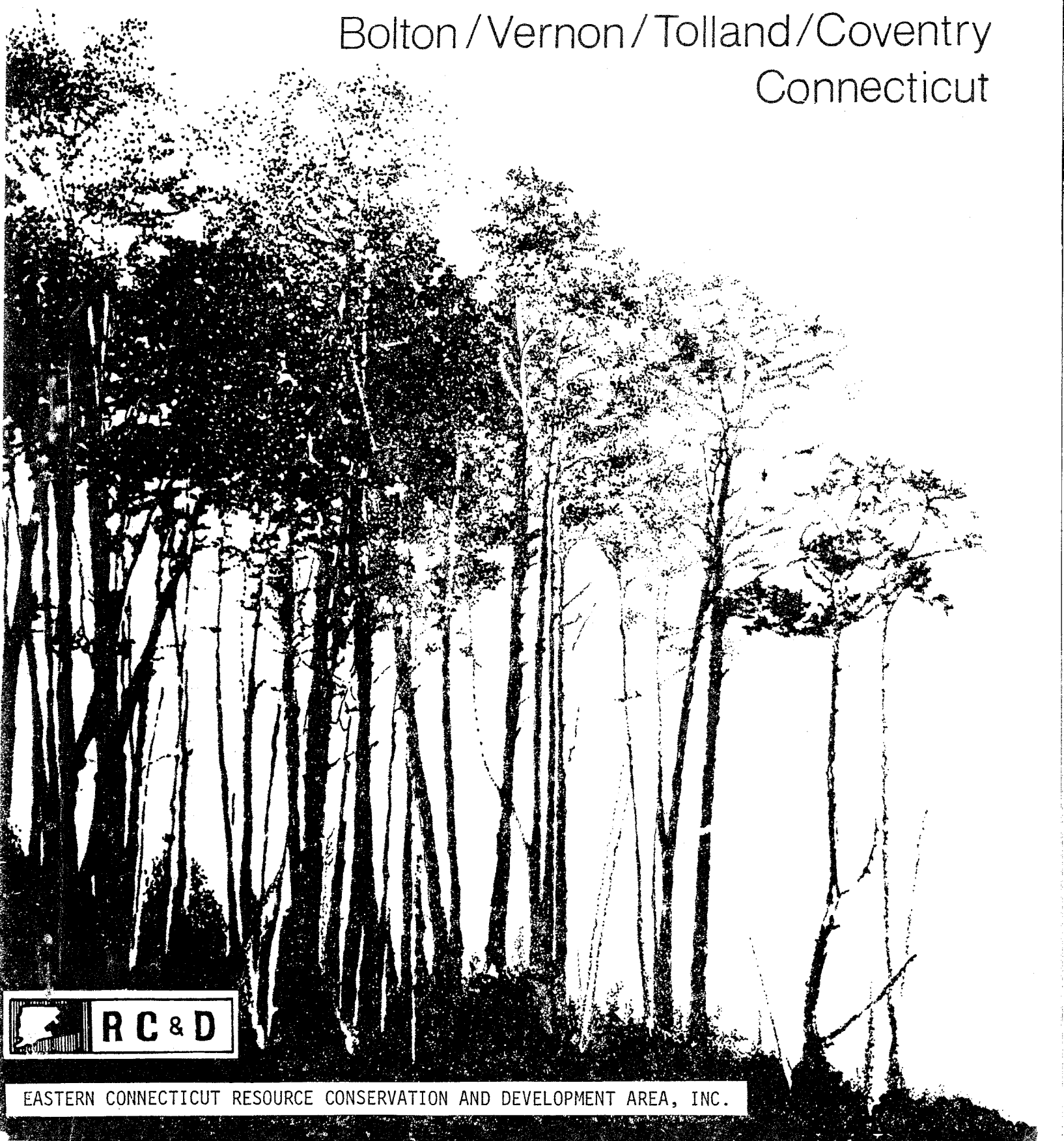
Environmental Review Team Report

Bolton Lakes

Bolton / Vernon / Tolland / Coventry

Connecticut



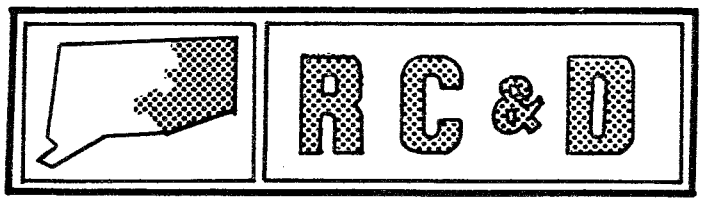
R C & D

EASTERN CONNECTICUT RESOURCE CONSERVATION AND DEVELOPMENT AREA, INC.

Environmental Review Team Report
on

Bolton Lakes
Bolton/Vernon/Tolland/Coventry
Connecticut

December 1978

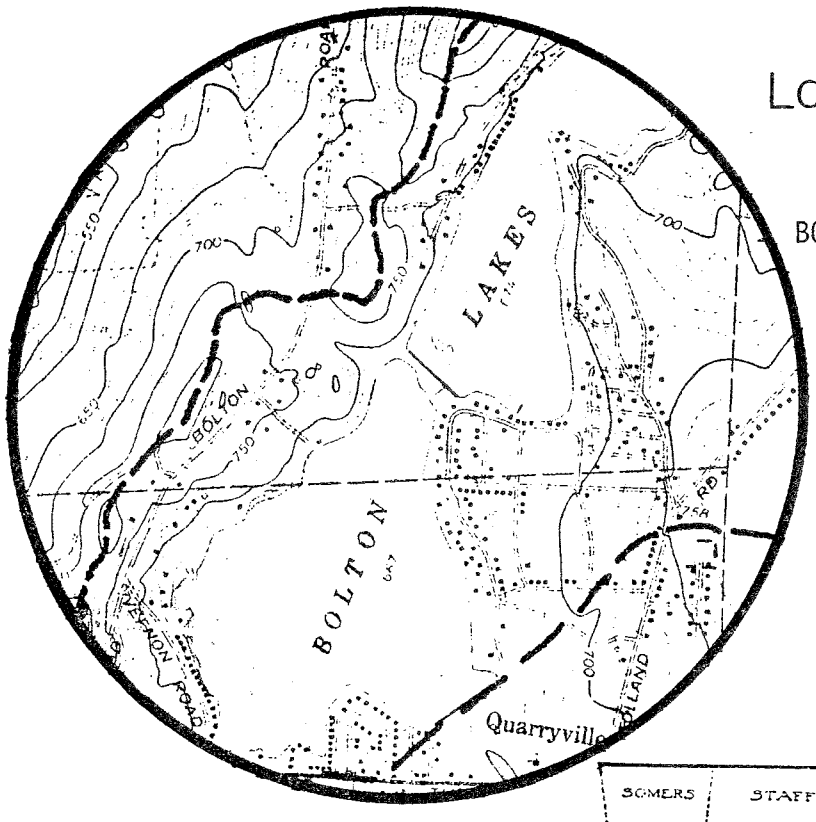


eastern connecticut resource conservation & development area

environmental review team
139 boswell avenue
norwich, connecticut 06360

Location of Study Site

BOLTON LAKE
BOLTON/VERNON/TOLLAND/COVENTRY
CONNECTICUT



EASTERN CONNECTICUT
RESOURCE CONSERVATION AND DEVELOPMENT PROJECT

ENVIRONMENTAL REVIEW TEAM REPORT
ON
BOLTON LAKES
BOLTON, VERNON, TOLLAND AND COVENTRY, CONNECTICUT

This report is an outgrowth of a request from the Coventry Planning and Zoning Commission 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. The request was approved by the RC&D Executive Committee and the measure was reviewed by the Eastern Connecticut Environmental Review Team (ERT).

The soils of the site were mapped by a soil scientist from the United States Department of Agriculture, Soil Conservation Service (SCS). Reproductions of the soil survey map, a table of soils limitations for certain land uses and a topographic map showing property boundaries were distributed to all Team members prior to their review of the site.

The ERT that field-checked the site consisted of the following personnel: Timothy Dodge, District Conservationist, Soil Conservation Service (SCS); Tom Ladny, Soil Conservationist, (SCS); Michael Zizka, Geologist, Connecticut Department of Environmental Protection (DEP); Don Smith, Forester, (DEP); Al Buzzetti and Ernest Julian, Sanitarians, State Department of Health; Sia Bauer and Len Tollisano, Regional Planners, Capitol Region Council of Governments (CRCOG); Les Barber, Regional Planner, Windham Regional Planning Agency; Joseph Risigo, Wildlife Biologist (DEP); Charles Phillips, Fisheries Biologist (DEP); Jim Murphy, Lake Ecologist, (DEP); Charles Fredette, Senior Sanitary Engineer, (DEP); and Jeanne Shelburn, ERT Coordinator, Eastern Connecticut RC&D Area.

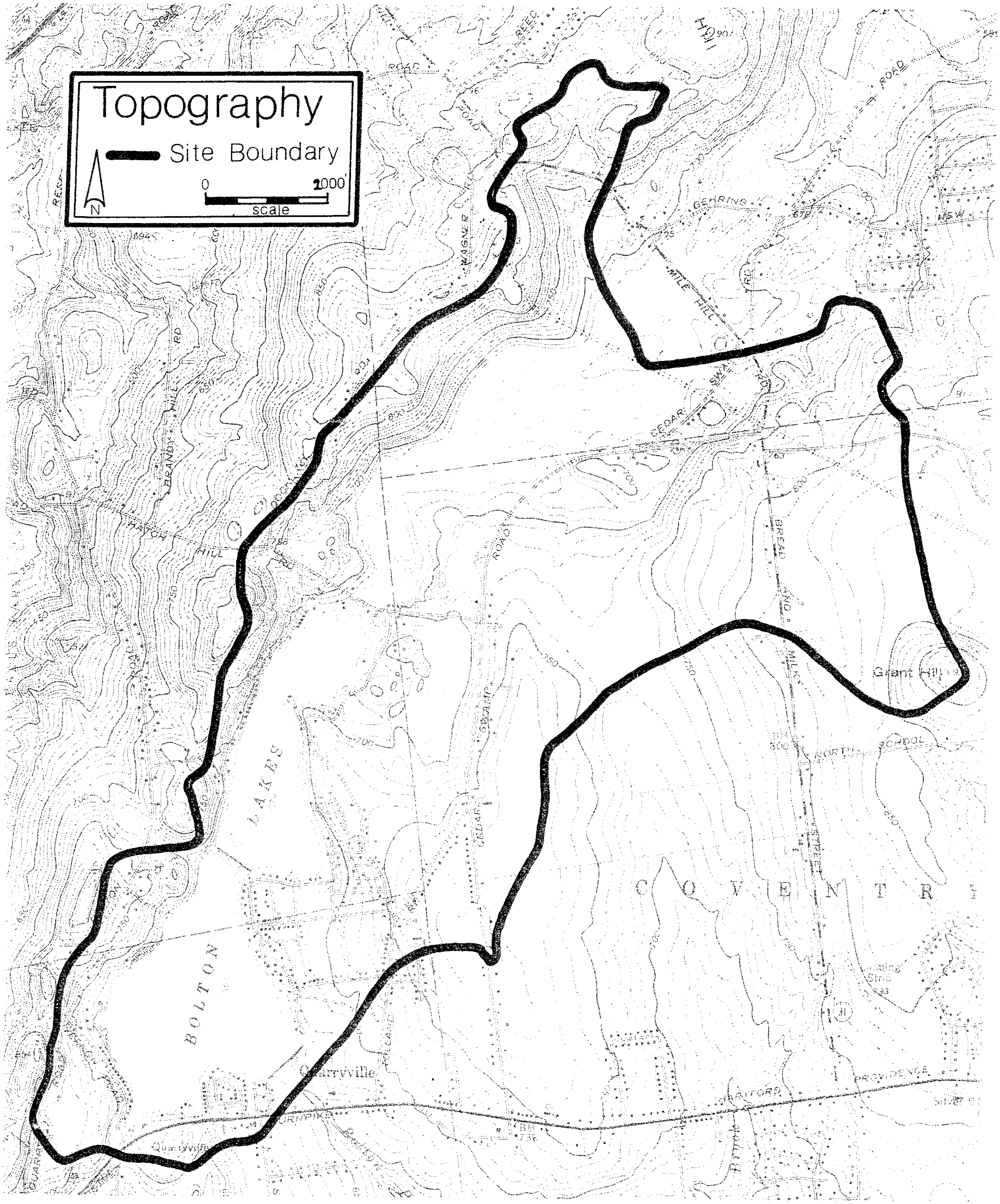
The Team met and field checked the site on Thursday, June 1, 1978. Reports from each contributing Team member were sent to the ERT Coordinator for review and summarization for the final report.

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 the proposed development and also suggests considerations that should be of concern to the developer and the Towns of Coventry, Bolton, Vernon and Tolland. 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 Area Committee hopes that this report will be of value and assistance in making any decisions regarding 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.

CONTENTS


Topography
Site Boundary
0
2000'
scale
N
BOLTON
LAKES
COVENTRY
Quarryville
Grant Hill
CEDAR SWAMP ROAD
BREAD AND MILK
NORTH SCHOOL
HATCH HILL RD
BRANDY HILL RD
MILE HILL
GEHRING
WAGNER
PROVIDENCE
HARTFORD
TURNPIKE

INTRODUCTION

The Eastern Connecticut Environmental Review Team was asked to study the Bolton Lake watershed, produce a natural resource inventory and suggest management practices for this area. The 1945-acre watershed area falls within the political boundaries of the towns of Vernon, Tolland, Bolton and Coventry. Although the lake itself does not come within the bounds of the town of Coventry, the largest undeveloped section of the watershed is found there. The study will be used as a planning tool by the Coventry Planning and Zoning Commission, who originally requested this review.

There are three lakes that comprise the Bolton Lake system. The northern or "Upper" Lake is considerably smaller than the other two. It is also the shallowest and has the least amount of development contiguous to it. It is northeast of this lake that the largest mapped wetlands, Cedar Swamp, exists. The mapped swamp compares in size with all three lakes combined. The Upper Lake straddles the border of Coventry and Vernon and touches on Tolland.

The Middle Lake and Lower Lake are both approximately a mile long. The Lower Lake is the widest, having a bulge that expands the lake to 3/4 of a mile in width. The Lower Lake is also the deepest, averaging 11 feet but going to 25 feet in depth. Residential development is predominantly found near the Middle and Lower Bolton Lakes.

Parallel to the western shore of the two lower lakes runs a steep slope, frequently over 20% with a ridge line and watershed boundary 100 feet west of these two lakes. The Middle Lake is located in Vernon and the Lower Lake straddles the Vernon/Bolton boundary, the major portion of the lake being in Bolton.

Activities in any specific part of the watershed should not be regarded only in light of their effects on that area; rather, the outcome of any activity should be examined as regards its influence on the entire watershed. Because the lakes receive their input from all parts of the watershed, the way in which the watershed is used and managed both now and in the future will control the quality of water in the lakes and the utility of the lakes for recreational purposes.

Present use of the watershed includes residential development, predominantly zoned one or two families per acre; wetlands; undeveloped areas of slope over 20%; agricultural lands; open spaces; forested, potentially developable areas; and a small amount of residential development with a minimum two-acre zoning.

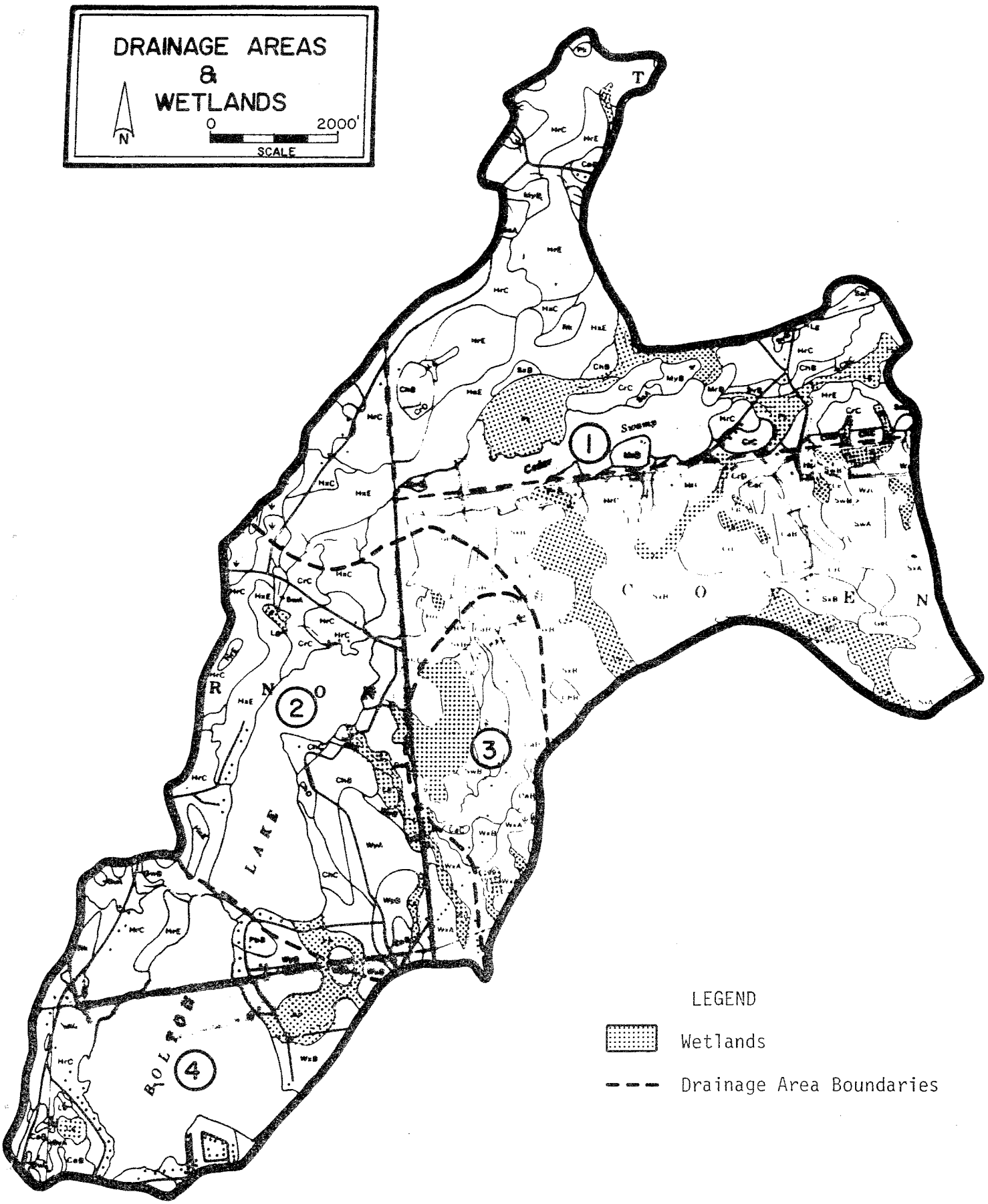

DRAINAGE AREAS
&
WETLANDS
N
0
2000'
SCALE
1
2
3
4
LAKE
ROLTON
LEGEND
Wetlands
Drainage Area Boundaries

FIGURE 2

NATURAL RESOURCE INVENTORY

DRAINAGE AREAS

The Bolton Lakes drainage area totals approximately 2,419 acres; of this total, about 1,945 acres are contained in that area upstream of the lower lake. These acreages are important in the determination of a lake's "trophic status" (nutrient levels) by the assessment of upland influences.

Within the total drainage area, several landform, vegetative, and hydraulic characteristics stand out. The major characteristics are illustrated in figure 2. Lower Bolton Lake is seven feet less in elevation than the other lakes. The drainage divide which segregates these two systems is shown on several of the accompanying illustrations for analysis purposes. The upper lakes have been further segregated to assess direct upland influence to each water body. It should be noted however, that these two lakes are at the same elevation and that the separation is more for convenience than consideration as an hydrologic divide of great significance.

Drainage area 1 on figure 2, representing the contributing area to the upper lake, is notable for having an extensive swamp-marsh complex at lower elevations and several large wetland areas lying across the eastern uplands. The organic wetlands (peats and mucks) are serving as slow release reservoirs, fed by the non-organic upland wetlands; those non-organic upland wetlands, dissected by stream channels, can be considered as functioning as conduits.

Drainage area 2 also features a large organic wetland, although its saturated state is largely dependent upon subsurface seepage. The other few wetland areas are largely of the non-organic conduit sort.

Drainage area 3 has few wetland soils and only one upland stream course within its bounds. This lake relies heavily upon the upper lakes for maintenance of base flow and general water level.

The wetlands of these drainage areas must be recognized as having functional roles; the organic soils serve as slow release reservoirs: substrate upon which unique flora and fauna subsist and from which darkly stained, acidic, nutrient impoverished waters flow. The upland non-organic wetlands serve as conduits for streams or as groundwater seepage collection areas, and as sites for specific vegetation types.

1. Lower Bolton Lake has a lake surface area of about 178 acres, has a mean depth of 11.3 feet (3.4 meters) and receives direct runoff from about 295 acres of immediately adjacent uplands.

2. The two upper lakes, having a combined surface area of about 150 acres and a combined mean depth of approximately 2.0 meters, receive runoff from about 1795 acres of immediately adjacent uplands.

From these characteristics, it may be concluded that the upper lakes are eutrophic, that is, rich in nutrients. This is made manifest by algal blooms and by proliferations of rooted aquatic macrophytes. (See Appendix B). Though

occasional lens-shaped pockets containing rock types different from the principal types. The most common minerals in the local rocks are quartz, oligoclase, microcline, biotite, muscovite, hornblende, and garnet. Typically, not all of these minerals are present in any one rock sample. Accessory, or less common, minerals include staurolite, hyanite, hematite, pyrite, tourmaline, graphite, epidote, calcite, magnetite, and sphene. No minerals are believed to exist in economically valuable concentrations, although some garnet-studded rocks in the towns of Bolton and Vernon have been quarried for exterior use on some buildings and for flagstone.

Perhaps the most important minerals from an economic standpoint are those which may harm the quality of local groundwater. Minerals rich in iron and manganese probably are the worst offenders. Connecticut Water Resources Bulletin No. 11, a U.S.G.S. publication (1967), indicates that many wells in the eastern section of the Bolton Lakes watershed produce groundwater containing objectionable amounts of iron and/or manganese.

SURFICIAL GEOLOGY

The surficial geology of the Bolton Lakes watershed is shown in a map accompanying this report. The map was prepared on the basis of field observations as well as interpretation of soils data and of aerial photographs. A brief description of each map unit is provided here.

Till is a glacial deposit that consists largely of rock particles of various shapes and sizes. The particles were removed from preexisting overburden or rock outcrops by overriding glacier ice, and then redeposited in a discontinuous, irregular blanket upon the land. The till cover smooths over some of the irregularities in the underlying bedrock surface; hence, the thickness of the till can vary greatly within short distances. In the western part of the watershed, the steep slopes and the abundance of rock outcrops suggest that the general thickness of the till is less than 5 feet. The outcrops were not mapped separately because of the large area involved in the watershed study. In the eastern part of the watershed, the thickness of the till in most places is probably greater than 5 feet but less than 30 feet. These thicknesses are not intended as absolute ranges, but rather as general guidelines as to what may be expected in each area. Deep pockets probably exist within the areas designated as thin till, while small outcrops of bedrock might be found within a region designated as thick till.

The texture of the till ranges from sandy and loose to hard and compact. The sandier till tends to form a relatively thin cover of the more compact variety. Numerous large boulders are scattered throughout the area.

Stratified drift is a term that refers to sediments deposited by meltwater from wasting glacier ice. These sediments often show a layering (stratification) that indicates their manner of deposition. Field inspection showed that the stratified drift in the northern part of the watershed was composed primarily of sand, pebble gravel, and cobble gravel.

Swamp deposits are accumulations of sand, silt, clay, and decayed organic material. The finer rock particles settled out in stagnant or nearly stagnant water and became a substrate on which swamp vegetation could grow. Plants died and settled to the bottom, decaying and mixing with the substrate materials to produce a brown to black, often strongly smelling deposit.

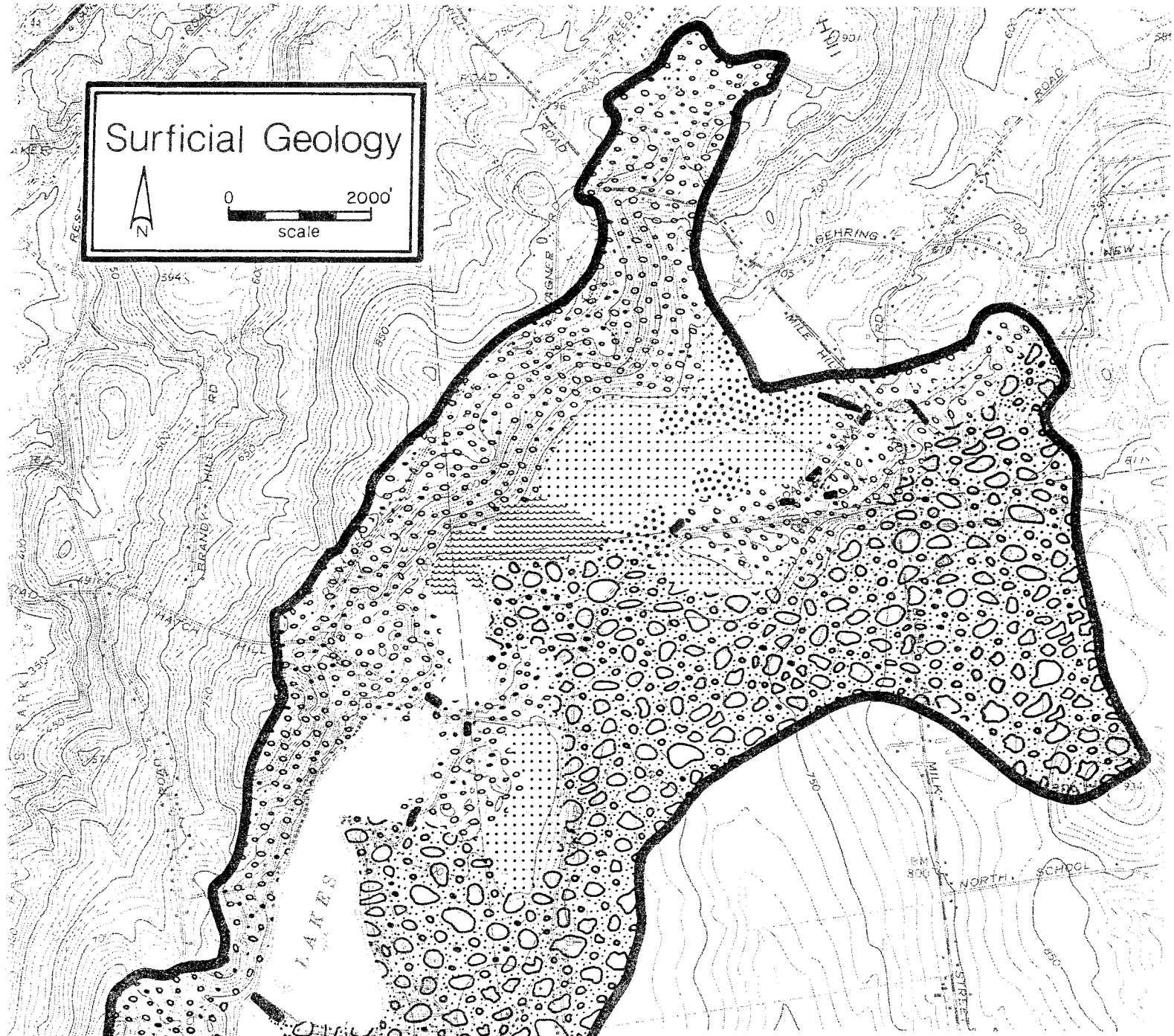

Surficial Geology
N
0
2000'
scale
LEGEND
Till, generally less than 5 feet thick
Till, generally between 5 and 30 feet thick
Stratified drift
Swamp deposits
Artificial fill
Water (not shown on topographic map)
BOLTON LAKES
Quarryville
TURNPIKE
GEHRING
MILK
NORTH
SCHOOL
BRANDY HILL RD
MILE HILL RD
ROAD

FIGURE 3

Artificial fill is a rather common man-made deposit composed of till, sand and gravel, rubble, and, sometimes, trash. It has been mapped only where it is topographically distinct.

The areas mapped as till less than 5 feet thick are least suitable for development. Steep slopes, in addition to the proximity of bedrock to the surface, are a problem in these areas. Wastewater discharge via septic systems into thin overburden may have several undesirable effects, which are discussed in a later section. Construction in these areas can lead to partial filling of the lakes with sediment.

WILDLIFE

The Bolton Lakes watershed area provides wildlife habitat for several species of resident and migrant wildlife populations, particularly waterfowl.

Of the three lakes, the area surrounding and including Upper Bolton Lake lends itself to especially good habitat for upland and wetland wildlife. Unlike the Lower and Middle Lake, the Upper Lake is relatively isolated from housing developments. This naturally occurring open space habitat provides good wildlife production potentials in both the upland and wetland areas.

The loss of habitat acreage can, in most instances, force an irreversible and irretrievable commitment of natural resources. The following index provides an assessment of some potential wildlife populations in the area relative to acres per individual.

Species	Breeding
Ducks - Dabblers	0.5 - 5.0
Ducks - Divers	10.0
Geese	2.0
Muckrat	0.5
Mink	50.0
Otter	100.0
Beaver	20.0
Cottontail Rabbit	0.75
Raccoon	100.0
Ruffed Grouse	10.0
Woodcock	20.0
Gray Squirrel	1.0
White-tailed Deer	30.0

Many species of animals not listed and animals listed as rare or endangered in Connecticut could be adversely affected through habitat loss.

FISH

The Bolton Lakes were surveyed on the week of July 24th, 1978. Trap nets and gill nets were used to sample the fish populations. Oxygen, pH and conductivity meters were used to determine water chemistry. While all three lakes can be classified as eutrophic, interesting differences in populations and physical descriptions existed.

Table 1. Physical Features

Lake	Area (acres)	Elevation	Max/mean depth (ft.)	(0'-3' depth) Shoal Area	(3'-14'depth) Sub-littoral area
Upper Bolton	35	672	3.5/2.5	95%	5%
Middle Bolton	115	672	17/12	10%	85%
Lower Bolton	178	667	12/10	20%	80%

Table 2. Chemical Features

Lake	pH*	Conductivity (umhos) C18*	Dissolved Oxygen (ppm)*	Temp. (°F)*	Transparency (ft.)
Upper Bolton	6.0/6.0	84/66	6.4/4.6	26/24.5	3.25
Middle Bolton	6.7/6.4	85/83	8.0/0.4	26/15	3.25
Lower Bolton	6.4/6.2	81/80	10.2/4.9	24/23.5	6.25

* Surface reading/Bottom reading

Table 3. Biological Features

	Fish										Arthropods & Mollusks		Plants Emergent				Plants Submergent			
	Bluegill sunfish	Pumpkinseed sunfish	Green sunfish	Largemouth bass	Brown bullhead	Yellow perch	Golden shiner	White sucker	Chain pickerel	Calico bass	Crayfish	Freshwater clam	White water lily	Spatterdock	Pickerel weed	Arrowhead	Floating pond weed	Water milfoil	Coontail	Cabomba
Upper Bolton	X	X			X	X	X			X			X	X	X	X	X	X	X	
Middle Bolton	X	X		X	X	X	X		X	X			X	X	X	X		X	X	
Lower Bolton	X	X	X	X		X	X	X	X	X	X	X								X

The most interesting discovery of the survey was the presence of the green sunfish (Lepomis cyanellus) in Lower Bolton. This sunfish has been reported from only six watersheds in Connecticut previously. The green sunfish represents an uncommon species in Connecticut, primarily due to its tendency to hybridize with other sunfish, specifically pumpkin seeds and bluegills. It is also known to have a lower reproductive capability than other sunfish. Since it does not reproduce as readily, other sunfish tend to crowd it out of existence.

Lower Bolton Lake provided an interesting contrast to the other lakes through its greater transparency and the absence of the brown bullhead, which was abundant in Upper and Middle Bolton Lakes. Despite greater light penetration and an abundance of sublittoral area ideal for the growth of submergent vegetation, Lower Bolton was visually nearly free of aquatic vegetation. Apparently the lake's generally round shape exposes it to frequent wind action, reducing weed growth particularly along the shorelines.

Middle Bolton, despite its dark-stained water, supported lush growths of coontail and water milfoil particularly along its western shore.

Upper Bolton was characterized by the dominance of emergent vegetation and the presence of brown bullheads and yellow perch in great abundance.

Results of the inventory indicate that all the Bolton lakes are best suited for warm water fish. It is extremely doubtful that any of the lakes could support trout.

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 basements, streets and parking, and landscaping. 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 consistant with the objectives of local and regional development, many soils and sites with difficult problems can be used. The soils map, with the publication Soil Survey: Tolland County, Connecticut, can aid in the identification and interpretation 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. Soil information for the watershed is presented in a summary form on a town by town basis. Actual descriptions of those soils mentioned in that form follow.

Bolton: Approximately 167 acres of watershed area exists in the town of Bolton. Of this area approximately 133 acres or 79% have severe limitations for development. The principal limiting factors include wetness, slope, large stones and shallow depth to bedrock. Soils representative of the watershed area in Bolton include the Charlton series, the Hollis series, the Leicester series, the Sutton series and the Woodbridge series.

Vernon: Approximately 435 acres of the watershed occurs within the town of Vernon. Of this acreage, approximately 379 acres or 87% have severe limitations for development. Soils representative of this section of the watershed include the Charlton series, the Gloucester series, the Hollis series, the Leicester series, the Leicester-Ridgebury-Whitman complex, the Paxton series, the Sutton series, the Woodbridge series, Alluvial land, peat and muck, and Rockland.

Tolland: Approximately 535 acres of watershed lands lie within the town of Tolland. Of this total, 436 acres of 86% have severe limitations for development. Principal limiting factors include slope, shallow depth to bedrock, wetness and large stones. Soils representative of this area include the Charlton series, the Hollis series, the Leicester series, the Leicester-Ridgebury-Whitman complex, the Whitman series, the Merrimac series, the Sudbury series, the Sutton series, peat and muck, and Rockland.

Coventry: The town of Coventry contains the largest section of the Bolton Lakes watershed, approximately 706 acres. Of this area 552 acres or 81% have severe limitations for development. Principal limiting factors include wetness, slope, large stones, and shallow depth to bedrock. Soils representative of this section of the watershed include the Charlton series, the Gloucester series, the Gloucester-Charlton series, the Hollis series, the Leicester series, the Leicester-Ridgebury-Whitman complex, the Merrimac series, the Paxton series, the Ridgebury series, the Sutton series, the Woodbridge series, and peat and muck.

Soil Descriptions

Alluvial land: This soil type contains stream-deposited material ranging from poorly drained silty or sandy material in low spots to well-drained sandy or gravelly material. These soils are subject to flooding. Slopes steeper than 8% pose limitations to development.

Charlton series: These soils are deep and well drained, and have formed on glacial till. Charlton soils are moderately permeable and have a high moisture-holding capacity. The principal limiting factor to development is slope exceeding 8%.

Gloucester series: These soils are somewhat excessively drained and have formed on coarse glacial till. Principal limiting factors are small stones and slope.

Gloucester-Charlton complex: This complex consists of deep, somewhat excessively well-drained soils with slopes up to 15%. Principal limiting factors are slope and occasional stoniness or bedrock outcrops.

Hollis series: These soils are shallow, with bedrock normally present within four feet of the surface. The principal limitation to development is the shallowness of the soil.

Leicester series: These soils are poorly to somewhat poorly drained and have formed on glacial till. Leicester is a regulated wetland soil under Public Act 155, and has severe limitations for development due to wetness and stoniness.

Leicester, Ridgebury, Whitman complex: This mapping unit is made up of poorly drained Leicester and Ridgebury and very poorly drained Whitman soils. All of these soils are wet and very stony and are regulated under Public Act 155.

Merrimac series: These soils are well drained to somewhat excessively drained and occur in nearly level to gently sloping areas. Merrimac soils overlie stratified sand and gravel and have few limitations for development.

Paxton series: These are prime agricultural soils that are deep and well-drained, and have formed on glacial till. A compact layer, generally found at a depth of two feet, causes a seasonally high water table and presents limitations to development.

Peat and muck: These soils consist of organic deposits in swamps and bogs. They are regulated wetlands under Public Act 155.

Ridgebury series: This series consists of poorly drained to somewhat poorly drained soils formed on a hard layer in glacial till. Public act 155 regulates the use of these soils. Principal limitations to development are wetness and large stones.

Rockland: This unit describes areas with more than 50% bedrock exposure.

Sudbury series: These soils are moderately well-drained and have formed over stratified sand and gravel. A seasonally high water table restricts internal drainage and limits development.

Sutton series: These soils are moderately well drained and were formed on compact glacial till. They have seasonally high water tables and cause severe limitations to development.

Woodbridge series: These soils are moderately well drained and have formed over compact glacial till. They have a hard compact layer at a depth of 20 to 30 inches, which causes a seasonally high water table. These soils have severe limitations to development due to slope, large stones and slow percolation.

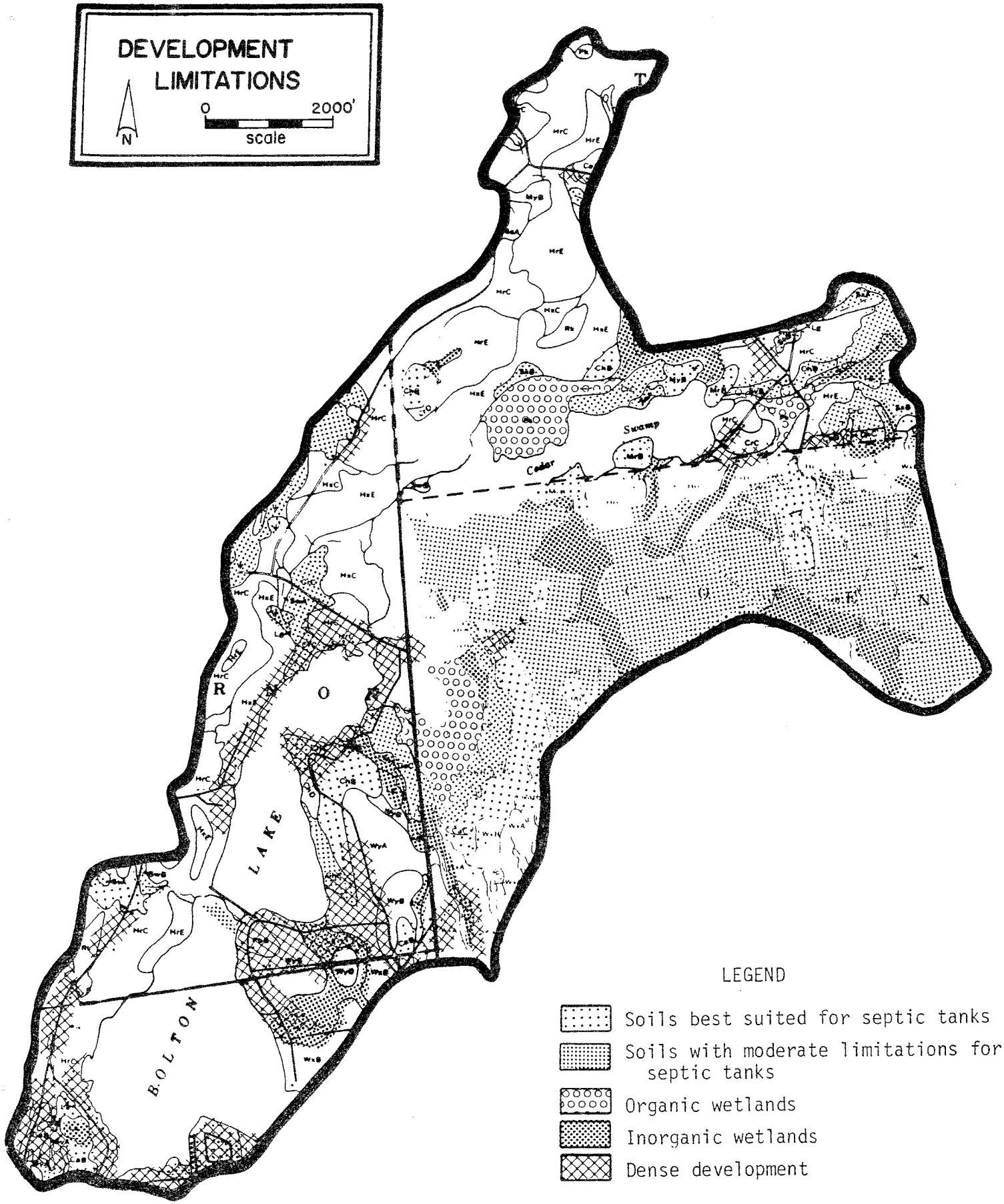

DEVELOPMENT
LIMITATIONS
N
0
2000'
scale
BOLTON
LAKE
Cedar
Swamp
LEGEND
Soils best suited for septic tanks
Soils with moderate limitations for septic tanks
Organic wetlands
Inorganic wetlands
Dense development

FIGURE 4

MANAGEMENT TECHNIQUES

WASTE DISPOSAL

Septic systems have been known to play an important role in the deterioration of many lakes. Part of the problem in Connecticut arises from the unsuitable nature of the overburden in many areas for subsurface waste disposal. However, another significant part of the problem lies in the unfortunate tendency to cluster houses along shoreline regions. Although this tendency is understandable, it hinders the natural ability of the soils, particularly marginal soils, to renovate (purify) the effluent generated by the septic systems.

Most of the soils immediately adjacent to the Bolton Lakes are poorly suited for individual on-site septic systems. Local problems include steep slopes, high water tables, layers of hardpan, and thin overburden. Any one of these conditions may cause effluent to surface downslope from the disposal unit. Shallow-to-bedrock conditions and hardpan layers limit percolation of the effluent downward through the overburden and can result in perching, or subsurface ponding, of the wastewater. A high water table can seriously limit the in-soil oxidation of bacterial and viral constituents in the effluent, allowing contamination of groundwater. Moreover, seasonal rises in the water table may flood tile lines, causing backups and allowing fine sediments to plug drainage openings. The proximity of bedrock to the surface also makes it possible for poorly renovated wastewater to enter fractures that supply groundwater to local homes.

It is clear that poor soils can be used for septic systems in some areas if the systems are carefully located and designed, and if the density of the units is low. Too often, however, the systems are located merely on the basis of convenience, and no special care goes into their design. Moreover, as previously mentioned, lakeside property is much desired, and the usual result is high residential densities along the shoreline.

High dwelling densities exist along Vernon Road in Bolton and along Wildwood Road in Vernon. Both areas are within the thin-till zone. Further developments of this sort, particularly on the west side of the lake, should be discouraged if the lakes' present quality is to be maintained or improved. Periodic checks should be made of all septic systems now present along the shoreline to be sure that their efficiency is still adequate.

Suitability for septic systems may be examined on the basis of detailed soils maps as well as on the basis of general geologic factors. In this manner, the Team has identified four sectors in the watershed that are considered to be of prime importance:

Sector #1. An area along the northern portion of Bread and Milk Street, Coventry which is being considered for a zone change to light industrial.

Sector #2. An area along the eastern periphery of the swamp/marsh area contiguous to Upper Bolton Lake. This area borders Cedar Swamp Road in the southwestern corner of Tolland.

Sector #3. Along Hatch Hill Road, Vernon between Upper and Middle Bolton Lakes.

Section #4. Located along the southern shore of Lower Bolton Lake in the vicinity of Route 44A, Bolton.

As outlined in the Soil Conservation Service listing of soils for Coventry, 78.3% of the soils in Sector #1 of the watershed have severe limitations for on-site subsurface sewage disposal, and 81% have severe limitations for buildings with basements.

Examination of the Inland-Wetlands maps reveal that a large portion of this area is classified as wetlands. Any development in this area, therefore, is also regulated by Public Act 155.

Wetland areas should be considered unsuitable for on-site subsurface sewage disposal and accompanying development. For septic systems to function in much of the remaining area, expensive engineered septic systems would be required.

Sector #2 contains a knoll sloping on its western edge directly toward the swamp and on its northern and eastern edges toward feeder streams for the swamp and toward marsh areas adjacent to the streams. Soil Conservation Service designations are Charlton series (C_rC) for the southeastern portion of the knoll and Hollis series (H_rC) for the northwestern portion of the knoll. Areas contiguous to the streams are designated peat and muck (PK).

Both soil types in the knoll area are indicated to have 3-15% slope. Field observation tended to confirm this although some areas may have steeper slopes. Generally speaking, Charlton series soils tend to be acceptable for on-site sewage disposal. Hollis series soils are shallow to bedrock (within 20 inches of ground surface) and are not suitable for on-site sewage disposal. Therefore, if care is taken to select those areas with the Charlton series and avoid areas with greater than 25% slope, the wetlands surrounding the streams, and/or shallow to bedrock areas, some limited development would appear feasible in this sector. However, the four single-family residences in this sector are immediately south of and fronting on Cedar Swamp Road. If soil mapping is accurate, available suitable soil would be to the rear of these properties and would require back-lot development.

Soil types in Sector #3 are generally indicated as Hollis series (H_rC); these have severe limitations because of depth to bedrock, as noted above. Slope conditions along the western shore of Middle Bolton Lake are severe, although many residences/cottages are located immediately adjacent to the lake in this area (Wildwood Road, Lakeside Drive). Any future conversion in this area of summer cottages to year-round residences must be carefully evaluated on an individual basis by the appropriate local authority. No such conversion should be allowed unless an adequately sized subsurface sewage disposal system meeting present code requirements is shown to be in place, or sufficient area is shown to be present for installation of an adequate system.

A 1973 State Health Department survey revealed some sewage overflow conditions which were responded to by the Vernon Health Department and which apparently have been abated. It is recommended, however, that any homes on excessively small lots be dye-tested and periodically monitored.

Further development in Sector #3 appears ill-advised although some development may be feasible along the eastern shore of Middle Bolton Lake.

Sector #4 is heavily developed with many residential structures present on small lots, particularly in the Lakeside Lane and Lakeside Circle areas. Residences on Keeney Drive are on larger lots. The 1973 survey did not reveal extensive sewage overflow conditions, but where lots are excessively small, dye-testing and monitoring should be done.

The eastern shore of Lower Bolton Lake is somewhat less heavily developed. Soil types indicated in this area are Leicester (Le) and Woodbridge (W_XB). Both soil types are subject to seasonally high water tables, which would severely hamper on-site sewage disposal, but Woodbridge soils are generally more successfully curtain-drained. Of particular concern with Woodbridge soils is that sufficient slope be present to discharge the curtain drain and that sufficient depth of permeable soil be present to enable the bottom of the leaching system to be installed 6-12 inches above the underlying compact layer.

In general, the areas most sensitive to development, and the areas which would have the greatest impact on lake water quality are the following:

1. Wetland areas.

2. Areas with a slope exceeding 8%. Development in these areas greatly increases the erosion hazard and the amount of silt entering the lakes.

3. Areas which have shallow-to-bedrock soils.

4. Areas which have highly permeable soils close to a watercourse. These soils provide little filtration, and they allow much greater concentrations of phosphates and nitrates from leaching systems to enter watercourses than moderately permeable soils.

5. Areas with seasonally high groundwater levels.

Recent efforts of Connecticut's areawide wastewater-management planning program have provided a new perspective on a number of land-use problems. Of particular interest to the current concern for Bolton Lake and its long-term health is the identified importance of the chemical phosphorus in the maintenance or deterioration of the quality of a lake's water. Phosphorus is a naturally occurring chemical, and it is an absolute necessity in order to maintain an active biological community in a lake. A water body very low in phosphorus, for instance, would not be fertile ground for the sports fisherman. An overabundance, however, results in the algae-choked, foul-smelling water often associated with pollution.

Each man-made alteration in the natural character of a lake's watershed generally results in a marked increase in the amount of phosphorus freed to enter a lake and to potentially cause harm. Should too much alteration occur, or should that alteration be in the wrong location or of the wrong type, the capacity of a lake to accept phosphorus without harm may be exceeded. As a result the lake becomes increasingly "eutrophic," which in layman's terms means more weed-infested and less pleasant. Bolton Lake has, of course, already exhibited many of the characteristics of eutrophication, which indicates that the lake's capacity to accept phosphorus has already been exceeded.

A very detailed guide to quantifying non-point sources of pollution to a lake (principally phosphorus) and for managing the control of that pollution has been

produced by the "208" Water Quality Planning program this year and will be published in final form by the Windham Regional Planning Agency in the near future.

The critical area of concern is the bank of land within 300 feet of the shore line of a lake (or a major tributary stream). Beyond that distance, because of the slow rate at which phosphorus travels through the soil, the impact of septic effluent is minimal. However, within that area, as the age of the septic systems increases and the capacity of the soil to retain the phosphorus is reached, substantial contributions of the chemical are made to the lake water. The contribution is increased, of course, as the density of the housing increases and as seasonal structures are converted to year round use. Best management practices would suggest that where land is currently undeveloped all parts of a septic system be set back from the lake a hundred feet and preferably more. The number of septic systems within that critical area should also be reduced to the maximum extent possible through the requirement of large lots and wider frontage requirements. Ideally, any deposition of septic tank effluent would be prohibited within that critical area.

The problem of existing septic systems is of particular concern and the corrective options available are limited and at times expensive. But, as perhaps in the case of Bolton Lake, the existing developed land in the vicinity of the lake may be sufficient alone to result in the deterioration of the lake. Short of public sewering, only the very careful maintenance and management of septic systems and the kinds of products (non-phosphorus detergents for instance) that go into them can minimize the effect of the existing systems.

EROSION CONTROLS

Eroded soil is a major source of phosphorus to lakes. The proximity to the lake of the area being eroded affects the impact that the erosion will have. Soils and slopes pose severe constraints. Most of the area west of the three lakes and Cedar Swamp, the northeast corner of the watershed east of Cedar Swamp, and two sections just east of Middle Lake consist of predominantly highly erosive soils. A minimal amount of vegetative cover should be removed from these areas and, if construction does occur, sedimentation controls should be utilized before, during, and after construction.

Four basic management techniques may be used to prevent excessive erosion: (1) the total amount of land disturbance should be kept to a minimum. This would require low density and land development control regulations which do not encourage or mandate extensive land disturbance when homes and other structures are being built; (2) construction that is permitted should occur on land of moderate slope. Even slopes of 7 to 8% significantly increase the amount of soil eroded and the amount of phosphorus carried to the lake when developed; (3) actual land disturbance should be well removed from any lake or stream bank, and buffers of undisturbed natural vegetation of 50 feet or more should be maintained along all principal watercourses; (4) erosion control measures should be diligently applied whenever land is disturbed and denuded during construction activity.

Erosion from cropland or livestock areas varies in importance, depending on its extent and proximity to the lake or tributary streams. Certain contributors to the phosphorus content of a lake come from sources not easily controlled by a single town or even a group of towns. For instance, air pollution or phosphorus

from cars is not easily managed by single communities but in certain circumstances may indeed be critical to the life of a lake.

Only a detailed analysis of the capacity of Bolton Lake to accept phosphorus and an estimation of the contribution of phosphorus from a variety of land uses currently found within the watershed would allow a useful estimate of the importance of each land use and the effectiveness and cost of each management technique that might possibly be applied to reverse the current deteriorated state of Bolton Lake. And it is only with such a detailed analysis that an adequate assessment of the importance of various management techniques can be made as they apply to the outer watershed: that remote portion found principally in the towns of Coventry and Tolland. Given the generally undeveloped nature of most of the outer watershed, it appears that the immediate and most critical problems lie within very close proximity to the lake in the already developed shores and in the limited area bordering the currently undeveloped portions of the lake shore.

Connecticut's Erosion and Sedimentation Handbook published by the Soil Conservation Service can aid in developing sedimentation and erosion control plans for future development in the watershed area. Vegetative and mechanical means for minimizing erosion are outlined in this Handbook. Technical assistance for implementing these plans can be obtained from the Soil Conservation Service office at the Tolland County Agricultural Extension Building.

FOREST AND AGRICULTURAL LAND MANAGEMENT

Water quality may easily be altered by modification of practices on forest and agricultural lands. The incidence of erosion is of primary concern in these areas. For instance, improper skidding, or transportation of felled trees, during forest harvesting operations can result in increased erosion. The location of yarding areas on slopes near wetlands can also produce problems. In regard to agricultural land, frequent cultivation of the soil, exposing mineral soil, may result in erosion problems, particularly on sloped areas. Related to this is a common practice of turning over the field in the fall, leaving the soil exposed all winter. In the spring, with heavy rains and thawing, much of the topsoil and nutrients will wash into local water bodies. Several steps may be taken to mitigate such erosion problems:

Forested Land

1. Tree preservation is one method, but by far the least desirable. Studies have shown that the prohibition of harvesting results in a decline in the vegetative productivity of a watershed and a reduction in the water quality.

2. Leaf barriers should be established around the margins of the lakes, where possible. Plantings of spruce, hemlock, or white pine in bands around the lakes will prevent the accumulation of leaves in the water, which would result in a decrease in lake storage capacity and water quality (color and acidity).

3. Mandating better harvesting practices through the establishment of informed and enforceable zoning ordinances may be the most feasible and productive step. These ordinances can help to protect the productivity of both the forest and the lakes. The Town of Lyme, Connecticut, has adopted an exemplary set of ordinances; officials of that town may be contacted for further information.

Agricultural Land

1. Areas within 100 feet of wetlands should be reforested, where possible.

2. If it is not possible to comply with step 1, due to economic or other considerations, buffer zones of 150 feet from the wetlands should be maintained in crops that require minimal cultivation (eg. hay and alfalfa).

3. All cultivated land on the watershed should be required to have a winter cover such as winter rye. This will minimize springtime erosion.

4. The county agricultural extension agent and the Soil Conservation Service may be consulted for other methods of erosion control on agricultural land.

Town-generated regulations concerning forest management and agriculture should not be adopted without concurrent consideration of other sources of potential water-quality problems, such as septic systems and development densities. Several guidelines for the proper harvesting of timber are included in the Appendix.

RECREATION POTENTIAL

The Bolton Lake watershed, along with bordering areas, has an abundance of recreational facilities. The three Bolton Lakes offer opportunities for fishing, ice fishing, ice skating, sailing, boating, canoeing, swimming and many related uses including picnicking and hiking. The State of Connecticut provides public boat access to the lower and middle lakes. Horsepower for outboard motor boats is limited to 10 or less. The upper lake is more shallow and swampy and is best adapted to wildlife and nature study, spring and fall canoeing, and photography. This lake fluctuates seasonally and access by canoe may be limited in the summer. This is a good wildlife habitat; an occasional sighting of osprey has been reported. Some of the less common herbaccous plants and trees, such as black spruce, can be found here.

Indian Notch Park is presently being constructed on the shore of Lower Bolton Lake. It will provide a beach area, picnic areas and a playfield. To the west of Bolton Lakes is Bolton Notch State Park. It has numerous hiking trails, rugged cliffs and scenic vistas. Valley Falls Park, located in and owned by the town of Vernon offers swimming, picnicking, hiking, active sports, a playground and nature study opportunities.

The potential for expansion of recreational facilities in the watershed is limited. Main factors of limitation are:

1. The abundance of existing homes, cottages, roads and buildings.

2. Soils: Many areas are wetlands or have hardpans that perch water tables. To the west of the lakes, bedrock or shallow-to-bedrock soils occur in many locations.

3. Steep slopes are very prominent on the western side of the lakes.

4. The relative shallowness of all three lakes. There is very little flow and mixing of waters. Sunlight often reaches the bottom to promote aquatic growth and depletion of oxygen.

5. Access: Considerably difficult and costly due to slope and bedrock.

The use of land surrounding the lake and land directly within the watershed, is important to the health of the lake. Already, high counts of organics and septic leachate are causing heavy algae blooms. Nutrients from farms may also be a contributing factor. As the water quality decreases, so does the quality of the water base for recreation. Fish populations will decrease from lack of oxygen. The lakes will become undesirable for swimming and fishing. Wildlife habitat will disappear and, eventually, the aesthetically pleasing appearance will become an eyesore. Carefully planned and implemented expansion is necessary in assuring a healthy environment capable of maintaining a satisfying recreational experience.

PLANNING CONSIDERATIONS

To preserve or maintain the quality of environmentally sensitive areas of the Bolton Lakes watershed, including in particular the three Bolton Lakes and Cedar Swamp, the four communities involved must plan the future development of the watershed to control the rate and amount of runoff, chemical and biological pollution, and erosion and sedimentation. This can only be accomplished through strong cooperation on the part of the four towns.

One method to control land use, and hence water quality, in the watershed would be to establish special watershed districts, whose purpose would be to regulate land use for optimum water quality and protection of environmentally sensitive areas. Special regulations should be developed and applied to these areas, whether formed into special watershed districts or distinguished through some other format of zoning. The objective would be eliminating the inflow of excessive nutrients, sediments, and other pollutants to the streams, ground water, wetlands, and the lakes themselves. The Capitol Region Council of Governments and Windham Regional Planning Agency could act as a vehicle in assisting the towns to come together in forming a watershed district.

A Bolton Lake Association presently exists. This is a relatively new organization that is actively concerned about the quality of lake water and, therefore, about any development that might occur in the watershed. It is an organization that has traversed the town boundaries. Efforts should be made to coordinate the town or regional actions within the watershed and the Bolton Lake Association.

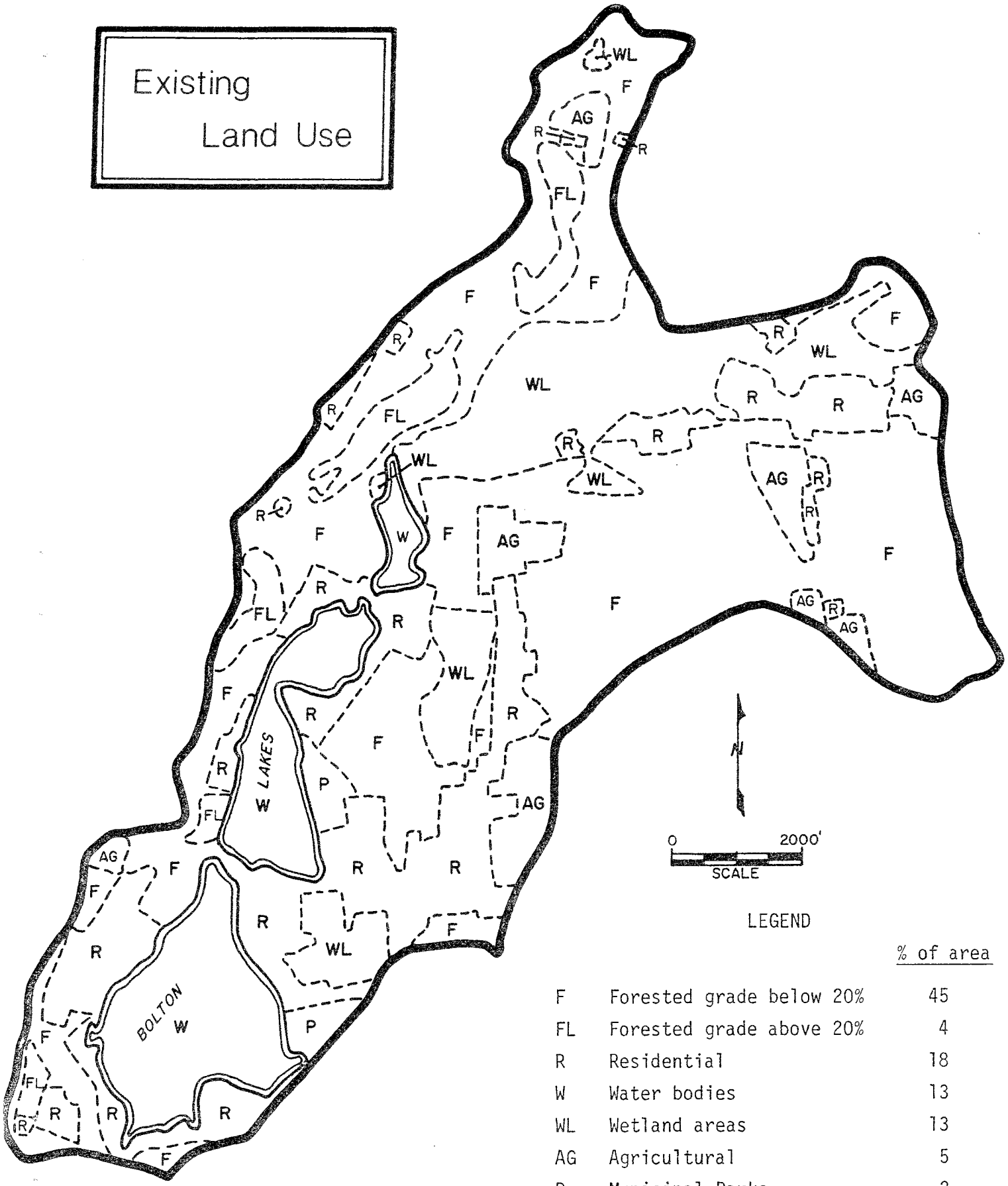
The capacity or capability of the land to support development must be recognized when considering a proposed use or evolving zoning regulations. The capacity of the land can be determined by the topography, types of soils, vegetative cover, climate and economic factors such as potential for sewering.

There are presently no public sewers or water services in the Bolton, Coventry, Tolland or Vernon sections of the Bolton Lake Watershed, and none are proposed.

Consideration and support should be given to protecting inland wetlands and floodprone areas as design elements, as efficient natural drainage resources, and as environmental attributes.

There are no major aquifers or industrial-zoned areas in the four towns of the watershed.

Existing Land Use



LEGEND

		% of area
F	Forested grade below 20%	45
FL	Forested grade above 20%	4
R	Residential	18
W	Water bodies	13
WL	Wetland areas	13
AG	Agricultural	5
P	Municipal Parks	2

FIGURE 5

INDUSTRIAL DISCHARGERS - SITE SUITABILITY MATRIX

KEY
1. Slight
2. Moderate
3. Severe

STANDARD INDUSTRIAL CLASSIFICATION (SIC CODE)	WATER USAGE	SEWERAGE SYSTEM		SUBSURFACE DISPOSAL			SURFACE DISCHARGE				NON-POINT SOURCE POLLUTION					RESIDUALS					AIR QUALITY	
	Gal. Per Empl.	Capacity	Amenability	Major Aquifer	Pretreat. requirements	Area Requirements	AA	A	B		AA	A	B		Major Aquifer	AA	A	B		Major Aquifer	AQMA	Other
									ELS	WQS			ELS	WQS				ELS	WQS			
19 ORDNANCE		3	3	2	2	2	NA	3	2	2	3	3	2	2	3	3	3	2	2	3		
20 FOOD		3	2	2	1	1	NA	3	2	3	2	2	1	1	2	3	3	2	2	3		
21 TOBACCO		3	3	2	2	3	NA	3	2	3	2	2	1	1	2	2	2	2	2	2		
22 TEXTILES		3	3	3	3	3	NA	3	2	3	2	2	1	1	2	3	3	2	2	3		
23 APPAREL		1	2	3	2	1	NA	3	1	2	2	2	1	1	2	1	1	1	1	1		
24 LUMBER AND WOOD		1	1	1	1	1	NA	3	1	1	3	3	2	2	1	2	2	2	2	2		
25 FURNITURE AND FIXTURES		1	1	1	1	1	NA	3	1	2	2	2	1	1	1	1	1	1	1	1		
26 PAPER		3	2	3	3	3	NA	3	2	3	3	2	2	2	2	3	3	2	2	3		
27 PRINTING AND PUBLISHING		1	2	3	2	1	NA	3	1	2	2	2	1	1	1	3	2	1	1	3		
28 CHEMICALS		3	2	3	3	3	NA	3	2	3	3	2	2	2	2	3	2	2	2	3		
29 PRODUCTS OF PETROLEUM AND COAL		2	3	3	1	2	NA	3	2	3	3	3	2	2	3	3	2	1	1	3		
30 RUBBER AND PLASTICS		2	2	3	2	2	NA	3	2	3	3	2	1	1	2	3	2	1	1	3		
31 LEATHER		1	2	3	2	2	NA	3	2	3	3	2	1	1	2	3	2	2	2	3		

CONSTRAINT KEY
1. Slight
2. Moderate
3. Severe

STANDARD INDUSTRIAL CLASSIFICATION (SIC CODE)		WATER USAGE	SEWERAGE SYSTEM		SUBSURFACE DISPOSAL			SURFACE DISCHARGE				NON-POINT SOURCE POLLUTION					RESIDUALS					AIR QUALITY	
		Gal. Per Empl.	Capacity	Amenability	Major Aquifer	Pretreat. requirements	Area Requirements	AA	A	B		AA	A	B		Major Aquifer	AA	A	B		Major Aquifer	AQMA	Other
										ELS	WQS			ELS	WQS				ELS	WQS			
32	STONE, CLAY, GLASS & CONCRETE PROD.		3	2-3	3	2	2	NA	3	1	1	3	3	2	2	2	2-3	2	1	1	2-3		
*33	PRIMARY METAL INDUSTRIES		3	3	3	3	3	NA	3	3	3	3	3	3	3	3	3	3	2	2	3		
*34	FABRICATED METAL PROD.		2	1	1	1	2-3	NA	3	1	2	3	2	1	1	3	3	2	2	2	3		
35	MACHINERY		2	3	3	3	2	NA	3	1	2	3	2	1	1	3	3	2	2	2	3		
*36	ELECTRICAL EQUIPMENT		1	3	3	3	1-2	NA	3	1	2	3	2	1	1	3	3	2	2	2	3		
*37	TRANS. EQPMT.		1	3	3	2-3	1-2	NA	3	1	2	3	2	1	1	3	3	2	1	1	3		
38	PROFESSIONAL, SCIENTIFIC & CONTROLLING INSTRU., PHOTO & OPTICAL GOODS WATCHES AND CLOCKS		1	2	2	1-2	1	NA	3	1	2	2	2	1	1	2	2-3	3	1	1	2		
0	MISC. MANUF. INDUS. (other)		1	2	2	1-2	1	NA	3	1	1-2	2	2	1	1	2	2	1	1	1	2		

Coventry has indicated a possible interest in establishing an industrial zone on a portion of the watershed. To the extent that the overall density of urban development in the watershed is maintained at a low level, the kind of specific development, whether residential, industrial, or commercial, is not critical provided site requirements of the use would not produce excessive erosion, pollute adjacent ground water, or stimulate subsidiary growth, which would work against a policy of low-density development within the total watershed. Another "208" preliminary document entitled "Industrial Site Constraint Manual" contains an industrial site-constraint matrix, included in this report, which indicates the relative degree of severity that might be encountered by selected industries in handling their waste products to prevent contamination of ground and surface waters. Such a matrix might be useful in tailoring an industrial district appropriate to the problems of Bolton Lake.

Towns may wish to plan their conservation efforts on the basis of an "Ecoregion" concept. An ecoregion has been defined as an area characterized by a distinctive pattern of landscapes and regional climate as expressed by the vegetative composition and pattern and the presence or absence of certain indicator species and species groups (Dowhan and Craig, 1976). The Bolton Lakes watershed lies within the Northeast Hills Ecoregion, an area dominated by oaks, hickories, maples, hemlocks, and white pine. It is not known whether rare or endangered species occur within the watershed, but the presence of extensive wetlands near Upper Bolton Lake indicates the likelihood that rare species indigenous to the wetlands exist in that area. These should be located and catalogued and should receive appropriate protection.

SUMMARY OF SUGGESTED MANAGEMENT TECHNIQUES

Of the 1945 acres over 60% have severe constraints for construction that include on-site sewage, excavation for basements, streets or hard-paved parking areas, and landscaping. Conversely, recreational activities, camping areas, picnic areas, and trails and paths are generally more suitable for the area, as they frequently have only moderate or slight constraints from soils or slopes.

In looking at existing development, strong inconsistencies can be found with the capabilities of the land. The east side of the lakes, between Middle and Lower Bolton Lake, contains the most densely developed area of the watershed, and soils that consistently have severe constraints for development.

Management considerations should insure optimum water quality and protection of environmentally sensitive areas. These should include:

1. A regular septic system maintenance and inspection program should be developed and undertaken periodically in the watershed area. All towns, especially Bolton and Vernon, should conduct a sanitary survey to assure that public health is not endangered, given the high recreational usage of the lower lake.

2. There are very few areas where soil conditions are suitable for acceptance of on-site sewage. However, light density development with carefully engineered, albeit expensive, septic systems may be possible in soils with moderate limitations for septic tanks. Prime areas where this could be attempted, if absolutely necessary, would be in drainage areas 1 and 3, of figure 1 as both

feature extensive organic wetlands downstream which may act to renovate any wastewaters that may escape on-site treatment, even from carefully designed and constructed leach fields.

3. A regular maintenance program for culverts and storm drainage systems (instead of drains) should be developed and undertaken periodically in the watershed.

4. Where land is actually developed, land capabilities should be recognized. For residential use, large lot sizes or cluster developments that provide large natural areas should be utilized. Light commercial or light dry industrial uses that require only small parking areas and would produce minimal quantities of septage would be appropriate. High density development is not recommended anywhere in the Bolton Lakes drainage area. The entire drainage area should be zoned at the lowest possible density. Agricultural and silvicultural pursuits should be encouraged where feasible. Open lands should be retained as such. The conservation commissions of all four towns should meet and agree to remove as much land as possible in this drainage area from development through whatever means appropriate.

5. A wide vegetated buffer strip of 150 feet where possible should be required along the base of any slope of over 8% for any distance, to protect the lakes from runoff and other pollutants.

6. Erosion, sediment, and runoff controls will be essential prior to, during, and following any construction activities. Tolland, Coventry and Bolton have signed Memoranda of Understanding with their local Soil and Water Conservation Districts whereby applications for land-disturbing activities must contain erosion and sedimentation control plans, which are then reviewed by agreement. The towns should adopt local regulations requiring that erosion-control techniques be used in the development of subdivisions and other large earth-moving operations. Since a good portion of the land in the Town of Coventry is presently forested land, it would be advisable to have regulations covering erosion generated from logging operations also.

7. Parking areas and roads should be kept to a minimum size. Curbs should be avoided and sidewalks installed only when necessary for reasons of safety, to utilize the maximum amount of natural drainage possible.

8. Expansive cuts of vegetation should be avoided, particularly where highly erosive soils have been identified.

9. Homeowners should be individually contacted and notified of the basic need for their cooperation in managing lake water quality. This could be accomplished by mail or personal visits. At these meetings, or in a mailing, basic drainage area, wetland, lake, and land-use processes and problems should be introduced and homeowner cooperation solicited. Phosphorous is a critical pollutant in lake algal blooms. Education of homeowners near the lake and near wetlands and watercourses around the lakes concerning the use of low-phosphorous detergents could greatly decrease the amount of phosphorous reaching the lakes. There is data available giving the phosphorous content of the 20 major laundry detergents. This list could be made available to homeowners, possibly through a newsletter from the Bolton Lake Lovers or the Bolton Lake Management Association.

10. Fertilizer applications to lawns and gardens should be carefully performed and pesticide usage should be minimized.

11. Weed harvesting and continued chemical treatment of the upper lakes may be necessary if the aesthetic and recreational usages now enjoyed are to continue. This is not to mean that haphazard, overly ambitious, unplanned and ill-managed in-lake corrective methods are sanctioned. These lakes are artificial, represent unnatural conditions and will require long term, unbroken, carefully planned and performed management techniques, the costs of which must be realistically assessed.

12. The lower lake is now in an apparent delicate trophic state, a condition which could easily change if further development occurs within its drainage area. It is recommended that a water-quality monitoring program be established to document existing chemical, physical, and biological characteristics and to monitor long-term trends. This monitoring should only be initiated after the advice of state water-management officials has been secured.

Any future in-lake chemical treatment or water-level manipulations should be performed only after all state water-resource-management entities are notified so that they may review, comment and monitor the event. This coordinated procedure should greatly aid in the documentation of environmental impacts from varied treatments and provide a more complete understanding of lake natural history and the effects of cultural pressures thereon.

OVERVIEW

The trophic status of each of the Bolton Lakes depends in large part upon conditions in their associated watersheds. Upper and Middle Bolton Lakes are completely artificial water bodies and are eutrophic. Lower Bolton Lake is natural, but its level has been raised by an impoundment. It is also eutrophic, but less so than the other lakes.

Bedrock in the watershed area consists primarily of metamorphic rocks, specifically gneisses and schists, and partly of igneous rocks, notably granite and pegmatite. Minerals in the rocks probably lack significant economic value, but iron and manganese in the bedrock may affect groundwater quality.

Surficial geologic materials are principally of glacial origin and include till and stratified drift. More recent sediments include swamp deposits and artificial fill. Thicknesses of these materials vary locally.

Although the entire Bolton Lakes watershed provides wildlife habitat for numerous species, the area surrounding and including Upper Bolton Lake offers an especially good environment for upland and wetland wildlife.

The Bolton Lakes provide a suitable habitat for many fish species. The green sunfish, which has been found in only a few Connecticut lakes, was discovered in Lower Bolton Lake.

The soils in the watershed vary in several characteristics, including slope, drainage, texture, and depth to bedrock. Moderate to severe limitations to development are present throughout most of the watershed. Proper management of soils is crucial to the maintenance of lake quality.

The adequacy of particular areas in the watershed for on-site septic systems may be examined on the basis of general geologic and hydrologic conditions or on the basis of detailed soils maps. Much of the watershed has severe limitations for septic systems because of slope, shallow depths to bedrock, seasonal high water tables, and other conditions. Systems presently established near the lakes or near wetland areas should be checked periodically for problems, and future development should be very cautiously planned. Failing systems in proximity to the lakes may result in significant contributions of phosphorus to the water.

Soil erosion may also add substantial amounts of phosphorus. Control measures should be established to minimize such erosion. Improper forest and agricultural land-management practices are a major problem. Steps should be taken to establish controls on the use of these types of land, or, in the alternative, to educate landowners concerning proper management practices.

The three Bolton Lakes offer opportunities for various water-related activities, but the maintenance of good water quality is essential. Several small parks and trails exist or are under construction near the lakes. These may be used for hiking, picnicking, and other activities, but the potential for further recreational development is limited.

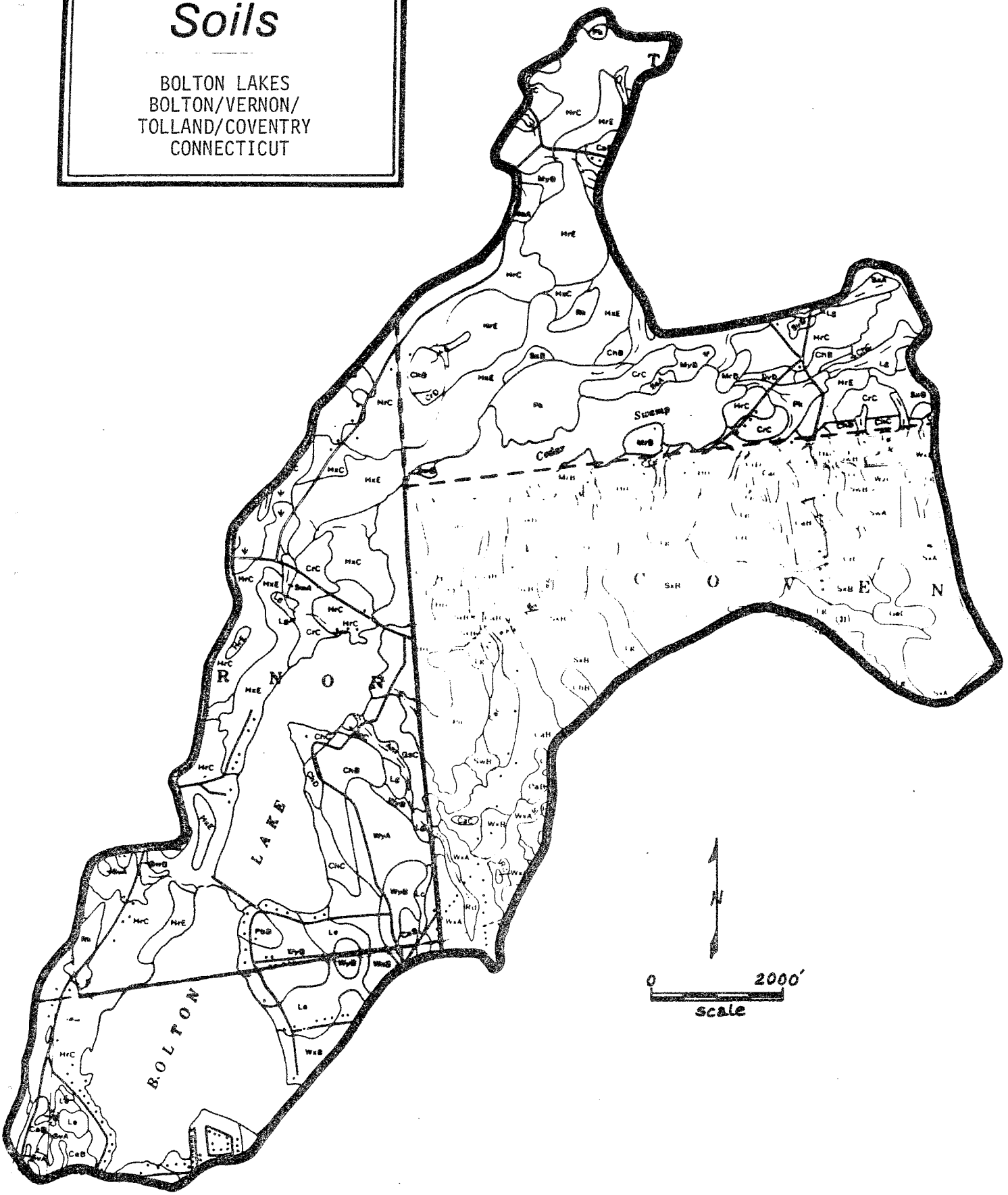
Town planning methods for controlling and monitoring the quality of the lakes may include the formation of watershed districts or the adoption of new zoning

ordinances. A continued low density of development is recommended to preserve an adequate water quality. The ecoregion concept may aid towns in planning for the conservation of vegetative and wildlife resources within the watershed.

Appendix

Soils

BOLTON LAKES
BOLTON/VERNON/
TOLLAND/COVENTRY
CONNECTICUT



Information taken from: Soil Survey, Tolland County, Connecticut, 1966, soil survey sheets Nos. 28, 29, 33, 34; published by the United States Department of Agriculture, Soil Conservation Service. Advance copy, subject to change.

BOLTON LAKE WATERSHED - TOWN OF VERNON

PROPORTIONAL EXTENT OF SOILS AND THEIR LIMITATIONS FOR CERTAIN LAND USES

Soil Series and Symbol	Approx. Acres	Percent of Area	URBAN USE LIMITATIONS: On-Site Sewage	Buildings with Basements	Streets and Parking	Land-scaping	RECREATION LIMITATIONS: Camp Areas	Picnic Areas	Play-grounds	Trails and Paths	Principal Limiting Factors
Alluvial Land											
Am	5.5	1.3	3	3	3	3					
Charlton											
CaB	5.0	1.1	1	1	1	1	1	1	1	1	Slope
ChB	23.0	5.3	2	2	1	2	1	1	1	1	Slope
ChC	13.5	3.1	2	2	2	2	2	2	3	1	Slope
ChD	3.0	0.7	3	3	3	3	3	3	3	2	Slope
CrC	1.0	0.2	2	2	2	2	2	2	3	1	Slope
Gloucester & Charlton											
GeC	14.0	3.2	2	2	3	3	2	2	3	1	Small Stones, Slope Slow Perc
Hollis											
HrC	142.5	32.7	3	3	3	3	2	2	3	1	Slope, Stones, Depth to Bedrock
HrE	11.0	2.5	3	3	3	3	3	3	3	3	" " "
HxC	30.0	6.9	3	3	3	3	2	2	3	1	" " "
HxE	61.0	14.0	3	3	3	3	3	3	3	3	" " "
Leicester											
Lc	3.0	0.7	3	3	3	3	3	3	3	3	Wetness
Le	10.0	2.3	3	3	3	3	3	3	3	3	Wetness
Leicester-Ridgebury-Whitman											
Lg	10.5	2.4	3	3	3	3	3	3	3	3	Wetness
Paxton											
PbB	7.0	1.6	3	2	2	2	2	1	2	1	Slope, Slow Perc

BOLTON LAKE WATERSHED - TOWN OF VERNON

PROPORTIONAL EXTENT OF SOILS AND THEIR LIMITATIONS FOR CERTAIN LAND USES

Soil Series and Symbol	Approx. Acres	Percent of Area	URBAN USE LIMITATIONS: On-Site Sewage	Buildings with Basements	Streets and Parking	Land-scaping	RECREATION LIMITATIONS: Camp Areas	Picnic Areas	Play grounds	Trails and Paths	Principal Limiting Factors
Peat & Muck											
Pm	4.0	0.9					3	3	3	3	Wetness
Rock land											
Rk	7.0	1.6					3	3	3	3	Rock
Sutton											
SwA	3.0	0.7	3	3	2	2	2	1	2	1	Slope, Large Stones
SwB	2.3	0.5	3	3	2	2	2	1	3	1	Slope, Large Stones
Woodbridge											
WxA	4.5	1.0	3	3	3	1	1	1	1	1	Slope
WxB	12.5	2.9	3	3	3	1	1	1	2	1	Slope
WyA	29.0	6.7	3	3	3	2	2	2	2	2	Large Stones, Slope, Slow Perc
WyB	31.5	7.2	3	3	3	2	2	2	2	2	" " "
Total	435.5	100 %									

1 = Slight
2 = Moderate
3 = Severe

ACREAGE SUMMARY OF LIMITATIONS

Total Acres =	Slight Acres	Slight Percent	Moderate Acres	Moderate Percent	Severe Acres	Severe Percent
On-Site Sewage	5.0	1.1	51.5	11.8	379.0	87.0
Buildings with Basements	5.0	1.1	58.5	13.4	372.0	85.4
Streets and Parking	28.0	6.4	26.5	6.1	381.0	87.5
Landscaping	22.0	5.1	110.0	25.3	303.5	69.7

BOLTON LAKE WATERSHED - TOWN OF TOLLAND

PROPORTIONAL EXTENT OF SOILS AND THEIR LIMITATIONS FOR CERTAIN LAND USES

Soil Series and Symbol	Approx. Acres	Percent of Area	URBAN USE LIMITATIONS				RECREATION LIMITATIONS				Principal Limiting Factors
			On-Site Sewage	Buildings with Basements	Streets and Parking	Land-scaping	Camp Areas	Picnic Areas	Play-Grounds	Trails and Paths	
Charlton											
CaB	4.5	0.8	1	1	1	1	1	1	1	1	Slope
CaC	5.5	1.0	2	2	2	2	2	2	3	1	Slope
ChC	3.0	0.6	2	2	2	3	2	2	3	1	Slope
ChD	3.0	0.6	3	3	3	3	3	3	3	2	Slope
CrC	32.0	6.0	2	2	2	3	2	2	3	1	Slope
CrD	16.5	3.1	3	3	3	3	3	3	3	2	Slope
Hollis											
HrC	93.0	17.4	3	3	3	3	2	2	3	1	Slope, Stones, Depth Bedrock
HrE	85.5	15.8	3	3	3	3	3	3	3	2-3	" " "
HxC	4.0	0.7	3	3	3	3	2	2	3	1	" " "
HxE	63.0	11.8	3	3	3	3	3	3	3	2-3	" " "
Leicester											
Le	3.5	0.7	3	3	3	3	3	3	3	3	Wetness
Leicester-Ridgebury-Whitman											
Lg	49.5	9.2	3	3	3	3	3	3	3	3	Wetness
Merrimac											
MrB	11.5	2.1	1	1	1	1	1	1	2	1	Slope
MyA	3.5	0.7	1	1	1	1	1	1	1	1	Slope
MyB	10.0	1.9	1	1	1	1	1	1	2	1	Slope
Peat & Muck											
Pk	104.5	19.5	3	3	3	3	3	3	3	3	Wetness
Rock land											
Rk	6.0	1.1	3	3	3	3	3	3	3	3	Depth to Bedrock

BOLTON LAKE WATERSHED - TOWN OF TOLLAND

PROPORTIONAL EXTENT OF SOILS AND THEIR LIMITATIONS FOR CERTAIN LAND USES

Soil Series and Symbol	Approx. Acres	Percent of Area	URBAN USE LIMITATIONS: On-Site Sewage	Buildings with Basements	Streets and Parking	Land-scaping	RECREATION LIMITATIONS: Camp Areas	Picnic Areas	Play-grounds	Trails and Paths	Principal Limiting Factors
Sudbury											
SsA	7.0	1.3	3	3	2	1	2	1	2	1	Slope, Large Stones
Sutton											
SvB	15.0	2.8	3	3	2	1	2	1	3	1	Slope, Large Stones
SxA	6.0	1.1	3	3	2	2	2	1	2	1	Slope, Large Stones
SxB	9.0	1.2	3	3	2	2	2	1	3	1	Slope, Large Stones
Total	535.5	100 %									

1 = Slight
2 = Moderate
3 = Severe

ACREAGE SUMMARY OF LIMITATIONS

Total Acres	Slight Acres	Slight Percent	Moderate Acres	Moderate Percent	Severe Acres	Severe Percent
On-Site Sewage	31.5	5.9	40.5	7.6	463.5	86.5
Buildings with Basements	31.5	5.9	40.5	7.6	463.5	86.5
Streets and Parking	31.5	5.9	77.5	14.5	426.5	79.6
Landscaping	53.5	10.0	20.5	3.8	461.5	86.2

BOLTON LAKE WATERSHED - TOWN OF COVENTRY

PROPORTIONAL EXTENT OF SOILS AND THEIR LIMITATIONS FOR CERTAIN LAND USES

Soil Series and Symbol	Approx. Acres	Percent of Area	URBAN USE LIMITATIONS			RECREATION LIMITATIONS				Principal Limiting Factors
			On-Site Sewage	Buildings with Basements	Streets and Parking	Land-scaping	Camp Areas	Picnic Areas	Play-grounds	Trails and Paths	
Charlton											
CaA	3.0	0.4	1	1	1	1	1	1	1	1	Slope
CaB	63.5	9.0	1	1	1	1	1	1	1	1	Slope
CaC	18.5	2.6	2	2	2	2	2	2	3	1	Slope
ChB	4.0	0.6	2	2	1	2	1	1	1	1	Slope
CrC	34.5	4.9	2	2	2	2	2	2	3	1	Slope
CrD	8.0	1.1	3	3	3	3	3	3	3	2	Slope
Gloucester											
GaB	7.0	1.0	1	2	1	2	1	1	2	1	Small Stones, Slope
Gloucester & Charlton											
GeC	50.5	7.2	2	2	3	3	2	2	3	1	Small Stones, Slope
Hollis											
HrC	57.0	8.1	3	3	3	3	2	2	3	1	Slope, Stones, Depth to Bedrock
Leicester											
Le	5.0	0.7	3	3	3	3	3	3	3	3	Wetness
Leicester-Ridgebury-Whitman											
Lg	80.5	11.4	3	3	3	3	3	3	3	3	Wetness
Merrimac											
MrB	7.0	1.0	1	1	1	1	1	1	2	1	Slope
Paxton											
PbB	1.0	0.1	3	2	2	2	2	1	2	2	Large Stones, Slope, Slow Perc
PbC	3.0	0.4	3	2	2	2	2	2	3	2	" " "
PeC	13.0	1.8	3	2	2	2	2	2	3	2	" " "
PeD	1.0	0.1	3	3	3	3	3	3	3	2	" " "

COVENTRY

ACREAGE SUMMARY OF LIMITATIONS

Total Acres =	Slight		Moderate		Severe	
	Acres	Percent	Acres	Percent	Acres	Percent
On-Site Sewage	80.5	11.4	73.0	10.3	552.5	78.3
Buildings with Basements	73.5	10.4	131.5	18.6	501.0	81.0
Streets and Parking	84.5	12.0	306.0	43.3	315.5	44.7
Landscaping	73.5	10.4	326.0	46.2	306.5	43.4

BOLTON LAKE WATERSHED - TOWN OF BOLTON

PROPORTIONAL EXTENT OF SOILS AND THEIR LIMITATIONS FOR CERTAIN LAND USES

Soil Series and Symbol	Approx. Acres	Percent of Area	URBAN USE LIMITATIONS: On-Site Sewage	Buildings with Basements	Streets and Parking	Land-scaping	RECREATION LIMITATIONS: Camp Areas	Picnic Areas	Play-grounds	Trails and Paths	Principal Limiting Factors
Charlton											
CaA	4.0	2.4	1	1	1	1	1	1	1	1	Slope
CaB	29.0	17.3	1	1	1	1	1	1	1	1	Slope
CaC	1.0	0.6	2	2	2	2	2	2	3	1	Slope
Hollis											
HrC	59.0	35.2	3	3	3	3	2	2	3	1	Slope, Stones, Depth to Bedrock
Leicester											
Le	26.0	15.5	3	3	3	3	3	3	3	3	Wetness
Sutton											
SvA	3.5	2.1	3	3	2	1	1	1	1	1	Slope
Woodbridge											
WxB	30.0	17.9	3	3	3	1	1	1	2	1	Slope
WyB	15.0	9.0	3	3	3	2	2	2	2	2	Large Stones, Slope, Slow Perc
Total	167.5	100 %									

1 = Slight
2 = Moderate
3 = Severe

ACREAGE SUMMARY OF LIMITATIONS

Total Acres =	Slight Acres	Slight Percent	Moderate Acres	Moderate Percent	Severe Acres	Severe Percent
On-Site Sewage	33.0	19.7	1.0	0.6	133.5	79.7
Buildings with Basements	33.0	19.7	1.0	0.6	133.5	79.7
Streets and Parking	33.0	19.7	4.5	2.7	130.0	77.6
Landscaping	66.5	39.7	16.0	9.6	85.0	50.7

BOLTON LAKE WATERSHED

ACREAGE SUMMARY OF LIMITATIONS

Total Acres = 1844.5	Slight		Moderate		Severe	
	Acres	Percent	Acres	Percent	Acres	Percent
On-Site Sewage	150.0	8.1	166.0	9.0	1528.5	82.9
Buildings with Basements	143.0	7.8	231.5	12.5	1470.0	79.7
Streets and Parking	177.0	9.6	414.5	22.5	1253.0	67.9
Landscaping	215.5	11.7	472.5	25.6	1156.5	62.7

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.

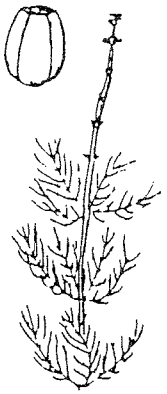
Moderate Limitations

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.

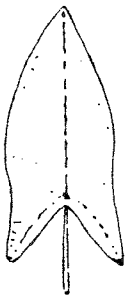
Severe Limitations

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.

① Pontederia sp. PICKEREL WEED

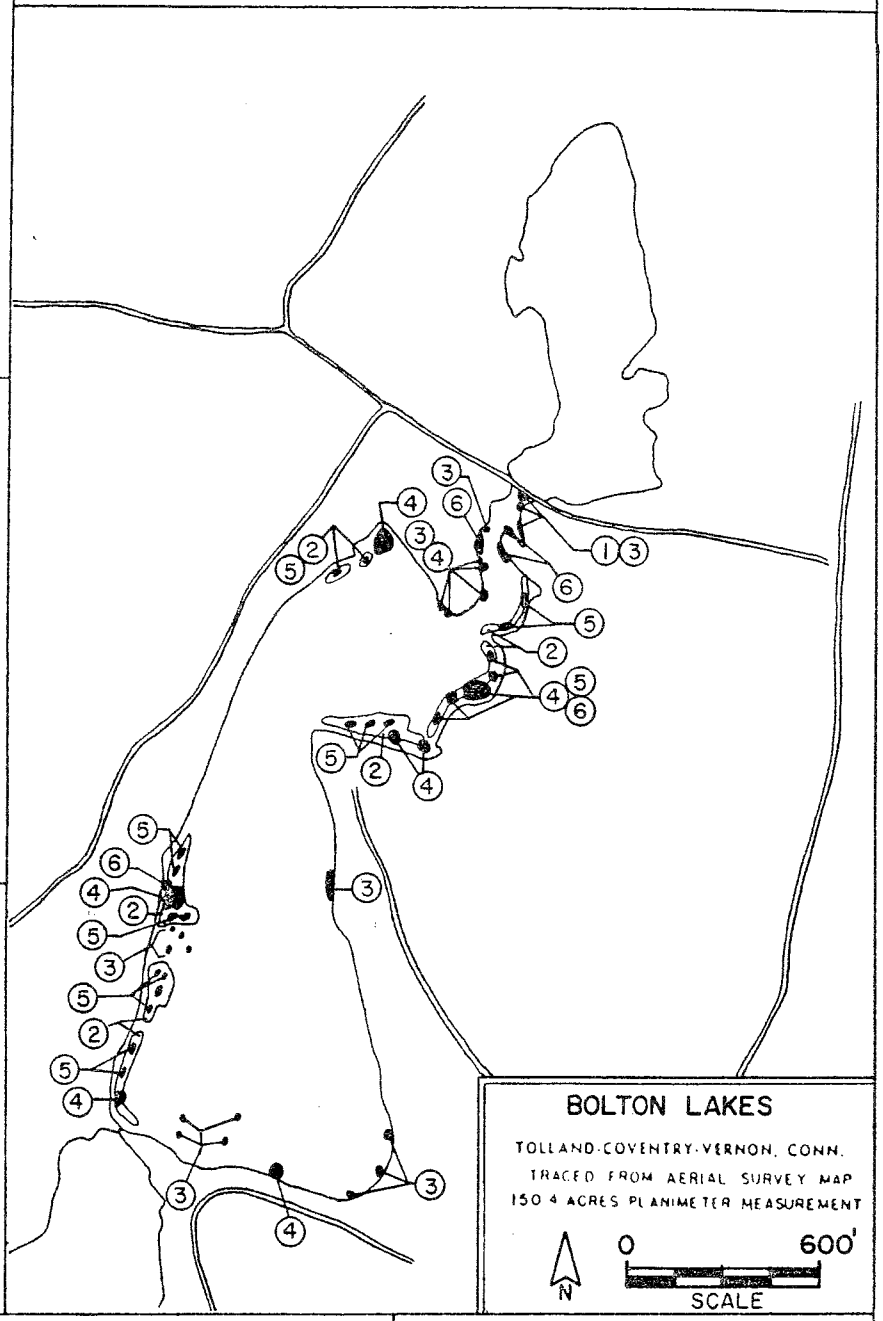


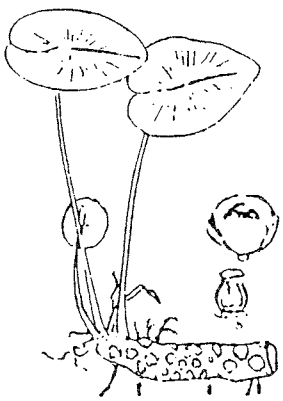
② Myriophyllum sp. WATER MILFOIL



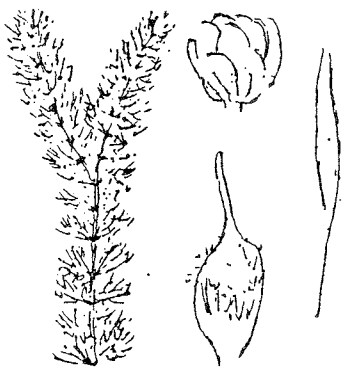
③ Peltandra sp. ARROW ARUM

MACROPHYTE AND STATION LOCALE MAP

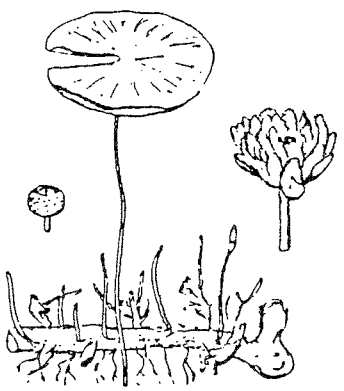




④ Nuphar sp. YELLOW WATER LILY



⑤ Ceratophyllum sp COONTAIL



⑥ Nymphaea sp. WHITE POND LILY

Prepared by: Thomas T. Haze

CONNECTICUT BIOLOGICAL MONITORING

Biological Survey Data Sheet

Macrophyte Data

Date: 9-7-78

Time:

Sample Station No. and Description: Middle Bolton Lake

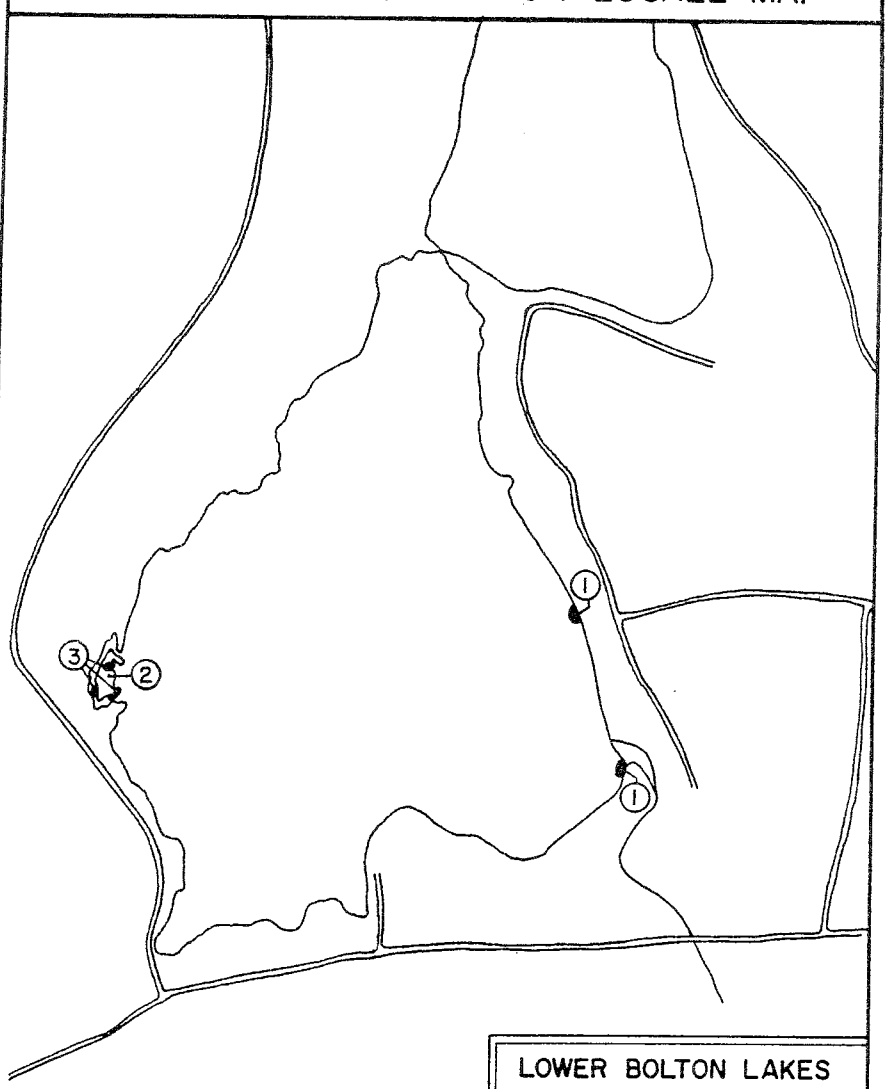
Macrophyte	Stat.	Depth	Bottom Type	Relative Abundance
Myciophyllum sp.				most abundant
Ceratophyllum sp.				abundant
Nymphaea sp.				common
Nuphar sp.				common
Peltandra sp.				common
Pontederia sp.				scarce

Notes:

1) Transparency 1 meter or less due to algal bloom

2.) Upper Bolton Lake completely filled with a combination of all of the above weeds plus Ceratophyllum sp. and Potamogeton sp.

MACROPHYTE AND STATION LOCALE MAP



LOWER BOLTON LAKES

BOLTON VERNON, CONN.

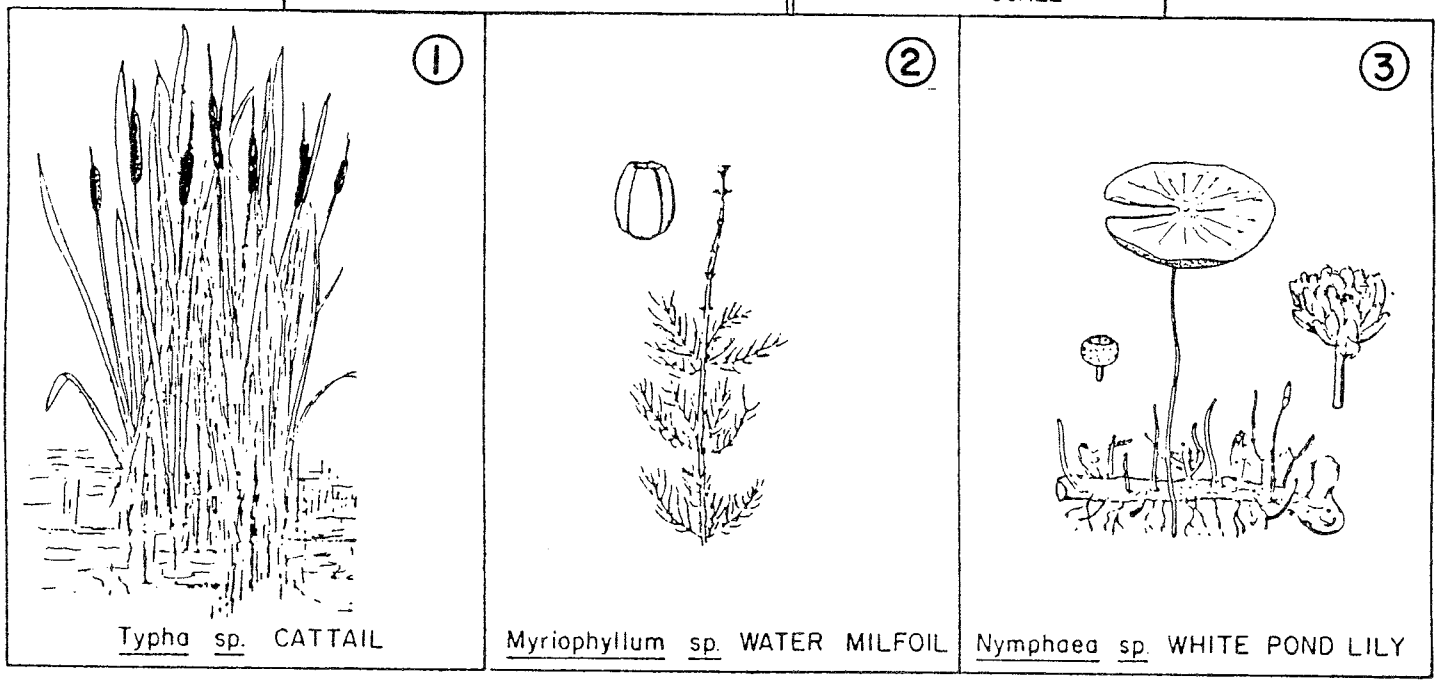
TRACED FROM AERIAL SURVEY MAP

178.4 ACRES PLANIMETER MEASUREMENT

N

0 600'

SCALE



Typha sp. CATTAIL

Myriophyllum sp. WATER MILFOIL

Nymphaea sp. WHITE POND LILY

Prepared by:

CONNECTICUT BIOLOGICAL MONITORING — Thomas T. Haze

Biological Survey Data Sheet — Date: 9-7-78

Macrophyte Data — Time:

Sample Station No. and Description: Lower Bolton Lake

Macrophyte	Stat.	Depth	Bottom Type	Relative Abundance
Myriophyllum sp.				most abundant
Nymphaea sp.				relatively abundant
Typha sp.				scarce

notes:

1.) Transparency 2-3 meters

2.) Lake in process of draw-down, 1 foot below mean water level.

3.) Shoal areas very rocky with some ledge

4.) Contours deeper than 12 feet do not exist. Majority of lake 12 feet deep and flat. (Fisheries survey, summer 1978)

ORGANISM	TALLY	c/ml	RELATIVE ABUNDANCE %
CYANOPHYCEAE			
Non-filamentous blue-green algae			
TOTAL			
Filamentous blue-green algae			
Anabaena *	16	18,753	100
TOTAL		18,753	
CHLOROPHYCEAE			
Non-filamentous green algae			
TOTAL			
Filamentous green algae			
TOTAL			

Phytoplankton Sedgwick-Rafter Count

Part A

STATION NUMBER: 1

COLLECTION LOCATION: middle Bolton Lake

COLLECTED BY: T. Haze

DATE COLLECTED: 9-7-78

DEPTH: Surface

CONCENTRATION FACTOR: 1.04

TOTALS: PARTS A & B

TOTAL PHYTOPLANKTON (count/ml): 18,753

DIVERSITY INDEX:

TOTAL GENERA: 1

AMORPHOUS MATTER:

PLANKTON BIOMASS:
Dry Weight
Ash-free weight

IDENTIFIED BY: C. Hoffman, 9

N.Q. = not quantitative

Enumeration Factor:
40x - 1127

* See Comments on Reverse side

ORGANISM	TALLY	c/ml	RELATIVE ABUNDANCE %
CHLOROPHYCEAE			
Flagellated green algae			
TOTAL			
BACILLARIOPHYCEAE			
Centric diatoms			
TOTAL			
Pennate diatoms			
TOTAL			
CHRYSOPHYCEAE			
Other pigmented algae			
TOTAL			
Other pigmented flagellated algae			
TOTAL			
DINOPHYCEAE			
Dinoflagellates			
TOTAL			
OTHERS			
TOTAL			

Phytoplankton Sedgwick-Rafter Count

Part B

Middle Bolton 9-7-78

REMARKS:

Anabaena filaments were extremely fragmented. This could be the result of the algae beginning to die

Besides the sixteen filaments tallied, 33 individual cells were counted (37,191 /ml) This would bring the total count to 55,944 /ml

A qualitative analysis of this sample revealed no other genera present.

Av. filament diam. - 11 μ
Av. Heterocyst diam. - 17 μ
Av. Spore diam. - 11 μ

Suggested Timber Management Procedures

The following procedures are taken from the first draft of "Timber Harvesting Guidelines," by the Wood Producers Association of Connecticut.

Maintenance of water quality.

1) Cross Streams at right angles and at a minimum number of places. This should prevent changes in channel and minimize bank disturbance. Crossing where bottom is hard will also prevent pools that slow water flow.

2) Keep slash out of streams. Prevention of acid built-up from vegetative decay and maintenance of fast flow of streams.

3) Leave over half of original shade over water bodies after logging. Maintenance of cool, high oxygen content water and cool fishing places are desired.

4) Locate skid trails on less than 15% grade, or water bar while in use. On all grades not outsloped, install water bars and runoffs immediately after use. This is done to minimize rainfall-water flow and velocity and resulting silt loss.

5) Get permit from town or DEP on all road construction on wetland soils. This is the law.

SILVICULTURE - Harvest to encourage fast growing healthy trees within the cut area. Tree farming is encouraged along with the idea that both landowner and logger are stewards of the land and its' resources. Where property size and site permit sustained yield - periodic harvesting is encouraged.

1) Fell nearly all badly damaged and bent over poles and larger trees.

2) Leave a minimum of culls on cut area.

AESTHETICS - Help landowners to manage land for multiple benefits through timber harvesting to minimize eyesores. The following help to minimize mans' footprint in the management process:

LOGGING ROADS AND SKID TRAILS

Logging roads and skid trails are prime areas for erosion and sedimentation if they are not properly planned. Most of the real environmental problems, in relation to logging and water quality, come from these areas of soil disturbance.

1) Before starting any logging operation, look over the logging chance so that skid trails and logging roads can be properly planned.

2) Avoid making a skid trail directly up a hill as this will result in excessive channelization and erosion. Use an alternate route, if available.

3) Grades should be kept below 10-percent. For very short distances grades of 15 to 20-percent can be used. (NOTE: a 10-percent grade is one that has an elevation change of 10 feet for each 100 feet of horizontal distance.)

4) Road surface diversions, such as water bars and open top culverts, should be placed at distances commensurate with the road grade. Recommended spacing is:

Road grade (%)	Spacing (Feet) *
2 - 5	300 - 500
6 - 10	200 - 300
11 - 15	100 - 200
16 - 20	100 - —

5) Logging roads and skid trails should be "put-to-rest" after the logging operation is completed. Its access should be prevented by a barrier at its entrance. Water bars should be repaired so that proper road drainage can be obtained while the vegetation is reestablishing itself on the road. Seeding of the logging roads and skid trails is recommended both for aesthetics and for deterring soil erosion on the roadways.

6) Refer to the following publications for details in the proper construction and maintenance of skid trails and logging roads.

* *Haussman & Pruett. 1973. Permanent Logging Roads for Better Woodlot Management. USDA. State & Private Forestry, Upper Darby, PA. 45 pp.*

Kochenderfer. 1970. Erosion Control on Logging Roads in the Appalachians. USDA. N.E. Forest Experiment Station, Upper Darby, PA. 28 pp.

Society of American Foresters. Forestry Handbook. Chapter 18.

WETLAND AND STREAM PROTECTION

Legislation in past years has focused on wetlands, and their value and protection. Operations in these wetlands and streams should be handled carefully so that problems will not result in the future. A logging operation well handled around wetlands and streams is a credit to a good logger.

1) Near streams only a portion of the timber volume should be harvested. This harvested volume will vary in individual cases, but generally 50-percent of the volume should be left to guarantee protection of the stream to provide shade and a filter strip. Trees growing in wetlands have a shallow root system and can suffer windthrow if a sufficient residual volume is not retained.

2) Avoid felling trees into streams.

3) Remove tops and limbs in streams.

4) Debris which finds its way into streams should be removed promptly.

5) Stream crossings, when necessary, should be made at right angles to the stream, and where banks are low and bottom is rock or compacted gravel.

6) Temporary structures used to cross wetlands and streams should be removed after their use has ended.

7) Seeding of disturbed areas near streams is in order. Small amounts of grass seed judiciously placed can make a big difference in a disturbed area. Backblade the area when operations are completed and then apply seed.

8) Never leave litter near streams and never change the crankcase or hydraulic oil near these areas.

9) Permits may be required when logging near wetlands or streams.

YARDING AND LANDING AREAS

These areas are some of the most likely places to cause an undesirable effect on water quality. The large amount of activity near these areas will cause soil and vegetation disturbances and thus special precautions must be taken.

1) Locate yarding areas well away from streams.
2) Keep the area as small as possible.
3) Remove debris and waste oil daily.
4) Blade the area after it has served its purpose.
5) Seed the area when the logging chance is completed.
6) Dispose of cull material in such a way as to be aesthetically pleasing to the eye.

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 - nturient level.

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

BIBLIOGRAPHY - SOURCES NOT PREVIOUSLY CITED

Dowhan, Joseph J. and Robert J. Craig, Rare and Endangered Species of Connecticut and Their Habitats, State Geological and Natural History Survey of Connecticut, Natural Resources Center, Department of Environmental Protection, Report of Investigations no. 6, 1976.

Hardy, Rudolph W., The Impact of Urbanization on New England Lakes, U.S. Dept. of the Interior, Office of Water Research and Technology, Volume 2, December 1977.

West, Ronald J., Lake Management Handbook - A Guide to Quantifying Phosphorus Inputs to Lakes and Developing Watershed Management Programs, DRAFT. Windham Regional Planning Agency, 1978.

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.