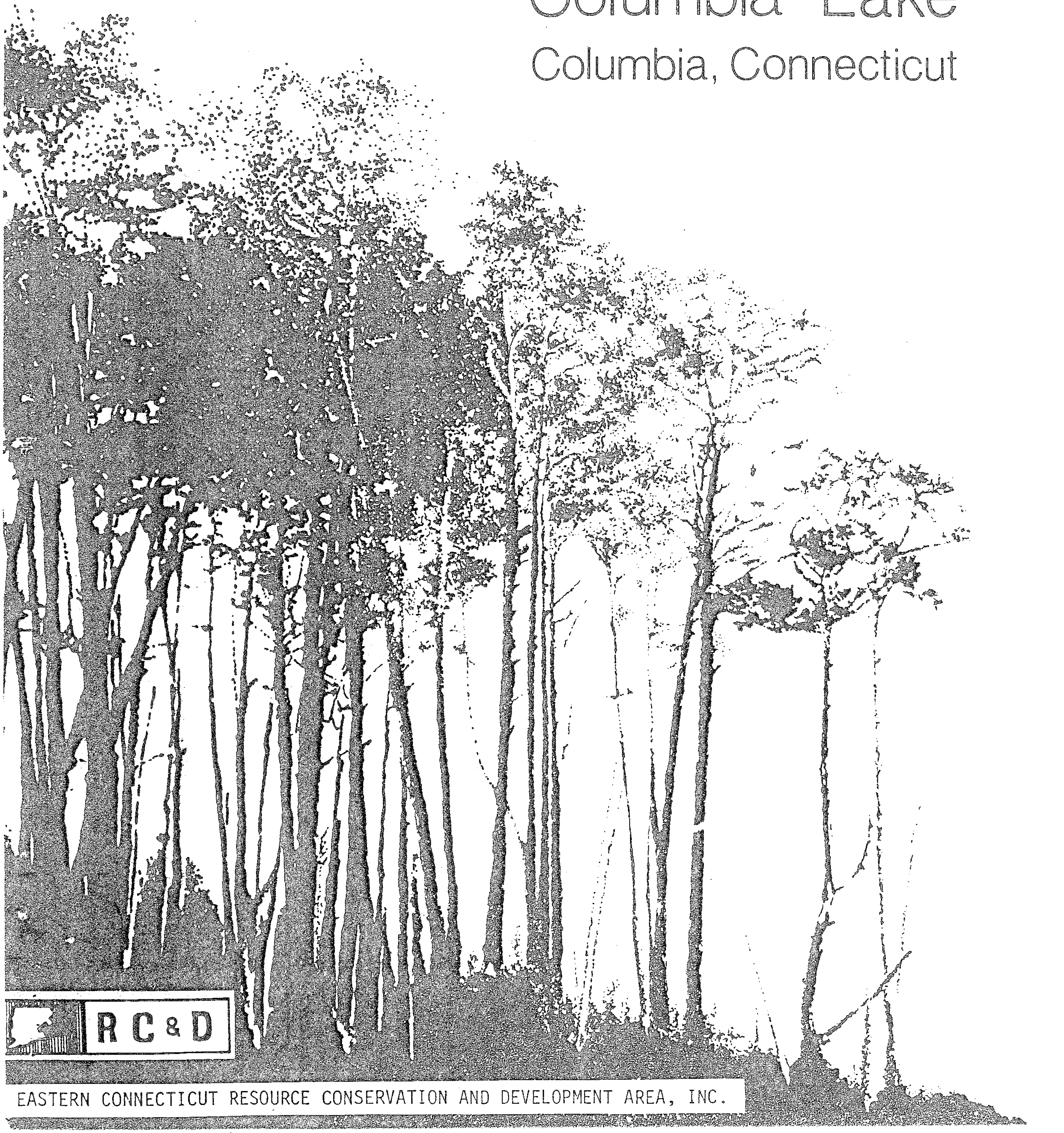
Environmental Review Team Report

Columbia Lake

Columbia, Connecticut



RC&D

EASTERN CONNECTICUT RESOURCE CONSERVATION AND DEVELOPMENT AREA, INC.

Environmental Review Team Report

on

Columbia Lake

Columbia, Connecticut

March 1981

eastern connecticut resource conservation & development area

environmental review team
139 boswell avenue
norwich, connecticut 06360

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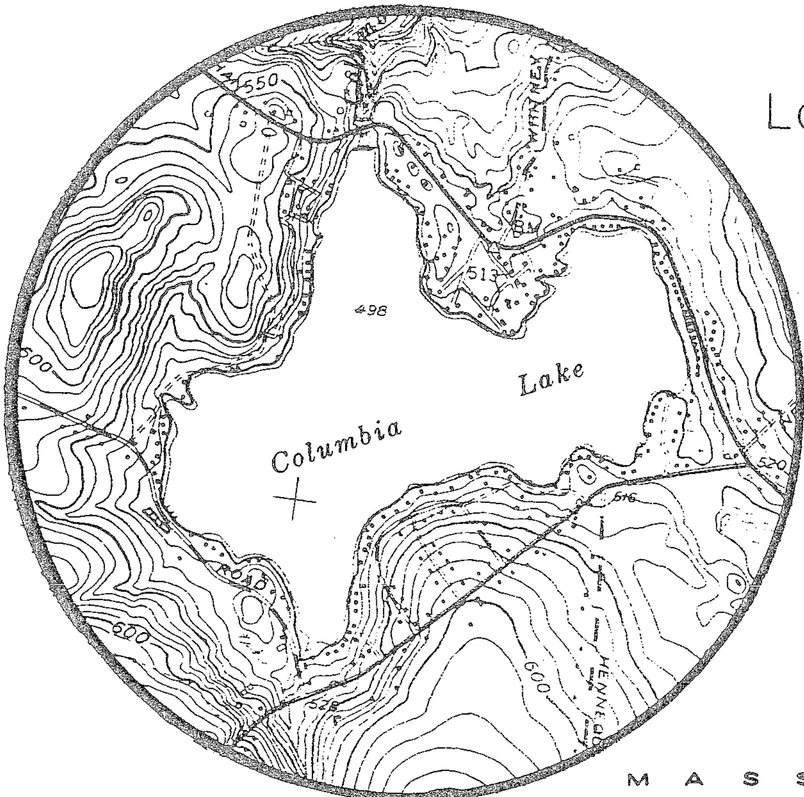
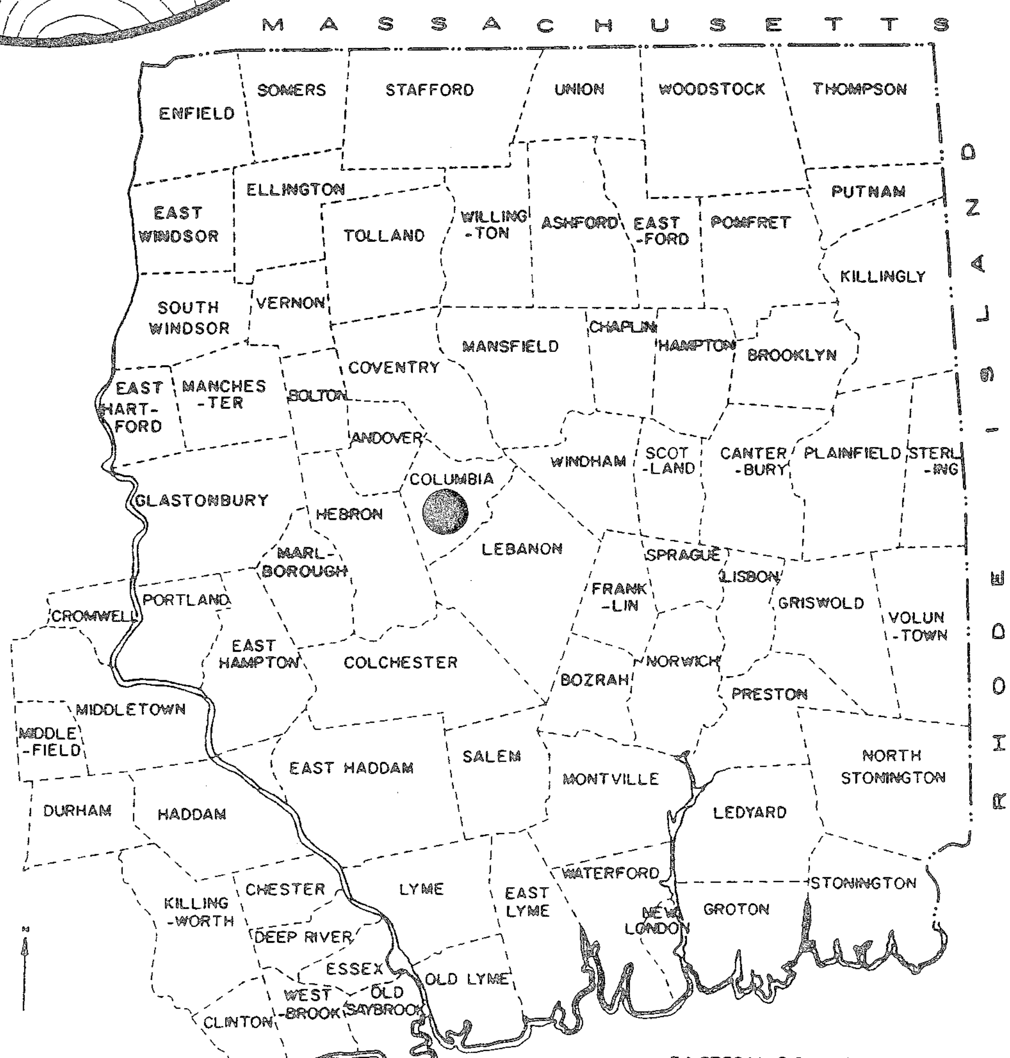
Location of Study Site

COLUMBIA LAKE
Columbia, Connecticut





EASTERN CONNECTICUT
RESOURCE CONSERVATION AND DEVELOPMENT PROJECT

ENVIRONMENTAL REVIEW TEAM REPORT
ON
COLUMBIA LAKE
COLUMBIA, CONNECTICUT

This report is an outgrowth of a request from the First Selectman of Columbia to the Tolland County Soil and Water Conservation District (S&WCD). The S&WCD referred this request to the Eastern Connecticut Resource Conservation and Development (RC&D) Area Executive Committee for their consideration and approval as a project measure. The request was approved and the measure reviewed by the Eastern Connecticut Environmental Review Team (ERT).

The soils of the site were mapped by a soil scientist of the United States Department of Agriculture (USDA), Soil Conservation Service (SCS). Reproductions of the soil survey map as well as a topographic map of the site were distributed to all ERT participants prior to their field review of the site.

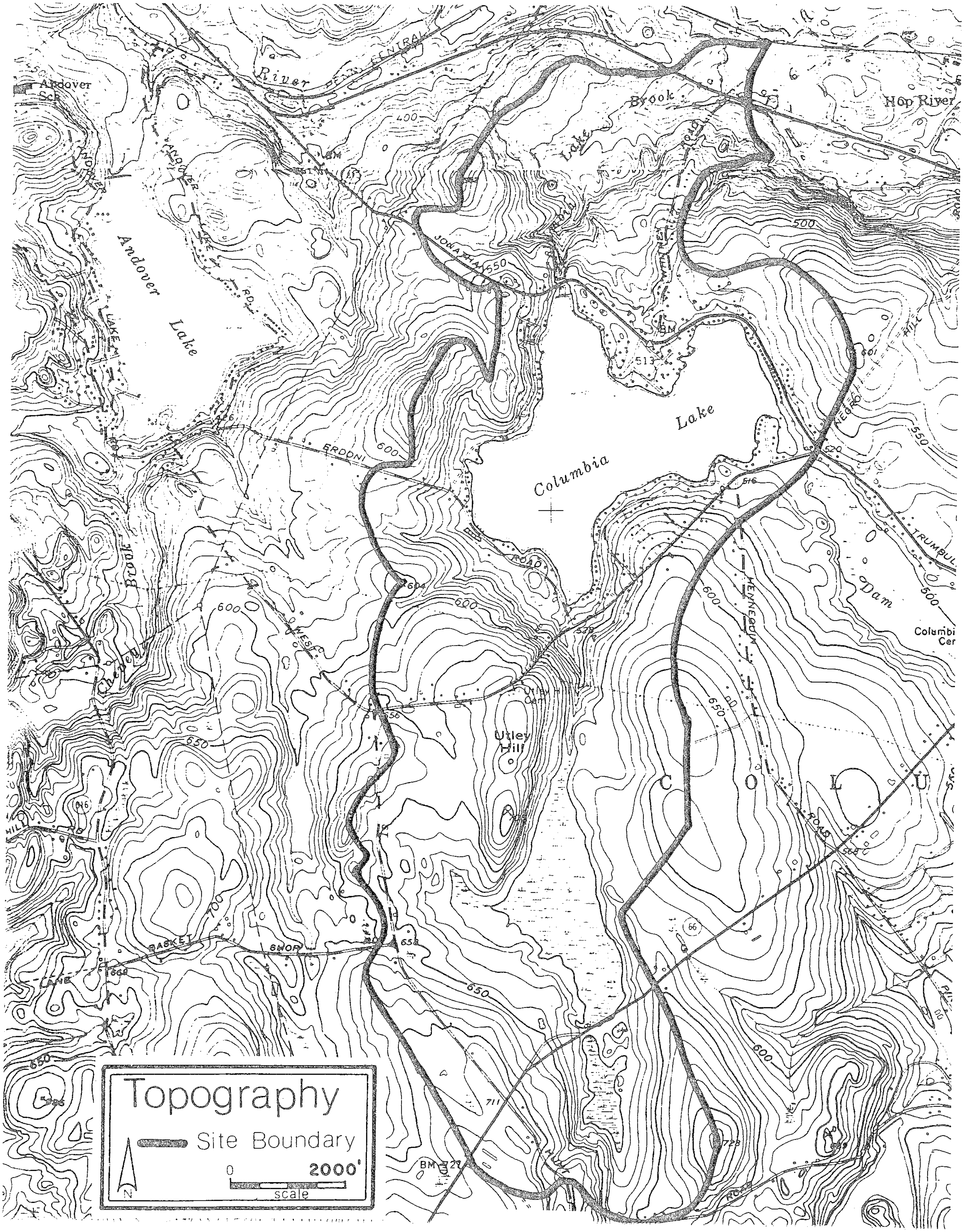
The ERT that field checked the site consisted of the following personnel: Joe Neafsey, District Conservationist, SCS; Mike Zizka, Geologist, Department of Environmental Protection (DEP); Rob Rocks, Forester, DEP; Don Capellaro, Sanitarian, State Department of Health; Les Barber, Regional Planner, Windham Regional Planning Agency, Nancy Parent, Lake Ecologist, DEP; Doug Cooper, Wetlands Ecologist, DEP; Chuck Phillips, Fisheries Biologist, DEP; Tim Dodge, Wildlife Biologist, SCS; Andy Petracco, Recreation Specialist, DEP; and Jeanne Shelburn, ERT Coordinator, Eastern Connecticut RC&D Area.

The Team met and field-checked the site on Thursday, August 28, 1980. Reports from each Team member were sent to the ERT Coordinator for review and summarization for the final report.

This report is not meant to compete with private consultants by supplying site designs or detailed solutions to development problems. This report identifies the existing resource base and evaluates its significance to any proposed development and also suggests considerations that should be of concern to the potential developer and the Town of Columbia. The results of this Team action are oriented toward the development of a better environmental quality and the long-term economics of the land use.

The Eastern Connecticut RC&D Project Committee hopes you will find this report of value and assistance in making your decisions on this particular site.

If you require any additional information, please contact: Ms. Jeanne Shelburn, Environmental Review Team Coordinator, Eastern Connecticut RC&D Area, 139 Boswell Avenue, Norwich, Connecticut 06360, 889-2324.



Topography
Site Boundary
0
2000'
scale
N
Andover Lake
Columbia Lake
Andover Sch
Hop River
Lake Brook
River
PENN CENTRAL
Utley Hill
Utley Hill Cem
Dam
Cheney Brook
JONATHAN
ERDONI
ROAD
WEST
HENNEQUIN
TRUMBULL
BASKET SHOP
LANE
C O L U
BM 727
513
520
516
528
556
604
658
668
711
728
400
500
550
600
650
700

INTRODUCTION

Columbia Lake, located within Columbia, Connecticut, is artificial in origin and was impounded in 1865. The morphological characteristics of the Lake are as follows:

Surface Area - 277.2 acres
Maximum Depth - 26 feet
Mean Depth - 16.7 feet
Volume - 5,710,000. cubic meters
Retention Time - 467 days
Watershed Area - 3.04 square miles

A stream which enters the Lake on its south shore is the only mapped tributary. Approximately one-half of the Lake watershed drains through the wetland which gives rise to this stream. Columbia Lake Brook drains through the dam which impounds the Lake on its north shore.

Columbia Lake does not thermally stratify into three distinct layers. During the summer months, two layers are formed, a warmer epilimnion on the surface and a cooler metalimnion below it.

Public access to Columbia Lake is available to town residents at a boat launching and swimming area.

The shoreline is fairly well developed with a mixture of seasonal cottages and year round dwellings. The heaviest concentration of dwellings being along Route 87 and Lake Road between Route 87 and Erdoni Road. The major portion of the watershed area, however, is relatively undeveloped. Some of the wooded and open watershed land, particularly to the south and west of the lake (Utley Hill-West Road) is owned by and under the control of the Joshua's Tract Land Trust and other property is used for farm purposes. On the upper hillside opposite and east of the Land Trust property, the town has a recreational area.

The terrain towards the west, northwest and southwest sides of the lake rises more steeply and the contours are more irregular than in other directions. Rock outcrops and corresponding shallow underlying bedrock are also present in some immediate areas to the lake, with overall rock conditions extending and effecting areas north of the lake in particular.

The land, in part, on other portions of the watershed is characterized by having a firm or compacted underlying soil of various materials which can, at times, affect the seasonal high water table and the movement of subsurface water.

Lake water was observed to be generally clear for a surface body of water and seemed to be free of algae or weeds. Sanitary bacteriological quality, as reviewed by samples collected during the summer at various locations at the lake over a number of years (1975-79), of the water was generally good for bathing purposes. Counts, with the exception of the year 1976, were well below the upper limit (1,000 coliform colonies/100 ml.) which is considered acceptable for this purpose. The high counts obtained in 1976 may possibly have reflected surface wash runoff resulting from a period of rainfall or some other factor (it is noted the results for many bathing water samples collected during the summer season of that particular year were much higher than expected). Overall, the findings did not indicate a significant or consistent degree of sewage contamination from waste disposal facilities.

A 1977 study on the impact of urbanization on New England Lakes, conducted by the United States Department of the Interior, identified Columbia Lake as eutrophic in nature, with phosphorus concentrations in excess of those which would be expected under natural conditions. Phosphorus, which has been identified as the limiting nutrient in most Connecticut Lakes was reported responsible for promoting the dense algal growth of Aitella, Anabaena and Oscillatoria.

An empirical model prepared by the Department of Environmental Protection, relates watershed area, surface area and mean depth to trophic condition. The model predicts Columbia Lake to be meso-oligotrophic, or with moderately low concentrations of nutrients and few instances of nuisance algal blooms or dense weed growth. Sampling data (U.S. Department of Interior, 1977) shows the Lake to be eutrophic relative to concentrations of phosphorous. The actual phosphorus concentrations are in excess of those which would naturally occur. The sources of phosphorus input are likely to be: septic systems, lawn runoff and atmospheric fallout.

The Town of Columbia has lowered the water level of the lake for several consecutive winters. The purpose of these drawdowns was to protect lakeshore and dock structures from damage caused by flooding or ice. As a consequence, the growth of aquatic macrophytes has been checked by exposing them to over-winter freezing. By lowering the Lake level late in the summer when nutrient concentrations are normally at their highest, algal blooms which would generally appear at that time, are minimized.

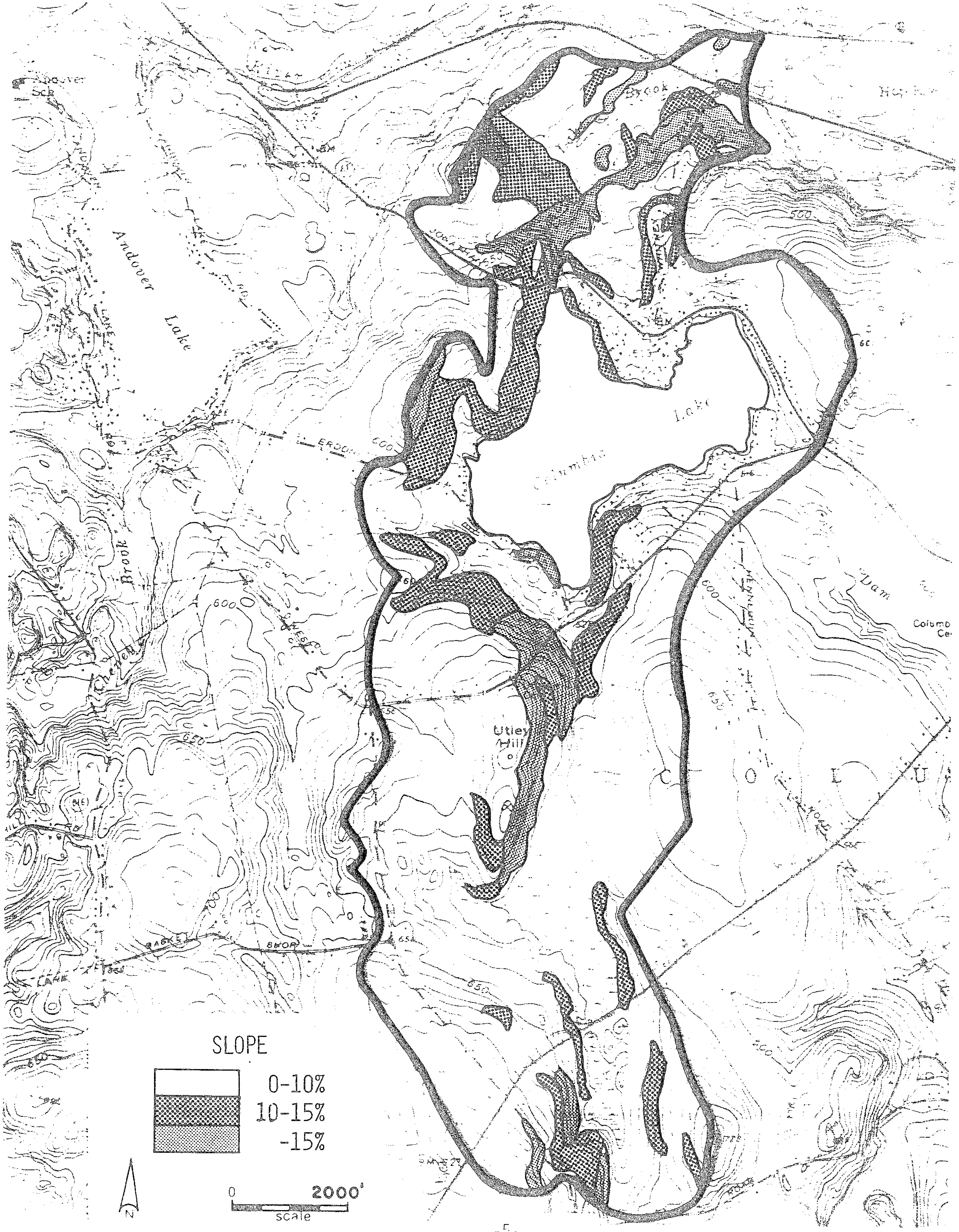
The Connecticut Agricultural Experiment Station (CAES), under contract with the DEP is currently studying Columbia Lake to determine its trophic classification. The results of this study should be available late this year.

The Environmental Protection Agency has established policies and procedures governing the granting of Federal financial assistance to the State for the protection and restoration of publicly owned freshwater lakes as authorized by Section 314 of the Clean Water Act. A publicly owned freshwater lake is defined by the EPA as one which offers public access through publicly owned contiguous lands, so that any member of the public may have equivalent opportunity to enjoy the privileges and benefits of the lake as any other member of the public. Columbia Lake is ineligible for federal financial assistance because access is available to town residents only, and not the general public.

NATURAL RESOURCE INVENTORY

GENERAL WATERSHED CONDITIONS

The watershed of Columbia Lake may be defined as that land area from which all of the natural water input to the lake is derived. A raindrop falling on



SLOPE
0-10%
10-15%
-15%
0
2000'
scale
N
Andover Lake
Columbia Lake
Brook
Utley Hill
Dam
Andover Sch
600
650
500

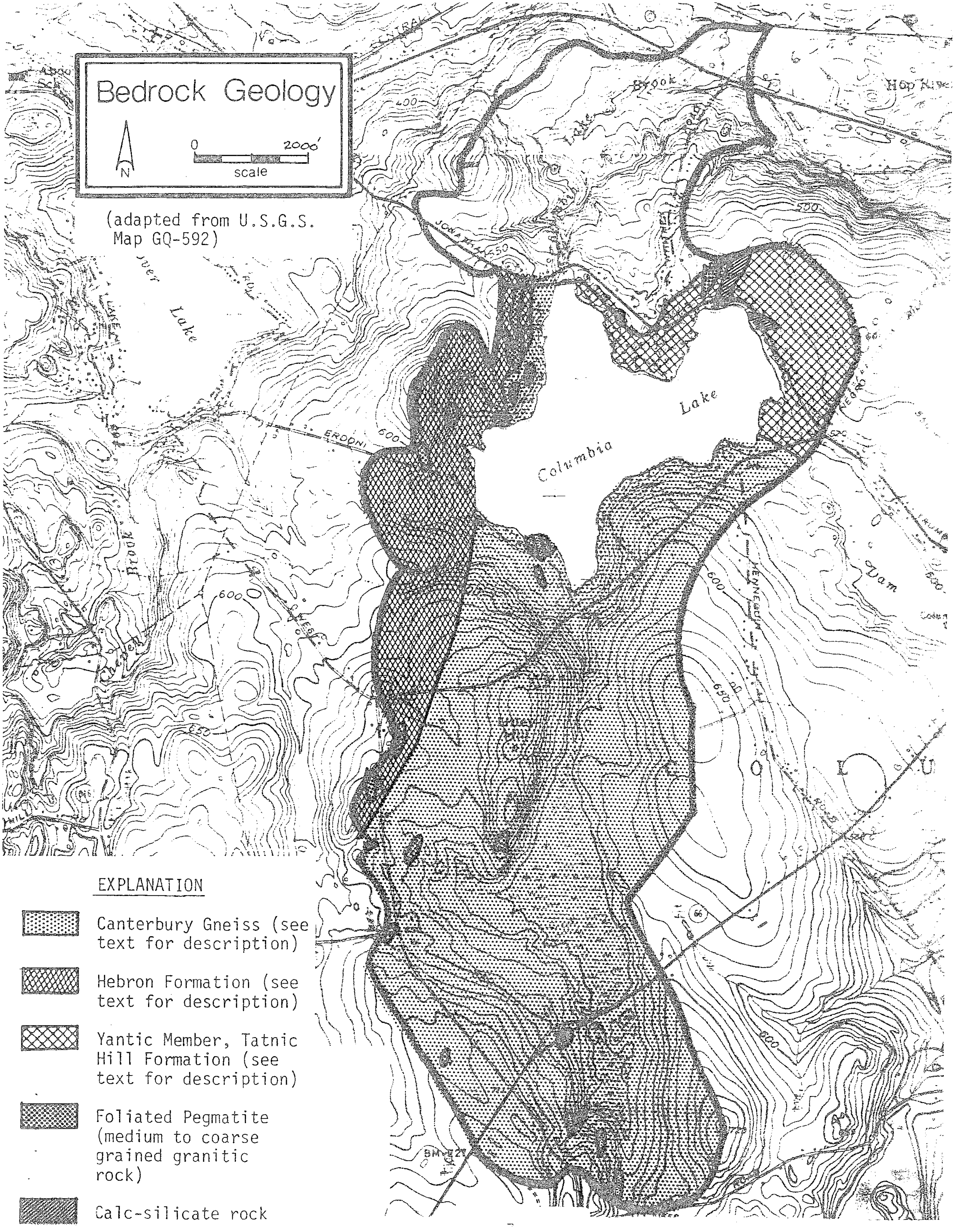
the watershed boundary would have a 50-50 chance of passing into or out of the watershed. As shown on the accompanying map, the watershed boundary tends to follow the crests of local ridges and hills. Since the contour interval of the topographic map is 10 feet and since former contour-mapping techniques did not produce total precision, the watershed boundary as shown in this report may not represent a completely accurate rendition. Small topographic elements such as bedrock outcrops may serve as local controls for water flow, causing a slight deviation of the true watershed boundary from the line shown herein. Nevertheless, most variations will be minor and the watershed as depicted in this report may be used as a reliable indicator of the general area of concern. It should be recognized, however, that any variations would be particularly important where the watershed boundary is closest to the lake, e.g. between Erdoni Road and Route 87, and between Whitney Road and Laurel Lane. Any planning for these areas should include a reasonable "buffer" strip beyond the depicted watershed boundary.

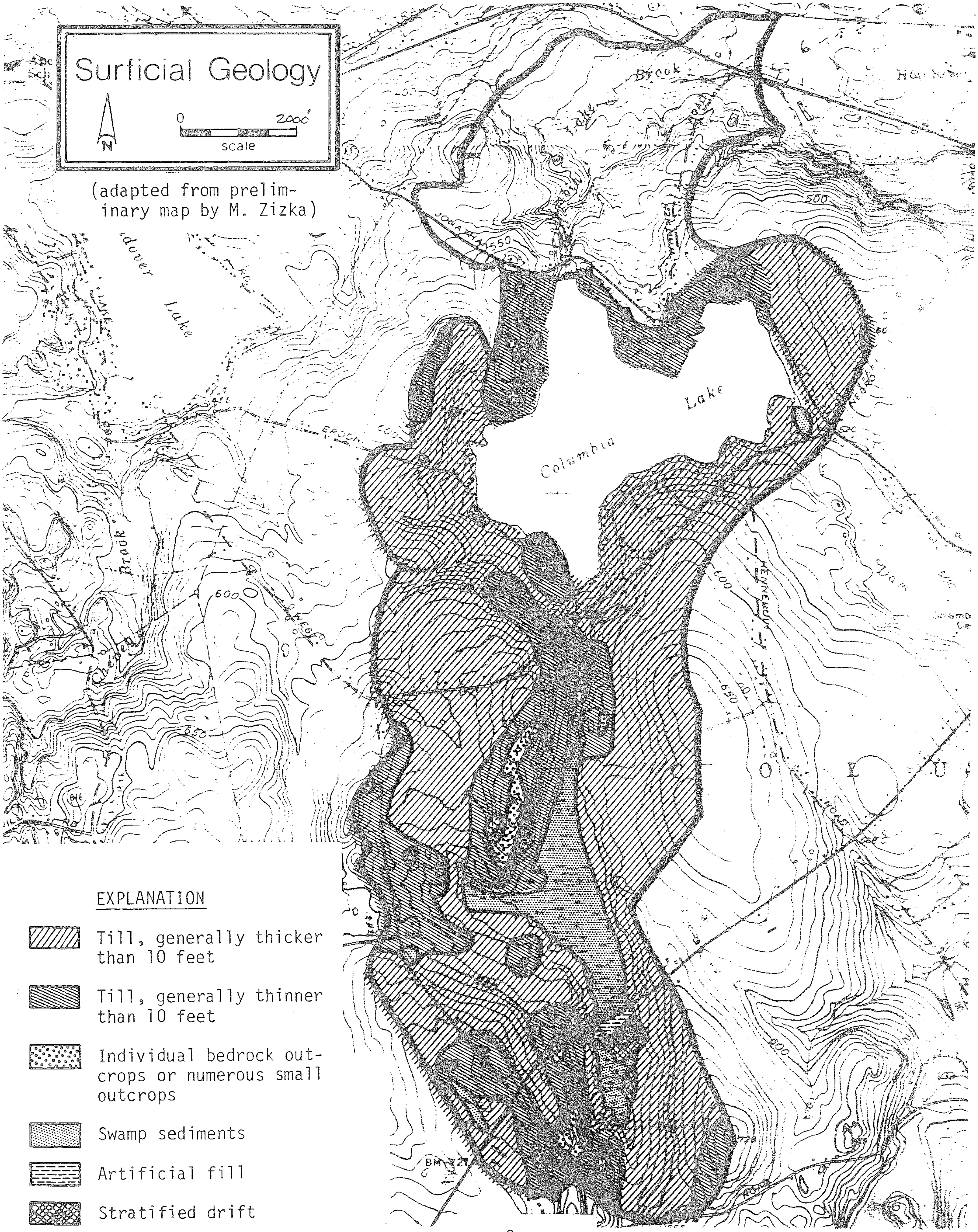
TOPOGRAPHY

The Columbia Lake watershed encompasses a relatively linear tract of land: the length of the watershed (approximately 16,000 feet) is more than three times the average width (approximately 5000 feet). The lake and its feeder swamps and stream occupy only one pronounced valley, which divides the watershed lengthwise. The valley appears to have resulted from the erosion of a belt of relatively weak rocks that intruded the more resistant rock underlying most of the watershed's hills (the latter rock type also underlies Post Hill, the highest point in the town of Columbia, just south of the watershed). The maximum elevation in the watershed is 708 feet above mean sea level at the top of Utley Hill. The minimum elevation is the same as the existing lake level (usually 498 feet). Of the hills that surround the main valley, most appear to have bedrock-controlled topography. A notable exception is the hill immediately west of Hennequin Road - this hill has a streamlined shape commonly associated with glacial activity.

GEOLOGY

The bedrock geology of the Columbia topographic quadrangle, which encompasses the entire lake watershed, was mapped by G.L. Snyder in 1959-1961. The U.S. Geological Survey published the map in 1967 (Map GQ-592). An accompanying illustration shows the bedrock geology of the watershed, as adapted from Snyder's map. In the following description of the mapped units, the terms "schist" and "gneiss" are frequently used. Both terms relate to the structural and textural aspects of the local rocks. All of the rocks in the watershed have undergone deformation one or more times during the period following their creation (more than 350 million years ago). The stresses of deformation caused the alignment of platy, flaky, and elongate minerals into thin sheets or bands. Where the alignment has resulted in a slabby rock (one that parts relatively easily along surfaces of mineral alignment), the rock is termed a "schist." Where the alignment has resulted in a banded but more massive rock, the rock is termed a "gneiss." One form may grade into another, and the actual term used may be based on individual preference.


Bedrock Geology
N
0
2000'
scale
(adapted from U.S.G.S. Map GQ-592)
Columbia Lake
Brook
Lake
EXPLANATION
Canterbury Gneiss (see text for description)
Hebron Formation (see text for description)
Yantic Member, Tatnic Hill Formation (see text for description)
Foliated Pegmatite (medium to coarse grained granitic rock)
Calc-silicate rock


Surficial Geology
N
0
2000'
scale
(adapted from preliminary map by M. Zizka)
Columbia
Lake
Brook
550
500
600
650
EXPLANATION
Till, generally thicker than 10 feet
Till, generally thinner than 10 feet
Individual bedrock outcrops or numerous small outcrops
Swamp sediments
Artificial fill
Stratified drift

The dominant bedrock type in the watershed is named Canterbury Gneiss. This unit is described as a uniform, medium-grained, gray to white gneiss composed primarily of the minerals oligoclase, orthoclase, quartz, and biotite. The western portion of the watershed is underlain by rocks of the Hebron Formation. This unit includes fine-grained, gray-black to gray-green, interlayered biotite schist, biotite-hornblende schist, calc-silicate rock (rock composed largely of calcium silicate minerals), and minor layered coarse biotite gneiss. The Hebron Formation also includes a silvery-weathering to rusty-weathering muscovite schist. Outcrops of the Hebron Formation are found in many places along the swamps and lowlands of the watershed's principal valley. The weakness of these rocks compared to the Canterbury Gneiss probably explains the existence of the valley to some extent. The northeastern section of the watershed is underlain by the Yantic Member of the Tatnic Hill Formation. This is a silvery-weathering, medium-grained, biotite-muscovite gneiss, which locally contains garnet and sillimanite, and which locally grades into a rusty-weathering muscovite-graphite schist. Scattered throughout the watershed are small inclusions of pegmatite, a very coarse-grained gray to white rock composed of oligoclase, microcline, quartz, and biotite.

Surficial geologic materials consist of those unconsolidated rock particles or other debris that overlie bedrock. The surficial geology of the Columbia quadrangle was mapped in 1975-1977 by M.A. Zizka; the map has not been published to date, but it is available for inspection at the Natural Resources Center, State Office Building, Hartford. The surficial geology of the Columbia Lake watershed adapted from the map, is shown in an accompanying illustration.

The predominant surficial geologic material is till. Till consists of rock particles and fragments that were accumulated by a moving sheet of glacier ice and later redeposited directly from the ice. The glacier acted as a giant bulldozer, churning up pre-existing soils and scraping, gouging, and breaking bedrock surfaces. Since the ice collected rock particles of all sizes and since these particles were not sorted by meltwater, till contains everything from clay to boulders and it is locally very variable in texture. Two major till varieties have been observed in eastern Connecticut: a fairly loose, coarse-grained, olive-gray to olive-brown or yellowish-brown till and a finer-grained, compact, often crudely layered, olive-brown to light olive-brown till. The coarser till is most common in surface exposures, but the compact variety may underlie it. The thickest till in the watershed is probably located on the hill just west of Hennequin Road; the thinnest till is that which mantles the eastern flank of Utley Hill.

No large deposits of stratified drift (sorted sediments deposited by glacial meltwater) are present in the watershed. A small sandy area just south of Route 66 appears to be the only noteworthy accumulation of this type of sediment. Smaller lenses of water-worked and water-sorted materials may be interspersed with the till throughout the watershed. Swamp sediments are the only other natural and significant deposits in the watershed. These sediments consist of sand, silt, clay, and a high percentage of organic material (decayed plant matter). Manmade deposits (artificial fill) are shown on the accompanying surficial geologic map where they are of significant aerial extent and thickness.

HYDROLOGY

Columbia Lake is an artificial impoundment with a surface area of 277 acres and a watershed of approximately 3.04 square miles. The lake has a maximum depth of 26 feet, an average depth of approximately 17 feet, and a maximum storage capacity of about 1,549 million gallons. The lake has one principal inlet stream, which enters the lake near the corner of Erdoni and Lake Roads. The outlet stream, Columbia Lake Brook, is tributary to Hop River. Flow in both streams is to the north.

Columbia Lake is recharged by precipitation, but the path may be direct or indirect. Rainfall onto the lake is the shortest route. Rainfall in the form of surface runoff may also pass overland to the lake or to the inlet stream. Finally, water may move into and through the ground, being discharged downslope in a spring, seep, wetland, or stream, or directly into the lake. The quality of the lake's water therefore depends upon both the initial quality of the precipitation and the route the precipitation takes to reach the lake. It is advisable to note in this regard that a natural route that water would take toward the lake may be interrupted by a man-made diversion into a home or business and back out again through an on-site waste disposal system.

Natural soils are regarded as a highly effective medium for removing contaminants from water. Soil organisms and oxygen help to destroy harmful bacteria and viruses in wastewater, while fine soil particles filter out or absorb suspended materials. The soil does not always provide complete treatment, however. In particular, dissolved chemical agents such as nitrates may not be eliminated from percolating groundwater. In addition, minerals in the bedrock and overburden may be a source of iron, manganese, calcium, and other elements. Nevertheless, runoff from developed areas and discharges of wastewater from houses or other buildings may receive a considerable cleansing in the soil. The problem is determining how much stress (in the form of polluted water) can be placed on the soils before their renovative abilities are overtaxed. The answer to this problem varies from soil to soil and from contaminant to contaminant. For instance, bacteria are more effectively removed from soils with a deep water table, while nitrates tend to be less of a problem in soils with a shallow water table.

Since most new development in the Columbia Lake watershed is likely to rely upon the use of on-site septic systems, soil conditions which best accommodate such systems are those with which the town should be most concerned. The "ideal" soil for septic-system operation would have a deep water table, a substantial depth to bedrock, and a fine sandy loam texture. Charlton, Enfield, and Gloucester soils most closely approximate the ideal. Paxton soils generally have adequate drainage, but they have a compact till layer at shallow depths. Sutton soils have an appropriate texture, but they do not drain as readily as the ideal. Woodbridge soils have both a compact till layer at depth and a shallow seasonal water table. Hollis soils have good textural characteristics, but are shallow to bedrock. Leicester, Ridgebury, and Whitman soils, as well as peat and muck soils, have water tables at or near the surface either seasonally or year-round. Hinckley and Merrimac soils have deep water tables, but are coarse-grained and very rapidly permeable.

It is difficult to make recommendations about the use of land based only upon soil characteristics. Many soil limitations can be overcome by suitable engineering practices while other limitations may have no satisfactory solutions. A shallow depth to bedrock, for instance, may be overcome by placement of artificial fill over the natural soil. The limitations of a deep peat and muck soil, on the other hand, may be effectively insoluble. Of course, even soils with limitations that can be "engineered around" should not be treated as automatically appropriate for development: in many instances, poor design of rectifying measures, or poor follow-through on a good design, may leave the soil as bad as or worse than it was initially. For example, it is easy to claim that fill placement will solve a high water table problem, but the fill must have appropriate textural characteristics and must be placed in such a way that wastewater won't just leak out at the base. The key to appropriate development of marginal soil areas is enforcement of mitigating practices.

The emphasis in the discussion above has focused on soil limitations as they relate to the use of individual septic systems. This focus was based on the awareness of waste disposal as a "necessary evil" in any residential or commercial development and the corresponding potential for major water-quality impairment if careful environmental planning is foregone. This does not imply that waste disposal may be the only serious problem, but rather that it will be a universal consideration. As such, a study by hydrogeologist T.L. Holzer of septic system usage in eastern Connecticut* may provide a useful framework for the town's planning. Holzer concentrated on nitrates produced by septic systems, as these compounds are not readily renovated in the soil and must be brought to acceptable levels in the groundwater by dilution. His analysis suggested that, in till-covered areas such as the Columbia Lake watershed, residential development should not exceed one unit per acre, at least where groundwater was to be used for drinking-water supplies. This estimate is for an "average" till soil, so it may be presumed that the densities could be somewhat greater on the better soils (e.g. Charlton) and somewhat less on the poorer soils (e.g. Woodbridge). Lake residents are fortunate that Charlton soils in the watershed are most concentrated in the lake-shore area, where the densest development to date predictably has occurred.

There are several obvious limitations to the density figure cited above, the most important of which probably is that the control used in determining the figure was groundwater quality rather than lake quality. If nitrates move relatively easily through the soil-groundwater system, they would end up in the lake and would affect its water quality. However, the lake and the major feeder swamp to the south make up almost one-quarter of the watershed, so that only about three quarters would be practically available for development. If lake quality alone were a consideration, the suggested residential density could therefore be increased by about one-third; however, the necessity for groundwater withdrawal for drinking purposes warns against such an increase. In brief, the maximum density desirable in the watershed may be a function of factors more limiting than the goal of preserving lake quality.

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* Holzer, T.L., 1975, "Limits to Growth and Septic Tanks," in Water Pollution Control in Low Density Areas: Proceedings of a Rural Environmental Engineering Conference, W.J. Jewell and R. Swan, eds., Univ. Press of New England.

Another restriction on the suggested density of one-unit per acre is that the estimate is based solely on nitrates. Many other possible contaminants, particularly phosphates, must also be considered. Nevertheless, the sporadic occurrence of other sources of contamination and the fact of soil action on other types of pollutants makes the calculation of suggested densities less realistic for these sources. Phosphate use, for example, may vary widely from residence to residence. In addition, different types of soils may have different capacities for absorbing and retaining phosphates. These capacities may, in turn, depend upon the age of the residence and the previous discharges that have passed through the soil.

In summary, it seems reasonable to offer Holzer's estimation of a maximum density of one residential unit per acre as a starting point in the preservation of the lake. However, because of the difficulty of making a similar estimation in relation to factors other than nitrates, it can only be suggested that watershed residents be made aware of the many possible sources of potential pollution and that they employ mitigating measures to the greatest extent feasible to reduce this potential.

SOILS

A detailed soils map of this site is included in the Appendix to this report, accompanied by a chart which indicates soil limitations for various urban uses. As the soil map is an enlargement from the original 1,320'/inch scale to 2,000'/inch, the soil boundary lines should not be viewed as absolute boundaries, but as guidelines to the distribution of soil types of the site. The soil limitation chart indicates the probable limitations for each of the soils for on-site sewage disposal, buildings with basement, streets and parking, landscaping, camp sites, picnic areas, playgrounds and trails and paths. However, limitations, even though severe, do not preclude the use of the land for development. If economics permit large expenditures for land development and the intended objective is consistent with the objectives of local and regional development, many soils and sites with difficult problems can be used. The soils map, within the publication Soil Survey: Tolland County, Connecticut, can aid in the identification and interpretations of soils and their uses on this site. Know Your Land: Natural Soil Groups for Connecticut can also give insight to the development potentials of the soils and their relationship to the surficial geology of the site.

Soils typical of this watershed have been broken down into four major groups. These groups are the Peat and Muck wetlands, the Leicester, Ridgebury and Whitman wetlands which occupy drainageways, the seasonally wet soils - Sutton and Woodbridge in transitional areas and the Hollis, Paxton and Charlton soils which occupy the well drained uplands. Descriptions of these major soil types follow.

Adrian-Palms muck. This nearly level, very poorly drained, organic soil is in low depressions of outwash terraces and glacial till plains. The areas of this soil are mainly round or irregular in shape and mostly range from 3 to 80 acres. Slopes are 0 to 2 percent but are dominantly less than 1 percent.

Typically, this soil has an organic layer 24 inches thick. The upper eight inches of the organic layer is very dark brown muck, the next twelve inches is black muck, and the lower four inches is very dark grayish brown muck. The substratum is dark gray gravelly sand to a depth of sixty inches or more.

Included with this soil in mapping are small, intermingled areas of very poorly drained Carlisle, Saco, Whitman, and Scarboro soils. Included areas make up 5 to 20 percent of this map unit.

The permeability of this soil is rapid. The soil has moderate to high available water capacity. Runoff is very slow or ponded. This soil remains wet most of the year and is ponded for several weeks from fall through spring and after heavy rains in summer. Unlimed areas are very strongly acid to neutral in the organic layers.

This soil has poor potential for community development. The major limitations are the high water table that is at or near the surface most of the year, frequent flooding or ponding, and the very low strength and poor stability of the organic layers. If fill is placed on top of the organic layers, it will settle. If the soil is drained, the organic material subsides and shrinks and the surface of the soil is lowered. Excavations are unstable. Onsite septic systems are not feasible on this soil.

Leicester, Ridgebury, and Whitman extremely stony fine sandy loams. This unit consists of nearly level to gently sloping, poorly drained and very poorly drained soils in drainageways and depressions of glacial till uplands. Areas are long and narrow or irregular in shape and range from 3 to 200 acres. Slopes range from 0 to 5 percent and are mostly 50 to 300 feet long. This unit has more than 3 percent of the surface covered with stones and bounders. The total acreage of this unit is about 40 percent Leicester soils, 25 percent Ridgebury soils, 15 percent Whitman soils and 20 percent other soils. The soils of this unit were mapped together because they react similarly to most uses and to management. Some areas of this unit contain only one of the major soils, and some areas contain two or three.

Typically, the surface layer of the Leicester soils is very dark brown fine sandy loam 7 inches thick. The subsoil is grayish brown and brown, mottled fine sandy loam 26 inches thick. The substratum is 9 inches of brown, mottled fine sandy loam over yellowish brown, mottled gravelly sandy loam to a depth of 60 inches or more.

Typically, the surface layer of the Ridgebury soils is very dark gray fine sandy loam 7 inches thick. The subsoil is 17 inches thick. The upper 8 inches is grayish brown, mottled fine sandy loam, and the lower 9 inches is grayish brown and brown, mottled sandy loam. The substratum is brown, mottled, firm fine sandy loam to a depth of 60 inches or more.

Typically, the surface layer of the Whitman soils is black fine sandy loam 5 inches thick. The subsoil is dark gray, grayish brown, and light brownish gray, mottled fine sandy loam 17 inches thick. The substratum is light brownish gray, mottled, firm fine sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are areas that are made up of as much as 5 acres of moderately well drained Woodbridge soils, poorly drained Walpole soils, and very poorly drained Adrian soils. Also included are a few small areas of soils that have slopes of as much as 10 percent.

The permeability of the Leicester soils is moderate or moderately rapid. Available water capacity is moderate. Runoff is slow. Unlimed areas of the Leicester soils are very strongly acid or strongly acid above a depth of 40 inches and very strongly to medium acid below 40 inches.

The permeability of the Ridgebury soils is moderate or moderately rapid in the surface layer and subsoil and slow or very slow in the substratum. Available water capacity is moderate. Runoff is slow. Unlimed areas of the Ridgebury soils are very strongly acid to medium acid.

The permeability of the Whitman soils is moderate or moderately rapid in the surface layer and subsoil and slow or very slow in the substratum. Available water capacity is moderate. Runoff is very slow or ponded. Unlimed areas of the Whitman soils are very strongly acid to slightly acid.

The soils of this unit are poorly suited to cultivated crops. Stoniness and wetness are the major limitations. Farming is not practical on these soils.

These soils have poor potential for community development. Wetness, stoniness, and the slow to very slow permeability of the substratum in the Ridgebury and Whitman soils are major limitations. These soils are not suited to community development unless they are extensively filled. Where practical, artificial drains help prevent unstable footings and wet basements. If the soils are cleared, removing stones and boulders is often difficult. In places, onsite septic systems are not feasible; in other places, they require very careful design and installation.

Charlton-Hollis very stony fine sandy loams, 3 to 15 percent slopes. This complex consists of gently sloping and sloping, well drained and somewhat excessively drained soils on ridges where the relief is affected by the underlying bedrock and on upland glacial till plains. These soils formed in glacial till derived from gneiss, schist, and granite. Areas are oblong or irregular in shape and range from 5 to 250 acres. Slopes are smooth or complex and mostly 100 to 300 feet long. Stones and boulders cover 0.1 to 3 percent of the surface. This complex is about 50 percent Charlton soils, 30 percent Hollis soils, and 20 percent other soils and bedrock outcrops. The soils of this complex are in such an intricate pattern that it was not practical to map them separately.

Typically, the surface layer of the Charlton soils is dark brown fine sandy loam 2 inches thick. The subsoil is 34 inches thick. The upper 30 inches is dark yellowish brown, yellowish brown, and light olive brown fine sandy loam. The lower 4 inches is light yellowish brown gravelly sandy loam. The substratum is brown fine sandy loam to a depth of 60 inches or more.

Typically, the surface layer of the Hollis soils is very dark grayish brown fine sandy loam 3 inches thick. The subsoil is yellowish brown fine sandy loam 11 inches thick. Hard, unweathered schist bedrock is at a depth of 14 inches.

Included with this complex in mapping are small, intermingled areas of well drained Canton, Montauk, and Paxton soils; moderately well drained Woodbridge soils; poorly drained Leicester and Ridgebury soils; and very poorly drained Adrian and Whitman soils. Also included are bedrock outcrops and a few ares where the stones and boulders have been cleared from the surface.

The permeability of the Charlton soils is moderate or moderately rapid. Available water capacity is moderate. Runoff is medium to rapid. Unlimed areas of the Charlton soils are very strongly acid to medium acid.

The permeability of the Hollis soils is moderate or moderately rapid above the bedrock. Available water capacity is low. Runoff is medium to rapid. Unlimed areas of the Hollis soils are very strongly acid to medium acid.

This complex is poorly suited to cultivated crops. It is limited mainly by stoniness, bedrock outcrops, and the shallow depth to bedrock in many places. The complex is suited to orchards and pasture. It has a moderate to severe erosion hazard, and minimum tillage and maintaining permanent vegetative cover help to control erosion.

This complex has fair potential for community development. The shallow depth to bedrock in the Hollis soils and the bedrock outcrops make excavation difficult. Onsite septic systems require very careful design and installation, and an area of more than 2 acres is sometimes needed as a suitable site for an onsite septic system. In a few areas, bedrock outcrops have esthetic value for homesites.

Hollis-Charlton extremely stony fine sandy loams, 15 to 40 percent slopes. This complex consists of moderately steep to very steep, somewhat excessively drained and well drained soils on ridges where the relief is affected by the underlying bedrock on upland glacial till plains. These soils formed in glacial till derived mostly from granite, gneiss, and schist. Areas of this complex are irregular in shape and range from 5 to 250 acres. Slopes are smooth or complex and are mostly 100 to 800 feet long. The areas have a rough surface with bedrock outcrops; narrow, intermittent drainageways; and small, wet depressions. In most areas 3 to 5 percent of the surface is covered with stones and boulders. The total acreage of this complex is about 40 percent Hollis soils, 35 percent Charlton soils and 25 percent other soils and bedrock outcrops. The soils of this complex are in such an intricate pattern that it was not practical to map them separately.

Typically, the surface layer of the Hollis soils is very dark grayish brown fine sandy loam 3 inches thick. The subsoil is friable, yellowish brown fine sandy loam 11 inches thick. Hard, unweathered schist bedrock is at a depth of 14 inches.

Typically, the surface layer of the Charlton soils is dark brown fine sandy loam 2 inches thick. The subsoil is 34 inches thick. The upper 30 inches is dark yellowish brown, and light olive brown fine sandy loam. The lower 4 inches is light yellowish brown gravelly sandy loam. The substratum is friable, brown fine sandy loam to a depth of 60 inches or more.

Included with this complex in mapping are small, intermingled areas of well drained Canton, Montauk, and Paxton soils and moderately well drained Woodbridge soils. Also included are bedrock outcrops, areas of soils with slopes of less than 15 percent, and a few nonstony areas.

The permeability of the Hollis soils is moderate or moderately rapid above the bedrock. Available water capacity is low. Runoff is rapid. Unlimed areas of the Hollis soils are very strongly acid to medium acid.

The permeability of the Charlton soils is moderate or moderately rapid. Unlimed areas of the Charlton soils are very strongly acid to medium acid.

This complex has poor potential for community development. The soils are limited mainly by the steep slopes, shallowness to bedrock, rock outcrops, and stoniness. Excavation is difficult because of the shallow depth to bedrock in many places. Onsite septic systems require very careful and often special design and installation. Many areas of this complex provide a scenic and picturesque setting for homes. The rock outcrops, stones, and boulders have esthetic value and are sometimes left undisturbed. During construction, quickly establishing plant siltation basins are suitable management practices.

Paxton and Montauk fine sandy loams 3 to 8 percent slopes. These gently sloping, well drained soils are on drumlins and till plains of glaciated uplands. Areas are oblong or irregular in shape and range from 3 to 85 acres. Slopes are smooth and convex and are mostly 100 to 300 feet long. Areas of this unit consist of either Paxton soils or Montauk soils or both. The soils were mapped together because there is no significant difference that affects their use and management. The mapped acreage of this unit is about 40 percent Paxton soils, 40 percent Montauk soils, and 20 percent other soils.

Typically, the surface layer of the Paxton soils is very dark grayish brown fine sandy loam 10 inches thick. The subsoil is brownish yellow and yellowish brown sandy loam 22 inches thick. The substratum is dark grayish brown, firm, gravelly fine sandy loam to a depth of 60 inches or more.

Typically, the surface layer of the Montauk soils is dark brown fine sandy loam 7 inches thick. The subsoil is 23 inches thick. The upper 13 inches is dark yellowish brown fine sandy loam. The lower 10 inches is dark yellowish brown and yellowish brown sandy loam. The substratum is dark yellowish brown, firm sandy loam to a depth of 60 inches or more.

Included with these soils in mapping are small, intermingled areas of well drained Canton and Charlton soils, moderately well drained Woodbridge soils, and poorly drained Leicester and Ridgebury soils.

The permeability of the Paxton soils is moderate in the surface layer and subsoil and slow or very slow in the substratum. Available water capacity is moderate. Runoff is medium. Unlimed areas of the Paxton soils are strongly acid to slightly acid.

The permeability of the Montauk soils is moderate in the surface layer and subsoil and slow in the substratum. Available water capacity is moderate. Runoff is medium. Unlimed areas of the Montauk soils are extremely acid to medium acid.

These soils are well suited to cultivated crops. The soils warm up slowly in the spring. The erosion hazard is moderate. Minimum tillage, use of cover crops, and stripcropping are suitable management practices on these soils.

These soils have fair potential for community development. They are mainly limited by the slowly permeable or very slowly permeable substratum. Onsite septic systems require careful design and installation. Steep slopes of excavations slump when saturated. Artificial drains help prevent wet basements. Lawns are often wet and soft in autumn and spring. Quickly establishing plant cover, providing temporary diversions, and establishing siltation basins are suitable management practices during construction.

FISH RESOURCES

Columbia Lake, located in Tolland County, Connecticut, was surveyed during the week of September 1st, 1980, for relative fish populations and water chemistry. Trap nets and gill nets were set to sample the fish populations. Oxygen and conductivity meters were utilized to determine the water chemistry.

Several warm-water fish species were common in this lake. A cross-section of the Columbia Lake fish populations, in order of relative abundance, is as follows: yellow perch, red bellied sunfish, calico bass, brown bullhead, chain pickerel, small mouth bass, pumpkinseed and large mouth bass. Surprisingly, the red breasted sunfish was found to be the most abundant sunfish species. Ordinarily, these fish are out-competed by bluegill and pumpkinseed sunfish.

The waters of Columbia Lake were found to be very clear, with a transparency to a depth of approximately twelve feet. The only obvious vegetation present were the submergent weeds, elodea and nitella, neither weed was found in great abundance. The scarcity of pond vegetation appears due chiefly to the sterility of the substrate, which consists mainly of broken ledge, boulders, rubble, sand and gravel. The chemical features of the lake were found to be consistent with other reports (see table). The results of this chemical survey suggest that the lake is best suited to warm-water fish such as those found to be common in this survey.

Based on this limited evidence, it does not appear that Columbia Lake is at the edge of the eutrophic lake category. The obvious signs of eutrophication, low visibility and aquatic vegetation proliferation, are not present at this time. The Connecticut Agricultural Experiment Station is preparing a report on the lake for DEP Water Compliance which should shed further light on the issue of the lake's rate of eutrophication.

WATER CHEMISTRY - COLUMBIA LAKE

Depth (ft.)	Temp. (°F)*	pH	Conductivity (UMHOS at C 18)	Dissolved Oxygen+
Surface	76/76	7.0	60	6.8/6.6/6.8
2	76			
4	76			
6	76			
8	76			
10	76/74			
12	76	7.2		6.8/ /
14	76			
16	76/74			/5.4/5.2
18	73/68		53	/1.4/0.4
20	71			
22	68	6.8		0.0/ /

Transparency - 12 feet

* Temperature data drawn from CT Fish and Game Survey 1969 and CT DEP Survey 1980.

+ Dissolved oxygen data drawn from CT F&G (1969), CT DEP (1980) and CT Ag. Exp. Sta (1980).

WILDLIFE

Wildlife habitat within the Columbia Lake Watershed can be fit into two categories.

An urban type habitat is provided around the lake where residential development is most dense. Backyard feeding stations for songbirds, landscape plantings with values to songbirds and small mammals and open lawn areas are common. Seasonal songbirds, racoons, skunks, squirrels, chipmunk, and cottontail rabbits are common to this environment.

Waterfowl may, at times, use the lake for courtship, loafing and other activities, however, the lack of emergent vegetation, shallow water areas and other wetland plants limit its value to ducks and geese.

The second category of habitat is that provided by the surrounding watershed lands. This area consists of open fields, woodland, wetlands and the stream corridor. This habitat has less disturbance by people and domestic pets. Its trees and shrubs of varying age and size provide food and cover to the wildlife within the watershed.

The large wetland area at the southern end of the watershed while not unique, is significant to wildlife in the watershed and protects and provides water to the lake. Woodcock, white tailed deer, ruffed grouse and other animals less tolerant to disturbance typically use these areas for all or part of their daily and seasonal needs.

Any watershed management plan should place a high priority on preserving the wildlife habitat values of food and cover these fields, wetlands and wooded areas provide.

Any development proposed in the watershed should be carefully evaluated for its impacts on the wetland - stream system from sediment, nutrients, storm water runoff and maintenance of groundwater levels and stream flow as well as wildlife habitat.

VEGETATION

The Columbia Lake Watershed lies within the Southeastern Hills eco-region.* It is a near-coastal upland, lying within 30 miles of eastern Long Island Sound, characterized by low, rolling hills, moderately broad and level upland and valley bottoms, and, locally, by steep and rugged topography.

Elevations average 150-500 feet, reaching a maximum of almost 800 feet. The maximum topographic relief and elevation are along a broad north-trending ridgeland near the western border of the region. There is also considerable topographic relief along the Connecticut and Thames river valleys.

On well-drained soils the major forest vegetation is Central Hardwoods-Hemlock, characterized by White, Red, and Black Oaks (Quercus alba, Q. rubra, and Q. velutina), Hickories (Carya ovata, C. cordiformis, C. tomentosa, and C. glabra/ovalis complex), Tulip or Yellow Poplar (Liriodendron tulipifera), Black Birch

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* Dowhan, Joseph J. and Robert J. Craig. "Rare and Endangered Species of Connecticut and Their Habitats," Geological and Natural History Survey, Bulletin No. 6.

(Betula lenta), White Ash (Fraxinus americana), and Hemlock (Tsuga canadensis). White Pine (Pinus strobus), generally absent from mesic sites and old-field developmental stages, is abundant and dominant on many of the extensive sandy soils of the eastern part of the region. Here, too, Scarlet Oak (Quercus coccinea), Chestnut Oak (Q. prinus), and Pitch Pine (Pinus rigida) are locally abundant. Old-field vegetation development is dominated by Red Cedar (Juniperus virginiana). Several Coastal Plain plant species occur on the sandier soils of this region, including a number of rare Panic grasses (Panicum spp.). Atlantic White Cedar (Chamaecyparis thyoides) swamps are frequent throughout the eastern half of the region. Significant biologic habitats include old-growth forests, sand plains, and cedar swamps. There is a pronounced coastal influence on the flora. Rare plants characteristically occurring here include Swamp Cottonwood (Populus heterophylla), Allegheny Plum (Prunus alleghaniensis), Showy Aster (Aster spectabilis), Bur-Marigold (Bidens heterodoxa vars.), Small's Yellow-eyed Grass (Xyris smalliana), White Milkweed (Asclepias variegata), and Rhododendron (Rhododendron maximum).

WETLAND RESOURCES

The upper watershed has four distinct soilscapes: 1) the Peat and Muck wetlands, 2) the Leicester and Ridgebury soils of the drainageways, 3) the Sutton and Woodbridge soils transitional to these drainageways, and 4) the Hollis, Paxton and Charlton, upland till soils which are generally steeply sloped in this case.

A significant portion (1/2 - 1/3) of this upper watershed drains into and through the peat and muck wetlands. These wetlands exert a great deal of influence upon the lake, its water supply, and water quality. The upper watershed is generally in excellent condition with few (if any) significant erosion sites, pollution sources, or densely developed areas. The wetlands of the upper watershed provide the following important functions for maintenance of the lake environment.

1. Sediment removal.
2. Nutrient uptake during critical months when these nutrients could cause or exacerbate algae blooms in the lake.
3. Storm flow detention and maintenance of stream flow during low flow periods thereby moderating runoff episodes and providing a source of water during dry periods of the year.
4. Wildlife and aquatic organism habitat.

MANAGEMENT TECHNIQUES

WASTE MANAGEMENT

As the town of Columbia does not have a public sewerage system nor is one anticipated in the foreseeable future, waste disposal occurs by on-site means. In the case of many of the existing older homes or cottages built on small lake lots, sewage disposal systems are most likely to be marginal and not consistent with present day code requirements and established design and installation practices. In some cases, lot sizes and topography would not permit fully acceptable systems. Systems should provide for long term use giving a high degree of treatment to the septic effluent in order to protect ground and surface waters. Special consideration and measures need to be taken for those areas having surface or shallow ledge rock, high ground water levels, impervious soils and excessively steep slopes.

Certain situations or areas, due to the degree of limitations, may not warrant the use of conventional on-site subsurface sewage disposal systems. If an existing system fails on a particularly unsuitable and/or very small lot, some alternative type or method of sewage disposal may be feasible, reliable and practical from the standpoint of abating a health and pollution problem. In terms of possible conversion of a dwelling from seasonal to year-round occupancy, it should be first ascertained the sewage disposal system conforms with the existing State Health Code regulations or there is suitable and available land area to install a full size system which would meet the Code. Land use decision and lot size for possible new subdivisions or undeveloped land should reflect: Severe adverse soil and topographic conditions, possible elimination of or the need for larger wetland lots, watercourses and possibility of stream belts, public, central or private type of water supply facilities. It is understood that at the present time zoning requires minimum size lots of one acre. While lots of this size are generally satisfactory as to the density for both on-site sewage disposal and water supply, larger lots may be viable and necessary in order to secure proper sewage disposal systems, adequate and safe water supplies and due protection and prevention of degradation to water courses and surface bodies of water.

During October (1980), the Team sanitarian, at the request of the town sanitation official, made a visual sanitary survey of the perimeter of the lake. At this time, the water level had been drawn down a number of feet allowing an expanse of some 25-50 feet of land around the lake exposed which is normally covered with water. Although an assortment of various pipes (clay, orangeburg, metal) were apparent at different points along the edge of the shoreline, no visual signs of sewage discharge, overflow or active seepage could be determined. It is realized, however, that at that time of the year many of the cottages were not occupied and that water conditions, both surface and ground water levels, were below normal. The latter factor, perhaps allowing for satisfactory operation for some of the sewage systems still in use. This in general shows the need for a comprehensive sampling and dye testing program for possible detection of sewage violators.

At the time it was noted the lake was supporting a large population of geese that, no doubt, were contributing fecal enrichment.

SEDIMENT AND EROSION CONTROLS

Rich and Pallotti (1977) used the Dillon-Rigler Model to predict total phosphorus loading of Columbia Lake. Results of this study suggested that runoff at atmospheric fallout from lakefront property and stormdrains, septic tank seepage, and runoff of fertilizers used on lawns and gardens account for ±35% of phosphorus input to the lake. These sources are to a certain extent controllable. The undeveloped watershed above the lake and direct atmospheric input are responsible for the remaining input of phosphorus. These sources, which originate from a relatively undisturbed forest ecosystem, are not controllable.

To minimize input of phosphorus from the developed areas adjacent to the lake, several activities could be considered.

1. A replacement program for catch basins or retrofitting to provide sediment traps or sumps. A monitoring/maintenance plan should be developed to ensure the systems are kept clean.

2. Application of lawn and garden fertilizers should be applied at rates recommended by a soil test. An education program could accomplish this.

3. Critical area treatment: Eroding banks, driveways and lakeshore can be identified and stabilized.

4. Street sweeping/leaf pickup program. (Fallen leaves can contribute phosphorus to runoff water if left piled on roadsides for long periods of time awaiting pickup.) Encourage composting or bagging leaves to avoid this problem.

5. Develop program to ensure adequate functioning of septic systems.

Rich and Pallotti (1977) have estimated the phosphorus output by the Columbia Lake watershed to be 42 kg P $\cdot$ km^{-2} $\cdot$ yr^{-1}, a rate considered low compared with other disturbed forest ecosystems.

The large wetland area and surrounding buffer strip of forestland are probably factors responsible for the low loss of phosphorus from the watershed. Maintaining the integrity of the wetland and buffer strip of forest along the stream can easily be accomplished as land uses in this area are presently committed to undeveloped uses (i.e., Joshua's Tract).

Land use in the remainder of the upper watershed is probably not as critical to maintaining the trophic status of Columbia Lake, as the wetland area will serve as a natural filter for both surface and subsurface water.

WETLAND MANAGEMENT

The wetlands and watercourses in the upper watershed are vital to the maintenance of water supply and quality for Columbia Lake. To insure that these areas continue to function in this respect, all reasonable measures should be implemented to keep this watershed area in good health.

Due to the marginal nature of the upper watershed for development (both wetland and upland soils), the Team would recommend the following management practices to insure lake water quality:

A. The town Planning and Zoning Commission should consider re-zoning the upper watershed from the current one (1) acre zone to one more compatible with the soil conditions (i.e., a soil based zoning approach) to require larger minimum lot sizes.

B. The Planning & Zoning Commission should give careful attention to the affects of any proposed development within the watershed (especially for runoff attenuation and sediment and erosion control).

C. The town may investigate requiring buffers or conservation easements between any new development in the watershed and the sensitive wetland soil or watercourse areas.

D. The town may wish to investigate an active land acquisition program in the watershed.

E. The Connecticut Department of Environmental Protection (DEP) Inland Wetland Program (IWP) has jurisdiction over inland wetland activities in Columbia. The Planning & Zoning Commission, Lake Management Committee or other interested citizens can take a more active role in permit procedures of this Unit of DEP (as a result of this Environmental Review, the Columbia Lake Management Committee has been added to the DEP Inland Wetland Program mailing list for public notices of activities in Columbia).

F. The town of Columbia may wish to explore establishing a local Inland Wetland Agency to insure responsive and timely processing of proposals in the watershed area. DEP assistance is available to assist towns in establishing a local wetland agency as well as provide technical assistance after adoption of such an agency.

FOREST MANAGEMENT

The Forestry Unit of the Department of Environmental Protection encourages all woodland owners to manage their forest lands. When properly prescribed and executed, forest management practices will increase the production of forest products, improve wildlife habitat and enhance the overall condition of the woodland with minimum negative environmental impact. A public service forester from the Department of Environmental Protection may be contacted at (tel. 295-9523) to provide basic advice and technical assistance in woodland management. Services of a more intensive nature are available from private consulting foresters.

Healthy woodlands provide a protective influence on water quality: they stabilize soils, reduce the impact of precipitation and runoff, and moderate the effects of adverse weather conditions. By so doing, woodlands help to reduce erosion, sedimentation, siltation and flooding. Research has shown that soil protected by the cover of litter and humus associated with woodland areas contributes little or no sediment to streams.

Silvicultural practices, the cultivation and harvesting of timber for commercial purposes, may be capable of lowering water quality in at least five different ways: 1) erosion, siltation and sedimentation caused by improperly located and improperly constructed access roads, skid trails, yarding areas and stream crossings. 2) Siltation and sedimentation caused by logging debris left in streams, interfering with natural flows. 3) Thermal pollution resulting from complete or partial harvesting of stream bank vegetation, eliminating shade. 4) Chemical pollution caused by improper application of herbicides and insecticides. 5) Influx of nutrients caused by the application of fertilizer, soil conditioners and wetting agents (used in forest fire control).

Research has determined that nutrient loss from normal silvicultural practices does not, for the most part, result in signficant deterioration of water quality.

In Connecticut, the widespread use of chemicals in forest management is not prevalent and, therefore, does not constitute a great threat to water quality at this time.

The harvesting of trees is, however, a major tool used in forest land management. The actual cutting of trees causes no erosion or sedimentation and, therefore, no degradation of water quality. The soil disturbances associated with the transportation of the felled trees (e.g. access roads, skid trails, yarding areas and stream crossings) does, however, have the potential to degrade water quality by stimulating erosion and sedimentation. These impacts can be lessened by proper planning, placement, construction and maintenance of access roads, skid trails, yarding areas and stream crossings.

A series of Best Management Practices (BMP's), which are recommendations designed to minimize the negative impact of silvicultural activities on water quality, has been compiled by the State Forester. A pamphlet entitled "Logging and Water Quality in Connecticut: A Practical Guide for Harvesting Forest Products and Protecting Water Quality" will be published and made available through the Department of Environmental Protection's Forestry Unit. The implementation of these BMP's will most likely be of a voluntary nature, through an accelerated education program and perhaps an incentive program.

A "BMP" as defined in the above mentioned pamphlet is "a practical, economical and effective management or control practice which will reduce or prevent the generation of pollution."

Examples of recommended BMP's for preventing or reducing degradation of water quality resulting from silvicultural activities include:

Phase I. Planning the Job.

a. Locate all streams, wetlands and poorly drained soils (sensitive areas) on USGS topographic maps and/or county soils maps.

b. Plan preliminary locations of access roads, skid roads and yarding areas to avoid the sensitive areas. Locate potential stream crossings.

c. Plan for the best time of year to implement individual silvicultural activities. Sensitive areas that cannot be avoided should be planned for winter when the ground is frozen and more stable.

d. Plan Stream Management Zones which are aimed at protecting stream beds and stream banks.

Phase II. Implementing the Job.

a. Locate logging roads and skid trails so that slopes which exceed 10% are avoided except for short distances.

b. Locate yarding areas on well drained soils with a slight slope, avoiding drainage discharge directly into access roads or streams.

c. Locate Stream Management Zones and avoid equipment operation in these areas to the greatest extent possible.

d. Provide undisturbed buffer strips between streams and roads or yarding areas. The width of these buffer strips is generally between 30 and 100 feet but should depend on slope, soil erodability and the magnitude of road or yarding area drainage discharge.

e. Avoid, when possible, equipment operation on poorly drained soils, in swales and around or in stream channels.

f. Avoid complete clearing of vegetation in the Stream Management Zone.

g. Avoid disturbing understory vegetation within 30 feet of a stream channel.

h. Avoid reducing overstory crown cover below 50% within 30 feet of stream channel.

i. Avoid felling trees in streams; if this occurs, remove debris as soon as possible.

j. Avoid stream crossings, if possible; if not, consider building temporary bridges. Crossings should be made at right angles to the stream over stable rock or gravel bottoms, and should avoid steep or unstable banks.

Phase III. Completing the Job.

a. Install erosion control measures on access roads and primary skid trails, including properly placed waterbars and reconditioned cross drains, located at intervals which take into account road length, slope and common sense.

b. Remove all temporary bridges and culverts from streams.

c. Lime and seed specific critical areas, such as steeply sloped roads or problems areas.

d. Close roads to prevent continuing access.

Following these BMP's along with the use of common sense will help to avoid water quality degradation resulting from silvicultural operations.

Further guidelines to maintain water quality on managed woodlands may be found in the pamphlet "Timber Harvesting Guidelines" by the Wood Producers' Association of Connecticut. The principles set forth in this publication are aimed at protecting the forest ecosystem from thoughtless timber harvesting practices that may lower environmental quality in both the long and short run. Copies of this pamphlet are available from the Department of Environmental Protection's Forestry Unit and members of the Wood Producers' Association of Connecticut.

PLANNING CONCERNS

The Columbia Lake basin is currently zoned to 40,000 square foot lots for single family homes only. Past development, however, resulted in small lot cottage development along the lake's edge which over the years have been converted to year-round homes. The lake's long-term health will depend in large measure on the management and control of septic tank effluent from these dense neighborhoods within 300 feet of the lake. It is the control of phosphorus input into the lake in this critical area which will most directly shape the future quality of the lake.

Nevertheless, the undeveloped nature of much of the lake's watershed helps immeasureably to reduce harmful phosphorus loading to the lake. With increased urban development, this portion of the watershed will contribute significant quantities of phosphorus unless development is kept to a minimum, and if development which does occur is carefully controlled to minimize soil erosion and sedimentation into streams tributary to the lake. Any reduction in density of development which will limit disturbance of steeply sloping land, or highly erodible soils, or construction near stream banks will improve the chances of limiting phosphorus release from disturbed, exposed soils into tributary streams and ultimately into the lake. A reduction in density to one home per two acres, coupled with flexible cluster provisions, might increase the protection of the lake from upper watershed development. Permanent open space protection of the watershed would more directly achieve that objective. Most important, perhaps, is an effective erosion and sedimentation control program which monitors all land use changes in the watershed and insists on effective erosion control measures.

The predominant land-uses within the watershed, as compiled by the Connecticut Areawide Waste Treatment Management Planning Program, their acreage and percentage of the total watershed area are as follows:

Category of land-use	Area (acres)	% of Total Watershed Area
Low density residential 2 dwell/acre	149.0	7.7
Moderate density residential 2-8 dwell/acre	63.0	3.2
Openland	218.0	11.2
Cropland	138.0	7.1
Dairy and Poultry	6.0	0.3
Wetland	235.0	12.1
Water	287.0	14.7
Woodland	850.0	43.7

The greatest density of residential development lies immediately adjacent to the lake. The major portion of the lakeshore was developed prior to 1944.

The major portion of the drainage basin lies to the south of the lake. This area is primarily undeveloped wetland and woodland. This relatively large wetland acts as a nutrient sink, tying up nutrients which would otherwise enter the Lake. The undeveloped wooded areas of the watershed act as both a nutrient and erosion barrier. Should these areas be developed, a significant increase in nutrients reaching the Lake would occur with a subsequent decline in water quality.

The Connecticut 208 study of nonpoint phosphorus sources to Columbia Lake recommended the use of nonphosphorus detergents in the lake watershed. Subsequently, the Town of Columbia requested the DEP to issue an order pursuant to Section 25-5400 of the General Statutes to ban phosphorus detergents in the watershed. Such an action would be accompanied by enforcement responsibilities and legal penalties for violations. The DEP initiated a detailed lot by lot study of septic systems in the watershed to evaluate the potential improvement in trophic conditions which could be anticipated from this action. DEP requested assistance from the town in obtaining information, but was not successful in obtaining a response.

RECREATION POTENTIAL

The recreation potential of the Columbia Lake Watershed is considerable and could meet a rather wide range of recreational needs. The area involved is large and contains much open space land, particularly along the southern half. A pattern of private ownership of open space land normally points to recreational use which is informal and extensive in nature. Trail development with trail related activities would be included in this type of use. Landowner permission to pass and repass on trails would be prerequisite to establishing or designating use of any existing trails. The landowner liability law which holds landowners blameless for injuries sustained by users who are not charged a fee to use those private lands, has opened up more land to these types of use by making private landowners more amenable to granting permission to use their lands.

Other than swimming and other water-related recreational pursuits, the demand for which seems to always exceed the ability to meet it, the need for facilities to meet active recreation demands appears to be rather low. The town population density is comparatively low and the nearby (just outside the watershed boundary) Columbia Recreation Area probably is adequate to meet the demand for active recreation facility use generated in this area. If it is possible for the town to acquire additional open space land, particularly on or near Columbia Lake, it would be prudent to do so and thereby be prepared to expeditiously meet expanded recreational demands in the future. The Columbia Recreation Area has the following facilities:

> hockey rink, volleyball area, putting green, basketball court, tennis courts, three ballfields (one with soccer nets), and picnic pavilion.

In addition, the recreation area is well situated to serve as a parking area and take-off point for trails which might be located on the relatively undeveloped southern portion of the watershed (south of West Street). The ownership patterns and desires of those landowners involved will help determine what potential exists for recreational use of the area.

The town has a public beach approximately 200' wide on Columbia Lake. A larger beach would obviously be desirable to meet the demand for swimming areas. It would, therefore, be advantageous for the town to expand the water based recreational facilities either by purchase or lease of additional land on the lake. Even if development of any additional holdings (for swimming, fishing, boat launching) is not immediately undertaken, the guarantee of maintained open space land on the lake is desirable and provides the option for future development.

The bulk of the relatively undeveloped lake front lies along the west side of Columbia Lake at Camp Asta-Wamah, a church camp. If the church ever decided to divest itself of the camp (improbable likelihood), it would be in the town's best interest to try to acquire the camp. Camp Asta-Wamah lends itself to developing a small park which could support bathing, picnicking, and camping. There are docks on the camp's waterfront which could be used to moor boats and to fish from. The camp's shoreline is south-facing which is a desirable aspect for a bathing facility.

There are a few development guidelines* which can be offered for development along watercourses. These call for no development within 100 feet of rivers and streams; that wetlands be preserved in their natural state; and that steep slopes and poor soils be used for extensive recreation only. Additionally, the removal of trees and vegetation, particularly on steep slopes, can result in soil erosion and siltation of an adjacent watercourse and is not recommended. As mentioned, waterfront open space land enhances the possibilities for recreational use and for maintaining a potable water supply.

The large and varied area within the watershed provides opportunities for: boating, camping, fishing, hunting, picnicking, swimming, also trail-related activities such as hiking and jogging; birdwatching and other nature studies, horseback riding, etc.

Winter sports such as cross-country skiing, ice skating, snowshoing and possibly sledding, tobogganing and downhill skiing (if slopes are usable). Playgrounds and ballfields--seemingly provided for adequately by the nearby Columbia Recreation Area.

The total demands on water resources for drinking, cleaning, farming, industry and recreation are ever increasing while the available supply remains static or, in some cases, even dwindles because of contamination by chemicals, etc. The wise management and use of this valuable, life-sustaining resource must be an integral part of a region's plan if it hopes to retain the opportunity for sustained and ordered growth.

The protection of water resources through proper use is both wise management and a matter of economic necessity. Establishment of realistic limits on the amount and type of development which the resource base can sustain can help preserve the available resources and make possible their continued usability. Properly directed development will not only maximize the usability of the resource but help to protect property values in the subject area. It is, therefore, in the best interest of persons living in or making use of this watershed to protect it and use it wisely.

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* Source: Report by Brown, Donald and Donald

OVERVIEW/RECOMMENDATIONS

The Team field review took place on August 28, 1980. Discussion revealed that the water quality of Columbia Lake is good for most uses. The lake is characterized as eutrophic with respect to phosphorus, but problems with rooted aquatic plants and/or algae bloom have not been experienced. A large quantity of planning information has been accumulated by the Lake Management Committee and is available for reference.

Field inspection of the watershed revealed the following:

1. The watershed contains no cultivated cropland where soil erosion is contributing sediment to watercourses.
2. Most of the open land is maintained in permanent vegetative cover and used as hay or pasture.
3. Residential development in the upper watershed is limited to small single lots where any exposed land is stabilized within a year.
4. The majority of the upper watershed is forested.
5. The major watercourse which drains into Columbia Lake originates from a large wetland area south of the lake. This wetland provides stormwater control, acts as a debris and sediment trap, and possibly as a nutrient trap.
6. The watercourse north of this wetland is protected by an undeveloped parcel of land owned by Joshua's Tract Land Trust.
7. Lakefront development is fairly dense. Road drains discharge directly into the lake. Many dwellings once used for summer homes are being or have been converted to year-round use.

The majority of non-point source inputs to the lake that are controllable come from the developed lakefront property. With the information available to the committee, these inputs can be minimized through implementation of a management plan that addresses stormwater runoff, adequacy of septic systems and landscape practices by homeowners. The annual drawdown of the lake may also have a beneficial effect.

The watershed which feeds Columbia Lake has a low rate of phosphorus input. Maintaining the integrity of the large wetland area and a forested buffer strip along the stream edge will minimize the potential for increasing the rate of phosphorus input to the lake.

Development of other portions of the watershed should be carefully planned taking into account soil limitations for proposed uses, sediment and erosion control and stormwater management.

The following basic suggestions are offered for minimizing the potential adverse effects of land use changes in the upper watershed on the quality of surface water contributions to Columbia Lake:

1. Literature regarding the benefits of non-phosphate detergent use should be distributed to those residents within a conservative distance of the lake, for example, 500 feet. This should also apply to persons residing within close proximity to tributary streams. Listings of the Phosphorus concentrations of various laundry detergents should also be made available.

2. The development of any undeveloped land within the watershed should proceed with caution and the knowledge that it has been demonstrated in most cases, that residential development within a lake watershed accelerates the eutrophication process, leading to degradation of existing water quality.

3. The detailed soil information and interpretations should be taken into account in the planning process.

4. Sediment and erosion control plans should be developed for all sites where major land disturbance is planned. These are especially important in the area of the watershed which have hardpan soils (Paxton, Woodbridge series).

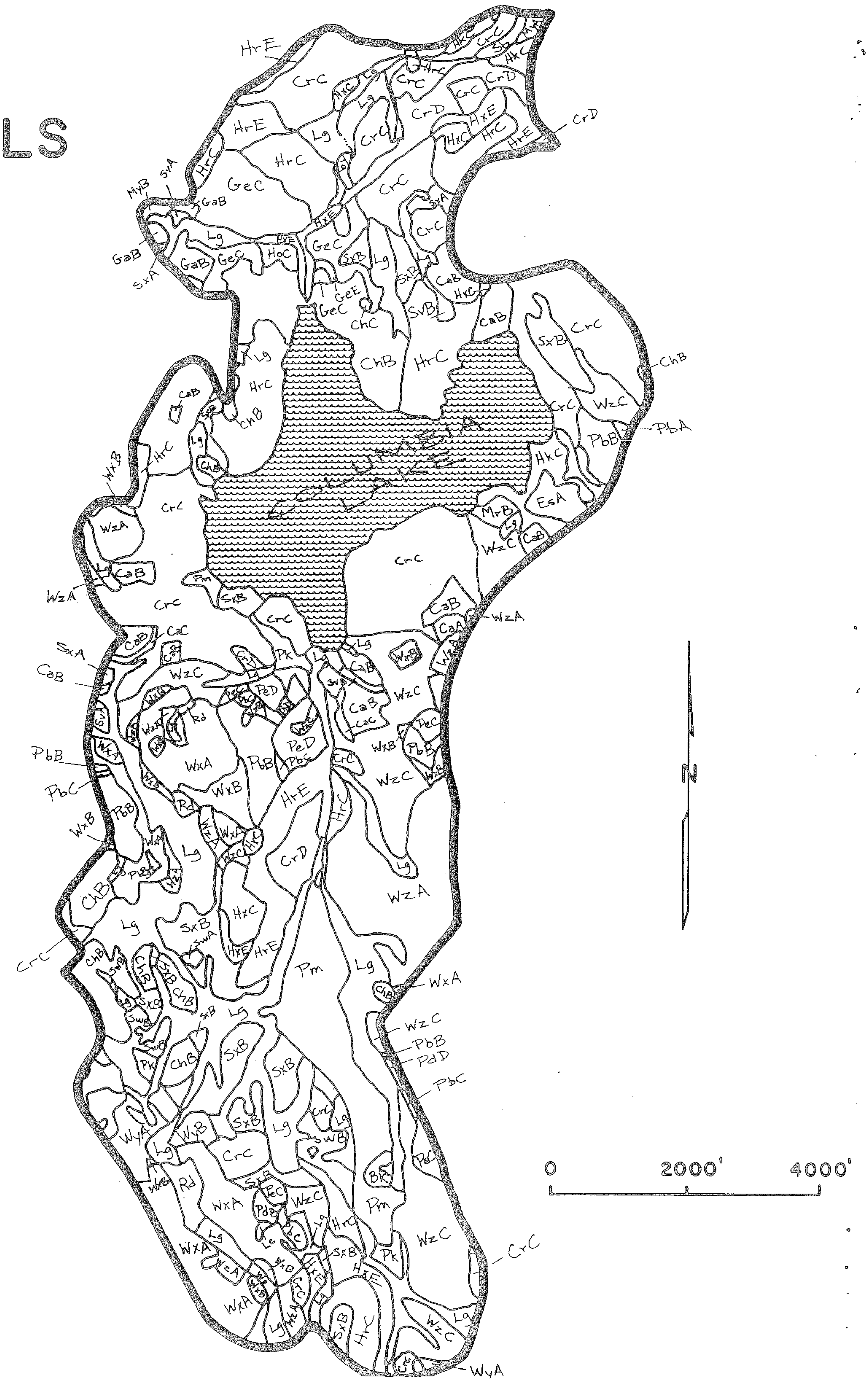
5. Stormwater management plans should consider the fate of surface runoff and utilize designs which minimize the effects of non-point source pollution. These should be developed for sites where major land disturbance are planned.

6. Existing sources of erosion and sedimentation from roadbanks and construction should be corrected.

7. If new development does proceed within proximity to the Lake or tributaries to the Lake, septic systems should be so located as to reduce the potential for phosphorus enrichment.

Appendix

SOILS



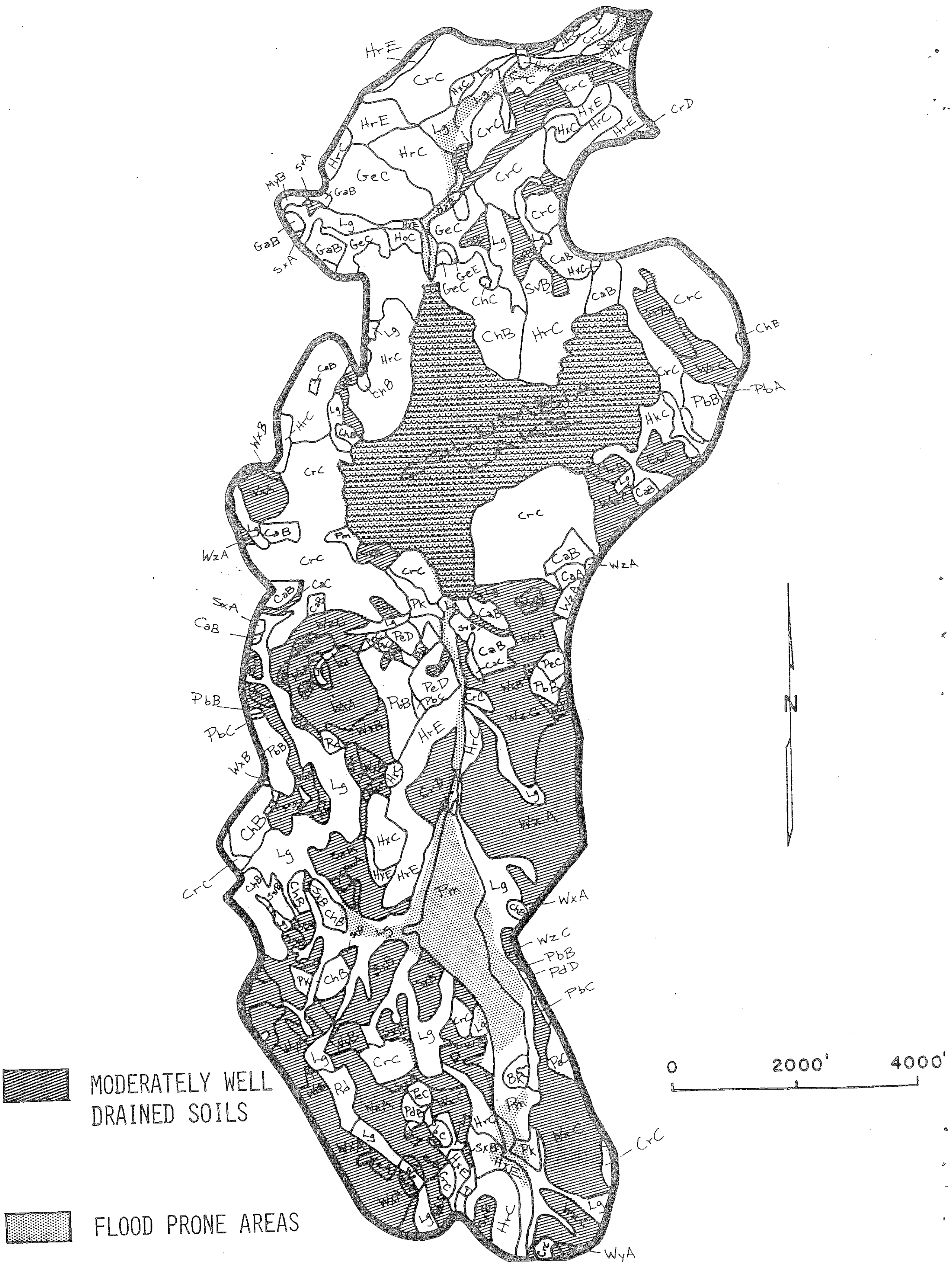
TOLLAND COUNTY DETAILED SOILS KEY

Symbol	Mapping Unit	Natural Soils Group and Color	Percolation Rate	Slope	Inland Wetlands	Soil Sat. 2-12 mo. per year	Soil Sat. 1-2 mo. per year	Ag. Capability
Aba	Agawam sandy loam, 0-3% slopes	A-1d,917	F,909	A,909				II,915
AbB	Agawam sandy loam, 3-8% slopes	A-1d,917	F,909	B,915				II,915
Am	Alluvial land	E-3a,931			yes	931		
BhA	Birchwood sandy loam, 0-3% slopes	C-2a,924	S,924	A,909			903	II,915
BhB	Birchwood sandy loam, 3-8% slopes	C-2a,924	S,924	B,915			903	II,915
Bk	Borrow and fill land, coarse materials	U						
Bl	Borrow and fill land, loamy materials	U						
BnC	Brimfield very rocky fine sandy loam, 3-15% slopes	D-1,945		BC,915				
BnD	Brimfield very rocky fine sandy loam, 15-25% slopes	D-2,945		D,924				
BpC	Brimfield extremely rocky fine sandy loam, 3-15% slopes	D-2,945		BC,915				
BpD	Brimfield extremely rocky fine sandy loam, 15-25% slopes	D-2,945		D,924				
BrA	Broadbrook silt loam, 0-3% slopes	C-1a,929	S,924	A,909				I,910
BrB	Broadbrook silt loam, 3-8% slopes	C-1a,929	S,924	B,915				II,915
BsB	Broadbrook stony silt loam, 3-8% slopes	C-1a,929	S,924	B,915				
BtB	Brookfield fine sandy loam, 3-8% slopes	B-1a,913	PF,913	B,915				II,915
BvC	Brookfield stony fine sandy loam, 3-15% slopes	B-1b,913	PF,913	BC,915				
ByC	Brookfield very stony fine sandy loam, 3-15% slopes	B-1c,913	PF,913	BC,915				
ByD	Brookfield very stony fine sandy loam, 15-25% slopes	B-1e,910	PF,913	D,924				
CaA	Charlton fine sandy loam, 0-3% slopes	B-1a,913	PF,913	A,909				I,910
CaB	Charlton fine sandy loam, 3-8% slopes	B-1a,913	PF,913	B,915				II,915
CaC	Charlton fine sandy loam, 8-15% slopes	B-1b,913	PF,913	C,915				IIIe,924
CaD	Charlton fine sandy loam, 15-25% slopes	B-1d,910	PF,913	D,924				
ChB	Charlton stony fine sandy loam, 3-8% slopes	B-1b,913	PF,913	B,915				
ChC	Charlton stony fine sandy loam, 8-15% slopes	B-1b,913	PF,913	C,915				
ChD	Charlton stony fine sandy loam, 15-25% slopes	B-1d,910	PF,913	D,924				
CrC	Charlton very stony fine sandy loam, 3-15% slopes	B-1c,913	PF,913	BC,915				
CrD	Charlton very stony fine sandy loam, 15-25% slopes	B-1e,910	PF,913	D,924				
CsA	Cheshire fine sandy loam, 0-3% slopes	B-1a,913	PF,913	A,909				I,910
CsB	Cheshire fine sandy loam, 3-8% slopes	B-1a,913	PF,913	B,915				II,915
CsC	Cheshire fine sandy loam, 8-15% slopes	B-1b,913	PF,913	C,915				IIIe,924
CsC2	Cheshire fine sandy loam, 8-15% slopes, eroded	B-1b,913	PF,913	C,915				IIIe,924
CsD2	Cheshire fine sandy loam, 15-25% slopes,eroded	B-1d,910	PF,913	D,924				
CtB	Cheshire stony fine sandy loam, 3-8% slopes	B-1b,913	PF,913	B,915				
CtC	Cheshire stony fine sandy loam, 8-15% slopes	A-2,942	PF,913	C,915			903	
EfA	Ellington fine sandy loam, 0-3% slopes	A-1d,917	F,909	A,909				II,915
EsA	Enfield silt loam, 0-3% slopes	A-1d,917	F,909	A,909				I,910
EsB	Enfield silt loam, 3-8% slopes	A-1d,917	F,909	B,915				II,915
EtA	Enfield silt loam, shallow, 0-3% slopes	A-1a,915	F,909	A,909				II,915
EtB	Enfield silt loam, shallow, 3-8% slopes	A-1a,915	F,909	B,915				II,915
GaB	Gloucester sandy loam, 3-8% slopes	B-1a,913	F,909	B,915				II,915
GaC	Gloucester sandy loam, 8-15% slopes	B-1b,913	F,909	C,915				IIIe,924
GbB	Gloucester stony sandy loam, 3-8% slopes	B-1a,913	F,909	B,915				
GbC	Gloucester stony sandy loam, 8-15% slopes	B-1b,913	F,909	C,915				
GeC	Gloucester and Charlton very stony soils, 3-15% slopes	B-1e,909	F,909	BC,915				
GeE	Gloucester and Charlton very stony soils, 15-35% slopes	B-1e,909		D,924				
HdA	Hartford fine sandy loam, 0-3% slopes	A-1d,917	F,909	A,909				I,910
HdB	Hartford fine sandy loam, 3-8% slopes	A-1d,917	F,909	B,915				II,915
HfA	Hartford sandy loam, 0-3% slopes	A-1d,917	F,909	A,909				II,915
HfB	Hartford sandy loam, 3-8% slopes	A-1a,915	F,909	B,915				II,915
HkA	Hinckley gravelly sandy loam, 0-3% slopes	A-1b,915	F,909	A,909				IIIs,929
HkC	Hinckley gravelly sandy loam, 3-15% slopes	A-1b,929	F,909	BC,915				IIIs,929
HmC	Hinckley gravelly loamy sand, 3-15% slopes	A-1b,915	F,909	BC,915				
HoC	Hollis rocky fine sandy loam, 3-15% slopes	D-1,945		BC,915				
HrC	Hollis very rocky fine sandy loam, 3-15% slopes	D-1,945		BC,915				
HrE	Hollis very rocky fine sandy loam, 15-35% slopes	D-2,945		DE,924				
HxC	Hollis extremely rocky fine sandy loam, 3-15% slopes	D-2,945		BC,915				
HxE	Hollis extremely rocky fine sandy loam, 15-35% slopes	D-2,945		DE,924				
JaC	Jaffrey gravelly sandy loam and loamy sand, 3-15% slopes	A-1b,915	F,909	BC,915				
Lc	Leicester fine sandy loam	B-3a,931			yes	931		
Le	Leicester fine sandy loam	B-3a,931			yes	931		
Lg	Leicester-Ridgebury-Whitman very stony complex	B-3b,931			yes	931		
Lm	Limerick silt loam	E-3a,931			yes	931		
Ma	Made land	U						

Slope	Mapping Unit	Natural Soils Group and Color	Percolation Rate	Slope	Inland Wetlands	Soil Sat. 2-12 mo. per year	Soil Sat. 1-2 mo. per year	Ag. Capability
MgA	Manchester gravelly sandy loam, 0-3% slopes	A-1a,915	F,909	A,909				IIIs,929
MgC	Manchester gravelly sandy loam, 3-15% slopes	A-1b,915	F,909	B,915				IIIs,929
MhC	Manchester gravelly loamy sand, 3-15% slopes	A-1b,915	F,909	B,915				
MrA	Merrimac fine sandy loam, 0-3% slopes	A-1d,917	F,909	A,909				I,910
MrB	Merrimac fine sandy loam, 3-8% slopes	A-1d,917	F,909	B,915				II,915
MyA	Merrimac sandy loam, 0-3% slopes	A-1d,917	F,909	A,909				II,915
MyB	Merrimac sandy loam, 3-8% slopes	A-1d,917	F,909	B,915				II,915
NaA	Narragansett silt loam, 0-3% slopes	B-1a,913	PF,913	A,909				I,910
NaB	Narragansett silt loam, 3-8% slopes	B-1a,913	PF,913	B,915				II,915
NaC	Narragansett silt loam, 8-15% slopes	B-1b,913	PF,913	C,915				IIIe,924
NgB	Narragansett stony silt loam, 3-8% slopes	B-1a,913	PF,913	B,915				
NgC	Narragansett stony silt loam, 8-15% slopes	B-1b,913	PF,913	C,915				
NrA	Ninigret sandy loam, 0-3% slopes	A-2,942	F,909	A,909			903	
NrB	Ninigret sandy loam, 3-8% slopes	A-2,942	F,909	B,915			903	II,915
On	Ondawa sandy loam	E-1,918			yes			II,915
PbA	Paxton fine sandy loam, 0-3% slopes	C-1a,929	S,924	A,909				I,910
PbB	Paxton fine sandy loam, 3-8% slopes	C-1a,929	S,924	B,915				II,915
PbC	Paxton fine sandy loam, 8-15% slopes	C-1b,929	S,924	C,915				IIIe,924
PbD	Paxton fine sandy loam, 15-25% slopes	C-1d,926	S,924	D,924				
PdB	Paxton stony fine sandy loam, 3-8% slopes	C-1a,929	S,924	B,915				
PdC	Paxton stony fine sandy loam,8-15% slopes	C-1b,929	S,924	C,915				
PdD	Paxton stony fine sandy loam, 15-25% slopes	C-1d,926	S,924	D,924				
PeC	Paxton very stony fine sandy loam, 3-15% slopes	C-1c,929	S,924	BC,915				
PeD	Paxton very stony fine sandy loam, 15-25% slopes	C-1e,926	S,924	D,924				
Pk	Peat and muck	F-1,931			yes	931		
Pm	Peat and muck, shallow	A-3b,931			yes	931		
Po	Podunk fine sandy loam	E-2,918			yes			
PuA	Poquonock sandy loam, 0-3% slopes	C-1a,929	S,924	A,909				I,910
PuB	Poquonock sandy loam, 3-8% slopes	C-1a,929	S,924	B,915				II,915
RaA	Rainbow silt loam, 0-3% slopes	C-2a,924	S,924	A,909			903	II,915
RaB	Rainbow silt loam, 3-8% slopes	C-2a,924	S,924	B,915			903	II,915
RbB	Rainbow stony silt loam, 0-6% slopes	C-2a,924	S,924	A,909			903	
Rc	Raynham silt loam	G-3a,931			yes	931		
Rd	Ridgebury fine sandy loam	C-3a,931			yes	931		
Rg	Ridgebury stony fine sandy loam	C-3a,931			yes	931		
Rk	Rock land	D-2,945						
Ru	Rumney fine sandy loam	E-3a,931			yes	931		
Sa	Saco fine sandy loam	E-3b,931			yes	931		
Sb	Saco silt loam	E-3b,931			yes	931		
Sf	Scarboro fine sandy loam	A-3b,931			yes	931		
SsA	Sudbury fine sandy loam, 0-6% slopes	A-2,942	F,909	A,909			903	II,915
SvA	Sutton fine sandy loam, 0-3% slopes	B-2a,909	PF,913	A,909			903	II,915
SvB	Sutton fine sandy loam, 3-8% slopes	B-2a,909	PF,913	B,915			903	II,915
SwA	Sutton stony fine sandy loam, 0-3% slopes	B-2a,909	PF,913	A,909			903	
SwB	Sutton stony fine sandy loam, 3-8% slopes	B-2a,909	PF,913	B,915			903	
SxA	Sutton very stony fine sandy loam, 0-3% slopes	B-2b,909	PF,913	A,909			903	
SxB	Sutton very stony fine sandy loam, 3-15% slopes	B-2b,909	PF,913	BC,915			903	
Tg	Terrace escarpments	A-1c,915	F,909					
TsA	Tisbury silt loam, 0-3% slopes	A-2,942	F,909	A,909			903	II,915
Wd	Walpole sandy loam	A-3a,931			yes	931		
WeA	Wapping silt loam, 0-3% slopes	B-2a,909	PF,913	A,909			903	II,915
WeB	Wapping silt loam, 3-8% slopes	B-2a,909	PF,913	B,915			903	II,915
WfB	Wapping stony silt loam, 3-8% slopes	B-2a,909	PF,913	B,915			903	
WgA	Watchaug fine sandy loam, 0-3% slopes	B-2a,909	PF,913	A,909			903	II,915
WgB	Watchaug fine sandy loam, 3-8% slopes	B-2a,909	PF,915	B,915			903	II,915
Wp	Whitman stony fine sandy loam	C-3b,931			yes	931		
Wr	Wilbraham silt loam	C-3a,931			yes	931		
Ws	Wilbraham stony silt loam	C-3a,931			yes	931		
WvB	Windsor loamy sand, 3-8% slopes	A-1a,915	F,909	B,915				
WvC	Windsor loamy sand, 8-15% slopes	A-1b,915	F,909	C,915				
Ww	Winooski and Hadley silt loams	E-2,918			yes			II,915
WxA	Woodbridge fine sandy loam, 0-3% slopes	C-2a,924	S,924	A,909			903	II,915
WxB	Woodbridge fine sandy loam, 3-8% slopes	C-2a,924	S,924	B,915			903	II,915
WyA	Woodbridge stony fine sandy loam, 0-3% slopes	C-2a,924	S,924	A,909			903	
WyB	Woodbridge stony fine sandy loam, 3-8% slopes	C-2a,924	S,924	B,915			903	
WzA	Woodbridge very stony fine sandy loam, 0-3% slopes	C-2b,924	S,924	A,909			903	
WzC	Woodbridge very stony fine sandy loam, 3-15% slopes	C-2b,924	S,924	BC,915			903	

WELL AND EXCESSIVELY WELL DRAINED SOILS

INLAND WETLAND SOILS



HrE
CrC
HrC
GeC
Lg
CrD
HxE
HxC
MyB
SxA
GaB
HoC
GeE
ChC
SvB
CaB
ChB
PbA
PbB
HkC
WxB
WzA
CaA
CaC
Pk
PeD
PeC
PbC
HxC
Pm
WxA
WzC
PdD
Rd
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PdB
BR
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0
2000'
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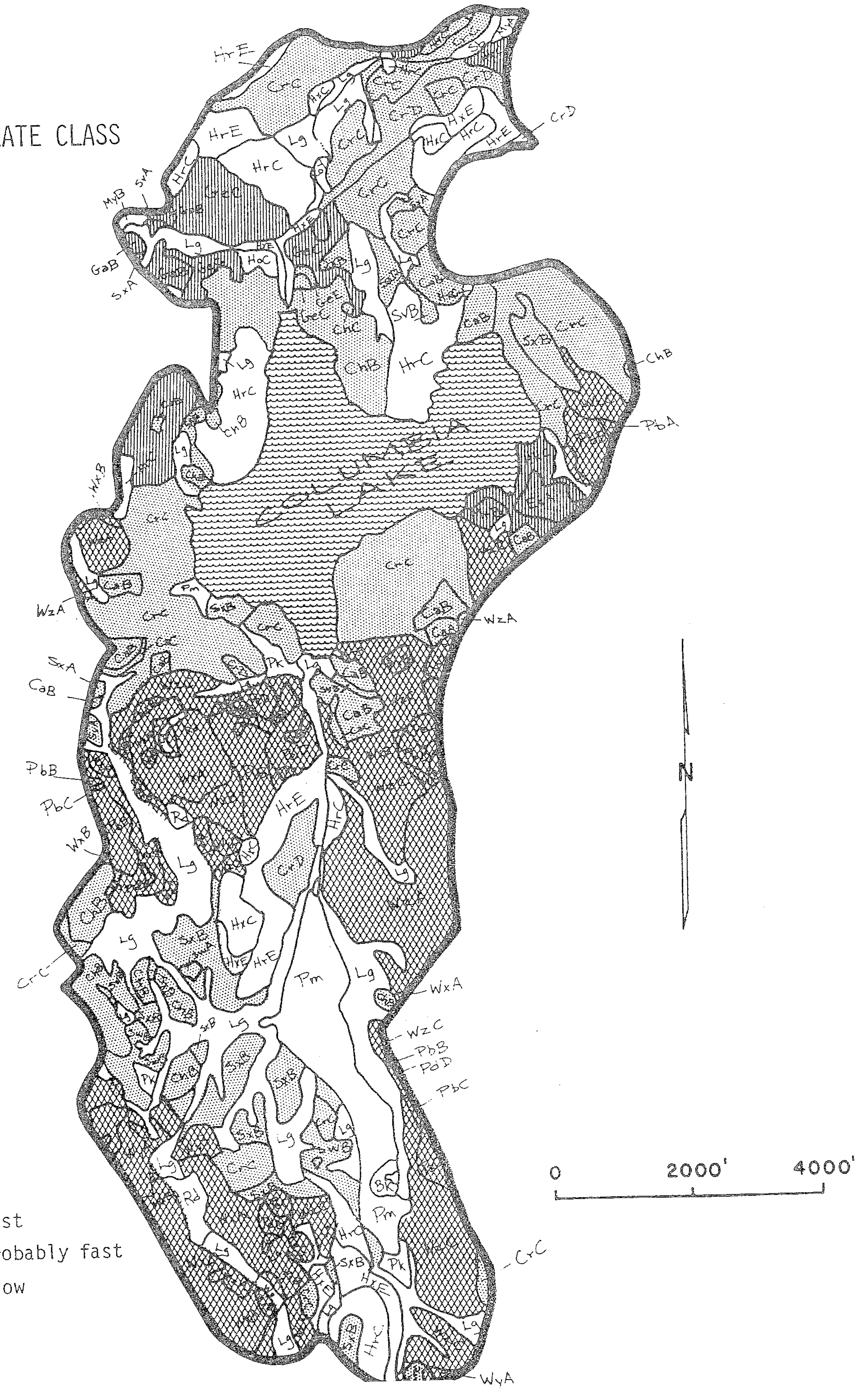
MODERATELY WELL DRAINED SOILS
FLOOD PRONE AREAS

PERCOLATION RATE CLASS



fast

probably fast

slow

SOIL INTERPRETATIONS FOR URBAN USES

The ratings of the soils for elements of community and recreational development uses consist of three degrees of "limitations:" slight or no limitations; moderate limitations; and severe limitations. In the interpretive scheme various physical properties are weighed before judging their relative severity of limitations.

The user is cautioned that the suitability ratings, degree of limitations and other interpretations are based on the typical soil in each mapping unit. At any given point the actual conditions may differ from the information presented here because of the inclusion of other soils which were impractical to map separately at the scale of mapping used. On-site investigations are suggested where the proposed soil use involves heavy loads, deep excavations, or high cost. Limitations, even though severe, do not always preclude the use of land for development. If economics permit greater expenditures for land development and the intended land use is consistent with the objectives of local or regional development, many soils and sites with difficult problems can be used.

Slight Limitations

Areas rated as slight have relatively few limitations in terms of soil suitability for a particular use. The degree of suitability is such that a minimum of time or cost would be needed to overcome relatively minor soil limitations.

Moderate Limitations

In areas rated moderate, it is relatively more difficult and more costly to correct the natural limitations of the soil for certain uses than for soils rated as having slight limitations.

Severe Limitations

Areas designated as having severe limitations would require more extensive and more costly measures than soils rated with moderate limitations in order to overcome natural soil limitations. The soil may have more than one limiting characteristic causing it to be rated severe.

GLOSSARY

Aperiodic - at irregular time intervals.

Aquatic Macrophytes - multi-celled aquatic plant life.

Buffer Strip - the area of undisturbed vegetation between developed land or land in construction and a waterbody or stream.

Drainage Area - an area which contributes water to a specific waterbody or stream.

Erosion - the gradual process of wearing away soils by water, wind or glacial ice.

Eutrophic - state of high nutrient enrichment of lake water, generally of poor transparency during summer months, often with an oxygen deficiency near the lake bottom.

Hardpan - a compact layer in some soils which is made up of rock particles, sand, clay and silt.

Littoral Zone - shore region.

Mesotrophic - state of moderate nutrient level and good conditions for most forms of freshwater fish.

Non-point Pollution - pollution which is not contributed to a waterbody from a single identifiable source (eg. pipe). This can include agricultural and urban runoff in the form of phosphates or septic effluent.

Nutrient Sink - An organism which acts as a trap for chemical nutrients suspended in lake water, by incorporating these nutrients in their body structure.

Oligotrophic - state of low nutrient level and very clear water.

Overburden - a geologic term refering to soil and subsoil layers.

Pathogenic - capable of causing disease.

Phytoplankton - microscopic aquatic plant life.

Runoff - That portion of the rainfall not absorbed by the soil, which runs off the surface.

Sedimentation - the process by which eroded soil settles to the bottom of a waterbody or stream.

Thermal Stratification - A temperature distribution in which the lake water is distinctly layered because of thermal density differences.

Trophic Status - nutrient level.

Watershed - Topographic area made up of drainage areas which contributes runoff to a specific water body.

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About the Team

The Eastern Connecticut Environmental Review Team (ERT) is a group of professionals in environmental fields drawn together from a variety of federal, state, and regional agencies. Specialists on the Team include geologists, biologists, foresters, climatologists, soil scientists, landscape architects, archeologists, recreation specialists, engineers and planners. The ERT operates with state funding under the supervision of the Eastern Connecticut Resource Conservation and Development (RC&D) Area.

The Team is available as a public service at no cost to Connecticut towns.

PURPOSE OF THE TEAM

The Environmental Review Team is available to help towns and developers in the review of sites proposed for major land use activities. To date, the ERT has been involved in reviewing a wide range of projects including subdivisions, sanitary landfills, commercial and industrial developments, sand and gravel operations, elderly housing, recreation/open space projects, watershed studies and resource inventories.

Reviews are conducted in the interest of providing information and analysis that will assist towns and developers in environmentally sound decision-making. This is done through identifying the natural resource base of the project site and highlighting opportunities and limitations for the proposed land use.

REQUESTING A REVIEW

Environmental reviews may be requested by the chief elected officials of a municipality or the chairman of town commissions such as planning and zoning, conservation, inland wetlands, parks and recreation or economic development. Requests should be directed to the Chairman of your local Soil and Water Conservation District. This request letter should include a summary of the proposed project, a location map of the project site, written permission from the landowner allowing the Team to enter the property for purposes of review, and a statement identifying the specific areas of concern the Team should address. When this request is approved by the local Soil and Water Conservation District and the Eastern Connecticut RC&D Executive Council, the Team will undertake the review on a priority basis.

For additional information regarding the Environmental Review Team, please contact Jeanne Shelburn (889-2324), Environmental Review Team Coordinator, Eastern Connecticut RC&D Area, 139 Boswell Avenue, Norwich, Connecticut 06360.