orange (MR) Larch (LP) Black Locust (LO) White Pine (LPE) Scotch Pine (LPEX) Douglas Fir (LPE) Spruce (LPE) Red Pine (LPE)	Spruce (LPE) Douglas Fir (LPE) Red Pine (LPE) White Pine (LPE) Jack Pine (LPE) Scotch Pine (LPEX)	Apple Pear Plum Sour Cherry	European Beech (LO) Am. Hornbeam (MO) Norway Maple (MR) Sugar Maple (LO) Manchurian Maple (LO) Red Oak (LR) Pin Oak (LP) Scarlet Oak (LP) White Oak (LO) N. Catalpa (LO) Sycamore (LO) Silver Linden (LO) Chinese Chestnut (LO) Am. Yellowwood (MR)	Flowering Cherry (MR) Ginkgo Tree (LP) Tulip Tree (LO) Black Gum (LO) Little Leaf Linden (LO) Sweet Gum (LO)	Colorado Spruce (LPE) Amur Maple (SO) White Fir (LPE) Veitch Fir (LPE) Pissard Plum (SR) White Birch (LO) Wash. Hawthorn (SR) Black Cherry (LR) European Mt. Ash (SO)	East Red Cedar (MPE) Lombardy Poplar (LC) Quaking Aspen (MO) Hedge Maple Tree Lilac	Sun
					White Oak (LO) Green Ash (MO) European Ash (SO) Silver Linden (LO) Sycamore (LO) Norway Maple (MR) N. Catalpa (LO) Am. Hornbeam (MO)	Little Leaf Linden (LO) Ginkgo Tree (LP) Mountain Maple (SO) Sweet Gum (LO) Flowering Cherry (MR)	Rosebay Rhododendron Colorado Spruce (LPE) Norway Spruce (LPE) Engleman Spruce (LPE) White Birch (LO) Flowering Dogwood (SR) Red Bud (SU) European Mt. Ash (SO) White Pine (LPE)	Lombardy Poplar (LC) Quaking Aspen (MO) Canada Hemlock (LPE)	Partial Shade
					White Ash (LO) Sycamore (LO) Striped Maple (SO) N. Catalpa (LO)	Ginkgo Tree (LP)	Rosebay Rhododendron Red Bud (SU) Colorado Spruce (LPE) Norway Spruce (LPE) Engleman Spruce (LPE) Am. Arborvitae (MCE) Flowering Dogwood (SR) Mountain Ash (SO) White Pine (LPE) White Birch (LO)	Lombardy Poplar (LC) Quaking Aspen (MO) Canada Hemlock (LPE)	Shade
T2	Moderately well drained upland soils with moderately slow permeability and imperfectly drained soils. Soil Map Symbols: 146A 194E2 298C2 146B 194E3 341B 146B+ 194F 357B 146B2 194F2 357C 189A 223B 442A 189B 223B2 442B 192B 223C 490A 192C 223C2 490B 192C2 223C3 502A 194B 223D2 502B 194B2 223D3 531B 194C 223E2 531B2 194C2 223E3 531C2 194C3 293A 531D 194D 293B 531D2 194D2 295B 531E2 194D3 298B 697B 194E 298C	Red Oak (LR) White Oak (LR) Osage Orange (MR) White Pine (LPE) Larch (LP) Spruce (LPE) Douglas Fir (LPE) Red Pine (LPE) Cottonwood (LO) Jack Pine (LPE) Scotch Pine (LPEX)	White Pine (LPE) Larch (LP) Douglas Fir (LPE) Red Pine (LPE) Jack Pine (LPE) Scotch Pine (LPEX) Red Cedar (MPE)	Apple Pear	European Beech (LO) Am. Hornbeam (MO) Norway Maple (MR) Sugar Maple (LO) Manchurian Maple (LO) Red Oak (LR) Pin Oak (LP) Scarlet Oak (LP) White Oak (LO) N. Catalpa (LO) Sycamore (LO) Silver Linden (LO) Chinese Chestnut (LO) Am. Yellowwood (MR)	Flowering Cherry (MR) Ginkgo Tree (LP) Tulip Tree (LO) Black Gum (LO) Little Leaf Linden (LO) Sweet Gum (LO)	Colorado Spruce (LPE) Amur Maple (SO) White Fir (LPE) Veitch Fir (LPE) Pissard Plum (SR) White Birch (LO) Wash. Hawthorn (SR) Black Cherry (LR) European Mt. Ash (SO)	East Red Cedar (MPE) Lombardy Poplar (LC) Quaking Aspen (MO) Hedge Maple Tree Lilac	Sun
					White Oak (LO) Green Ash (MO) European Ash (SO) Silver Linden (LO) Sycamore (LO) Norway Maple (MR) N. Catalpa (LO) Am. Hornbeam (MO)	Little Leaf Linden (LO) Ginkgo Tree (LP) Mountain Maple (SO) Sweet Gum (LO) Flowering Cherry (MR)	Rosebay Rhododendron Colorado Spruce (LPE) Norway Spruce (LPE) Engleman Spruce (LPE) White Birch (LO) Flowering Dogwood (SR) Red Bud (SU) European Mt. Ash (SO) White Pine (LPE)	Lombardy Poplar (LC) Quaking Aspen (MO) Canada Hemlock (LPE)	Partial Shade
					White Ash (LO) Sycamore (LO) Striped Maple (SO) N. Catalpa (LO)	Ginkgo Tree (LP)	Rosebay Rhododendron Red Bud (SU) Colorado Spruce (LPE) Norway Spruce (LPE) Engleman Spruce (LPE) Am. Arborvitae (MCE) Flowering Dogwood (SR) Mountain Ash (SO) White Pine (LPE) White Birch (LO)	Lombardy Poplar (LC) Quaking Aspen (MO) Canada Hemlock (LPE)	Shade

TABLE 11--CONTINUED

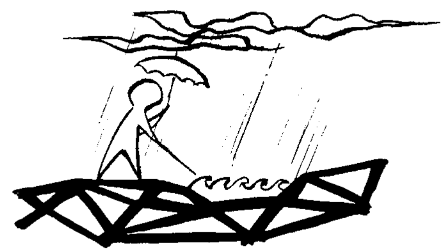
T3	Imperfectly to moderately well drained upland soils with slow permeability. Soil Map Symbols: 23A 91C 241D2 23B 91C2 241F2 23B2 91D2 241G2 91B 91D3 320B	Jack Pine (LPE) Scotch Pine (LPEX) Red Cedar (MPE)	Any tree specie will be difficult to establish.		Swamp White Oak (LR) Black Locust (LO) Chestnut Oak (LR) N. Catalpa (LO) Red Maple (LO) Tree of Heaven (LO) White Poplar (LO) Weeping Willow (MPe) Norway Maple (MR)	Thornless Honey Locust (LO) Black Gum (LO) Sycamore (LO) Red Gum (LO) European Alder (LR)	Red Cedar (MPE) Austrian Pine (LPE) European Larch (LP) White Pine (LPE) White Spruce (LPE)	Lombardy Poplar (LC) Quaking Aspen (MO) N. White Cedar (MPE)	Sun
					Black Locust (LO) Tree of Heaven (LO) White Poplar (LO) Weeping Willow (MPe) Silver Maple (LO) Norway Maple (MR) N. Catalpa (LO) Swamp White Oak (LR) Red Maple (LO)	Sycamore (LO) European Alder (LR)	Red Alder (LR) Black Spruce (MPE) European Larch (LP) Austrian Pine (LPE) Am. Arborvitae (MCE) White Pine (LPE)	Lombardy Poplar (LC) Quaking Aspen (MO) Speckled Alder (LR)	Partial Shade
					Tree of Heaven (LO) White Poplar (LO) Weeping Willow (MPe) Silver Maple (LO) N. Catalpa (LO)	Sycamore (LO) European Alder (LR)	Red Alder (LR) Black Spruce (MPE) Austrian Pine (LPE) Am. Arborvitae (MCE)	Lombardy Poplar (LC) Quaking Aspen (MO) Speckled Alder (LR)	Shade
T4	Organic and some mineral soils with watertables above 3 feet most of the year. Soil Map Symbols: W76, W103, W103+, 103⸙, 103+⸙, W107, 312⸙, W330, W330+, 330⸙		Leave in natural state for wildlife cover. Planting is difficult. Adaptable species: Willow (LR), Cottonwood (LO).						
T5	Bottomland and some organic soils with watertables below 3 feet except during wet seasons or periods of overflow. Soil Map Symbols: 76, 103, 103+, 107, 312+	Leave in natural state or plant the following species principally for shelterbelts: Almond Leaf Willow (MR), Arborvitae (MCE)							
T6	Drained lowland mineral soils having watertables below 3 feet except during wet seasons. Soil Map Symbols: 67A 232A 347A 67B 232A+ 347B 126 232B 594A 153A 232B+ 594A+ 153A+ 330 594B 153B 330+ 594B+	Black Walnut (LO) Red Oak (LR) White Oak (LR) Black Locust (LO) Osage Orange (MR) Cottonwood (LO) Willow (LR)	Cottonwood (LO) Red Oak (LR) White Oak (LR)		White Poplar (LO) Red Oak (LR) White Oak (LR) Pin Oak (LP) Swamp White Oak (LR) Cottonwood (LO) Weeping Willow (MPe)	European Alder (LR) Sweet Gum (LO)	European Larch (LP) White Birch (LO)	Lombardy Poplar (LC) N. White Cedar (MPE)	Sun
					White Poplar (LO) Cottonwood (LO) Red Maple (LO)	European Alder (LR)	Red Alder (LR) European Larch (LP) White Birch (LO)	Speckled Alder (LR) Lombardy Poplar (LC)	Partial Shade
					White Poplar (LO)	European Alder (LR)	White Birch (LO)	Lombardy Poplar (LC)	Shade

[1]The letters in parenthesis following each tree species means as follows: FIRST LETTER - General tree height at maturity; S=(less than about 30 feet), M=(about 30-60 feet), L=(more than 60 feet). SECOND LETTER - General tree shape at maturity (see Figure 4); C=columnar, O=oval, P=pyramidal, Pe=pendulus, R=round, U=umbrella. THIRD LETTER - Type of tree; E=evergreen (all others are not evergreen), X=recommended for Xmas trees only.

CHAPTER IX

WATER MANAGEMENT INTERPRETATIONS[1/]

Water in variable amounts is a part of every soil in which plants grow.



Water naturally reaches the surface of the soil principally as rain or as waters from melting snow and ice. After it reaches the soil surface, it soaks in, stands on the surface, runs off, or evaporates. That water which enters the soil becomes a part of the soil or becomes free water which, if not restricted, is able to move down through the soil by gravity.

As water becomes a part of the soil, the use and management of land becomes involved with water problems. Some soils are naturally very wet and need drainage; some soils are subject to flooding while others tend to yield surface runoff water; some soils supply inadequate amounts of moisture for optimum plant growth and need irrigation. In general, it can be said that for Ela Township, many limitations of the soil and the soil management practices needed are dependent upon the recognition and management of internal and surface water.

The purpose of this water management information is to relate the problems and management of water to the various soil mapping units as they appear on the soil map. The areas of water management which are discussed are: (a) flooding hazards, (b) watershed characteristics relating to runoff, (c) agricultural drainage, and (d) sprinkler irrigation.

Flooding Hazards

As precipitation of any intensity falls on the soil landscape, there is the likelihood of having surface water runoff. This flow will occur during or immediately following storms. The greater the storm intensity, the greater will be the amount of surface water flow. Sloping upland areas will yield runoff water causing flow to lower areas. Some low areas, being depressional, tend to impound water. Other low areas, being nearly level, tend to concentrate runoff or become flooded.

The surface water flow characteristics of all soil mapping units are interpreted into six general water flow or flooding potential categories. Table 17 "Engineering Properties" gives a statement of flooding potential in column (n) for each of the soil mapping units. The statements are not meant to imply that flooding or ponding, etc., will occur during every storm or for any particular intensity of storm. The statements give a general idea as to whether or not a flooding potential exists and therefore, serve only as a preliminary to on-site study. The various classes of flooding potential are explained as follows:

1/ All material on water management was prepared with the help of J. T. Whelan and was reviewed by Owen T. Dobyns, Soil Conservation Service. Water management, as treated in this report, is primarily concerned with the management of water as it affects the use and management of the soil landscape. The use and management of open bodies of water, flowing streams and water supplies usable for domestic and industrial purposes are of great importance but are not discussed here.

Subject to Stream Overflow

Soil mapping units in this category are bottomlands. These areas are subject to stream bank overflow.

The soil areas generally are recognized as not well suited for agricultural crop production. Usually, the same soil areas are poorly suited for building sites. Water management practices as drainage and adequate protection from overflow can improve these soil units to a degree. Soil mapping units in this category are 76, W76, 107, W107.

Subject to Ponding

Soil mapping units considered subject to ponding are those occupying depressional areas within the landscape. They tend to impound water received through surface runoff from adjacent sloping areas. By nature, the soil areas were very wet; however, some have been drained using agricultural drainage systems. The drained soil units will be subject to a lesser degree of ponding.

The undrained areas are not suited for agricultural use. Drained areas and others that might be feasible to drain adequately in the future are suited for intensive crop production.

These soils tend to be poorly suited for most types of construction. Soil mapping units in this category are 103, 103+, W103, W103+, 103 [marsh symbol], 103+ [marsh symbol], 312+, 312 [marsh symbol], 330, 330+, W330, W330+, 330 [marsh symbol].

Subject to Standing Water

Low lying and relatively level soil areas that receive runoff from adjacent sloping areas are included in this category. The areas are broad flats or drainageways which are subject to temporary standing water or concentrated runoff that tends to flow slowly.

Most of the soil units have systems of agricultural drain tile or ditches installed. Agricultural cropping systems are adapted to these soils as generally the period of inundation is of short enough duration so as not to drown out crops. During abnormally wet years, there is the likelihood of reduced yields. Water management requires the maintenance or improvement of the drainage systems.

In utilizing the soil mapping units for building sites, the wetness problem must be recognized and adequate means of water management are needed. In many cases, it is doubtful that existing agricultural drainage systems will prove adequate for urban developments.

In this category are the following soil mapping units: 67A, 126, 153A, 153A+, 232A, 232A+, 347A, 594A, 494A+.

Subject to Concentrated Runoff

This category includes those soil mapping units subject to concentrated flow of surface runoff water. In most areas, the areas are gently sloping drainageways which extend into the upland landscape. Surface water flow is usually during and immediately following storm periods.

Often there are random lines of agricultural drain tile installed thereby enabling the areas to be cropped. Certain areas are subject to gully erosion and are in need of grassed waterways.

These soils are apt to fall within planned urban developments. Such soil units need to be recognized as areas of concentrated runoff and planned accordingly.

The soil mapping units in this category are 67B, 153B, 232B, 232B+, 347B, 594B, 594B+.

Produces Slow Runoff

These soil mapping units are relatively level upland soils usually not subject to receiving water from other areas. The soils tend to hold rainfall on the surface for very short periods or tend to yield surface runoff water at a slow rate during storms of high intensity.

These areas are not subject to hazards of flooding. It is well to recognize the need for removal of surface and internal water when any type of land use is considered.

Soil mapping units in this category are 23A, 146A, 189A, 293A, 442A, 490A, 502A.

Produces Runoff

This category is not subject to flooding. It includes the sloping upland soil mapping units which produce runoff during storm periods. Water flows over these areas and contributes to the flooding problems of the low lying areas. Within this landscape there are small drainageways that tend to concentrate the runoff.

Soil mapping units in this category are not listed here as they are not subject to flooding. In Table 17, column (n), the statement "produces runoff" is made for all mapping unitsin this category.

The information on flooding is general and is designed to point out those soil mapping units which may have flooding potential. On-site studies are needed for any particular place in question. In the study of on-site problems, it is often necessary to evaluate the characteristics of the watershed as to the effect it has on the runoff discharge through a particular point.

Watershed Characteristics

Management of water flow through any particular place in a surface drainageway necessitates a study of the entire watershed contributing to the runoff. It is possible to calculate the water flow past a point by evaluating the soil landscape and type of vegetative cover that exists within the watershed. Runoff can be calculated to give the probable peak flow of water in cubic feet per second.1/

1/ For watersheds larger than 600 acres, the "Rational Method" is suggested, whereby Q = CIA. USCS data may also be available.

The purpose of this information on watershed characteristics is to present a method which can be used to arrive at the peak flow of small watersheds. The information is applicable for watersheds smaller than 600 acres. It is mainly designed for use by engineers.

Four factors affecting peak runoff of watersheds are considered. They are (a) the slope of the landscape, (b) the infiltration of water into the soil, (c) the surface water storage capacity of the landscape, and (d) the kind of vegetative cover on the landscape.

Combining the individual factors, a ΣW (summation of watershed characteristics) can be evaluated.

By using the soil map, it is possible to obtain that portion of the ΣW value which is affected by slope, infiltration and storage capacity of the soils. This has been calculated and appears for each soil mapping unit in Table 17 in column (o) entitled "ΣW value."

The weighted factor of vegetative cover or land use needs to be added to these figures for the total ΣW. As vegetative cover or land use cannot be obtained from the soil map, there is need to inspect the entire watershed in the field and then apply the appropriate weighted factor in accordance with the following definitions:

Factor 5: About 90 percent of the watershed is and is expected to remain in good grassland, woodland, or equivalent cover.

Factor 10: About 50 percent of the watershed is and is expected to remain in good grassland or woodland with the remaining 50 percent in clean tilled crops. Also, this factor is applicable to urban areas whereby lot sizes are, on the average, 5 acres or larger.

Factor 15: Less than 10 percent of the watershed is and is expected to remain in good grassland or woodland with the remainder in clean tilled crops. Also, this factor is applicable to urban areas whereby the watershed contains lot sizes of 2 to 3 acres on the average.

Factor 20: Is used when there is and is expected to continue to have no effective plant cover or all of the watershed will be in clean tilled crops. Also, this factor is applicable to those built up areas whereby lots will average ½ to 1 acre in size.[1]

After arriving at the total ΣW value and acreage of a watershed, Tables 12-A, 12-B, and 12-C are to be used to find the probable discharge "Q" in cubic feet per second (c.f.s.) as it relates to 10, 25, and 50 year frequency storms, respectively.

The following procedure and hypothetical example will serve as an overall guide to be used in arriving at watershed discharge rates:

Step 1: Locate the point on the soil map where the water discharge (Q) rate is desired.

1/ Special investigation is considered necessary when watersheds are "built up" whereby lots are of less than one-half acre average size.

Step 2: On the soil map, draw out the watershed above this point. (U.S.G.S. topography sheets, field observation or other means are helpful in accurately plotting the boundary.) Measure the size of the watershed in acres. For example: 100 acres.

Step 3: Measure the total area of the various different soil mapping units within the total watershed area. For example: 50 acres of soil mapping unit 223D2; 20 acres of soil mapping unit 146B; 20 acres of soil mapping unit 232A; 10 acres of soil mapping unit 103.

Step 4: Examine the whole watershed with respect to existing and/or anticipated vegetative cover or land use. If a watershed is either anticipated to be used entirely for urban development or if use is not to contain any urban development, evaluate the watershed as one unit.

As portions of a watershed are anticipated to contain both urban and non-urban uses, evaluate those different areas separately and in accord with the definitions. For example: 70 acres presently have, or it is predicted to have, no effective plant cover and will be in clean tilled crops. 30 acres are planned for urban use whereby lot sizes will average over 5 acres.

Step 5: Calculate ≤W value. Choose that ≤W value from Table 17 column (o) for the appropriate soil mapping unit and multiply each by the percent of the watershed that it includes. Also, choose the appropriate land and vegetative cover factors as per definitions and apply to them the percent of the watershed involved. Total the values to obtain the ≤W of the watershed. For example:

Soil Mapping Unit:	≤W Value:		% of Watershed		Effectiveness of ≤W Value for Watershed:
223D2	45	x	50%	=	22.5
146B	30	x	20%	=	6.0
232A	22	x	20%	=	4.4
103	7	x	10%	=	.7
Veg Vegetative Cover or Land Use:					
Agriculture					
Clean Till	20	x	70%	=	14.0
Urban					
5 acre lots	10	x	30%	=	3.0
≤W Value of the Entire Watershed			(total)	=	50.6 Use 50.0

Step 6: Using the ≤W value of the watershed and the watershed acreage, read the probable runoff in cubic feet per second (c.f.s.) on Tables 12-A, 12-B, or 12-C. The respective tables are designed to predict runoff for rainfall frequencies that may occur on the average of once in 10, 25 or 50 year periods. The appropriate table used will depend upon the purpose of the study. (Agriculturally, the 10 year table is used in waterway design and the 25 and 50 year tables are used in the design of permanent structures.

For example: On the 50 year frequency table (Table 12-C), the watershed of 100 acres having the ΣW value of 50 will have a probable peak discharge of 168 cubic feet per second. This discharge can be expected, on the average, to occur once in fifty years.

Agricultural Drainage Guides

Agriculture has long recognized the need for adequate systems of farm drainage. It is recognized that the design of such systems requires some knowledge of the soils.

To make the soil maps of Ela Township usable to those people who design and install farm drainage systems, Table 13 sets up guides for soil mapping units that normally require drainage (17). Soil mapping units not normally needing drainage systems are not given consideration.

The soil mapping units can be grouped together. The Guide to Interpretive Groupings, which is located at the end of this report, gives the "Soil Group (Drainage)" into which each mapping unit is placed.

It is not to be assumed that the information will prove adaptable for the design of urban drainage systems, either to lower water tables or to handle storm drainage water.

Sprinkler Irrigation Guide

At present, irrigation is not practiced widely in Ela Township for commercial crop production. However, there may be increased interest in the use of sprinkler irrigation in the future.

There are certain soil characteristics to be considered in the design and operation of sprinkler irrigation systems. An irrigation system that successfully supplies water to crops and, at the same time, conserves soil and water must be designed to fit the crops and the soils that are being irrigated.

The material in Table 14 provides information about soils and crops needed in the design and operation of sprinkler irrigation systems (12).

TABLE 12-A.--LAKE COUNTY, ILLINOIS RUNOFF CHART BASED ON 10 YEARS FREQUENCY AND RAINFALL FACTOR OF 0.8 (15)

DRAINAGE AREA IN ACRES	WATERSHED CHARACTERISTICS (≤W VALUE) Cubic Feet Per Second										
	30	35	40	45	50	55	60	65	70	75	85
4	4	6	6	7	8	9	10	12	14	16	19
6	5	6	8	9	11	13	14	17	19	22	27
8	6	7	10	10	14	16	19	22	26	30	35
10	6	8	11	13	17	20	24	28	32	37	42
12	7	9	13	15	19	23	28	33	38	43	50
14	8	10	14	18	22	26	32	38	44	50	57
16	9	12	16	20	25	30	36	42	50	56	64
18	10	14	18	22	27	34	40	47	56	62	71
20	11	15	19	25	30	37	44	52	61	69	78
25	13	18	22	29	37	44	53	63	72	82	94
30	14	20	26	34	42	51	62	73	84	96	111
35	16	22	29	38	48	58	70	83	96	110	127
40	18	26	33	42	54	66	78	93	108	123	143
45	19	29	37	47	61	73	89	104	120	137	160
50	21	32	41	52	66	80	95	113	132	150	176
60	24	36	47	61	78	94	111	132	154	178	207
70	27	40	53	70	88	106	127	150	176	202	238
80	30	44	59	78	98	119	143	169	198	228	271
90	34	48	65	86	109	133	159	187	219	254	303
100	37	52	70	93	120	145	174	205	240	278	335
120	42	60	82	108	140	170	205	240	281	328	389
140	48	68	93	123	160	195	234	275	322	377	445
160	54	76	103	138	180	220	263	310	362	424	500
180	58	84	114	152	196	244	292	345	400	468	555
200	63	92	124	166	217	259	318	381	440	512	611
220	68	99	134	179	235	283	345	413	478	555	676
240	73	106	144	193	253	314	372	445	516	595	719
260	78	113	154	206	272	336	397	476	554	639	771
280	82	119	163	218	290	360	422	507	589	683	822
300	86	126	173	231	308	384	448	537	625	724	873
320	91	134	182	248	326	405	473	566	659	775	920
340	95	140	192	258	342	424	498	597	693	805	968
360	99	147	203	270	362	444	523	625	727	846	1020
380	103	154	212	285	378	464	548	657	762	886	1060
400	108	160	222	297	394	484	570	685	795	928	1110
420	113	167	230	309	412	504	593	713	828	958	
440	117	173	239	322	428	522	613	739	860	1010	
460	121	179	248	333	443	541	637	768	894	1040	
480	125	185	257	346	469	560	660	797	925	1080	
500	129	190	265	357	472	578	682	824	960	1110	
520	133	197	274	370	485	597	705	850	990	1150	
540	137	203	282	381	500	614	726	878	1020	1180	
560	141	208	290	392	514	633	749	906	1050	1220	
580	145	213	298	404	525	650	772	932	1080	1250	
600	148	219	306	415	540	667	794	958	1120	1280	

How To Use The Chart: Determine the watershed characteristic (≤W value) of the watershed following the procedure as outlined. Find this numerical value under the above heading. Follow down the particular column to the line showing drainage area in acres of the watershed in question. Read the probable runoff in cubic feet per second (c.f.s.) for 10 year frequency.

TABLE 12-B.--LAKE COUNTY, ILLINOIS RUNOFF CHART BASED ON 25 YEARS FREQUENCY AND RAINFALL FACTOR OF 0.8 (15)

DRAINAGE AREA IN ACRES	WATERSHED CHARACTERISTICS (ΣW VALUE) Cubic Feet Per Second												
	25	30	35	40	45	50	55	60	65	70	75	85	100
4	3	5	6	7	9	10	10	12	14	16	18	22	24
6	4	6	7	10	10	12	15	17	20	22	26	32	34
8	5	6	9	11	12	16	18	22	26	30	34	41	44
10	6	7	10	13	16	19	23	29	34	38	44	50	54
12	6	8	11	14	18	22	27	34	39	45	52	58	64
14	6	10	13	17	22	26	31	38	45	52	60	67	74
16	7	10	14	18	24	30	35	42	50	58	66	76	84
18	8	11	16	21	26	33	39	47	56	64	73	84	94
20	9	13	18	22	29	35	42	51	61	70	80	91	103
25	10	14	21	26	34	42	52	62	73	85	97	111	126
30	12	17	24	31	40	50	60	72	85	99	114	131	150
35	14	18	27	35	45	57	69	82	97	113	130	151	173
40	14	21	30	39	50	64	77	92	109	126	147	170	195
45	17	22	33	43	56	71	87	102	121	139	162	190	229
50	18	25	35	47	61	77	95	111	133	153	178	210	242
60	19	29	41	54	72	90	109	131	155	179	208	243	289
70	22	33	46	62	82	103	124	150	178	206	239	282	335
80	24	36	52	69	91	115	139	170	200	233	269	317	388
90	26	39	57	76	100	128	153	187	221	258	298	352	421
100	29	42	61	82	110	139	176	203	242	283	326	392	465
120	33	49	71	96	128	166	198	238	284	332	380	458	548
140	37	56	80	109	145	186	227	262	323	378	448	525	
160	41	62	90	122	162	201	257	306	363	425			
180	45	68	98	135	178	231	283	347	403	472			
200	49	73	110	147	194	255	309	372	444				
220	52	79	116	158	210	276	335	405	481				
240	55	84	124	170	225	298	362	438					
260	58	90	132	180	241	310	389	468					
280	62	95	140	192	257	341	425	497					
300	65	100	148	203	271	362	442	526					
320	68	106	156	215	288	383	465						
340	72	112	165	226	303	400	487						
360	75	115	172	236	318	420	510						
380	78	121	180	249	333	437							
400	82	127	187	260	348	460							
420	85	132	194	270	363	479							
440	88	136	201	280	376	497							
460	91	140	210	290	390	515							
480	93	145	216	300	404	529							
500	96	150	223	310	408								
520	99	155	240	319	432								
540	102	160	236	329	444								
560	104	162	243	339	458								
580	107	167	250	349	471								
600	110	170	257	359	485								

How To Use The Chart: Determine the watershed characteristic (W) of the watershed following the procedure as outlined. Find this numerical value under the above heading. Follow down the particular column to the line showing the drainage area in acres of the watershed in question. Read the probable runoff in cubic feet per second (c.f.s.) for 25 year frequency.

TABLE 12-C.--LAKE COUNTY, ILLINOIS RUNOFF CHART BASED ON <u>50</u> YEARS FREQUENCY AND RAINFALL FACTOR OF 0.8 (15)

DRAINAGE AREA IN ACRES	WATERSHED CHARACTERISTICS (ΣW VALUE												
	25	30	35	40	45	50	55	60	65	70	75	85	100
	Cubic Feet Per Second												
4	4	6	8	9	10	11	12	14	17	19	22	27	29
6	5	6	9	11	12	14	18	20	24	27	32	38	41
8	6	8	10	14	14	19	22	27	32	36	42	49	53
10	6	9	12	15	19	23	28	34	40	47	52	60	65
12	7	10	14	18	22	27	33	40	47	54	62	71	78
14	8	11	15	20	26	31	38	46	54	62	72	81	90
16	9	12	17	22	29	35	42	51	61	70	80	91	102
18	10	14	19	25	32	39	47	57	67	77	88	101	114
20	10	15	21	27	34	42	51	62	74	84	96	110	124
25	13	18	25	32	42	51	62	74	88	102	117	134	152
30	14	20	29	38	48	60	73	87	102	119	137	158	180
35	16	22	33	42	54	69	83	99	117	136	157	183	208
40	18	25	36	47	61	78	94	111	131	152	177	206	236
45	19	27	39	52	67	86	104	123	146	168	195	230	264
50	21	30	42	57	74	94	114	134	160	184	213	253	292
60	23	34	50	65	86	109	132	157	187	216	251	294	348
70	26	39	55	74	98	124	150	182	214	248	288	341	404
80	29	43	62	83	110	138	169	204	241	280	324	384	456
90	32	47	68	91	121	154	186	224	267	311	358	425	507
100	35	51	74	99	132	168	204	245	292	341	392	474	560
120	39	59	86	115	153	197	240	287	342	400	459	554	660
140	44	67	97	131	174	225	276	328	390	456	526	634	760
160	49	75	107	146	195	252	312	358	438	512	591	714	856
180	54	82	118	162	214	279	324	508	486	567	647	792	953
200	58	89	128	176	234	307	376	448	533	624	720	864	1050
220	62	95	138	190	253	333	408	488	579	675	784	936	1140
240	66	102	149	204	272	359	440	528	625	727	849	1010	1220
260	70	108	159	217	290	381	472	564	670	775	908	1080	1310
280	72	114	169	230	309	410	504	598	715	825	966	1150	1400
300	79	121	179	245	326	436	536	633	760	872	1020	1220	1490
320	82	127	188	256	346	461	574	669	800	921	1080	1300	1570
340	86	134	198	270	364	483	592	704	840	969	1140	1370	1660
360	90	139	207	292	382	507	620	740	880	1020	1190	1440	1750
380	94	146	216	299	401	530	648	772	920	1060	1250	1510	1830
400	98	152	225	312	419	553	676	808	960	1110	1300	1580	1910
420	102	158	234	324	435	576	704	838	998	1160	1350	1650	1990
440	106	163	243	336	452	599	732	868	1040	1210	1410	1720	2070
460	110	169	252	348	469	620	760	900	1070	1250	1460	1780	2150
480	113	175	260	360	486	642	788	930	1110	1300	1510	1850	2230
500	116	180	268	372	502	664	816	960	1150	1340	1560	1920	2310
520	119	186	276	384	518	685	840	990	1190	1390	1610	1960	2380
540	122	191	284	396	535	705	874	1020	1230	1430	1660	2040	2460
560	126	196	292	408	550	726	896	1050	1260	1470	1710	2100	2520
580	129	200	300	420	567	747	912	1080	1300	1520	1750	2160	2620
600	132	204	308	432	582	768	926	1110	1330	1560	1800	2220	2690

How To Use The Chart: Determine the watershed characteristic (ΣW value) of the watershed following the procedure as outlined. Find this numerical value under the above heading. Follow down the particular column to the line showing drainage area in acres of the watershed in question. Read the probable runoff in cubic feet per second (c.f.s.) for 50 year frequency.

TABLE 13.--AGRICULTURAL DRAINAGE GUIDE FOR ELA TOWNSHIP (17)

SOIL GROUP (Drainage)	SOIL MAPPING UNITS	RECOMMENDED TILE Depth (feet)	RECOMMENDED TILE Spacing (feet)	SURFACE DRAINAGE	REMARKS
D1	67A 153B 67B 347A 153A 347B 153A+	3-4	80-100	Random surface drains may be needed to improve flat and depressional areas.	Drainage needed to lower and/or maintain a lowered water table.
D2	126 W330 232A W330+ 232A+ 330ψ 232B 594A 232B+ 594A+ 330 594B 330+ 594B+	3-3½	75-90	Random surface drains are needed to improve the effectiveness of tile systems.	Drainage needed to lower and/or maintain a lowered water table.
D3	103 103ψ 103+ 103+ψ W103 312+ W103+ 312ψ	Initial drainage should be accomplished by open ditches. After subsidence following initial drainage, random tile may be used. Use long tile. Open ditches most often provide adequate drainage. Check dams should be used in open ditches to control the water table.			
D4	76 W76 107 W107	3-3½	80-100	Complete surface system needed.	Drainage is required; however, outlets are often not available. Check for peat, muck and sand pockets.
D5	293A 490B 293B 502A 442A 502B 442B 697B 490A	3-4	100-120	Random surface drainage may improve the natural surface drainage.	Drainage recommended where required for maximum production. Random tile may be adequate.
D6	23A 189B 23B 295B 23B2 298B 146A 298C 146B 298C2 146B+ 357B 146B2 357C 189A	3-3½	65-80	Random surface drains may be needed. Waterway diversions and drainage type terraces have proven satisfactory.	Small depressional areas may be drained by using random tile lines with open surface inlets.
D7	91B 91D2 91C 91D3 91C2 320B	Not recommended		Use random surface drains and waterways to remove surface water. Drainage type terraces may function on uneroded areas.	Tiling not recommended due to the impervious subsoil.

TABLE 14.--SPRINKLER IRRIGATION GUIDE FOR THE SOILS THAT ARE ADAPTED TO IRRIGATION

SOIL INFORMATION						CROP INFORMATION[1]		IRRIGATION SPECIFICATIONS										
SOIL GROUP (Irrigation)	SYMBOL ON MAP	SOIL DEPTH	AVAILABLE MOISTURE	INFILTRATION RATE Bare	INFILTRATION RATE Vegetative Cover	PEAK RATE OF MOISTURE USE	SOIL DEPTH TO BE IRRIGATED	WATER TO BE APPLIED AT EACH IRRIGATION[2] (70% efficiency) 40%	55%	70%	TIME REQUIRED TO APPLY IRRIGATION WATER (Based on average intake rate of soil)[3] 40% Bare	40% Vegetative Cover	55% Bare	55% Vegetative Cover	70% Bare	70% Vegetative Cover	MAXIMUM TIME TO COVER IRRIGATED AREA[4]
		(in.)	(in./in.)	(in./hr.)	(in./hr.)	(in./day)	(in.)	(in.)	(in.)	(in.)	(hr.)	(hr.)	(hr.)	(hr.)	(hr.)	(hr.)	(days)
I1	103, 103+	0-24	.25	1.0-1.5	1.4-2.0	0.20	9	1.3	1.8	2.2	1.0	0.8	1.4	1.1	1.8	1.3	4
		24-42	.22			0.25	9	1.3	1.8	2.2	1.0	0.8	1.4	1.1	1.8	1.3	4
						0.20	12	1.7	2.4	3.0	1.4	1.0	1.9	1.4	2.4	1.8	6
						0.25	12	1.7	2.4	3.0	1.4	1.0	1.9	1.4	2.4	1.8	5
						0.20	18	2.5	3.5	4.5	2.0	1.5	2.8	2.0	3.6	2.6	9
						0.25	18	2.5	3.5	4.5	2.0	1.5	2.8	2.0	3.6	2.6	7
						0.30	18	2.5	3.5	4.5	2.0	1.5	2.8	2.0	3.6	2.6	6
I2	60D3 293A 442B	0-12	.18	0.5-0.9	0.8-1.2	0.20	9	0.9	1.3	1.6	1.3	0.9	1.9	1.3	2.3	1.6	3
	67A 293B 443B	12-30	.13			0.25	9	0.9	1.3	1.6	1.3	0.9	1.9	1.3	2.3	1.6	3
	67B 294B 443C2	30-42	.12			0.20	12	1.3	1.7	2.2	1.9	1.3	2.4	1.7	3.1	2.2	4
	76 294C2 490A					0.25	12	1.3	1.7	2.2	1.9	1.3	2.4	1.7	3.1	2.2	4
	153A 347A 490B					0.20	18	1.7	2.4	3.0	2.4	1.7	3.4	2.4	4.3	3.0	6
	153A+ 347B 495B					0.25	18	1.7	2.4	3.0	2.4	1.7	3.4	2.4	4.3	3.0	5
	153B 442A					0.30	18	1.7	2.4	3.0	2.4	1.7	3.4	2.4	4.3	3.0	4
						0.25	24	2.2	3.0	3.8	3.1	2.2	4.3	3.0	5.4	3.8	6
						0.30	24	2.2	3.0	3.8	3.1	2.2	4.3	3.0	5.4	3.8	5
I3	107 223C 330	0-18	.18	0.2-0.5	0.4-0.9	0.20	9	0.9	1.3	1.6	2.6	1.4	3.7	2.0	4.6	2.5	3
	126 223C2 330+	18-30	.17			0.25	9	0.9	1.3	1.6	2.6	1.4	3.7	2.0	4.6	2.5	3
	146A 223C3 341B	30-42	.16			0.20	12	1.3	1.7	2.2	3.7	2.0	4.9	2.6	6.3	3.4	4
	146B 223D2 448B					0.25	12	1.3	1.7	2.2	3.7	2.0	4.9	2.6	6.3	3.4	4
	146B+ 223D3 448C2					0.20	18	1.8	2.5	3.2	5.1	2.8	7.1	3.8	9.1	4.9	6
	146B2 232A 594A					0.25	18	1.8	2.5	3.2	5.1	2.8	7.1	3.8	9.1	4.9	5
	189A 232A+ 594A+					0.30	18	1.8	2.5	3.2	5.1	2.8	7.1	3.8	9.1	4.9	4
	189B 232B 594B					0.25	24	2.4	3.3	4.2	6.8	3.7	9.4	5.1	12.0	6.5	7
	223B 232B+ 594B+					0.30	24	2.4	3.3	4.2	6.8	3.7	9.4	5.1	12.0	6.5	6
	232B2 295B																
I4	449B 450B 696C2	0-12	.16	0.5-0.9	0.7-1.1	0.20	9	0.8	1.1	1.4	1.1	0.9	1.6	1.2	2.0	1.6	3
	449C2 450C2 696C3	12-30	.13			0.25	9	0.8	1.1	1.4	1.1	0.9	1.6	1.2	2.0	1.6	2
	449C3 502A 697B	30-36	.12			0.20	12	1.1	1.5	1.9	1.6	1.2	2.1	1.7	2.7	2.1	4
	449D2 502B 698B					0.25	12	1.1	1.5	1.9	1.6	1.2	2.1	1.7	2.7	2.1	3
	449D3 696B					0.20	18	1.5	2.1	2.7	2.1	1.7	3.0	2.3	3.9	3.0	5
						0.25	18	1.5	2.1	2.7	2.1	1.7	3.0	2.3	3.9	3.0	4
						0.30	18	1.5	2.1	2.7	2.1	1.7	3.0	2.3	3.9	3.0	4
						0.25	24	2.0	2.7	3.5	2.9	2.2	4.1	3.0	5.0	3.9	6
						0.30	24	2.0	2.7	3.5	2.9	2.2	4.1	3.0	5.0	3.9	5
I5	23A 194C 357B	0-12	.16	0.2-0.5	0.4-0.8	0.20	9	0.8	1.1	1.4	2.2	1.3	3.1	1.8	4.0	2.3	3
	23B 194C2 357C	12-30	.17			0.25	9	0.8	1.1	1.4	2.2	1.3	3.1	1.8	4.0	2.3	2
	23B2, 194D 531B	30-36	.16			0.20	12	1.1	1.5	1.9	3.1	1.8	4.3	2.5	5.4	3.2	4
	192B , 194D2 531B2					0.25	12	1.1	1.5	1.9	3.1	1.8	4.3	2.5	5.4	3.2	3
	192C , 194D3 531C					0.20	18	1.7	2.3	2.9	4.9	2.8	6.6	3.8	8.3	4.8	6
	192C2 298B 531C2					0.25	18	1.7	2.3	2.9	4.9	2.8	6.6	3.8	8.3	4.8	5
	194B 298C 531D					0.30	18	1.7	2.3	2.9	4.9	2.8	6.6	3.8	8.3	4.8	4
	194B2, 298C2 531D2					0.25	24	2.2	3.1	3.9	6.3	3.7	8.9	5.2	11.2	6.5	6
						0.30	24	2.2	3.1	3.9	6.3	3.7	8.9	5.2	11.2	6.5	5
I6	91B, 91C, 91C2,	0-12	.16	0.1-0.3	0.2-0.5	0.20	9	0.8	1.1	1.4	4.0	2.3	5.5	3.2	7.0	4.0	3
	91D2	12-36	.14			0.25	9	0.8	1.1	1.4	4.0	2.3	5.5	3.2	7.0	4.0	2
						0.20	12	1.1	1.5	1.9	5.5	3.2	7.5	4.3	9.5	5.4	4
						0.25	12	1.1	1.5	1.9	5.5	3.2	7.5	4.3	9.5	5.4	3
						0.20	18	1.5	2.1	2.7	7.5	4.3	10.5	6.0	13.5	7.7	5
						0.25	18	1.5	2.1	2.7	7.5	4.3	10.5	6.0	13.5	7.7	4
						0.30	18	1.5	2.1	2.7	7.5	4.3	10.5	6.0	13.5	7.7	4
						0.25	24	2.0	2.8	3.6	10.0	5.7	14.0	8.0	18.0	10.3	6
						0.30	24	2.0	2.8	3.6	10.0	5.7	14.0	8.0	18.0	10.3	5

[1] Under the heading "Crop Information" in Table 14 are given the peak rates of moisture use and the soil depths to be irrigated as they are related to the kinds of crops listed in Table 15. To determine the correct irrigation specifications, first select the proper irrigation group in Table 14 that applies to the soil which is proposed to be irrigated. Within that group, select the moisture use rate and soil depth to be irrigated as they agree with the kind of crop listed in Table 15. This will be the line on which you will find the correct irrigation specifications concerning the amount of water to be applied, the time required to apply water, and the maximum time in which the entire irrigated area should be covered.

[2] Lists the total water to be applied during each irrigation at 70% efficiency. (A 30% loss is anticipated because of evaporation, uneven distribution and interception by foliage.) It is desirable to begin irrigating when 40% of the available moisture has been used and a system should be designed to cover the entire area before the available soil moisture drops below 20%. At the start, apply 40% of the available moisture as given to the first 1/3 of the area, secondly apply 55% to the second 1/3 of the area as given, and thirdly apply the 70% amount given to the last 1/3 of the field. For subsequent irrigations, apply the 40% amount to the entire area and in the same sequence. If rainfall interrupts the sequence, return to the 40-55-70% schedule.

[3] Gives the time required to apply those various amounts as listed under "Water to be applied at each irrigation." This time is needed because of the infiltration rates as given under "Infiltration Rate." The average of the infiltration rates was used in arriving at the time figures.

[4] Gives the maximum time between the start of one irrigation cycle and the start of the next provided no rain falls in the interim. Time is figured on the basis of keeping the moisture available to plants above the 40% level. Refer to Table 15 to obtain the "peak moisture use rates" and soil "depth to be irrigated" in accord with the crop being grown.

TABLE 15.--CROP INFORMATION APPLICABLE TO THE DESIGN OF SPRINKLER IRRIGATION SYSTEMS

TYPE OF CROP BASED ON ROOTING DEPTH1/	SOIL DEPTH TO BE IRRIGATED2/ Inches	PEAK RATE OF MOISTURE USE3/ Inches per Day
Shallow Rooted:		
Celery, gladioli, lettuce, nursery seedlings, onions, radishes, strawberries, spinach, lawn grasses.	9	0.20
Potatoes	9	0.25
Medium Rooted:		
Beans, cabbage, carrots, nursery transplants, peas, peppers	12	0.20
Cucumbers, soybeans	12	0.25
Deep Rooted:		
Brambles, horseradish	18	0.20
Asparagus, melons, tomatoes, pumplins	18	0.25
Corn, grass-legume forage	18	0.30
Very Deep Rooted:		
Fruit trees, grapes	24	0.25
Alfalfa	24	0.30

1/ Other crops can be estimated by comparison with those listed.

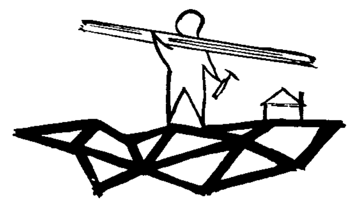
2/ Depth of irrigation is that soil depth normally supplying most of the crop moisture needs. It is not the rooting depth.

3/ Average rate for several days during the period of most rapid water demand by the crop and by direct evaporation.

CHAPTER X

ENGINEERING PROPERTIES AND INTERPRETATIONS OF SOILS[1]

This section provides engineering data and interpretive information about the soils of Ela Township. It is in a form that can be used to furnish engineers and others with basic soil information as it relates to the design, construction and performance of engineering works (10).



It is not considered that the information is such that it will eliminate the need for sampling and testing of on-site soil conditions which will affect the design for construction of a specific engineering work. The information should be considered as somewhat generalized and, therefore should be used only as a preliminary study or guide for the more detailed on-site investigations.

Soil Properties Affecting Septic Tanks[2]

The population increase and the migration of families to the suburban areas has expanded the residential development of rural land. In many cases, this expansion occurs beyond the limits of existing or proposed community type of water supply and sewage disposal facilities. In Lake County, there now are approximately 25,000 individual sewage disposal systems and the number is ever increasing.

The individual type of sewage disposal system relies on the soil for the removal of effluent from the system. The design and satisfactory function of individual systems, therefore, become dependent on those physical and chemical properties of the soil which have an effect on the water movement or percolation rate of the soil.

The failure of an individual sewage disposal system can and does create potential health hazards through the exposure of sanitary sewage to a community. In the interest of public safety and health, the Lake County Health Department has been concerned with the satisfactory function of the sewage systems. The test procedure developed by the U. S. Department of Health, Education and Welfare (21) has been used by them as a method to determine the suitability of the soil at building sites for installation of effluent absorption fields of individual sewage disposal systems.

A field study was made between the percolation test records of the Lake County Health Department and the soil classification system used and soil maps prepared by the Soil Conservation Service in Ela Township. Results of the study show that any particular soil, classified and mapped, will consistently have a percolation rate within relatively narrow ranges. Resultantly, it has become possible to make percolation rate estimates for all of the soil mapping units in Ela Township.

1/ All information in this section was reviewed by T. H. Thornburn, Professor of Civil Engineering, Dept. of Civil Engineering, University of Illinois.

2/ Information on septic tanks is based on a report prepared by John Morris, Lake County Health Department, Waukegan, Illinois.

In Table 17, column (g), the estimated range in percolation rate is given for each soil mapping unit. It has been found that these estimates have a high degree of reliability.

The estimated percolation rate or the percolation test itself does not show the whole picture of how a septic tank disposal field may function. For example, on certain soils a seasonal high water table can impair septic tank operation although the percolation rate of the soil may be good. Table 18, column (d) rates each soil mapping unit with respect to the overall desirability for use as septic tank sewage disposal fields.

The use of the soil maps and interpretations with regard to individual sewage disposal systems will be most applicable when working with large plots of land such as proposed land for subdivision development. Such use will allow for reliable estimates of the whole or portions of the area considered.

In the consideration of specific lots or portions of lots, the information becomes more restricted in use and it becomes important to have further on-site study.

The information presented in the tables as interpretations for the soil msps is for the soils as they occur in their natural state. Soil manipulation such as extensive cut and fill operations will so alter the areas that the information will no longer apply.

Over much of Ela Township, the removal of the natural soil during cut and fill operations will expose materials which will be less suitable for the location of septic tank absorption fields.

Engineering Test Data[1/]

Engineering test data is presented in Table 16 for certain selected soil types which are the most extensive within the township. The data is the result of laboratory analysis of soil samples taken from the major horizons of representative sites for each of the soil types. Samples, from five of the soil types, were obtained from within Ela Township and are so designated in the table. The remainder of the data comes from sample sites elsewhere in Illinois but pertains to these soil types as they were classified and mapped within the township.

This test data will be of most use to engineers and scientists who are interested in the general soil characteristics which pertain to engineering.

The engineering terms as well as the classification systems used in the column headings are explained as follows:

Liquid Limit (8)

The moisture content at which the soil material passes from a plastic to a liquid state (tests performed according to ASTM Standards: D 423-54T).

1/ Engineering test data was obtained through the cooperation of the Department of Civil Engineering, University of Illinois.

Plasticity Index (8)

The numerical difference between the liquid limit and plastic limit. The plasticity index indicates the range of moisture content within which a soil material is plastic. The plastic limit, though not given in the table, is the moisture content at which a soil changes from a semisolid to a plastic state. (Tests performed according to ASTM Standards: D424-54T.)

Maximum Dry Density

The maximum weight in pounds per cubic foot of oven-dry soil which can be attained with a specific compaction effort. (Tests performed according to ASTM Standards: D698-57T.)

Optimum Moisture

The moisture percentage of the soil at which maximum dry density can be obtained with a specific compaction force.

Mechanical Analysis

The percent of soil materials which will pass the #10 and #200 seives and the percent of less than 2 micron clay by the Hydrometer method. (Tests performed according to ASTM Standards: D422-54T.)

AASHO (1)

Most highway engineers classify soil materials in accordance with the system approved by the American Association of State Highway Officials. In this system, soil materials are classified in seven principal groups. The groups range from A-1, consisting of gravelly soils of high bearing capacity, to A-7, consisting of clayey soils having low strength when wet. Group index (1) is a number designed to express the relative value of the soil materials for subgrades and is given in conjunction with the AASHO classification. Group indexes range from 0, for the best materials, to 20 for the poorest.

Unified (23)

In this system, soil materials are identified as coarse grained (8 classes), fine grained (6 classes), or highly organic (1 class).

Estimated Engineering Properties[1/]

Based on the study of the test data, soil characteristics and field behavior of the soil and soil materials, Table 17 provides estimates of soil properties and Table 18 provides interpretive ratings for all mapping units as they may affect engineering works. Certain soils or soil materials can be expected to perform well for a particular engineering

1/ Contributions in the development of Tables 17 and 18 were made by L. H. Pierard, P. J. Warrick and J. T. Whalen; Soil Conservation Service Geologist, Engineering Specialist and Agricultural Engineer, respectively. Percolation test data used in making percolation rate estimates (Table 17, column (g)) was made available through the cooperation of John Morris, Sanitary Engineer of the Lake County Health Department.

use while others will perform very poorly. For example, Houghton muck, as such, is very poor for most engineering purposes. Also, certain soil properties need to be recognized and dealt with accordingly. For example, a soil having a high corrosion potential indicates that installation of corrosion resistant conduits is desirable.

It again needs to be recognized that the information is general and should be used only in planning more detailed on-site studies for a proposed engineering construction.

The various column headings are defined in the footnotes to the table. Further discussion on certain of the interpretations can be found in "Engineering Soil Classification for Residential Developments." (4)

Engineering Properties of Glacial Deposits[1/]

During 1960, a reconnaissance geologic investigation was conducted in Ela Township at which time a series of borings ranging from twenty to fifty feet in depth were made at nine representative sites.

This discussion of engineering properties is confined to the unconsolidated glacial deposits, the bedrock surface being beyond the depth limit of most engineering works.

The foundation bearing capacity of the glacial till was tested by the standard penetration resistance method whereby a 2 inch (outside diameter) sampling tube is driven into the soil material to be tested. In measuring the resistance to penetration, a driving force was supplied by a 140 pound hammer falling free for a distance of 30 inches. The number of hammer blows required to drive the sampling tube 1 foot into the soil material is defined as the standard penetration resistance. Blow counts were made at the 5, 10 and 15 foot depths in all borings and at 20 and 25 foot depths in 3 of the borings. The lowest recorded blow count was between 15 and 20 blows per foot, thereby indicating a very stiff material capable of supporting loads of about 2 to 4 tons per square foot without failure. These tests apply only to the rather compact glacial till and should not be considered applicable to the whole township. Furthermore, this correlation between bearing capacity and penetration resistance is considered rather unreliable for clay soils. Additional testing should be performed on samples of foundation material representative of the on-site conditions. Bearing strength of the peat and muck materials will be very low, probably below ¼ ton per square foot. Some of the gravelly formations can be expected to exceed a bearing strength of 4 tons per square foot.

The permeability of most of the silty and clayey glacial till is slow to moderately slow, the lake clays will be very slow, and the glacial sands and gravels moderately rapid. The possibilities for surface water storage reservoirs are good in areas where glacial till would underlie reservoir areas. However, the possible occurrence of permeable sand and gravel within the till can result in leakage and this possibility should be thoroughly investigated prior to construction.

1/ The information on generalized engineering properties is based on a report of field study by L. H. Pierard, Geologist of the Soil Conservation Service. The information gives some indication of the engineering properties of soil materials to a depth of up to 25 feet.

Study of geologic literature indicates that ground water is supplied in sandy and gravelly glacial deposits at depths varying from 30 to over 200 feet. The western half of the township has a more abundant supply available than does the eastern half. Some wells obtain favorable water supplies from cracks and crevices in the dolomitic limestone bedrock although this source is usually not as plentiful or reliable as that from the glacial gravels.

Attention is directed to the extensive investigation and research concerning this general area performed by the Illinois State Geological Survey and the Illinois State Water Survey (9). Publications and general information are available from these agencies.

TABLE 16.--ENGINEERING TEST DATA FOR SELECTED SOIL TYPES

SOIL TYPE NUMBER	SOIL TYPE NAME	HORIZON	DEPTH FROM SURFACE (inches)	LIQUID LIMIT	PLASTICITY INDEX	MAXIMUM DRY DENSITY (lb./cu.ft.)	OPTIMUM MOISTURE (percent)	MECHANICAL ANALYSIS[1]			CLASSIFICATION	
								#10 Sieve	#200 Sieve	2 Micron Clay	A.A.S.H.O.[2]	Unified[3]
23	Blount silt loam[5]	A	0-10	29	8	108	17	98	87	17	A-4(8)	CL-ML
		B	15-27	52	28	104	22	96	90	48	A-7-6(18)	CH
		C	27+	33	14	113	15	97	88	32	A-6(10)	CL
126	Bonpas silty clay loam[6]	A_1	0-16	34	15	109	14	100	74	26	A-6(10)	CL
		B_1	16-22	37	20	113	15	100	74	27	A-6(12)	CL
		B_2	22-30	37	21	113	14	100	76	28	A-6(12)	CL
146	Elliott silt loam[5]	A	0-8	35	11	105	18	100	95	29	A-6(8)	ML-CL
		B	18-33	45	23	105	19	100	87	40	A-7-6(14)	CL
194	Morley silt loam[4]	A_1	0-4	46	14	91	28	98	82	17	A-7-5(11)	CL
		A_2	4-10	30	8	107	17	99	87	25	A-4(8)	CL
		B	13-19	52	27	93	23	98	90	61	A-7-6(17)	CH
		C	26-36	35	17	109	18	93	78	39	A-6(11)	CL
223	Varna silt loam[4]	A	0-7	37	13	101	20	97	70	26	A-6(8)	CL
		B	14-22	44	20	99	21	99	91	52	A-7-6(13)	CL
		C	30-36	38	18	109	17	98	90	44	A-6(11)	CL
232	Ashkum Silty clay loam[5]	A	0-12	54	21	93	21	100	98	39	A-7-5(15)	MH
		B	12-26	59	33	97	23	100	100	47	A-7-6(20)	CH
294	Symerton silt loam[4]	A	2-11	44	16	95	24	99	86	28	A-7-6(11)	CL
		B	15-25	44	20	99	22	98	91	43	A-7-6(13)	CL
		C	32-40	32	14	114	16	95	83	26	A-6(9)	CL
		D	46-56	31	14	114	15	95	82	32	A-6(10)	CL
330	Peotone silty clay loam[4]	A	3-13	49	21	94	23	98	86	42	A-7-6(15)	CL
		B	15-27	47	26	102	19	99	86	45	A-7-6(16)	CL
		C	40-46	41	20	105	19	99	91	50	A-7-6(12)	CL
594	Pella silty clay loam, moderately fine substratum[4]	A	2-12	58	24	87	27	99	86	33	A-7-5(17)	OH or MH
		B	22-28	44	24	105	18	99	89	41	A-7-6(15)	CL
		C	34-42	27	11	117	14	84	52	21	A-6(4)	CL
		D	53-60	29	11	115	15	96	85	30	A-6(8)	CL

[1]Mechanical analysis according to the American Association of State Highway Officials Designation: T88. Figures given are for the percent of the total material passing the #10 and #200 sieves respectively. The percent of 2 micron clay is by the Hydrometer method.

[2]The classification of soils and soil-aggregate mixtures for highway purposes, A.A.S.H.O. Designation: M 145-49.

[3]The Unified soil classification system; Technical Memorandum No. 3-357, Volume I, Waterways Experiment Station, March 1953.

[4]Soils sampled in Ela Township, Lake County, Illinois. Tests performed by the Department of Civil Engineering, University of Illinois, in accordance with standard procedures of the American Association of State Highway Officials (A.A.S.H.O.).

[5]Soils sampled in Will County, Illinois. Tests performed by the Bureau of Public Roads in accordance with standard procedures of the American Association of State Highway Officials.

[6]Soil sampled in Wabash County, Illinois. Tests performed by the Bureau of Public Roads in accordance with standard procedures of the American Association of State Highway Officials.

TABLE 17.--BRIEF DESCRIPTION OF THE SOILS AND ESTIMATED PROPERTIES SIGNIFICANT TO ENGINEERING[1]

BRIEF SOIL DESCRIPTION (a)	SYMBOL ON MAP (b)	SOIL HORIZON (c)	DEPTH FROM SURFACE (inches) (d)	pH (e)	HYDRAULIC CONDUCTIVITY (inches/hr.) (f)	PERCOLATION RATE (min./inch)[2] (g)	BEARING STRENGTH (tons/sq.ft.) (h)	SHRINK-SWELL RATIO (i)	CORROSION POTENTIAL (j)	SUSCEPTIBILITY TO FROST ACTION[2] (k)	SUSCEPTIBILITY TO EROSION[2] (l)	WATER TABLE DEPTH[2] (m)	FLOODING POTENTIAL[2] (n)	ξW VALUE[2] (o)
Blount silt loam. Upland timber soils which have somewhat poor internal drainage; silt loam A horizons which are low in organic matter; blocky silty clay loam B horizons and massive silty clay loam C horizons.		A	0-10	6.0-6.5	0.8-2.5		-	-	Moderate			Seasonally 1 to 3 ft.	Produces Slow Runoff	28
	23A	B	10-32	5.5-6.0	0.2-0.8	>91[3]	1½-3	Moderate	Moderate	High	Low			
		C	32-60	8.5	0.2-0.8		1½-3	Moderate	High					
	23B	A	0-10	6.0-6.5	0.8-2.5		-	-	Moderate			Seasonally 1 to 3 ft.	Produces Runoff	
	23B2	B	10-32	5.5-6.0	0.2-0.8	>91[3]	1½-3	Moderate	Moderate	High	Moderate			32
		C	32-60	8.5	0.2-0.8		1½-3	Moderate	High					
LaRose Soils. Upland prairie soils which have good internal drainage; blocky gritty silty clay loam B horizons and massive loam C horizons. (A horizons absent due to past erosion.)		A	Absent											
	60D3	B	0-18	6.0-6.5	0.8-2.5	31-60	1½-3	Moderate	Low	High	Moderate	>3 ft.[3]	Produces Runoff	41
		C	18-60	8.5	0.8-2.5		2-3	Low	Moderate					
Harpster silty clay loam. Low lying dark colored soils with poor internal drainage; silty clay loam A horizons which are high in organic matter; blocky silty clay loam B horizons and massive loam to sandy loam C horizons.		A	0-15	8.5	0.8-2.5		-	-	Very high			Seasonally[3] <1 ft.	Subject to Standing Water	
	67A	B	15-36	8.5	0.8-2.5	31-60	½-1½	Moderate	Very high	High	Low			19
		C	36-60	8.5	0.8-2.5		1-3	Low	Very high					
		A	0-15	8.5	0.8-2.5		-	-	Very high			Seasonally[3] <1 ft.	Subject to Concentrated Runoff	
	67B	B	15-36	8.5	0.8-2.5	31-60	½-1½	Moderate	Very high	High	Low			23
		C	36-60	8.5	0.8-2.5		1-3	Low	Very high					
Otter silt loam. Dark colored bottomland soils with poor internal drainage; silt loam surface soils which are high in organic matter; massive to blocky stratified loam to silty clay loam subsurface soils which are high in organic matter.		I	0-20	6.5-7.3	0.8-2.5		-	-	High			Seasonally <1 ft.	Subject to Stream Overflow	
	76	II	20-40	6.5-7.3	0.8-2.5	31-60	½-1½	Moderate	High	High	Low			19
		III	40-60	6.5-7.3	0.8-2.5		½-1½	Moderate	High					
	W76	I	0-20	6.5-7.3	0.8-2.5	Restricted Due To Watertable	-	-	High			Perennially[3] <1 ft.	Subject to Stream Overflow	
		II	20-40	6.5-7.3	0.8-2.5		½-1½	Moderate	High	Very High	Low			19
		III	40-60	6.5-7.3	0.8-2.5		½-1½	Moderate	High					
Swygert silt loam. Upland prairie soils with somewhat poor internal drainage; silt loam A horizons which are high in organic matter; blocky silty clay B horizons and massive silty clay C horizons.		A	0-11	6.0-6.5	0.8-2.5		-	-	Moderate			Seasonally 1 to 3 ft.	Produces Runoff	
	91B	B	11-29	6.0-6.5	0.2-0.8	>91[3]	½-1½	High	Moderate	Moderate	Moderate			32
		C	29-60	8.5	0.05-0.2		1-3	High	High					
	91C	A	0-11	6.0-6.5	0.8-2.5		-	-	Moderate			Seasonally 1 to 3 ft.	Produces Runoff	
	91C2	B	11-29	6.0-6.5	0.2-0.8	>91[3]	½-1½	High	Moderate	Moderate	Moderate			39
		C	29-60	8.5	0.05-0.2		1-3	High	High					
		A	0-11	6.0-6.5	0.8-2.5		-	-	Moderate			Seasonally 1 to 3 ft.	Produces Runoff	
	91D2	B	11-29	6.0-6.5	0.2-0.8	>91[3]	½-1½	High	Moderate	Moderate	High			47
		C	29-60	8.5	0.05-0.2		1-3	High	High					
		A	Absent											
	91D3	B	0-18	6.0-6.5	0.2-0.8	>91[3]	½-1½	High	Moderate	Moderate	High	Seasonally 1 to 3 ft.	Produces Runoff	47
		C	18-60	8.5	0.05-0.2		1-3	High	High					
Houghton muck. Depressional organic soils with very poor internal drainage; muck surface soils; massive muck subsurface soils. (Silt loam deposition on some areas.)	103	I	0-36	6.5-7.3	2.5-5.0	11-30	<¼ [3]	Very high	Very high	Moderate	Low	Seasonally[3] <1 ft.	Subject to Ponding	7
	103+	II	36-60	6.5-7.3	2.5-5.0		<¼	Very high	Very high					
	W103	I	0-36	6.5-7.3	2.5-5.0	Restricted Due To Watertable	<¼ [3]	Very high	Very high			Perennially[3] <1 ft.	Subject to Ponding	
	W103+	II	36-60	6.5-7.3	2.5-5.0		<¼	Very high	Very high	Moderate	Low			7
	103 [marsh symbol]													
	103+ [marsh symbol]													
Sawmill silty clay loam. Dark colored bottomland soils with poor internal drainage; silty clay loam surface soils which are high in organic matter; massive to blocky, stratified silty clay loam to silt loam subsurface soils.		I	0-12	6.5-7.3	0.8-2.5		-	-	Very high			Seasonally[3] <1 ft.	Subject to Stream Overflow	
	107	II	12-44	6.5-7.3	0.8-2.5	31-60	¼-1	Moderate	Very high	High	Low			19
		III	44-60	6.5-7.3	0.8-2.5		¼-1	Moderate	Very high					
		I	0-12	6.5-7.3	0.8-2.5	Restricted Due To Watertable	-	-	Very high			Perennially[3] <1 ft.	Subject to Stream Overflow	
	W107	II	12-44	6.5-7.3	0.8-2.5		¼-1	Moderate	Very high	High	Low			19
		III	44-60	6.5-7.3	0.8-2.5		¼-1	Moderate	Very high					

TABLE 17 (CONTINUED)

Bonpas silty clay loam. Low lying dark colored soils with poor internal drainage; silty clay loam A horizons which are high in organic matter; blocky silty clay loam B horizons and massive silty clay loam C horizons.	126	A B C	0-14 14-34 34-60	6.5-7.3 6.5-7.3 8.5	0.8-2.5 0.2-0.8 0.2-0.8	61-90	- ½-3 ½-3	- Moderate Moderate	High High High	High	Low	Seasonally[3] <1 ft.	Subject to Standing Water	19
Elliott silt loam. Upland prairie soils which have somewhat poor internal drainage; silt loam A horizons which are high in organic matter; blocky silty clay loam B horizons and massive silty clay loam C horizons.	146A	A B C	0-12 12-31 31-60	6.0-6.5 6.0-6.5 8.5	0.8-2.5 0.8-2.5 0.2-0.8	61-90	- 1-3 1-3	- Moderate Moderate	Moderate Moderate High	High	Low	Seasonally 1 to 3 ft.	Produces Slow Runoff	26
	146B 146B+ 146B2	A B C	0-12 12-31 31-60	6.0-6.5 6.0-6.5 8.5	0.8-2.5 0.8-2.5 0.2-0.8	61-90	- 1-3 1-3	- Moderate Moderate	Moderate Moderate High	High	Moderate	Seasonally 1 to 3 ft.	Produces Runoff	30
Pella silty clay loam. Low lying dark colored soils with poor internal drainage; silty clay loam A horizons which are high in organic matter; blocky gritty silty clay loam B horizons and massive loam to sandy loam C horizons (silt loam deposition on some areas.)	153A 153A+	A B C	0-18 18-36 36-60	6.5-7.3 6.5-7.3 8.5	0.8-2.5 0.8-2.5 0.8-2.5	31-60	- ½-1½ 1-3	- Moderate Low	High High High	Very high	Low	Seasonally[3] <1 ft.	Subject to Standing Water	19
	153B	A B C	0-18 18-36 36-60	6.5-7.3 6.5-7.3 8.5	0.8-2.5 0.8-2.5 0.8-2.5	31-60	- ½-1½ 1-3	- Moderate Low	High High High	Very high	Low	Seasonally[3] <1 ft.	Subject to Concentrated Water	23
Martinton silt loam. Upland prairie soils which have somewhat poor internal drainage silt loam A horizons which are high in organic matter; blocky silty clay loam B horizons and massive silty clay loam C horizons showing varving.	189A	A B C	0-13 13-34 34-60	6.0-6.5 6.0-6.5 8.5	0.8-2.5 0.8-2.5 0.2-0.8	61-90	- 1-3 1-3	- Moderate Moderate	Moderate Moderate High	High	Low	Seasonally 1 to 3 ft.	Produces Slow Runoff	26
	189B	A B C	0-13 13-34 34-60	6.0-6.5 6.0-6.5 8.5	0.8-2.5 0.8-2.5 0.2-0.8	61-90	- 1-3 1-3	- Moderate Moderate	Moderate Moderate High	High	Moderate	Seasonally 1 to 3 ft.	Produces Runoff	30
Del Rey silt loam. Upland timber soils which have moderately good internal drainage; silt loam A horizons which are low in organic matter; blocky silty clay loam B horizons and massive silty clay loam C horizons that show varving.	192B	A B C	0-10 10-38 38-60	5.5-6.0 5.5-6.0 8.5	0.8-2.5 0.2-0.8 0.2-0.8	61-90	- 1-3 1-3	- Moderate Moderate	Low Low Moderate	High	Moderate	>3 ft.[3]	Produces Runoff	30
	192C 192C2	A B C	0-10 10-38 38-60	5.5-6.0 5.5-6.0 8.5	0.8-2.5 0.2-0.8 0.2-0.8	61-90	- 1-3 1-3	- Moderate Moderate	Low Low Moderate	High	Moderate	>3 ft.[3]	Produces Runoff	37
Morley silt loam. Upland timber soils which have moderately good internal drainage; silt loam A horizons which are low in organic matter; blocky silty clay loam B horizons and massive silty clay loam C horizons.	194B 194B2	A B C	0-10 10-30 30-60	5.5-6.0 5.5-6.0 8.5	0.8-2.5 0.2-0.8 0.2-0.8	61-90	- 1-3 1-3	- Moderate Moderate	Low Low Moderate	High	Moderate	>3 ft.[3]	Produces Runoff	30
	194C 194C2	A B C	0-10 10-30 30-60	5.5-6.0 5.5-6.0 8.5	0.8-2.5 0.2-0.8 0.2-0.8	61-90	- 1-3 1-3	- Moderate Moderate	Low Low Moderate	High	Moderate	>3 ft.[3]	Produces Runoff	37
	194C3	A B C	Absent 0-19 19-60	5.5-6.0 8.5	0.2-0.8 0.2-0.8	>91[3]	1-3 1-3	Moderate Moderate	Low Moderate	High	High	>3 ft.[3]	Produces Runoff	37
	194D 194D2	A B C	0-9 9-28 28-60	5.5-6.0 5.5-6.0 8.5	0.8-2.5 0.2-0.8 0.2-0.8	61-90	- 1-3 1-3	- Moderate Moderate	Low Low Moderate	High	High	>3 ft.[3]	Produces Runoff	45
	194D3	A B C	Absent 0-19 19-60	5.5-6.0 8.5	0.2-0.8 0.2-0.8	>91[3]	1-3 1-3	Moderate Moderate	Low Moderate	High	High	>3 ft.[3]	Produces Runoff	45
	194E 194E2	A B C	0-9 9-28 28-60	5.5-6.0 5.5-6.0 8.5	0.8-2.5 0.2-0.8 0.2-0.8	61-90	- 1-3 1-3	- Moderate Moderate	Low Low Moderate	High	High	>3 ft.[3]	Produces Runoff	56
	194E3	A B C	Absent 0-18 18-60	5.5-6.0 8.5	0.2-0.8 0.2-0.8	>91[3]	1-3 1-3	Moderate Moderate	Low Moderate	High	High	>3 ft.[3]	Produces Runoff	56

See footnotes at end of table, page 114 .

TABLE 17 (CONTINUED)--BRIEF DESCRIPTION OF THE SOILS AND ESTIMATED PROPERTIES SIGNIFICANT TO ENGINEERING[1/]

BRIEF SOIL DESCRIPTION (a)	SYMBOL ON MAP (b)	SOIL HORIZON (c)	DEPTH FROM SURFACE (inches) (d)	pH (e)	HYDRAULIC CONDUCTIVITY (inches/hr.) (f)	PERCOLATION RATE[2/] (min./inch) (g)	BEARING STRENGTH (tons/sq.ft.) (h)	SHRINK-SWELL RATIO (i)	CORROSION POTENTIAL (j)	SUSCEPTIBILITY TO FROST ACTION[2/] (k)	SUSCEPTIBILITY TO EROSION[2/] (l)	WATER TABLE DEPTH[2/] (m)	FLOODING POTENTIAL[2/] (n)	Σ W VALUE[2/] (o)
	194F 194F2	A	0-8	5.5-6.0	0.8-2.5	61-90	-	-	Low	High	High	>3 ft.[3/]	Produces Runoff	66
		B	8-27	5.5-6.0	0.2-0.8		1-3	Moderate	Low					
		C	27-60	8.5	0.2-0.8		1-3	Moderate	Moderate					
Varna silt loam. Upland prairie soils which have moderately good internal drainage; silt loam A horizons which are high in organic matter; blocky silty clay loam B horizons and massive, silty clay loam C horizons.	223B 223B2	A	0-10	5.5-6.0	0.8-2.5	61-90	-	-	Low	High	Moderate	>3 ft.[3/]	Produces Runoff	30
		B	10-30	5.5-6.0	0.8-2.5		1-3	Moderate	Low					
		C	30-60	8.5	0.2-0.8		1-3	Moderate	Moderate					
	223C 223C2	A	0-10	5.5-6.0	0.8-2.5	61-90	-	-	Low	High	Moderate	>3 ft.[3/]	Produces Runoff	37
		B	10-30	5.5-6.0	0.8-2.5		1-3	Moderate	Low					
		C	30-60	8.5	0.2-0.8		1-3	Moderate	Moderate					
	223C3	A	Absent			>91[3/]				High	Moderate	>3 ft.[3/]	Produces Runoff	37
		B	0-20	5.5-6.0	0.8-2.5		1-3	Moderate	Low					
		C	20-60	8.5	0.2-0.8		1-3	Moderate	Moderate					
	223D2	A	0-6	5.5-6.0	0.8-2.5	61-90	-	-	Low	High	High	>3 ft.[3/]	Produces Runoff	45
		B	6-26	5.5-6.0	0.8-2.5		1-3	Moderate	Low					
		C	26-60	8.5	0.2-0.8		1-3	Moderate	Moderate					
	223D3	A	Absent			>91[3/]				High	High	>3 ft.[3/]	Produces Runoff	45
		B	0-20	5.5-6.0	0.8-2.5		1-3	Moderate	Low					
		C	20-60	8.5	0.2-0.8		1-3	Moderate	Moderate					
	223E2	A	0-6	5.5-6.0	0.8-2.5	61-90	-	-	Low	High	High	>3 ft.[3/]	Produces Runoff	56
		B	6-26	5.5-6.0	0.8-2.5		1-3	Moderate	Low					
		C	26-60	8.5	0.2-0.8		1-3	Moderate	Moderate					
	223E3	A	Absent			>91[3/]						>3 ft.[3/]	Produces Runoff	56
		B	0-20	5.5-6.0	0.8-2.5		1-3	Moderate	Low	High	High			
		C	20-60	8.5	0.2-0.8		1-3	Moderate	Moderate	High	High			
Ashkum silty clay loam. Low lying dark colored soils with poor internal drainage; silty clay loam A horizons which are high in organic matter; blocky silty clay loam B horizons and massive silty clay loam C horizons (silt loam deposition on some areas).	232A 232A+	A	0-15	6.5-7.3	0.8-2.5	61-90	-	-	High	High	Low	Seasonally <1 ft.[3/]	Subject to Standing Water	22
		B	15-35	6.5-7.3	0.2-0.8		½-2	Moderate	High					
		C	35-60	8.5	0.2-0.8		½-3	Moderate	High					
	232B 232B+	A	0-15	6.5-7.3	0.8-2.5	61-90	-	-	High	High	Low	Seasonally <1 ft.[3/]	Subject to Concentrated Runoff	26
		B	15-35	6.5-7.3	0.2-0.8		½-2	Moderate	High					
		C	35-60	8.5	0.2-0.8		½-3	Moderate	High					
Chatsworth silt loam. Upland soils which have moderately good internal drainage; silt loam A horizons which are low in organic matter; structureless silty clay loam to silty clay C horizons.	241D2	A	0-5	6.5-7.3	0.8-2.5	>91[3/]	-	-	Low	Moderate	High	>3 ft.[3/]	Produces Runoff	55
		C	5-60	8.5	0.2-0.8		1½-3	Moderate	Moderate					
	241F2 241G2	A	0-5	6.5-7.3	0.8-2.5	>91[3/]	-	-	Low	Moderate	High	>3 ft.[3/]	Produces Runoff	76
		C	5-60	8.5	0.2-0.8		1½-3	Moderate	Moderate					
Andres silt loam. Upland prairie soils which have somewhat poor internal drainage; silt loam A horizons which are high in organic matter; blocky gritty silty clay loam B horizons; massive loam to sandy loam C horizons and massive silty clay loam D horizons.	293A	A	0-14	6.0-6.5	0.8-2.5	31-60	-	-	Moderate	High	Low	Seasonally 1 to 3 ft.	Produces Slow Runoff	22
		B	14-32	5.5-6.0	0.8-2.5		1-3	Moderate	Moderate					
		C	32-46	8.5	0.8-2.5		1-3	Low	High					
		D	46-60	8.5	0.2-0.8		1-3	Moderate	High					
	293B	A	0-14	6.0-6.5	0.8-2.5	31-60	-	-	Moderate	High	Low	Seasonally 1 to 3 ft.	Produces Runoff	26
		B	14-32	5.5-6.0	0.8-2.5		1-3	Moderate	Moderate					
		C	32-46	8.5	0.8-2.5		1-3	Low	High					
		D	46-60	8.5	0.2-0.8		1-3	Moderate	High					
Symerton silt loam. Upland prairie soils which have moderately good internal drainage; silt loam A horizons which are high in organic matter; blocky silty clay loam B horizons; massive silt loam C horizons and massive silty clay loam D horizons.	294B	A	0-11	5.5-6.0	0.8-2.5	31-60	-	-	Low	High	Low	>3 ft.[3/]	Produces Runoff	26
		B	11-30	5.5-6.0	0.8-2.5		1-3	Moderate	Low					
		C	30-44	8.5	0.8-2.5		1-3	Low	Moderate					
		D	44-60	8.5	0.2-0.8		1-3	Moderate	Moderate					
	294C	A	0-11	5.5-6.0	0.8-2.5	31-60	-	-	Low	High	Moderate	>3 ft.[3/]	Produces Runoff	33
		B	11-30	5.5-6.0	0.8-2.5		1-3	Moderate	Low					
		C	30-44	8.5	0.8-2.5		1-3	Low	Moderate					
		D	44-60	8.5	0.2-0.8		1-3	Moderate	Moderate					
Andres silt loam, fine substratum. Upland prairie soils which have somewhat poor internal drainage; silt	295B	A	0-12	5.5-6.0	0.8-2.5	61-90	-	-	Moderate	High	Low	Seasonally 1 to 3 ft.	Produces Runoff	26
		B	12-32	5.5-6.0	0.2-0.8		1-3	Moderate	Moderate					
		C	32-36	8.5	0.2-0.8		1-3	Low	High					
		D	36-60	8.5	0.05-0.2		1-3	High	High					

TABLE 17 (CONTINUED)

loam A horizons which are high in organic matter; blocky gritty silty clay loam B horizons; massive loam C horizons and massive silty clay D horizons.														
<u>Beecher silt loam.</u> Moderately dark upland soils which have somewhat poor internal drainage; silt loam A horizons which are moderately high in organic matter; blocky silty clay loam B horizons and massive silty clay loam C horizons.	298B	A B C	0-11 11-31 31-60	5.5-6.0 5.5-6.0 8.5	0.8-2.5 0.2-0.8 0.2-0.8	61-90	– 1-3 1-3	– Moderate Moderate	Moderate Moderate High	High	Moderate	Seasonally 1 to 3 ft.	Produces Runoff	31
	298C 298C2	A B C	0-11 11-31 31-60	5.5-6.0 5.5-6.0 8.5	0.8-2.5 0.2-0.8 0.2-0.8	61-90	– 1-3 1-3	– Moderate Moderate	Moderate Moderate High	High	Moderate	Seasonally 1 to 3 ft.	Produces Runoff	38
<u>Rollin muck.</u> Depressional organic soils with very poor internal drainage; muck surface soils; massive, marl underlying material (silt loam deposition on some areas).	312+	I II III	0-20 20-34 34-60	8.5 8.5 8.5	2.5-5.0 Variable Variable	Variable	<¼ <¼ [3] <¼	Very high Very high Variable	Very high Very high Very high	Moderate	Low	Seasonally[3] <1 ft.	Subject to Ponding	7
	312 ψ	I II III	0-20 20-34 34-60	8.5 8.5 8.5	2.5-5.0 Variable Variable	Restricted Due To Watertable	<¼ <¼ [3] <¼	Very high Very high Variable	Very high Very high Very high	Moderate	Low	Perennially[3] <1 ft.	Subject to Ponding	7
<u>Frankfort silt loam.</u> Moderately dark upland soil with somewhat poor internal drainage; silt loam A horizons which are moderately high in organic matter; blocky silty clay B horizons and massive silty clay C horizons.	320B	A B C	0-12 12-26 26-60	5.5-6.0 5.5-6.0 8.5	0.8-2.5 0.2-0.8 0.05-0.2	>91[3]	– 1-3 1-3	– High High	Moderate Moderate High	High	Moderate	Seasonally 1 to 3 ft.	Produces Runoff	35
<u>Peotone silty clay loam.</u> Depressional dark colored soils with very poor internal drainage; silty clay loam A horizons which are high in organic matter; blocky silty clay loam B horizons and massive loam to silty clay loam C horizons (silt loam deposition on some areas).	330 330+	A B C	0-16 16-40 40-60	6.5-7.3 6.5-7.3 8.5	0.8-2.5 0.2-0.8 0.2-0.8	61-90	– ½-1½ 1-3	– Moderate Moderate	High High High	High	Low	Seasonally[3] <1 ft.	Subject to Ponding	18
	W330 W330+ 330 ψ	A B C	0-16 16-40 40-60	6.5-7.3 6.5-7.3 8.5	0.8-2.5 0.2-0.8 0.2-0.8	Restricted Due To Watertable	– ½-1½ 1-3	– Moderate Moderate	High High High	High	Low	Perennially[3] <1 ft.	Subject to Ponding	18
<u>Gilmer silt loam.</u> Upland prairie soils which have moderately good internal drainage; silt loam A horizons which are high in organic matter; blocky silty clay loam B horizons and massive silty clay loam C horizons showing varving.	341B	A B C	0-13 13-38 38-60	5.5-6.0 5.5-6.0 8.5	0.8-2.5 0.8-2.5 0.2-0.8	61-90	– 1-3 1-3	– Moderate Moderate	Low Low Moderate	Moderate	Moderate	>3 ft.[3]	Produces Runoff	30
<u>Harpster complex.</u> Low lying dark colored soils with poor internal drainage; loam to silt loam A horizons which are high in organic matter; blocky clay loam B horizons and massive sandy loam C horizons. (Silty clay loam D horizons may be present in some areas).	347A	A B C	0-15 15-32 32-60	8.5 8.5 8.5	0.8-2.5 0.8-2.5 0.8-2.5	31-60	– ½-1 1-3	– Moderate Low	Very high Very high Very high	Very high	Low	Seasonally[3] <1 ft.	Subject to Standing Water	19
	347B	A B C	0-15 15-32 32-60	8.5 8.5 8.5	0.8-2.5 0.8-2.5 0.8-2.5	31-60	– ½-1 1-3	– Moderate Low	Very high Very high Very high	Very high	Low	Seasonally[3] <1 ft.	Subject to Concentrated Runoff	23
<u>Wauconda silt loam, fine substratum.</u> Moderately dark upland soils with somewhat poor internal drainage; silt loam A horizons which are moderately high in organic matter;	357B	A B C D	0-13 13-31 31-40 40-60	5.5-6.0 5.5-6.0 8.5 8.5	0.8-2.5 0.2-0.8 0.2-0.8 0.05-0.2	61-90	– 1-3 1-3 1-3	– Moderate Low High	Moderate Moderate High High	High	Moderate	Seasonally 1 to 3 ft.	Produces Runoff	31
	357C	A B	0-13 13-31	5.5-6.0 5.5-6.0	0.8-2.5 0.2-0.8	61-90	– 1-3	– Moderate	Moderate Moderate	High	Moderate	Seasonally 1 to 3 ft.	Produces Runoff	38

See footnotes at end of table, page 114 .

TABLE 17 (CONTINUED)--BRIEF DESCRIPTION OF THE SOILS AND ESTIMATED PROPERTIES SIGNIFICANT TO ENGINEERING[1]

BRIEF SOIL DESCRIPTION (a)	SYMBOL ON MAP (b)	SOIL HORIZON (c)	DEPTH FROM SURFACE (inches) (d)	pH (e)	HYDRAULIC CONDUCTIVITY (inches/hr.) (f)	PERCOLATION RATE (min./inch)[2] (g)	BEARING STRENGTH (tons/sq.ft.) (h)	SHRINK-SWELL RATIO (i)	CORROSION POTENTIAL (j)	SUSCEPTIBILITY TO FROST ACTION[2] (k)	SUSCEPTIBILITY TO EROSION[2] (l)	WATER TABLE DEPTH[2] (m)	FLOODING POTENTIAL[2] (n)	W VALUE[2] (o)
blocky clay loam B horizons; massive silt loam to sandy loam C horizons and silty clay D horizons.		C	31-40	8.5	0.2-0.8		1-3	Low	High					
		D	40-60	8.5	0.05-0.2		1-3	High	High					
Andres silt loam, loamy substratum. Upland prairie soils with somewhat poor internal drainage; silt loam A horizons which are high in organic matter; blocky gritty silty clay loam B horizons; massive stratified sandy loam to silt loam C horizons.		A	0-12	6.0-6.5	0.8-2.5		-	-	Moderate					
	442A	B	12-35	6.0-6.5	0.8-2.5	31-60	½-1½	Moderate	Moderate	Very high	Low	Seasonally 1 to 3 ft.	Produces Slow Runoff	22
		C	35-60	8.5	0.8-2.5		1-3	Low	High					
		A	0-12	6.0-6.5	0.8-2.5		-	-	Moderate					
	442B	B	12-35	6.0-6.5	0.8-2.5	31-60	½-1½	Moderate	Moderate	Very high	Low	Seasonally 1 to 3 ft.	Produces Runoff	26
		C	35-60	8.5	0.8-2.5		1-3	Low	High					
Symerton silt loam, loamy substratum. Upland prairie soils which have moderately good internal drainage; silt loam A horizons which are high in organic matter; blocky gritty silty clay loam B horizons; massive stratified sandy loam to silt loam C horizons.		A	0-11	6.0-6.5	0.8-2.5		-	-	Low					
	443B	B	11-37	6.0-6.5	0.8-2.5	31-60	1½-3	Moderate	Low	High	Low	>3 ft.[3]	Produces Runoff	26
		C	37-60	8.5	0.8-2.5		1-3	Low	Moderate					
		A	0-10	6.0-6.5	0.8-2.5		-	-	Low					
	443C2	B	10-34	6.0-6.5	0.8-2.5	31-60	1½-3	Moderate	Low	High	Moderate	>3 ft.[3]	Produces Runoff	33
		C	34-60	8.5	0.8-2.5		1-3	Low	Moderate					
Symerton silt loam, fine substratum. Upland prairie soils which have moderately good internal drainage; silt loam A horizons which are high in organic matter; blocky gritty silty clay loam B horizons; massive loam C horizons and massive silty clay D horizons.		A	0-13	5.5-6.0	0.8-2.5		-	-	Low					
	448B	B	13-38	5.5-6.0	0.8-0.8	61-90	1-3	Moderate	Low	High	Moderate	>3 ft.[3]	Produces Runoff	30
		C	38-44	8.5	0.2-0.8		1-3	Low	Moderate					
		D	44-60	8.5	0.05-0.2		1-3	High	High					
		A	0-13	5.5-6.0	0.8-2.5		-	-	Low					
	448C2	B	13-38	5.5-6.0	0.8-0.8	61-90	1-3	Moderate	Low	High	Moderate	>3 ft.[3]	Produces Runoff	37
		C	38-44	8.5	0.2-0.8		1-3	Low	Moderate					
		D	44-60	8.5	0.05-0.2		1-3	High	High					
Tuscola silt loam, moderately fine substratum. Upland timber soils which have moderately good internal drainage; silt loam A horizons which are low in organic matter; blocky gritty silty clay loam B horizons; massive silt loam to loam C horizons and massive silty clay loam D horizons.		A	0-11	5.5-6.0	0.8-2.5		-	-	Low					
	449B	B	11-36	5.5-6.0	0.8-2.5	31-60	1-3	Moderate	Low	High	Low	>3 ft.[3]	Produces Runoff	30
		C	36-53	8.5	0.8-2.5		1-3	Low	Moderate					
		D	53-60	8.5	0.2-0.8		1-3	Moderate	Moderate					
		A	0-11	5.5-6.0	0.8-2.5		-	-	Low					
	449C2	B	11-36	5.5-6.0	0.8-2.5	31-60	1-3	Moderate	Low	High	Moderate	>3 ft.[3]	Produces Runoff	37
		C	36-53	8.5	0.8-2.5		1-3	Low	Moderate					
		D	53-60	8.5	0.2-0.8		1-3	Moderate	Moderate					
		A	Absent											
	449C3	B	0-25	5.5-6.0	0.8-2.5		1-3	Moderate	Low					
		C	25-42	8.5	0.8-2.5	31-60	1-3	Low	Moderate	High	Moderate	>3 ft.[3]	Produces Runoff	37
		D	42-60	8.5	0.2-0.8		1-3	Moderate	Moderate					
		A	0-6	5.5-6.0	0.8-2.5		-	-	Low					
	449D2	B	6-31	5.5-6.0	0.8-2.5	31-60	1-3	Moderate	Low	High	Moderate	>3 ft.[3]	Produces Runoff	45
		C	31-48	8.5	0.8-2.5		1-3	Low	Moderate					
		D	48-60	8.5	0.2-0.8		1-3	Moderate	Moderate					
		A	Absent											
		B	0-25	5.5-6.0	0.8-2.5		1-3	Moderate	Low					
	449D3	C	25-42	8.5	0.8-2.5	31-60	1-3	Low	Moderate	High	Moderate	>3 ft.[3]	Produces Runoff	45
		D	42-60	8.5	0.2-0.8		1-3	Moderate	Moderate					
Grays silt loam, moderately fine substratum. Moderately dark upland soils which have moderately good internal drainage; silt loam A horizons which are moderately high in organic matter; blocky gritty silty clay loam B horizons; massive loam to sandy loam C horizons and massive silty clay loam D horizons.		A	0-10	5.5-6.0	0.8-2.5		-	-	Low					
	450B	B	10-30	5.5-6.0	0.8-2.5	31-60	1-3	Moderate	Low	High	Low	>3 ft.[3]	Produces Runoff	26
		C	30-44	8.5	0.8-2.5		1-3	Low	Moderate					
		D	44-60	8.5	0.2-0.8		1-3	Moderate	Moderate					
		A	0-9	5.5-6.0	0.8-2.5		-	-	Low					
	450C2	B	9-34	5.5-6.0	0.8-2.5	31-60	1-3	Moderate	Low	High	Moderate	>3 ft.[3]	Produces Runoff	33
		C	34-44	8.5	0.8-2.5		1-3	Low	Moderate					
		D	44-60	8.5	0.2-0.8		1-3	Moderate	Moderate					

TABLE 17 (CONTINUED)

<u>Odell loam.</u> Upland prairie soils which have somewhat poor internal drainage; loam A horizons which are high in organic matter; blocky silty clay loam B horizons and massive loam C horizons.	490A	A B C	0-13 13-33 33-60	6.0-6.5 6.0-6.5 8.5	0.8-2.5 0.8-2.5 0.2-0.8	31-60	- 1-3 2-3	- Moderate Low	Moderate Moderate High	Very high	Low	Seasonally 1 to 3 ft.	Produces Slow Runoff	22
	490B	A B C	0-13 13-32 32-60	6.0-6.5 6.0-6.5 8.5	0.8-2.5 0.8-2.5 0.2-0.8	31-60	- 1-3 2-3	- Moderate Low	Moderate Moderate High	Very high	Low	Seasonally 1 to 3 ft.	Produces Runoff	26
<u>Corwin loam.</u> Upland prairie soils which have moderately good internal drainage; loam A horizons which are high in organic matter; blocky gritty silty clay loam B horizons and massive loam C horizons.	495B	A B C	0-11 11-34 34-60	6.5-7.3 6.5-7.3 8.5	0.8-2.5 0.8-2.5 0.2-0.8	31-60	- 1-3 2-3	- Moderate Low	Low Low Moderate	High	Low	>3 ft.[3]	Produces Runoff	26
<u>Wauconda silt loam, moderately fine substratum.</u> Moderately dark upland soils which have somewhat poor internal drainage; silt loam A horizons which are moderately high in organic matter; blocky silty clay loam B horizons; massive silt loam to loam C horizons; massive silty clay loam D horizons.	502A	A B C D	0-13 13-36 36-55 55-60	5.5-6.0 5.5-6.0 8.5 8.5	0.8-2.5 0.8-2.5 0.8-2.5 0.2-0.8	31-60	- 1-3 2-3 1-3	- Moderate Low Moderate	Moderate Moderate High High	High	Low	Seasonally 1 to 3 ft.	Produces Slow Runoff	25
	502B	A B C D	0-13 13-36 36-55 55-60	5.5-6.0 5.5-6.0 8.5 8.5	0.8-2.5 0.8-2.5 0.8-2.5 0.2-0.8	31-60	- 1-3 1-3 1-3	- Moderate Low Moderate	Moderate Moderate High High	High Low	Low	Seasonally 1 to 3 ft.	Produces Runoff	29
<u>Markham silt loam.</u> Moderately dark upland soils which have moderately good internal drainage; silt loam A horizons which are moderately high in organic matter; blocky silty clay loam B horizons and massive silty clay loam C horizons.	531B 531B2	A B C	0-11 11-34 34-60	5.5-6.0 5.5-6.0 8.5	0.8-2.5 0.8-2.5 0.2-0.8	61-90	- 1-3 1-3	- Moderate Moderate	Low Low Moderate	High	Moderate	>3 ft.[3]	Produces Runoff	30
	531C 531C2	A B C	0-11 11-34 34-60	5.5-6.0 5.5-6.0 8.5	0.8-2.5 0.8-2.5 0.2-0.8	61-90	- 1-3 1-3	- Moderate Moderate	Low Low Moderate	High	Moderate	>3 ft.[3]	Produces Runoff	37
	531D 531D2	A B C	0-11 11-34 34-60	5.5-6.0 5.5-6.0 8.5	0.8-2.5 0.8-2.5 0.2-0.8	61-90	- 1-3 1-3	- Moderate Moderate	Low Low Moderate	High	High	>3 ft.[3]	Produces Runoff	45
	531E2	A B C	0-11 11-34 34-60	5.5-6.0 5.5-6.0 8.5	0.8-2.5 0.8-2.5 0.2-0.8	61-90	- 1-3 1-3	- Moderate Moderate	Low Low Moderate	High	High	>3 ft.[3]	Produces Runoff	56
<u>Pella silty clay loam, moderately fine substratum.</u> Low lying dark colored soils with poor internal drainage; silty clay loam A horizons which are high in organic matter; blocky silty clay loam B horizons; massive silt loam to sandy loam C horizons and massive silty clay loam to silty clay D horizons (silt loam deposition on some areas).	594A 594A+	A B C D	0-16 16-34 34-50 50-60	6.5-7.3 6.5-7.3 8.5 8.5	0.8-2.5 0.8-2.5 0.8-2.5 0.2-0.8	31-60	- ½-2 ½-2 ½-3	- Moderate Low Moderate	High High High High	Very high	Low	Seasonally[3] <1 ft.	Subject to Standing Water	22
	594B 594B+	A B C D	0-16 16-34 34-50 50-60	6.5-7.3 6.5-7.3 8.5 8.5	0.8-2.5 0.8-2.5 0.8-2.5 0.2-0.8	31-60	- ½-2 ½-2 ½-3	- Moderate Low Moderate	High High High High	Very high	Low	Seasonally[3] <1 ft.	Subject to Concentrated Runoff	26
<u>Tuscola silt loam.</u> Upland timber soils which have moderately good internal drainage; silt loam A horizons which are low in organic matter; blocky clay loam B horizons and massive stratified sandy loam to loam C horizons.	696B	A B C	0-10 10-33 33-60	6.0-6.5 6.0-6.5 8.5	0.8-2.5 0.8-2.5 0.8-2.5	31-60	- 1-3 1-3	- Moderate Low	Low Low Moderate	High	Low	>3 ft.[3]	Produces Runoff	30
	696C2	A B C	0-9 9-33 33-60	6.0-6.5 6.0-6.5 8.5	0.8-2.5 0.8-2.5 0.8-2.5	31-60	- 1-3 1-3	- Moderate Low	Low Low Moderate	High	Moderate	>3 ft.[3]	Produces Runoff	37
	696C3	A B C	Absent 0-24 24-60	6.0-6.5 8.5	0.8-2.5 0.8-2.5	31-60	1-3 1-3	Moderate Low	Low Moderate	High	Moderate	>3 ft.[3]	Produces Runoff	37
	696E	A B C	0-10 10-33 33-60	6.0-6.5 6.0-6.5 8.5	0.8-2.5 0.8-2.5 0.8-2.5	31-60	- 1-3 1-3	- Moderate Low	Low Low Moderate	High	High	>3 ft.[3]	Produces Runoff	56

See footnotes at end of table, page 114 .

TABLE 17 (CONTINUED)--BRIEF DESCRIPTION OF THE SOILS AND ESTIMATED PROPERTIES SIGNIFICANT TO ENGINEERING

BRIEF SOIL DESCRIPTION (a)	SYMBOL ON MAP (b)	SOIL HORIZON (c)	DEPTH FROM SURFACE (inches) (d)	pH (e)	HYDRAULIC CONDUCTIVITY (inches/hr.) (f)	PERCOLATION RATE (min./inch)2/ (g)	BEARING STRENGTH (tons/sq.ft.) (h)	SHRINK-SWELL RATIO (i)	CORROSION POTENTIAL (j)	SUSCEPTIBILITY TO FROST ACTION2/ (k)	SUSCEPTIBILITY TO EROSION2/ (l)	WATER TABLE DEPTH2/ (m)	FLOODING POTENTIAL2/ (n)	W VALUE2/ (o)
Wauconda silt loam. Moderately dark upland soils which have somewhat poor internal drainage; silt loam A horizons which are moderately high in organic matter; blocky gritty silty clay loam B horizons; and massive stratified sandy loam to silt loam C horizons.	697B	A	0-13	6.0-6.5	0.8-2.5		-	-	Low			Seasonally 1 to 3 ft.	Produces Runoff	
		B	12-34	6.0-6.5	0.8-2.5	31-60	1-3	Moderate	Low	Very high	Low			29
		C	35-60	8.5	0.8-2.5		1-3	Low	Moderate					
Grays silt loam. Moderately dark upland soils which have moderately good internal drainage; silt loam A horizons which are moderately high in organic matter; blocky clay loam B horizons and massive stratified sandy loam to loam C horizons.	698B	A	0-11	6.0-6.5	0.8-2.5		-	-	Low				Produces Runoff	
		B	11-33	6.0-6.5	0.8-2.5	31-60	1-3	Moderate	Low	High	Low	>3 ft.3/		26
		C	33-60	8.5	0.8-2.5		1-3	Low	Moderate					

1/ Column (a) gives a brief and general soil description.
Column (b) gives the soil mapping unit symbols as they appear on the soil map. They are given in numerical order.
Column (c) gives the major horizons of any particular soil. See glossary "Soil Horizons."
Column (d) gives average or most common depths of the various horizons. Depths are in inches from the soil surface.
Column (e) gives the estimated reaction or pH of the soil by horizons.
Column (f) gives the estimated hydraulic conductivity in inches per hour and is based on laboratory data obtained by the Uhland core method. Estimates are made by horizons.
Column (g) gives the estimated percolation rates in minutes per inch and is based on field data obtained by the method given in the "Manual of Septic Tank Practice" (19). Test data was made available by the Lake County Health Department. Estimates are made for the soil as a whole.
Column (h) gives estimated load-bearing capacity in tons per square foot when the soil is in its maximum moisture condition. Estimates are exclusive of the A horizon.
Column (i) gives the estimated degree of volume change which oven-dry soil goes through as the soil moisture content is increased. Estimates are exclusive of the A horizon.
Column (j) gives the estimated degree of metal pipe corrosion which the soil can cause on underground conduits. Estimates are made by horizons.
Column (k) gives the estimated degree of heave which can be caused by ice lenses forming in the soil and the subsequent loss of strength due to excess moisture during thawing. Estimates are for the soil as a whole.
Column (l) gives the estimated degree of erosion susceptibility the natural soil has when protective vegetation is removed. Estimates are for the soil as a whole.
Column (m) gives the estimated depth in feet to a free water surface normally occurring in the wet season (spring). Estimates are made for the soil as a whole.
Column (n) gives the estimated surface water flow characteristics which tend to occur during storms which are intense enough to cause surface water movement or collection. Estimates are made for soil areas as a whole. See discussion in the water management chapter.
Column (o) gives the ΣW values which are usable in calculating watershed runoff. Estimates are made for soil areas as a whole. See discussion in the water management chapter.

2/ Information given in these columns is for the soil as a whole and to a depth of five feet. All other columns give information for the various horizons and depths as given in columns (c) and (d), respectively.

3/ >means "greater than," <means "less than."

TABLE 18.--INTERPRETIVE RATINGS OF SOILS FOR ENGINEERING PURPOSES [1/]

SOIL NOMENCLATURE: SYMBOL ON MAP	SOIL NOMENCLATURE: SOIL HORIZON	SOIL NOMENCLATURE: DEPTH FROM SURFACE (inches)	In The Natural or Undisturbed Condition For: SEPTIC TANK DISPOSAL FIELD 3/	BUILDING FOUNDATION	TRAFFICABILITY 3/: Pedestrian	TRAFFICABILITY 3/: Vehicular	SURFACE STABILIZATION WITH ADDITIVES 3/	ROAD SUB-GRADE	WINTER GRADING 3/	As A Source of Material For: ROAD BASE	BACK FILL	SAND OR GRAVEL 3/	TOP SOIL 3/	COMPACTION CHARACTER	SURFACE WATER RESERVOIR: Embankments	SURFACE WATER RESERVOIR: Linings
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)
23A	A	0-10	5	4	3	4	3	4	4	N.S.	-	N.S.	5	-	4	4
	B	10-32		4				4		N.S.	4			3	3	1
	C	32-60		3				4		N.S.	4			3	3	1
23B 23B2	A	0-10	5	4	3	4	3	4	4	N.S.	-	N.S.	5	-	4	4
	B	10-32		4				4		N.S.	4			3	3	1
	C	32-60		3				4		N.S.	4			3	3	1
60D3	A	Absent														
	B	0-18	3	3	2	3	3	3	3	N.S.	4	N.S.	5	3	3	1
	C	18-60		2				3		N.S.	3			2	2	3
67A	A	0-15	3 When Adequately Drained	5	5	5	N.S.	5	5	N.S.	-	N.S.	2	-	4	5
	B	15-36		5				5		N.S.	5			2	4	1
	C	36-60		5				5		N.S.	4			1-2	2	3-4
67B	A	0-15	3 When Adequately Drained	5	5	5	N.S.	5	5	N.S.	-	N.S.	2	-	4	5
	B	15-36		5				5		N.S.	5			2	4	1
	C	36-60		5				5		N.S.	4			1-2	2	3-4
76	I	0-20	3 When Adequately Drained	N.S.	5	5	N.S.	5	5	N.S.	-	5	1	-	5	4-5
	II	20-40		N.S.				5		N.S.	5			5	5	4-5
	III	40-60		N.S.				5		N.S.	5			5	5	4-5
W76	I	0-20	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	-	5	1	-	5	4-5
	II	20-40		N.S.						N.S.	5			5	5	4-5
	III	40-60		N.S.						N.S.	5			5	5	4-5
91B	A	0-11	5	4	3	4	5	5	5	N.S.	-	N.S.	1	-	4	4
	B	11-29		5				5		N.S.	5			5	5	1
	C	29-60		4				5		N.S.	5			5	5	1
91C 91C2	A	0-11	5	4	3	4	5	5	5	N.S.	-	N.S.	1	-	4	4
	B	11-29		5				5		N.S.	5			5	5	1
	C	29-60		4				5		N.S.	5			5	5	1
91D2	A	0-11	5	4	3	4	5	5	5	N.S.	-	N.S.	1	-	4	4
	B	11-29		5				5		N.S.	5			5	5	1
	C	29-60		4				5		N.S.	5			5	5	1
91D3	A	Absent														
	B	0-18	5	5	3	4	5	5	5	N.S.	5	N.S.	5	5	5	1
	C	18-60		4				5		N.S.	5			5	5	1
103 103+	I	0-36	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	1	N.S.	N.S.	N.S.
	II	36-60		N.S.				N.S.		N.S.	N.S.			N.S.	N.S.	N.S.
W103 W103+ 103 103+	I	0-36	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	1	N.S.	N.S.	N.S.
	II	36-60		N.S.				N.S.		N.S.	N.S.			N.S.	N.S.	N.S.
107	I	0-12	3 When Adequately Drained	5	5	5	N.S.	5	5	N.S.	-	N.S.	1	-	4	5
	II	12-44		5				5		N.S.	4-5			4	4	5
	III	44-60		5				5		N.S.	4-5			4	4	5
W107	I	0-12	N.S.	5	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	-	N.S.	1	-	4	5
	II	12-44		5						N.S.	4-5			4	4	5
	III	44-60		5						N.S.	4-5			4	4	5
126	A	0-15	4 When Adequately Drained	5	5	5	N.S.	5	5	N.S.	-	N.S.	1	-	4	4
	B	15-34		5				5		N.S.	4			3	3	1
	C	34-60		5				5		N.S.	4			3	3	1
146A	A	0-12	4	5	3	4	5	5	4	N.S.	-	N.S.	1	-	4	4
	B	12-31		4				4		N.S.	4			3	3	1
	C	31-60		4				4		N.S.	4			3	3	1

See footnotes at end of table, page 120

TABLE 18 (CONTINUED)--INTERPRETIVE RATINGS OF SOILS FOR ENGINEERING PURPOSES[1/]

SOIL NOMENCLATURE			INTERPRETIVE RATINGS [2/] OF THE SOILS AND SOIL MATERIALS AS TO THE ADAPTABILITY FOR ENGINEERING USE													
			In The Natural or Undisturbed Condition For							As A Source of Material For						
SYMBOL ON MAP	SOIL HORIZON	DEPTH FROM SURFACE (inches)	SEPTIC TANK DISPOSAL FIELD[3/]	BUILDING FOUNDATION	TRAFFICABILITY [3/]		SURFACE STABILIZATION WITH ADDITIVES[3/]	ROAD SUB-GRADE	WINTER GRADING [3/]	ROAD BASE	BACK FILL	SAND OR GRAVEL[3/]	TOP SOIL[3/]	COMPACTION CHARACTER	SURFACE WATER RESERVOIR	
					Pedestrian	Vehicular									Embankments	Linings
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)
146B	A	0-12		5				5		N.S.	–			–	4	4
146B+	B	12-31	4	4	3	4	5	4	4	N.S.	4	N.S.	1	3	3	1
146B2	C	31-60		4				4		N.S.	4			3	3	1
153A	A	0-18	3 When	5				5		N.S.	–			–	4	5
153A+	B	18-36	Adequately	5	5	5	N.S.	5	5	N.S.	4	N.S.	1	3	3	1
	C	36-60	Drained	5				5		N.S.	2-3			3	Variable	Variable
	A	0-18	3 When	5				5		N.S.	–			–	4	5
153B	B	18-36	Adequately	5	5	5	N.S.	5	5	N.S.	4	N.S.	1	3	3	1
	C	36-60	Drained	5				5		N.S.	2-3			3	Variable	Variable
	A	0-13		5				5		N.S.	–			–	4	4
189A	B	13-34	4	4	3	4	5	4	4	N.S.	4	N.S.	1	3	3	1
	C	34-60		4				4		N.S.	4			3	3	1
	A	0-13		5				5		N.S.	–			–	4	4
189B	B	13-34	4	4	3	4	5	4	4	N.S.	4	N.S.	1	3	3	1
	C	34-60		4				4		N.S.	4			3	3	1
	A	0-10		3				4		N.S.	–			–	3	4
192B	B	10-38	4	3	2	3	3	4	3	N.S.	4	N.S.	5	3	3	1
	C	38-60		3				4		N.S.	4			3	3	1
192C	A	0-10		3				4		N.S.	–			–	3	4
192C2	B	10-38	4	3	2	3	3	4	3	N.S.	4	N.S.	5	3	3	1
	C	38-60		3				4		N.S.	4			3	3	1
194B	A	0-10		3				4		N.S.	–			–	3	4
194B2	B	10-30	4	3	2	3	4	4	3	N.S.	4	N.S.	5	3	3	1
	C	30-60		3				4		N.S.	4			3	3	1
194C	A	0-10		3				4		N.S.	–			–	3	4
194C2	B	10-30	4	3	2	3	4	4	3	N.S.	4	N.S.	5	3	3	1
	C	30-60		3				4		N.S.	4			3	3	1
	A	Absent														
194C3	B	0-19	5	3	2	3	4	4	3	N.S.	4	N.S.	5	3	3	1
	C	19-60		3				4		N.S.	4			3	3	1
194D	A	0-9		3				4		N.S.	–			–	3	4
194D2	B	9-28	4	3	2	3	4	4	3	N.S.	4	N.S.	5	3	3	1
	C	28-60		3				4		N.S.	4			3	3	1
	A	Absent														
194D3	B	0-19	5	3	2	3	4	4	3	N.S.	4	N.S.	5	3	3	1
	C	19-60		3				4		N.S.	4			3	3	1
194E	A	0-9		3				4		N.S.	–			–	3	4
194E2	B	9-28	4	3	2	3	4	4	3	N.S.	4	N.S.	5	3	3	1
	C	28-60		3				4		N.S.	4			3	3	1
	A	Absent														
194E3	B	0-18	5	3	2	3	4	4	3	N.S.	4	N.S.	5	3	3	1
	C	18-60		3				4		N.S.	4			3	3	1
194F	A	0-8		3				4		N.S.	–			–	3	4
194F2	B	8-27	4	3	2	3	4	4	3	N.S.	4	N.S.	5	3	3	1
	C	27-60		3				4		N.S.	4			3	3	1
223B	A	0-10		4				5		N.S.	–			–	4	4
223B2	B	10-30	4	3	2	3	4	4	3	N.S.	4	N.S.	1	3	3	1
	C	30-60		3				4		N.S.	4			3	3	1
223C	A	0-10		4				5		N.S.	–			–	4	4
223C2	B	10-30	4	3	2	3	4	4	3	N.S.	4	N.S.	1	3	3	1
	C	30-60		3				4		N.S.	4			3	3	1
	A	Absent														
223C3	B	0-20	5	3	2	3	4	3	3	N.S.	4	N.S.	5	3	3	1
	C	20-60		3				3		N.S.	4			3	3	1
	A	0-6		4				5		N.S.	–			–	4	4
223D2	B	6-26	4	3	2	3	4	3	3	N.S.	4	N.S.	1	3	3	1
	C	26-60		3				3		N.S.	4			3	3	1

TABLE 18--CONTINUED

223D3	A	Absent	5		2	3	4		3			N.S.	5			
	B	0-20		3				3		N.S.	4			3	3	1
	C	20-60		3				3		N.S.	4			3	3	1
223E2	A	0-6	4	4	2	3	4	5	3	N.S.	-	N.S.	1	-	4	4
	B	6-26		3				3		N.S.	4			3	3	1
	C	26-60		3				3		N.S.	4			3	3	1
223E3	A	Absent	5		2	3	4		3			N.S.	5			
	B	0-20		3				3		N.S.	4			3	3	1
	C	20-60		3				3		N.S.	4			3	3	1
232A 232A+	A	0-15	4 When Adequately Drained	5	5	5	N.S.	5	5	N.S.	-	N.S.	1	-	4	4
	B	15-35		5				5		N.S.	4			4	4	1
	C	35-60		5				5		N.S.	4			4	4	1
232B 232B+	A	0-15	4 When Adequately Drained	5	5	5	N.S.	5	5	N.S.	-	N.S.	1	-	4	4
	B	15-35		5				5		N.S.	4			4	4	1
	C	35-60		5				5		N.S.	4			4	4	1
241D2	A	0-5	5	3	2	3	4	-	2	N.S.	-	N.S.	5	-	4	4
	C	5-60		3-4				5		N.S.	4			4	4	1
241F2 241G2	A	0-5	5	3	2	3	4	-	2	N.S.	-	N.S.	5	-	4	4
	C	5-60		3-4				5		N.S.	4			4	4	1
293A	A	0-14	3	5	2	3	4	5	4	N.S.	-	N.S.	1	-	4	4
	B	14-32		4				4		N.S.	4			3	3	1
	C	32-46		3				4		N.S.	3			2-3	Variable	Variable
	D	46-60		3				4		N.S.	4			3	3	1
293B	A	0-14	3	5	2	3	4	5	4	N.S.	-	N.S.	1	-	4	4
	B	14-32		4				4		N.S.	4			3	3	1
	C	32-46		3				4		N.S.	3			2-3	Variable	Variable
	D	46-60		3				4		N.S.	4			3	3	1
294B	A	0-11	3	5	1	3	4	5	N.S.	N.S.	-	N.S.	1	-	4	4
	B	11-30		4				4		N.S.	4			3	3	1
	C	30-44		3				4		N.S.	3			2-3	Variable	Variable
	D	44-60		3				4		N.S.	4			3	3	1
294C	A	0-11	3	5	1	3	4	5	3	N.S.	-	N.S.	1	-	4	4
	B	11-30		4				4		N.S.	4			3	3	1
	C	30-44		3				4		N.S.	3			2-3	Variable	Variable
	D	44-60		3				4		N.S.	4			3	3	1
295B	A	0-12	4	5	2	3	4	5	4	N.S.	-	N.S.	1	-	4	4
	B	12-32		4				4		N.S.	4			3	3	1
	C	32-36		3				4		N.S.	3			2-3	Variable	Variable
	D	36-60		4				5		N.S.	5			4	5	1
298B	A	0-11	4	5	2	3	4	5	4	N.S.	-	N.S.	2	-	4	4
	B	11-31		4				4		N.S.	4			3	3	1
	C	31-60		3				4		N.S.	4			3	3	1
298C 298C2	A	0-11	4	5	2	3	4	5	4	N.S.	-	N.S.	2	-	4	4
	B	11-31		4				4		N.S.	4			3	3	1
	C	31-60		3				4		N.S.	4			3	3	1
312+	I	0-20	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	2	N.S.	N.S.	N.S.
	II	20-34		N.S.				N.S.		N.S.	N.S.			N.S.	N.S.	N.S.
	III	34-60		N.S.				N.S.		N.S.	N.S.			N.S.	N.S.	N.S.
312 ⩊	I	0-20	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	2	N.S.	N.S.	N.S.
	II	20-34		N.S.				N.S.		N.S.	N.S.			N.S.	N.S.	N.S.
	III	34-60		N.S.				N.S.		N.S.	N.S.			N.S.	N.S.	N.S.
320B	A	0-12	5	4	3	4	5	5	5	N.S.	-	N.S.	2	-	4	4
	B	12-26		4				5		N.S.	5			5	5	1
	C	26-60		3-4				5		N.S.	5			5	5	1

See footnotes at end of table, page 120

TABLE 18 (CONTINUED)--INTERPRETIVE RATINGS OF SOILS FOR ENGINEERING PURPOSES[1]

SOIL NOMENCLATURE			INTERPRETIVE RATINGS [2] OF THE SOILS AND SOIL MATERIALS AS TO THE ADAPTABILITY FOR ENGINEERING USE														
			In The Natural or Undisturbed Condition For							As A Source of Material For						
SYMBOL ON MAP	SOIL HORIZON	DEPTH FROM SURFACE (inches)	SEPTIC TANK DISPOSAL FIELD[3]	BUILDING FOUNDATION	TRAFFICABILITY [3]		SURFACE STABILIZATION WITH ADDITIVES[3]	ROAD SUB-GRADE	WINTER GRADING [3]	ROAD BASE	BACK FILL	SAND OR GRAVEL[3]	TOP SOIL[3]	COMPACTION CHARACTER	SURFACE WATER RESERVOIR	
					Pedestrian	Vehicular									Embankments	Linings
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)
330 330+	A B C	0-16 16-40 40-60	5	5 5 4	5	5	N.S.	5 5 5	5	N.S. N.S. N.S.	– 4 3-4	N.S.	1	– 3 3	4 3 3	4 1 1-2
W330 W330+ 330 [illegible]	A B C	0-16 16-40 40-60	5	N.S.	5	N.S.	N.S.	N.S.	N.S.	N.S. N.S. N.S.	– 4 3-4	N.S.	1	– 3 3	4 3 3	4 1 1-2
341B	A B C	0-13 13-38 38-60	4	4 3 3	2	3	5	5 4 4	3	N.S. N.S. N.S.	– 4 4	N.S.	1	– 3 3	4 3 3	4 1 1
347A	A B C	0-15 15-32 32-60	3 When Adequately Drained	5 5 5	5	5	N.S.	5 5 5	5	N.S. N.S. N.S.	– 3 2-3	N.S.	2	– 3 3	4 3 Variable	5 1 Variable
347B	A B C	0-15 15-32 32-60	3 When Adequately Drained	5 5 5	5	5	N.S.	5 5 5	5	N.S. N.S. N.S.	– 4 2-3	N.S.	2	– 3 3	4 3 Variable	5 1 Variable
357B	A B C D	0-13 13-31 31-40 40-60	4	5 4 4 4	2	4	4	5 4 4 5	4	N.S. N.S. N.S. N.S.	– 4 2-3 5	N.S.	2	– 3 4 4	4 3 5 5	4 1 1 1
357C	A B C D	0-13 13-31 31-40 40-60	4	5 4 4 4	2	4	4	5 4 4 4	4	N.S. N.S. N.S. N.S.	– 4 2-3 5	N.S.	2	– 3 3 4	4 3 Variable 5	4 1 Variable 1
442A	A B C	0-12 12-35 35-60	3	5 4 4	2	3-4	4	5 4 3	4	N.S. N.S. 5	– 4 2-3	4-5	1	– 3 2-3	4 3 Variable	4 1-2 4-5
442B	A B C	0-12 12-35 35-60	3	5 4 4	2	3-4	4	5 4 3	4	N.S. N.S. 5	– 4 2-3	4-5	1	– 3 2-3	4 3 Variable	4 1-2 4-5
443B	A B C	0-11 11-37 37-60	3	4 3 3	1	2-3	4	5 3 3	3	N.S. N.S. 5	– 4 2-3	4-5	1	– 3 2-3	4 3 Variable	4 1-2 4-5
443C2	A B C	0-10 10-34 34-60	3	4 3 3	1	2-3	4	5 3 3	3	N.S. N.S. 5	– 4 2-3	4-5	1	– 3 2-3	4 3 Variable	4 1-2 4-5
448B	A B C D	0-13 13-38 38-44 44-60	4	4 3 3 4	2	3	4	5 4 3 5	3	N.S. N.S. N.S. N.S.	– 4 2-3 5	N.S.	1	– 3 2-3 4	4 3 Variable 5	4 1 Variable 1
448C2	A B C D	0-13 11-38 38-44 44-60	4	4 3 3 4	2	3	4	5 4 3 5	3	N.S. N.S. N.S. N.S.	– 4 2-3 5	N.S.	1	– 3 2-3 4	4 3 Variable 5	4 1 Variable 1
449B	A B C D	0-11 11-36 36-53 53-60	3	3 3 3 3	1	3	3	3 4 3 4	3	N.S. N.S. N.S. N.S.	– 4 2-3 4	N.S.	5	– 3 2-3 3	4 3 Variable 3	4 1 Variable 1
449C2	A B C D	0-11 11-36 36-53 53-60	3	3 3 3 3	1	3	3	3 4 3 4	3	N.S. N.S. N.S. N.S.	– 4 2-3 4	N.S.	5	– 3 2-3 3	4 3 Variable 3	4 1 Variable 1
449C3	A B C D	Absent 0-25 25-42 42-60	3	3 3 3	2	3	3	4 3 4	3	N.S. N.S. N.S.	4 2-3 4	N.S.	5	3 2-3 3	3 Variable 3	1 Variable 1
449D2	A B C D	0-6 6-31 31-48 48-60	3	3 3 3 3	1	3	3	3 4 3 4	3	N.S. N.S. N.S. N.S.	– 4 2-3 4	N.S.	5	– 3 2-3 3	4 3 Variable 3	4 1 Variable 1

TABLE 18--CONTINUED

449D3	A B C D	Absent 0-25 25-42 42-60	3	 3 3 3	2	3	3	 4 3 4	3	 N.S. N.S. N.S.	 4 2-3 4	N.S.	5	 3 2-3 3	 3 Variable 3	 1 Variable 1
450B	A B C D	0-10 10-30 30-44 44-60	3	4 3 3 3	1	3	4	5 4 3 4	3	N.S. N.S. N.S. N.S.	- 4 2-3 4	N.S.	2	- 3 2-3 3	4 3 Variable 3	4 1 Variable 1
450C2	A B C D	0-9 9-34 34-44 44-60	3	4 3 3 3	1	3	4	5 4 3 4	3	N.S. N.S. N.S. N.S.	- 4 2-3 4	N.S.	2	- 3 2-3 3	4 3 Variable 3	4 1 Variable 1
490A	A B C	0-13 13-33 33-60	3	4 4 3	2	3	4	5 4 3	4	N.S. N.S. N.S.	- 4 3	N.S.	1	- 3 2	4 3 2	4 1 3
490B	A B C	0-13 13-33 33-60	3	4 4 3	2	3	4	5 4 3	4	N.S. N.S. N.S.	- 4 3	N.S.	1	- 3 2	4 3 2	4 1 3
495B	A B C	0-11 11-34 34-60	3	4 3 2	1	2	4	5 3 3	3	N.S. N.S. N.S.	- 4 3	N.S.	1	- 3 2	4 3 2	4 1 3
502A	A B C D	0-13 13-36 36-55 55-60	3	4 4 3 4	2	4	5	5 4 3 4	4	N.S. N.S. N.S. N.S.	- 4 2-3 4	N.S.	2	- 3 2-3 3	4 3 Variable 3	4 1 Variable 1
502B	A B C D	0-13 13-36 36-55 55-60	3	4 4 3 4	2	3	5	5 4 3 4	4	N.S. N.S. N.S. N.S.	- 4 2-3 4	N.S.	2	- 3 2-3 3	4 3 Variable 3	4 1 Variable 1
531B 531B2	A B C	0-11 11-34 34-60	4	4 3 3	2	3	5	5 4 4	3	N.S. N.S. N.S.	- 4 4	N.S.	2	- 3 3	4 3 3	4 1 1
531C 531C2	A B C	0-11 11-34 34-60	4	4 3 3	2	3	5	5 4 4	3	N.S. N.S. N.S.	- 4 4	N.S.	2	- 3 3	4 3 3	4 1 1
531D 531D2	A B C	0-11 11-34 34-60	4	4 3 3	2	3	5	5 4 4	3	N.S. N.S. N.S.	- 4 4	N.S.	2	- 3 3	4 3 3	4 1 1
531E2	A B C	0-11 11-34 34-60	4	4 3 3	2	3	5	5 4 4	3	N.S. N.S. N.S.	- 4 4	N.S.	2	- 3 3	4 3 3	4 1 1
594A+	A B C D	0-16 16-34 34-50 50-60	4 When Adequately Drained	5 5 5 5	5	5	N.S.	5 5 5 5	5	N.S. N.S. N.S. N.S.	- 4 2-3 4-5	N.S.	1	- 3 3-4 4	4 4 Variable 3	4 1 Variable 1
594B 594B+	A B C D	0-16 16-34 34-50 50-60	4 When Adequately Drained	5 5 5 5	5	5	N.S.	5 5 5 5	5	N.S. N.S. N.S. N.S.	- 4 2-3 4-5	N.S.	1	- 3 3-4 4	4 4 Variable 3	4 1 Variable 1
696B	A B C	0-10 10-33 33-60	3	3 3 3	1	2	3	3 3 1-3	3	N.S. N.S. 3-4	- 4 2-3	3	5	- 3 1-3	4 3 Variable	4 1-2 4-5
696C2	A B C	0-9 9-33 33-60	3	3 3 3	1	2	3	3 3 1-3	3	N.S. N.S. 3-4	- 4 2-3	3	5	- 3 1-3	4 3 Variable	4 1-2 4-5
696C3	A B C	Absent 0-24 24-60	3	 3 3	2	3	3	 3 1-3	3	 N.S. 3-4	 4 2-3	3	5	 3 1-3	 3 Variable	 1-2 4-5

See footnotes at end of table, page 120

TABLE 18 (CONTINUED)--INTERPRETIVE RATINGS OF SOILS FOR ENGINEERING PURPOSES 1/

SOIL NOMENCLATURE			INTERPRETIVE RATINGS 2/ OF THE SOILS AND SOIL MATERIALS AS TO THE ADAPTABILITY FOR ENGINEERING USE													
			In The Natural or Undisturbed Condition For							As A Source of Material For						
SYMBOL ON MAP	SOIL HORIZON	DEPTH FROM SURFACE (inches)	SEPTIC TANK DISPOSAL FIELD 3/	BUILDING FOUNDATION	TRAFFICABILITY 3/ Pedestrian	TRAFFICABILITY 3/ Vehicular	SURFACE STABILIZATION WITH ADDITIVES 3/	ROAD SUB-GRADE	WINTER GRADING 3/	ROAD BASE	BACK FILL	SAND OR GRAVEL 3/	TOP SOIL 3/	COMPACTION CHARACTER	SURFACE WATER RESERVOIR Embankments	SURFACE WATER RESERVOIR Linings
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)
	A	0-10		3				3		N.S.	-			-	4	4
696E	B	10-33	3	3	1	2	3	3	3	N.S.	4	3	5	3	3	1-2
	C	33-60		3				1-3		3-4	2-3			1-3	Variable	4-5
	A	0-13		5				5		N.S.	-			-	4	4
697B	B	12-35	3	4	2	3-4	4	4	4	N.S.	4	3	2	3	3	1-2
	C	35-60		3				3		3-4	2-3			1-3	Variable	4-5
	A	0-11		4				5		N.S	-			-	4	4
698B	B	11-33	3	3	1	2-3	3	3	3	N.S.	4	3	2	3	3	1-2
	C	33-60		3				2-3		3-4	2-3			1-3	Variable	4-5

1/ Column (a) gives the soil mapping unit symbols as they appear on the soil map. They are given in numerical order.
Column (b) gives the major horizons of any particular soil. See glossary "Soil Horizons."
Column (c) gives average or most common depths of the various horizons. Depths given are in inches from the soil surface.
Column (d) rates the soils as to their suitability for septic tank affluent absorption fields. Ratings are based on soil character, water table character, field behavior and percolation test data. Soils are rated as a whole.
Column (e) rates the soils to a depth of 5 feet as to their desirability for foundations for buildings of less than three stories in height or having maximum loads of about 2 tons per square foot. Ratings are made by horizons.
Column (f) rates the soils as to their desirability for year-round cross-country or off-road pedestrian movement over the natural soil surface. Ratings are made for the soil as a whole.
Column (g) rates the soils as to their desirability for year-round cross-country or off-road vehicular movement (auto, golf cart, etc.) over the natural soil surface. Ratings are for the soil as a whole.
Column (h) rates the soils as to the relative degree of stability achieved when treated with chemical additives as used for low-cost road construction or under foundation slabs. Ratings are for the soil as a whole.
Column (i) rates the soil as to the desirability for use as road subgrades or the surface of the earth upon which the surface course or base course is placed. Ratings are made by horizons.
Column (j) rates the soil as to the ease with which it can be handled or traversed by ordinary construction equipment during the winter months. Ratings are for the soil as a whole.
Column (k) rates the soil materials as to their suitability for road base or for the bottom course of a two or more course pavement that is placed directly on the subgrade. Ratings are for each horizon.
Column (l) rates the soil materials as to their desirability for use in back filling foundations or trenches. Ratings are exclusive of the A horizon.
Column (m) rates the soil materials as to being a possible source of sand and/or gravel within a depth of five feet. Ratings are for the soil as a whole.
Column (n) rates the soil as to being a source of good topsoil for use in top dressing lawns, road cuts, etc. in order to establish or promote vegetation. Ratings consider A horizon only.
Column (o) rates the soil materials with respect to the ease with which proper compaction can be attained, assuming that suitable compaction equipment is used and that proper moisture conditions are exercised.
Column (p) rates the soil materials as to the suitability for use in constructing low berms or embankments of less than 6 feet to impound surface water. Ratings are for all horizons.
Column (q) rates the soil material as to its suitability for compacted earth linings to prevent seepage from reservoir areas. Ratings are for all soil horizons.

2/ Ratings 1 through 5 are given to indicate the relative suitability or desirability of the soil or soil material for the various uses given. Rating 1 is used when the soil is considered most suitable; higher numbers indicate a suitability decreasing with the magnitude of the numbers, whereby rating 5 is considered least suitable. N.S. means not suited. All ratings are approximate and numerical comparisons apply only within a single vertical column.

3/ Ratings given in these columns are for the soil as a whole and to a depth of five feet. All other columns give ratings for the various soil horizons and depths as given in column (c) and (d), respectively.

CHAPTER XI

URBAN AND RURAL LAND USE INTERPRETATIONS

Ela Township lies within an area where rural and urban land uses are well intermixed and tend to compete with one another for land. Agricultural land area is being reduced as transportational, industrial, recreational and especially residential facilities are developed. This change has been taking place especially since World War II and indications are that it will continue for many years to come.

As different land areas are put to any of these uses, there are different kinds and degrees of problems encountered which are related to soil and water.

The purpose of this section is to evaluate those soil properties and related water management characteristics which can influence the suitability of the different soil areas for various uses. The information can serve as useful guides to land use planners and others who are concerned about the possible limitations to use. The material can be used as a guide to determine the general soil landscape limitations that need to be recognized or dealt with as a land area may be considered for a particular use. This report is not intended to eliminate the need for on-site study and testing of soils.

Large scale soil manipulation, such as extensive cut and fill operations, will in most cases, alter a soil area so that the information will no longer apply.

Use Suitability Ratings

To facilitate the use of the soil map, Table 19 gives soil interpretations for each soil mapping unit in terms of use suitability ratings for each of the potential land uses. Use suitability ratings are made from A (most favorable) through E (unfavorable) to designate the degree of limitation for use. The ratings are defined as follows:

A = (most favorable). The soil presents no serious limitation to the use in question.

B = (very favorable). The soil presents some limitation to use. The limitation is not serious and is easy to overcome.

C = (favorable). The soil presents moderate limitations. The limitations need to be recognized but can be overcome or corrected.

D = (somewhat unfavorable). The soil presents serious problems and has severe limitations to use which need to be recognized. Use tends to be questionable as the limitations are hard to overcome.

E = (unfavorable). The soil presents such severe limitations to use that extreme measures are needed to overcome the problem. Usage tends to be undesirable or unsound.

In making the ratings, all soil and water management characteristics which were considered to have influence or limitation on the various uses were evaluated. As the soil properties were evaluated, it was found that there were one or more of the properties that would be most limiting. For a soil mapping unit to rate "A" for a particular use, it is considered to have no limiting factor. Following each rating (except soils having an A rating), is a letter or letters in parenthesis which designate the kinds of limitation that reduce the suitability. The kind of limitations which influence the ratings are defined as follows:

b = (bearing strength). The load bearing capacity of the soil in a wet state and to a depth of five feet is such that normal foundations1/ for structures of less than three stories may prove unsatisfactory.

e = (erosion hazard). The soil landscape is such that it is normally susceptible to excessive erosion when in clean tilled crops.

f = (frost action susceptibility). The soil is such that there is detrimental loss of soil strength as a result of freezing and thawing.

m = (materials for road subgrade). The in-place soil materials to a depth of five feet are such that they are not highly desirable for use as road subgrade.

p = (percolation rate). The percolation rate of the undisturbed soil is such that it is limiting to the function of septic tank sewage disposal systems.

s = (soil productivity). The soil is limited in its ability to provide good growth rates for vegetative plants.

t = (topography). The topography of the soil landscape is considered limiting for the various possible uses.

v = (vehicular traffic). The soil is limiting to year-round cross-country or off-road vehicular movements.

w = (wetness hazard). The year-round or seasonal, internal and/or surface water characteristics are such that water management problems exist.

The general types of land use which are given consideration and which are rated according to the foregoing system are defined as follows:

Agricultural: This use category considers the use of land primarily with respect to the commercial production of general or specialized crops. Permanent pasture, woodland or homestead uses are not considered. Ratings were made with regard to those soil landscape features which can be most limiting to an intensive system of cropping such as cash grain or truck farming. Evaluation has shown that the major hazards of erosion or wetness or a combination of both are most limiting to use. Other hazards or problems may or may not exist but, if so, they exist to a lesser degree than either erosion or wetness in every case.

1/ A normal foundation is considered to be that which will have maximum load distribution of about 2 tons per square foot.

Residential--Open Type: This use takes into account those residential developments having homes of less than three stories on tracts of greater than one acre in size and requiring the use of septic tank sewage disposal systems. Ratings were based on those soil landscape properties which can cause limitations for this type of development. It was found that either bearing strength, percolation rate, topography, wetness or any combination of these factors are most limiting in all cases. Any other factors, as they exist, will be found to be less limiting than either one or more of the four.

Residential--Subdivision Type With Septic Tank: Consideration for this category includes those residential developments having homes, apartments, neighborhood shopping centers and other community type buildings of less than three stories on small lots of less than one acre in size and requiring the use of septic tank sewage disposal systems. Evaluation has shown that either bearing strength, percolation rate, topography, wetness or any combination of these are the greatest limiting factors. As other factors may exist, they were found to be of a lesser degree of limitation than those four.

Residential--Subdivision Type Without Septic Tank: This use category includes residential developments having a lot size of less than one acre and having sanitary sewage disposal systems planned or accessible. Homes and other community type buildings of less than three stories are considered. Ratings were made with respect to all soil landscape properties that can be limiting to the suitability for this use. Bearing strength, topography, wetness or any combination of these were found to be the most limiting; therefore, as other factors were considered, they were found to have a lesser degree of limitation.

Industrial: This use category includes industrial developments having structures or equivalent foundation load bearing requirements of less than three stories. Consideration is made with respect to those types of industrial facilities that normally need or prefer level site conditions. The major limitations of bearing strength, wetness, topography or any combination of these were found to be most limiting in making the ratings. All other factors of the soil landscape were found to have a lesser degree of limitation.

Transportational: This use category refers to roads, highways, railroads, airports and associated terminals. Ratings are made on the basis of those soil landscape properties that may be most limiting or hazardous to the development of transportation facilities in general. The properties or hazards found to be most limiting are topography, wetness, susceptibility to frost action and suitability of the in-place soil materials for road subgrade. Other properties were found to have a lesser degree of limitation in arriving at the various ratings.

Recreational--Natural: This use classification includes those types of outdoor recreational areas which require little human traffic and no cross-country vehicular traffic such as wildlife refuges, hunting areas, preserves of certain natural or introduced vegetations, etc. Ratings, as made, were found to be controlled by either wetness or soil productivity or both, as they are limiting to establishing or maintaining a variety of plant species or in providing for a good density of stand with a good rate of growth.

Recreational--Developed: This category of land use includes those types of outdoor recreational areas which are developed. They are considered as requiring seasonal or year-round human traffic and cross-country or off-road vehicular traffic. Golf courses, picnic sites, camp sites, etc. are examples. In making the ratings, it was found that either wetness, topography or limitation to vehicular traffic or any combination of these was most limiting in all cases. As other factors were considered, they were found to be less limiting.

TABLE 19 --USE SUITABILITY RATINGS OF SOIL MAPPING UNITS[1]

SYMBOL ON MAP	Potential Use: AGRICULTURAL[2]	RESIDENTIAL: OPEN TYPE	RESIDENTIAL: Subdivision Type: WITH SEPTIC TANK[4]	RESIDENTIAL: Subdivision Type: WITHOUT SEPTIC TANK[5]	INDUSTRIAL[6]	TRANSPORTATIONAL[7]	Recreational: NATURAL[8]	Recreational: DEVELOPED[9]
23A	B(w-e)	E(p)	E(p)	C(b)	C(b)	C(m)	A	C(v)
23B	B(w-e)	E(p)	E(p)	C(b)	C(b)	C(m)	A	C(v)
23B2	B(w-e)	E(p)	E(p)	C(b)	C(b)	C(m)	A	C(v)
60D3	D(e)	B(p-t-b)	C(t)	C(t)	C(t)	C(t)	A	C(v-t)
67A	B(w)	D(w)	D(w)	D(w)	C(w-b)	C(w-m)	A	D(v)
67B	B(w)	D(w)	D(w)	D(w)	C(w-b)	C(w-m)	A	D(v)
76	B(w)	E(b)	E(b)	E(b)	E(b)	D(w)	A	D(v)
W76	E(w)	E(w-b)	E(w-b)	E(w-b)	E(b)	D(w)	B(w)	D(v)
91B	B(w)	E(p)	E(p)	D(b)	D(b)	D(m)	A	C(v)
91C	C(e)	E(p)	E(p)	D(b)	D(b)	D(m)	A	C(v)
91C2	C(e)	E(p)	E(p)	D(b)	D(b)	D(m)	A	C(v)
91D2	D(e)	E(p)	E(p)	D(b)	D(b)	D(m)	A	C(v-t)
91D3	E(e)	E(p)	E(p)	D(b)	D(b)	D(m)	B(s)	D(v)
103	C(w)	E(w-b)	E(w-b)	E(w-b)	E(b)	E(w-m-f)	A	E(v)
103+	C(w)	E(w-b)	E(w-b)	E(w-b)	E(b)	E(w-m-f)	A	E(v)
W103	E(w)	E(w-b)	E(w-b)	E(w-b)	E(w-b)	E(w-m-f)	B(w)	E(v)
W103+	E(w)	E(w-b)	E(w-b)	E(w-b)	E(w-b)	E(w-m-f)	B(w)	E(v)
103 [marsh symbol]	E(w)	E(w-b)	E(w-b)	E(w-b)	E(w-b)	E(w-m-f)	C(w)	E(w-v)
103+ [marsh symbol]	E(w)	E(w-b)	E(w-b)	E(w-b)	E(w-b)	E(w-m-f)	C(w)	E(w-v)
107	B(w)	E(b)	E(b)	E(b)	E(b)	D(w)	A	D(v)
W107	E(w)	E(w-b)	E(w-b)	E(w-b)	E(b)	D(w)	B(w)	D(v)
126	A	D(w)	D(w)	D(w)	C(w-b)	C(w-m)	A	D(v)
146A	A	C(p-t-b)	C(p-b)	C(b)	C(b)	C(m)	A	C(v)
146B	B(e)	C(p-b)	C(p-b)	C(b)	C(b)	C(m)	A	C(v)
146B+	B(e)	C(p-b)	C(p-b)	C(b)	C(b)	C(m)	A	C(v)
146B2	B(e)	C(p-b)	C(p-b)	C(b)	C(b)	C(m)	A	C(v)
153A	A	D(w)	D(w)	D(w)	C(w-b)	C(w-m)	A	D(v)
153A+	B(w)	D(w)	D(w)	D(w)	C(w-b)	C(w-m)	A	D(v)
153+	B(w)	D(w)	D(w)	D(w)	C(w-b)	C(w-m)	A	D(v)
189A	A	C(p-t-b)	C(p-b)	C(b)	C(b)	C(m)	A	C(v)
189B	B(e)	C(p-b)	C(p-b)	C(b)	C(b)	C(m)	A	C(v)
192B	B(e)	C(p-b)	C(p-b)	C(b)	C(b)	C(m)	A	B(v)
192C	C(e)	C(p-b)	C(p-b-t)	C(t-b)	C(t-b)	C(m)	A	B(v-t)
192C2	C(e)	C(p-b)	C(p-b-t)	C(t-b)	C(t-b)	C(m)	A	B(v-t)
194B	B(e)	C(p-b)	C(p-b)	C(b)	C(b)	C(m)	A	B(v)
194B2	B(e)	C(p-b)	C(p-b)	C(b)	C(b)	C(m)	A	B(v)

SYMBOL ON MAP	Potential Use: AGRICULTURAL[2]	RESIDENTIAL: OPEN TYPE	RESIDENTIAL: Subdivision Type: WITH SEPTIC TANK[4]	RESIDENTIAL: Subdivision Type: WITHOUT SEPTIC TANK[5]	INDUSTRIAL[6]	TRANSPORTATIONAL[7]	Recreational: NATURAL[9]	Recreational: DEVELOPED[9]
194C	C(e)	C(p-b)	C(p-t-b)	C(t-b)	C(t-b)	C(m)	A	B(t-v)
194C2	C(e)	C(p-b)	C(p-t-b)	C(t-b)	C(t-b)	C(m)	A	B(t-v)
194C3	D(e)	E(p)	E(p)	C(t-b)	C(t-b)	C(m)	A	C(v)
194D	C(e)	C(p-b)	C(p-t-b)	C(t-b)	C(t-b)	C(t-m)	A	C(t)
194D2	C(e)	C(p-b)	C(p-t-b)	C(t-b)	C(t-b)	C(t-m)	A	C(t)
194D3	D(e)	E(p)	E(p)	C(t-b)	C(t-b)	C(t-m)	A	C(t-v)
194E	D(e)	C(p-b-t)	D(t)	D(t)	D(t)	C(t-m)	A	D(t)
194E2	D(e)	C(p-b-t)	D(t)	D(t)	D(t)	C(t-m)	A	D(t)
194E3	E(e)	E(p)	E(p)	D(t)	D(t)	C(t-m)	A	D(t)
194F	E(e)	D(t)	E(t)	E(t)	E(t)	E(t)	A	E(t)
194F2	E(e)	D(t)	E(t)	E(t)	E(t)	E(t)	A	E(t)
223B	B(e)	C(p-b)	C(p-b)	C(b)	C(b)	C(m)	A	B(v)
223B2	B(e)	C(p-b)	C(p-b)	C(b)	C(b)	C(m)	A	B(v)
223C	B(e)	C(p-b)	C(p-b)	C(b)	C(b)	C(m)	A	B(t-v)
223C2	C(e)	C(p-b)	C(p-b-t)	C(b-t)	C(t-b)	C(m)	A	B(t-v)
223C3	C(e)	E(p)	E(p)	C(b-t)	C(t-b)	C(m)	A	C(v)
223D2	C(e)	C(p-b)	C(p-b-t)	E(b-t)	C(t-b)	C(m)	A	C(t)
223D3	D(e)	E(p)	E(p)	C(b-t)	C(t-b)	C(m)	A	C(t-v)
223E2	D(e)	C(p-b-t)	D(t)	D(t)	D(t)	C(t-m)	A	D(t)
223E3	E(e)	E(p)	E(p)	D(t)	D(t)	C(t-m)	A	D(t)
232A	B(w)	D(w)	D(w)	D(w)	C(b-w)	C(w-m)	A	D(v)
232A+	B(w)	D(w)	D(w)	D(w)	C(b-w)	C(w-m)	A	D(v)
232B	B(w)	D(w)	D(w)	D(w)	C(b-w)	C(w-m)	A	D(v)
232B+	B(w)	D(w)	D(w)	D(w)	C(b-w)	C(w-m)	A	D(v)
241D2	E(e)	E(p)	E(p)	D(b)	D(b)	D(m)	C(s)	C(t)
241F2	E(e)	E(p)	E(p-t)	E(t)	E(t)	E(t)	C(s)	E(t)
241G2	E(e)	E(p-t)	C(p-t)	E(t)	E(t)	E(t)	C(s)	E(t)
293A	A	C(t-b)	C(b)	C(b)	C(b)	C(m)	A	C(v)
293B	B(e)	C(b)	C(b)	C(b)	C(b)	C(m)	A	C(v)
294B	B(e)	C(b)	C(b)	C(b)	C(b)	C(m)	A	B(v)
294C2	B(e)	C(b)	C(b)	C(b)	C(b)	C(m)	A	B(v)
295B	B(e)	D(b)	D(b)	D(b)	D(b)	D(m)	A	C(v)
298B	B(w-e)	C(p-b)	C(p-b)	C(b)	C(b)	C(m)	A	C(v)
298C	C(e)	C(p-b)	C(p-b-t)	C(b-t)	C(t-b)	C(m)	A	C(v)
298C2	C(e)	C(p-b)	C(p-b-t)	C(b-t)	C(t-b)	C(m)	A	C(v)
312+	E(w)	E(w-b)	E(w-b)	E(w-b)	E(b)	E(w-m-f)	A	E(v)

See footnotes at end of table, page 126.

TABLE 19 (CONTINUED)--USE SUITABILITY RATINGS OF SOIL MAPPING UNITS[1/]

SYMBOL ON MAP	Potential Use: AGRICULTURAL[2/]	RESIDENTIAL: OPEN TYPE	RESIDENTIAL: Subdivision Type: WITH SEPTIC TANK[4/]	RESIDENTIAL: Subdivision Type: WITHOUT SEPTIC TANK[5/]	INDUSTRIAL[6/]	TRANSPORTATIONAL[7/]	Recreational: NATURAL[8/]	Recreational: DEVELOPED[9/]
312 ψ	E(w)	E(w-b)	E(w-b)	E(w-b)	E(w-b)	E(w-m-f)	C(w)	E(w-v)
320B	C(w)	E(p)	E(p)	D(b)	D(b)	D(m)	A	C(v)
330	B(w)	E(w)	E(w)	E(w)	D(w)	D(w)	A	D(v)
330+	B(w)	E(w)	E(w)	E(w)	D(w)	D(w)	A	D(v)
W330	E(w)	E(w)	E(w)	E(w)	D(w)	D(w)	B(w)	D(v)
W330+	E(w)	E(w)	E(w)	E(w)	D(w)	D(w)	B(w)	D(v)
330 ψ	E(w)	E(w)	E(w)	E(w)	E(w)	E(w)	C(w)	E(w-v)
341B	B(e)	C(p-b)	C(p-b)	C(b)	C(b)	C(m)	A	B(v)
347A	B(w)	D(w)	D(w)	D(w)	C(w-b)	D(w-m)	A	D(v)
347B	B(w)	D(w)	D(w)	D(w)	C(w-b)	C(w-m)	A	D(v)
357B	B(w-e)	D(b)	D(b)	D(b)	D(b)	D(m)	A	C(v)
357C	C(e)	D(b)	D(b)	D(b)	D(b)	D(m)	A	C(v)
442A	A	C(t)	B(w-b-p)	B(w-b)	B(w-b)	B(w-m-f)	A	C(v)
442B	B(e)	B(w-b-p)	B(w-b-p)	B(w-b)	B(t-w-b)	B(w-m-f)	A	C(v)
443B	B(e)	B(b-p)	B(p-b)	B(b)	B(t-b)	B(m-f)	A	B(v)
443C2	B(e)	B(b-p)	C(t)	C(t)	C(t)	B(m-f)	A	B(v)
448B	B(e)	D(b)	D(b)	D(b)	D(b)	D(m)	A	B(v)
448C2	C(e)	D(b)	D(b)	D(b)	D(b)	D(m)	A	B(v)
449B	B(e)	C(b)	C(b)	C(b)	C(b)	C(m)	A	B(v)
449C2	B(e)	C(b)	C(b)	C(b-t)	C(b-t)	C(m)	A	B(t-v)
449C3	C(e)	C(b)	C(b-t)	C(b-t)	C(b-t)	C(m)	A	C(v)
449D2	C(e)	C(b)	C(b-t)	C(b-t)	C(b-t)	C(m-t)	A	C(t)
449D3	D(e)	C(b)	C(b-t)	C(b-t)	C(b-t)	C(m-t)	A	C(t)
450B	B(e)	C(b)	C(b)	C(b)	C(b)	C(m)	A	B(v)
450C2	B(e)	C(b)	C(b)	C(b)	C(b-t)	C(m)	A	B(v)
490A	A	C(t)	B(w-b-p)	B(w-b)	B(w-b)	B(w-m-f)	A	C(v)
490B	B(e)	B(w-b-p)	B(w-b-p)	B(w-b)	B(t-w-b)	B(w-m-f)	A	C(v)
495B	B(e)	B(b-p)	B(b-p)	B(b)	B(t-b)	B(m-f)	A	B(v)
502A	A	C(t-b)	C(b)	C(b)	C(b)	C(m)	A	C(v)
502B	B(w-e)	C(b)	C(b)	C(b)	C(b)	C(m)	A	C(v)
531B	B(e)	C(p-b)	C(p-b)	C(b)	C(b)	C(m)	A	B(v)
531B2	B(e)	C(p-b)	C(p-b)	C(b)	C(b)	C(m)	A	B(v)
531C	C(e)	C(p-b)	C(p-t-b)	C(b-t)	C(b-t)	C(m)	A	B(t-v)
531C2	C(e)	C(p-b)	C(p-t-b)	C(b-t)	C(b-t)	C(m)	A	B(t-v)
531D	C(e)	C(p-b)	C(p-t-b)	C(b-t)	C(b-t)	C(t-m)	A	C(t)
531D2	C(e)	C(p-b)	C(p-t-b)	C(b-t)	C(b-t)	C(t-m)	A	C(t)
531E2	D(e)	C(p-t-b)	D(t)	D(t)	D(t)	C(t-m)	A	D(t)
594A	B(w)	D(w)	D(w)	D(w)	C(w-b)	C(w-m)	A	D(v)
594A+	B(w)	D(w)	D(w)	D(w)	C(w-b)	C(w-m)	A	D(v)
594B	B(w)	D(w)	D(w)	D(w)	C(w-b)	C(w-m)	A	D(v)
594B+	B(w)	D(w)	D(w)	D(w)	C(w-b)	C(w-m)	A	D(v)
696B	B(e)	B(p-t-b)	B(p-b)	B(b)	B(b-t)	B(m-f)	A	B(v)
696C2	B(e)	B(p-b)	C(t)	C(t)	C(t)	B(m-f)	A	B(t-v)
696C3	C(e)	B(p-b)	C(t)	C(t)	C(t)	B(m-f)	A	C(v)
696E	D(e)	C(t)	D(t)	D(t)	D(t)	C(t)	A	D(t)
697B	B(e)	B(p-t-b)	B(p-b)	B(b)	B(b-t)	B(m-f)	A	C(v)
698B	B(e)	B(p-t-b)	B(p-b)	B(b)	B(b-t)	B(m-f)	A	B(v)

1/ Ratings are made from A (most favorable) to E (unfavorable) and are based on those soil properties to a depth of five feet which have an effect on the suitability of the use in question. The particular soil property or properties which are effective in causing the degree of suitability limitation follow each rating as letter symbols within parenthesis. For further definition, see text preceding.

2/ Refers primarily to the commercial production of general or specialized cultivated crops.

3/ Refers to home sites of greater than one acre in size, having homes of less than three stories, and requiring the use of septic tank sewage disposal systems.

4/ Refers to residential developments having less than one acre lot size, having buildings of less than three stories, and requiring the use of septic tank sewage disposal systems.

5/ Refers to residential developments having less than one acre lot size, having buildings of less than three stories, and not requiring the use of septic tank sewage disposal systems.

6/ Refers to industrial and commercial developments having structures or equivalent load limit requirements of less than three stories.

7/ Refers to roads, highways, railroads, airports and associated terminals.

8/ Refers to those types of recreational and scenic areas requiring no vehicular and only limited human traffic such as wildlife sanctuaries, hunting areas, preserves for natural vegetation, etc.

9/ Refers to those types of recreational areas which are developed to allow for off-road vehicular and human movement such as picnic sites, camp sites, golf courses, play areas, etc.

GLOSSARY OF TERMS

ADEQUATELY DRAINED.--Soil which is tiled or ditched in such a manner to provide for the most efficient agricultural crop production. The drainage may not be adequate for other types of land use.

AERATION, SOIL.--The process by which oxygen and other gasses in the soil are renewed. The rate of soil aeration depends largely on the size and number of soil pores and the amount of water occupying these pores.

"A" HORIZON.--See HORIZON, SOIL.

ALLUVIAL SOILS.--That part of the lowlands near streams formed from relatively recently deposited material (alluvium). Soils which are deposited by flood waters are young and have little or no profile development.

ALLUVIUM.--Soil material deposited by streams.

"B" HORIZON.--See HORIZON, SOIL.

BOTTOMLAND.--Low ground lying adjacent to a stream which is nearly flat and normally overflows during flood periods.

CALCAREOUS SOIL.--One that has sufficient calcium carbonate, often mixed with magnesium carbonate to effervesce (bubble) visibly when dilute (0.1 normal) hydrochloric acid is applied.

CATENA, SOIL.--A group of soils within a specific soil zone that has developed from a similar parent material. The soils are unlike in characteristics because of differences due to relief or internal drainage.

"C" HORIZON.--See HORIZON, SOIL.

CLASSIFICATION, SOIL.--A grouping of soils into categories ranging from very many narrow units (many thousand soil types) up to very few broad units (three orders). This facilitates speaking about the soils on any level desired. Similar soil types form a series, similar series form a family, similar families form a great soil group, similar great soil groups form a suborder and similar suborders form an order.

CLEAN TILLED CROPS.--Crops that are grown in rows of varying widths. The soil between the rows is kept bare usually by cultivation.

COLOR, SOIL.--A soil characteristic which is determined by use of the Munsell color chart. The word "mottled" used in defining color means that the soil is marked with spots of different color.

CONCRETION.--A more or less hardened, local concentration of lime, iron or manganese.

CONSISTENCE, SOIL.--The resistance to deformation of the soil material, whether hard, soft, sticky, plastic, etc. It is measured on dry, moist or wet soil.

DEPTH, SOIL.--The depth in inches to a root-impeding layer in the soil.

Very deep.................60 inches or more
Deep......................36 to 60 inches
Moderately deep...........20 to 36 inches
Shallow...................10 to 20 inches
Very shallow..............Less than 10 inches

DEVELOPMENT, SOIL.--The sum total of the changes in the original soil material by the interaction of the various soil-forming factors which are (1) vegetation and organisms, (2) relief or topography, (e) climate and (4) age. The degree of development is usually described in terms of subsoil "B" development.

Degree of Development

No development	No "B" or only a color "B".
Weak development	Slight "B" less than 10 inches of silty clay loam or clay loam, less than 30 inches of loam and sandy loam.
Moderate development	More than 10 inches of silty clay loam or clay loam.
Strong development	"B" of silty clay or clay texture.

"D" HORIZON.--See HORIZON, SOIL.

DRAINAGE PROFILE.--Also called natural drainage, internal drainage and degree of oxidation. The drainage profile is identified by the colors in a soil. Most of the soil color in the absence of organic matter is caused by the iron in the soil. When the soil has developed under waterlogged (excess of water) conditions, the iron in the soil has a gray color. Under dry conditions (excess of air), the iron in the soil tends to be yellow and red. Mottling usually indicates alternate wet and dry conditions. The drainage profiles in Ela Township are:

Well Drained--Bright yellow-red subsoils.
Moderately Well Drained--Upper subsoil and topsoil are free of mottles. The lower subsoil has some grayish mottles.
Imperfectly Drained--The major part of the subsoil is mottled with gray.
Poorly Drained--Gray colors predominate through all of the subsoil and most of the topsoil.
Very Poorly Drained--Soil colors exclusive of the organic matter are practically all gray or olive.

DRAINED LAND.--Land that has been ditched or tiled according to recommendations for that type of soil.

DROUGHTY SOIL.--Soil that has less available water-holding capacity than is normally needed by growing crops. Also, the water table is below the plant rooting zone.

DUG PONDS.--As used in this report, ponds excavated in a low-lying area and depending on the ground water table or a drainage tile for recharge. Very little surface water is allowed to enter the ponds.

ELUVIATION.--The movement of material from one place to another within the soil in either true solution or colloidal suspension. Soil horizons that have lost material through eluviation are said to be eluvial. The term refers especially to the movement of soil colloids in suspension.

EROSION, SOIL.--The removal of soil material by wind and running water. Technically, the term "erosion" refers to the wearing away of soils by geologic processes and the term "accelerated erosion" refers to the loss of soil material brought about through the activities of man. The term "erosion" is often used loosely to mean accelerated erosion.

GENESIS, SOIL.--The mode of origin of the soil with special reference to the processes responsible for the development of the solum or true soil from unconsolidated parent material.

GLACIAL DRIFT.--A collective term referring to any material deposited by a glacier or glacial waters.

GLACIAL OUTWASH.--Stratified, assorted glacial materials deposited by the melt waters from glaciers.

GLACIAL TILL.--A deposit of earth, sand, gravel and boulders transported and deposited by glaciers. Till is unstratified.

HORIZON, SOIL.--A layer of soil approximately parallel to the land surface with more or less well defined characteristics that have been produced by the soil development processes.

"A" Horizon--The upper horizon of a mineral soil having maximum biological activity or eluviation or both. (A more general term applied to this horizon is SURFACE SOIL.) Further subdivisions of this horizon are designated A_0, A_1, A_2 and A_3.

"B" Horizon--The soil horizon usually beneath the "A" horizon in which (a) clay, iron or aluminum with accessory organic matter have accumulated by receiving suspended material from the "A" horizon above it or by clay development in place, (b) the soil has a blocky or prismatic structure. (A more general term applied to the B horizon is SUBSOIL.) Further subdivisions within this horizon are designated B_1, B_2 and B_3.

"C" Horizon--The unconsolidated rock material in the lower part of the soil profile like that from which all or part of the upper (A and B) horizons have developed. (A more general term applied is SUBSTRATA.)

"D" Horizon--Any substrata underlying the soil profile that is unlike the material from which the soil has been formed.

ILLUVIATION.--An accumulation of material in a soil horizon through the deposition of suspended mineral and organic matter originating from horizons above. Because at least part of the fine clay in the B horizons (or subsoils) of many soils has moved into them from the A horizons above, these are called illuvial horizons.

INTERPRETATION, SOIL.--The art of explaining the meaning or significance of basic soil information.

LAKEBED SEDIMENTS.--Materials which were deposited by waters of old lakes which have long since disappeared.

LEACHING.--The removal of materials in solution by the passage of water through the soil.

LOESS.--Geological deposit of relatively uniform fine material (mostly silt) presumably transported by wind. Many unlike kinds of soil in the United States have developed from loess blown out of alluvial valleys and from other deposits during periods of aridity.

LOWLAND.--Low ground lying between higher areas.

MARL.--An earthy deposit consisting mainly of calcium carbonate commonly mixed with clay or other impurities. It is formed chiefly at the margins of fresh water lakes. It is commonly used for liming acid soils.

MUCK.--Fairly well decomposed organic soil material relatively high in mineral content, dark in color, which accumulated under conditions of excessive moisture.

OVERBURDEN.--Usually referred to as a soil that has 30 to 60 inches of loess or outwash or both over a different type of material (usually glacial till in Ela Township).

PARENT MATERIAL.--The unconsolidated mass of rock material or peat from which the soil profile develops.

PEAT.--Unconsolidated soil material consisting largely of under composed or slightly decomposed organic matter which accumulated under conditions of excessive moisture.

PHASE, SOIL.--The subdivision of a soil type or other classificational soil unit having variations in characteristics not significant to the classification of the soil in its natural landscape but significant to the use and management of the soil. Examples are differences of slope and thickness of surface soil due to accelerated erosion.

PROFILE, SOIL.--A vertical section of the soil through all its horizons and extending into the parent material.

SERIES, SOIL.--A group of soils that have soil horizons similar in their differentiating characteristics and arrangement in the soil profile except for texture of the surface soil and formed from a particular type of parent material.

SLOPE.--The incline of the surface of a soil. It is expressed in percentage of slope which equals the number of feet of fall per 100 feet of horizontal distance. The slope categories used in Ela Township are as follows:

0 to 2 percent	=	level and nearly level
2 to 4 percent	=	undulating
4 to 7 percent	=	gently rolling
7 to 12 percent	=	rolling
12 to 18 percent	=	hilly
18 to 30 percent	=	steep
30+ percent	=	very steep

SOLUM.--The upper part of a soil profile above the parent material in which the processes of soil formation are active. The solum in mature soils includes the A and B horizons. Usually the characteristics of the material in these horizons are quite unlike those of the underlying parent material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

STRUCTURE, SOIL.--The morphological aggregates in which the individual soil particles are arranged. The following kinds are recognized: prismatic, columnar, angular blocky, subangular blocky, granular, crumb, platy, single grained, and massive.[1]

TEXTURE, SOIL.--The relative proportion of the various size groups of individual soil grains in a mass of soil. Specifically, it refers to the proportions of sand, silt and clay.[2]

General Terms		Basic Soil Textural Class Names
Sandy soils	Coarse-textured	Sands Loamy sands
	Moderately coarse-textured	Sandy loam Fine sandy loam Very fine sandy loam
Loamy soils	Medium-textured	Loam Silt loam Silt Clay loam
	Moderately fine-textured	Sandy clay loam Silty clay loam Sandy clay
Clayey soils	Fine-textured	Silty clay Clay

TYPE, SOIL.--A group of soils that have soil horizons similar in their differentiating characteristics and arrangement in the soil profile and developed from a particular type of parent material. A subdivision of a soil series.

1/ Further discussion can be found in U.S. Department of Agriculture Handbook No. 18, 1951, SOIL SURVEY MANUAL.

2/ Ibid.

UPLAND.--High ground. Ground elevated above the lower areas along rivers or between hills.

WATERSHED.--In the United States, the total area above a given point on a stream that contributes water to the flow at that point. Synonyms are "drainage basin" or "catchment basin."

WATER TABLE.--The upper limit of the part of the soil or underlying rock material that is wholly saturated with water. In some places, an upper or perched water table may be separated from a lower one by a dry zone.

LITERATURE CITED

(1) American Association of State Highway Officials.
1955. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. Ed. 7, 2v., illustrated.

(2) Bartelli, Lindo J.
1960. SOIL SURVEY INFORMATION FOR SUBURBAN DEVELOPMENT. (Unpublished paper presented at the symposium "Land Zoning in Relation to Agricultural, Suburban, Industrial, Forest and Recreational Needs of the Future." Part II: Suburban Planning. 1960 Annual Meeting AAAS, New York.) 16pp., mimeographed.

(3) Edminster, Frank C.
1941. WILDLIFE MANAGEMENT THROUGH SOIL CONSERVATION ON FARMS IN THE NORTHEAST. U.S.D.A. Farmers Bulletin 1868.

(4) Federal Housing Administration.
1959. ENGINEERING SOIL CLASSIFICATION FOR RESIDENTIAL DEVELOPMENTS. FHA No. 373.

(5) Good, E. E. and Dambach, C. A.
1943. EFFECTS OF LAND USE PRACTICES ON BREEDING POPULATIONS IN OHIO. Journal of Wildlife Management 7:3.

(6) Leighton, M. M., Ekblaw, G. E. and Horberg, L., Illinois State Geological Survey.
1948. PHYSIOGRAPHIC DIVISIONS OF ILLINOIS. Report of Investigations No. 129. 33pp.

(7) McAtee, W. C.
1937. WILDLIFE IN LAND PLANNING. Pennsylvania Game News 8:4-5.

(8) Portland Cement Association.
1956. PCA SOIL PRIMER. 86pp, illustrated.

(9) Suter, Max; Bergstrom, Robert E.; Smith, H. F.; Emrich, Grover H.; Walton, W. C.; and Larson, T. E.
1959. PRELIMINARY REPORT ON GROUND WATER RESOURCES OF THE CHICAGO REGION, ILLINOIS. Cooperative Ground Water Report 1. 89pp., illustrated.

(10) Thornburn, Thomas H.
July 1960. SURFACE DEPOSITS OF ILLINOIS. Department of Civil Engineering, University of Illinois. (unpublished)

(11) Thorp, J. and Smith, Guy D.
1949. HIGHER CATEGORIES OF SOIL CLASSIFICATIONS: ORDER, SUBORDER, AND GREAT SOIL GROUPS. Soil Science 67:117-126.

(12) University of Illinois, College of Agriculture, Agriculture Extension Service and Soil Conservation Service, cooperating.
IRRIGATION GUIDE FOR DESIGNING SPRINKLER SYSTEMS. 22pp.

(13) U. S. Department of Agriculture.
1938. SOILS AND MEN. USDA Yearbook, 1232pp., illustrated.

(14) U. S. Department of Agriculture, Agricultural Research Service. June 1958. SOIL MOISTURE SURVEY OF SOME REPRESENTATIVE ILLINOIS SOIL TYPES. ARS 41-21. 40pp.

(15) U. S. Department of Agriculture, Soil Conservation Service. 1946. DETERMINATION OF PEAK FLOWS--50 YEAR FREQUENCY. (Unpublished Drawing No. 3-L-934D) Sheets 1 and 2 of 2.

(16) U. S. Department of Agriculture, Soil Conservation Service. 1959. READY REFERENCES FOR CONSERVATION FARM PLANNING. (Unpublished) 489pp.

(17) U. S. Department of Agriculture, Soil Conservation Service, Illinois. October 13, 1958. DRAINAGE RECOMMENDATIONS FOR ILLINOIS SOILS. (Unpublished Illinois Technical, Management and Information Note, Soils #6). 6pp., mimeographed.

(18) U. S. Department of Agriculture, Soil Conservation Service, Illinois. April 17, 1959. SOIL INFILTRATION FACTORS AND RATES FOR ILLINOIS SOILS. (Unpublished Illinois Technical, Management and Information Note, Soils #7). 4pp., mimeographed.

(19) U. S. Department of Agriculture, Soil Conservation Service, Illinois. July 7, 1960. YIELD RATINGS FOR ILLINOIS CAPABILITY UNITS. (Unpublished Illinois Technical, Management and Information Note, Soils #10). Mimeographed.

(20) U. S. Department of Agriculture, Soil Conservation Service, Upper Mississippi Region. 1950. BIOLOGY HANDBOOK--THIRD EDITION (REVISED). (Unpublished) 121pp.

(21) U. S. Department of Health, Education and Welfare, Public Health Service. MANUAL OF SEPTIC TANK PRACTICES. Publication No. 526. 85pp., illustrated.

(22) Wascher, H. L.; Alexander, J. D.; Ray, B. W.; Beavers, A. H.; and Odell, R. T., Agricultural Experiment Station, University of Illinois. 1960. CHARACTERISTICS OF SOILS ASSOCIATED WITH GLACIAL TILLS IN NORTHEASTERN ILLINOIS. Bulletin 665. 155pp.

(23) Waterways Experiment Station, Corps. of Engineers. 1953. THE UNIFIED SOIL CLASSIFICATION SYSTEM. Technical Memo No. 3-357, v.l.

SOIL MAPPING UNIT-SOIL GROUPING INDEX

SYMBOL ON MAP	SOIL MAPPING UNIT	SOIL MAPPING UNIT DESCRIPTION (Page)	SOIL MANAGEMENT GROUP	SOIL MANAGEMENT GROUP DESCRIPTION (Page)	SOIL GROUP FOR Table 7 (Crop Adapta-bility)	Table 8 (Wild-life)	Table 9 (Herb-aceous)	Table 10 (Shrub & Vine)	Table 11 (Trees)	Table 13 (Drain-age)	Table 14 (Irri-gation)
23A	Blount silt loam, 0 to 2 percent slopes.	24	7	72	C4	W3	H3	S4	T3	D6	I5
23B	Blount silt loam, 2 to 4 percent slopes.	24	7	72	C4	W3	H3	S4	T3	D6	I5
23B2	Blount silt loam, 2 to 4 percent slopes, moderately eroded.	24	7	72	--3/	W3	H3	S4	T3	D6	I5
60D3	LaRose soils, 7 to 12 percent slopes, severely eroded.	45	13	73	--3/	W5	H5	S5	T1	--1/	I2
67A	Harpster silty clay loam, 0 to 2 percent slopes.	55	6	71	C4	W3	H3	S3	T6	D1	I2
67B	Harpster silty clay loam, 2 to 4 percent slopes.	55	6	71	C4	W3	H3	S3	T6	D1	I2
76	Otter silt loam.	63	5	71	C4	W3	H3	S3	T5	D4	I2
W76	Otter silt loam, wet.	63	14	73	C2	W2	H2	S2	T4	D4	--2/
91B	Swygert silt loam, 2 to 4 percent slopes.	47	8	72	C5	W3	H3	S4	T3	D7	I6
91C	Swygert silt loam, 4 to 7 percent slopes.	47	10	73	--3/	W3	H3	S4	T3	D7	I6
91C2	Swygert silt loam, 4 to 7 percent slopes, moderately eroded.	47	10	73	--3/	W3	H3	S4	T3	D7	I6
91D2	Swygert silt loam, 7 to 12 percent slopes, moderately eroded.	47	13	73	--3/	W3	H3	S4	T3	D7	I6
91D3	Swygert soils, 7 to 12 percent slopes, severely eroded.	48	15	74	--3/	W6	H6	S6	T3	D7	--2/
103	Houghton muck, drained.	61	11	73	C3	W3	H3	S3	T5	D3	I1
103+	Houghton soils, silty overwash, drained.	61	11	73	C3	W3	H3	S3	T5	D3	I1
W103	Houghton muck, wet.	61	14	73	C2	W2	H2	S2	T4	D3	--2/
W103+	Houghton soils, silty overwash, wet.	61	14	73	C2	W2	H2	S2	T4	D3	--2/
103 ⸙	Houghton muck, marshy.	61	17	74	C1	W1	H1	S1	T4	D3	--2/
103+ ⸙	Houghton soils, marshy.	61	17	74	C1	W1	H1	S1	T4	D3	--2/
107	Sawmill silty clay loam.	64	5	71	C4	W3	H3	S3	T5	D4	I3
W107	Sawmill silty clay loam, wet.	64	14	73	C2	W2	H2	S2	T4	D4	--2/
126	Bonpas silty clay loam.	54	2	70	C4	W3	H3	S3	T6	D2	I3
146A	Elliott silt loam, 0 to 2 percent slopes.	43	1	70	C4	W4	H4	S4	T2	D6	I3
146B	Elliott silt loam, 2 to 4 percent slopes.	43	3	70	C4	W4	H4	S4	T2	D6	I3
146B2	Elliott silt loam, 2 to 4 percent slopes, moderately eroded.	43	3	70	--3/	W4	H4	S4	T2	D6	I3
146B+	Elliott silt loam, overwash, 2 to 4 percent slopes.	43	3	70	C4	W4	H4	S4	T2	D6	I3
153A	Pella silty clay loam, 0 to 2 percent slopes.	57	2	70	C4	W3	H3	S3	T6	D1	I2
153A+	Pella silt loam, overwash, 0 to 2 percent slopes.	57	5	71	C4	W3	H3	S3	T6	D1	I2
153B	Pella silty clay loam, 2 to 4 percent slopes.	57	5	71	C4	W3	H3	S3	T6	D1	I2
189A	Martinton silt loam, 0 to 2 percent slopes.	46	1	70	C4	W4	H4	S4	T2	D6	I3
189B	Martinton silt loam, 2 to 4 percent slopes.	46	3	70	C4	W4	H4	S4	T2	D6	I3
192B	Del Rey silt loam, brown subsoil variant, 2 to 4 percent slopes.	25	4	71	C7	W5	H5	S5	T2	--1/	I5
192C	Del Rey silt loam, brown subsoil variant, 4 to 7 percent slopes.	25	9	72	--3/	W5	H5	S5	T2	--1/	I5
192C2	Del Rey silt loam, brown subsoil variant, 4 to 7 percent slopes, moderately eroded.	25	9	72	--3/	W5	H5	S5	T2	--1/	I5
194B	Morley silt loam, 2 to 4 percent slopes.	26	4	71	C7	W5	H5	S5	T2	--1/	I5
194B2	Morley silt loam, 2 to 4 percent slopes, moderately eroded.	26	4	71	--3/	W5	H5	S5	T2	--1/	I5
194C	Morley silt loam, 4 to 7 percent slopes.	26	9	72	--3/	W5	H5	S5	T2	--1/	I5

See footnotes at the end of page 137.

SOIL MAPPING UNIT-SOIL GROUPING INDEX (CONTINUED)

SYMBOL ON MAP	SOIL MAPPING UNIT	SOIL MAPPING UNIT DESCRIPTION (Page)	SOIL MANAGEMENT GROUP	SOIL MANAGEMENT GROUP DESCRIPTION (Page)	SOIL GROUP FOR						
					Table 7 (Crop Adapta-bility)	Table 8 (Wild-life)	Table 9 (Herb-aceous)	Table 10 (Shrub & Vine)	Table 11 (Trees)	Table 13 (Drain-age)	Table 14 (Irri-gation)
194C2	Morley silt loam, 4 to 7 percent slopes, moderately eroded.	27	9	72	--3/	W5	H5	S5	T2	--1/	I5
194C3	Morley soils, 4 to 7 percent slopes, severely eroded.	27	13	73	--3/	W6	H6	S6	T2	--1/	I5
194D	Morley silt loam, 7 to 12 percent slopes.	27	9	72	--3/	W5	H5	S5	T2	--1/	I5
194D2	Morley silt loam, 7 to 12 percent slopes, moderately eroded.	27	9	72	--3/	W5	H5	S5	T2	--1/	I5
194D3	Morley soils, 7 to 12 percent slopes, severely eroded.	27	13	73	--3/	W6	H6	S6	T2	--1/	I5
194E	Morley silt loam, 12 to 18 percent slopes.	27	13	73	--3/	W5	H5	S5	T2	--1/	--2/
194E2	Morley silt loam, 12 to 18 percent slopes, moderately eroded.	27	13	73	--3/	W5	H5	S5	T2	--1/	--2/
194E3	Morley soils, 12 to 18 percent slopes, severely eroded.	27	15	74	--3/	W6	H6	S6	T2	--1/	--2/
194F	Morley silt loam, 18 to 30 percent slopes.	28	15	74	--3/	W5	H5	S5	T2	--1/	--2/
194F2	Morley silt loam, 18 to 30 percent slopes, moderately eroded.	28	15	74	--3/	W5	H5	S5	T2	--1/	--2/
223B	Varna silt loam, 2 to 4 percent slopes.	51	3	70	C7	W5	H5	S5	T2	--1/	I3
223B2	Varna silt loam, 2 to 4 percent slopes, moderately eroded.	51	3	70	--3/	W5	H5	S5	T2	--1/	I3
223C	Varna silt loam, 4 to 7 percent slopes.	51	3	70	--3/	W5	H5	S5	T2	--1/	I3
223C2	Varna silt loam, 4 to 7 percent slopes, moderately eroded.	51	9	72	--3/	W5	H5	S5	T2	--1/	I3
223C3	Varna soils, 4 to 7 percent slopes, severely eroded.	52	9	72	--3/	W6	H6	S6	T2	--1/	I3
223D2	Varna silt loam, 7 to 12 percent slopes, moderately eroded.	52	9	72	--3/	W5	H5	S5	T2	--1/	I3
223D3	Varna soils, 7 to 12 percent slopes, severely eroded.	52	13	73	--3/	W6	H6	S6	T2	--1/	I3
223E2	Varna silt loam, 12 to 18 percent slopes, moderately eroded.	52	13	73	--3/	W5	H5	S5	T2	--1/	--2/
223E3	Varna soils, 12 to 18 percent slopes, severely eroded.	52	15	74	--3/	W6	H6	S6	T2	--1/	--2/
232A	Ashkum silty clay loam, 0 to 2 percent slopes.	53	5	71	C4	W3	H3	S3	T6	D2	I3
232A+	Ashkum silt loam, overwash, 0 to 2 percent slopes.	53	5	71	C4	W3	H3	S3	T6	D2	I3
232B	Ashkum silty clay loam, 2 to 4 percent slopes.	53	5	71	C4	W3	H3	S3	T6	D2	I3
232B+	Ashkum silt loam, overwash, 2 to 4 percent slopes.	53	5	71	C4	W3	H3	S3	T6	D2	I3
241D2	Chatsworth silt loam, 7 to 12 percent slopes, moderately eroded.	65	16	74	--3/	W6	H6	S6	T3	--1/	--2/
241F2	Chatsworth silt loam, 18 to 30 percent slopes, moderately eroded.	65	16	74	--3/	W6	H6	S6	T3	--1/	--2/
241G2	Chatsworth silt loam, 30 to 50 percent slopes, moderately eroded.	65	16	74	--3/	W6	H6	S6	T3	--1/	--2/
293A	Andres silt loam, 0 to 2 percent slopes.	39	1	70	C4	W4	H4	S4	T2	D5	I2
293B	Andres silt loam, 2 to 4 percent slopes.	40	3	70	C4	W4	H4	S4	T2	D5	I2
294B	Symerton silt loam, 2 to 4 percent slopes.	48	3	70	C6	W5	H5	S5	T1	--1/	I2
294C2	Symerton silt loam, 4 to 7 percent slopes, moderately eroded.	48	3	70	--3/	W5	H5	S5	T1	--1/	I2
295B	Andres silt loam, fine substratum, 2 to 4 percent slopes.	41	3	70	C4	W4	H4	S4	T2	D6	I3
298B	Beecher silt loam, 2 to 4 percent slopes.	31	7	72	C4	W3	H3	S4	T2	D6	I5
298C	Beecher silt loam, 4 to 7 percent slopes.	31	9	72	--3/	W3	H3	S4	T2	D6	I5
298C2	Beecher silt loam, 4 to 7 percent slopes, moderately eroded.	31	9	72	--3/	W3	H3	S4	T2	D6	I5
312+	Rollin soils, silty overwash.	62	14	73	C3	W3	H3	S3	T5	D3	I1
312 ⸙	Rollin muck, marshy.	62	17	74	C1	W1	H1	S1	T4	D3	--2/
320B	Frankfort silt loam, 2 to 4 percent slopes.	32	12	73	C5	W3	H3	S4	T3	D7	--2/
330	Peotone silty clay loam.	59	5	71	C4	W3	H3	S3	T6	D2	I3
330+	Peotone silt loam, overwash.	59	5	71	C4	W3	H3	S3	T6	D2	I3
W330	Peotone silty clay loam, wet.	59	14	73	C2	W2	H2	S2	T4	D2	--2/
W330+	Peotone silt loam, overwash, wet.	60	14	73	C2	W2	H2	S2	T4	D2	--2/
330 ⸙	Peotone silty clay loam, marshy.	60	17	74	C1	W1	H1	S1	T4	D2	--2/

SOIL MAPPING UNIT-SOIL GROUPING INDEX (CONTINUED)

341B	Gilmer silt loam, 2 to 4 percent slopes.	44	3	70	C7	W5	H5	S5	T2	--1/	I3
347A	Harpster complex, 0 to 2 percent slopes.	56	6	71	C4	W3	H3	S3	T6	D1	I2
347B	Harpster complex, 2 to 4 percent slopes.	56	6	71	C4	W3	H3	S3	T6	D1	I2
357B	Wauconda silt loam, fine substratum, 2 to 4 percent slopes.	38	7	72	C4	W4	H4	S4	T2	D6	I5
357C	Wauconda silt loam, fine substratum, 4 to 7 percent slopes.	38	9	72	--3/	W4	H4	S4	T2	D6	I5
442A	Andres silt loam, loamy substratum, 0 to 2 percent slopes.	40	1	70	C4	W4	H4	S4	T2	D5	I2
442B	Andres silt loam, loamy substratum, 2 to 4 percent slopes.	40	3	70	C4	W4	H4	S4	T2	D5	I2
443B	Symerton silt loam, loamy substratum, 2 to 4 percent slopes.	49	3	70	C6	W5	H5	S5	T1	--1/	I2
443C2	Symerton silt loam, loamy substratum, 4 to 7 percent slopes, moderately eroded.	49	3	70	--3/	W5	H5	S5	T1	--1/	I2
448B	Symerton silt loam, fine substratum, 2 to 4 percent slopes.	50	3	70	C6	W5	H5	S5	T1	--1/	I3
448C2	Symerton silt loam, fine substratum, 4 to 7 percent slopes, moderately eroded.	50	9	72	--3/	W5	H5	S5	T1	--1/	I3
449B	Tuscola silt loam, moderately fine substratum, 2 to 4 percent slopes.	30	4	71	C6	W5	H5	S5	T1	--1/	I4
449C2	Tuscola silt loam, moderately fine substratum, 4 to 7 percent slopes, moderately eroded.	30	4	71	--3/	W5	H5	S5	T1	--1/	I4
449C3	Tuscola soils, moderately fine substratum, 4 to 7 percent slopes, severely eroded.	30	9	72	--3/	W5	H5	S5	T1	--1/	I4
449D2	Tuscola silt loam, moderately fine substratum, 7 to 12 percent slopes, moderately eroded.	30	9	72	--3/	W5	H5	S5	T1	--1/	I4
449D3	Tuscola soils, moderately fine substratum, 7 to 12 percent slopes, severely eroded.	30	13	73	--3/	W5	H5	S5	T1	--1/	I4
450B	Grays silt loam, moderately fine substratum, 2 to 4 percent slopes.	34	4	71	C6	W5	H5	S5	T1	--1/	I4
450C2	Grays silt loam, moderately fine substratum, 4 to 7 percent slopes, moderately eroded.	34	4	71	--3/	W5	H5	S5	T1	--1/	I4
490A	Odell loam, 0 to 2 percent slopes.	46	1	70	C4	W4	H4	S4	T2	D5	I2
490B	Odell loam, 2 to 4 percent slopes.	46	3	70	C4	W4	H4	S4	T2	D5	I2
495B	Corwin loam, 2 to 4 percent slopes.	42	3	70	C6	W5	H5	S5	T1	--1/	I2
502A	Wauconda silt loam, moderately fine substratum, 0 to 2 percent slopes.	37	1	70	C4	W4	H4	S4	T2	D5	I4
502B	Wauconda silt loam, moderately fine substratum, 2 to 4 percent slopes.	38	7	72	C4	W4	H4	S4	T2	D5	I4
531B	Markham silt loam, 2 to 4 percent slopes.	35	4	71	C7	W5	H5	S5	T2	--1/	I5
531B2	Markham silt loam, 2 to 4 percent slopes, moderately eroded.	35	4	71	--3/	W5	H5	S5	T2	--1/	I5
531C	Markham silt loam, 4 to 7 percent slopes.	35	9	72	--3/	W5	H5	S5	T2	--1/	I5
531C2	Markham silt loam, 4 to 7 percent slopes, moderately eroded.	35	9	72	--3/	W5	H5	S5	T2	--1/	I5
531D	Markham silt loam, 7 to 12 percent slopes.	36	9	72	--3/	W5	H5	S5	T2	--1/	I5
531D2	Markham silt loam, 7 to 12 percent slopes, moderately eroded.	36	9	72	--3/	W5	H5	S5	T2	--1/	I5
531E2	Markham silt loam, 12 to 18 percent slopes, moderately eroded.	36	13	73	--3/	W5	H5	S5	T2	--1/	--2/
594A	Pella silty clay loam, moderately fine substratum, 0 to 2 percent slopes.	58	5	71	C4	W3	H3	S3	T6	D2	I3
594A+	Pella silt loam, moderately fine substratum, overwash, 0 to 2 percent slopes.	58	5	71	C4	W3	H3	S3	T6	D2	I3
594B	Pella silty clay loam, moderately fine substratum, 2 to 4 percent slopes.	58	5	71	C4	W3	H3	S3	T6	D2	I3
594B+	Pella silt loam, moderately fine substratum, overwash, 2 to 4 percent slopes.	58	5	71	C4	W3	H3	S3	T6	D2	I3
696B	Tuscola silt loam, 2 to 4 percent slopes.	29	4	71	C6	W5	H5	S5	T1	--1/	I4
696C2	Tuscola silt loam, 4 to 7 percent slopes, moderately eroded.	29	4	71	--3/	W5	H5	S5	T1	--1/	I4
696C3	Tuscola soils, 4 to 7 percent slopes, severely eroded.	29	9	72	--3/	W5	H5	S5	T1	--1/	I4
696E	Tuscola silt loam, 12 to 18 percent slopes.	29	13	73	--3/	W5	H5	S5	T1	--1/	--2/
697B	Wauconda silt loam, 2 to 4 percent slopes.	37	7	72	C4	W4	H4	S4	T2	D5	I4
698B	Grays silt loam, 2 to 4 percent slopes.	33	4	71	C6	W5	H5	S5	T1	--1/	I4
Br.	Borrow Areas	66	NO GROUPINGS POSSIBLE								
Md.	Made Land	66	NO GROUPINGS POSSIBLE								

1/ Not applicable. Drainage is not normally needed.

2/ Not adapted. Irrigation is not normally needed or considered adapted.

3/ Crops are often adapted; however, erosion is a hazard which needs on-site consideration.

ERRATA SHEET

ELA TOWNSHIP SOIL REPORT

1. Page 13, Line 3: cut sand fills should read cuts and fills.

2. Page 22, Footnote 1/: Dunham should read Pella.

3. Page 60, Line 8: Symbol 330 should read 330 .

4. Page 61, Line 29: Symbol 103 should read 103 .
   Line 34: Symbol 103+ should read 103+ .

5. Page 62, Line 17: Symbol 312 should read 312 .

6. Page 70, Line 1: management group soils should read soil management groups.

7. Page 92, Footnote 1/: USCS should read USGS.

8. Page 108, Table 17, Column (k), map symbol W76: Very high should read High.

9. Page 110, Table 17, Column (b): 294C should read 294C2.

10. Page 112, Table 17, Column (h): Opposite symbols 442A and 442B, soil horizon B, ½-1½ should read 1½-3.

11. Pages 112 and 114, Table 17, heading of Column (o): W value should read ≤ W value.

12. Page 117, Table 18, Column (a): Symbol 294C should read 294C2.

13. Page 117, Table 18, Column (j): For symbol 294B, N. S. should read 3.

14. Page 118, Table 18, Column (d): For symbols 330 and 330+ the figure 5 should read 5 when adequately drained.

15. Page 118, Table 18, Symbols W330, W330+ and 330 :
    in Column (d): 5 should read N.S.
    in Column (e): N.S. should read 5 for A, B and C horizons.
    in Column (f): 5 should read N.S.
    in Column (i): N.S. applies to A and C horizons also.

16. Page 118, Table 18, Symbol 357B:
    in Column (p): figure 5 should read variable.
    in Column (q): figure 1 should read variable.

17. Page 119, Table 18, Column (a): Add symbol 594A with symbol 594A +.

18. Page 120, Footnote 3/, Line 2: Column (c) and (d) should read Column (b) and (c).

19. Pages 125 and 126, Table 19: Column headed open type should carry footnote 3/.

20. Page 125, Table 19: Column "with septic tank 4/", for symbol 241G2, C(p-t) should read E(p-t).

21. Page 125, Table 19: Column headed "symbol on map", symbol 153+ should read 153B.

Accessibility Statement