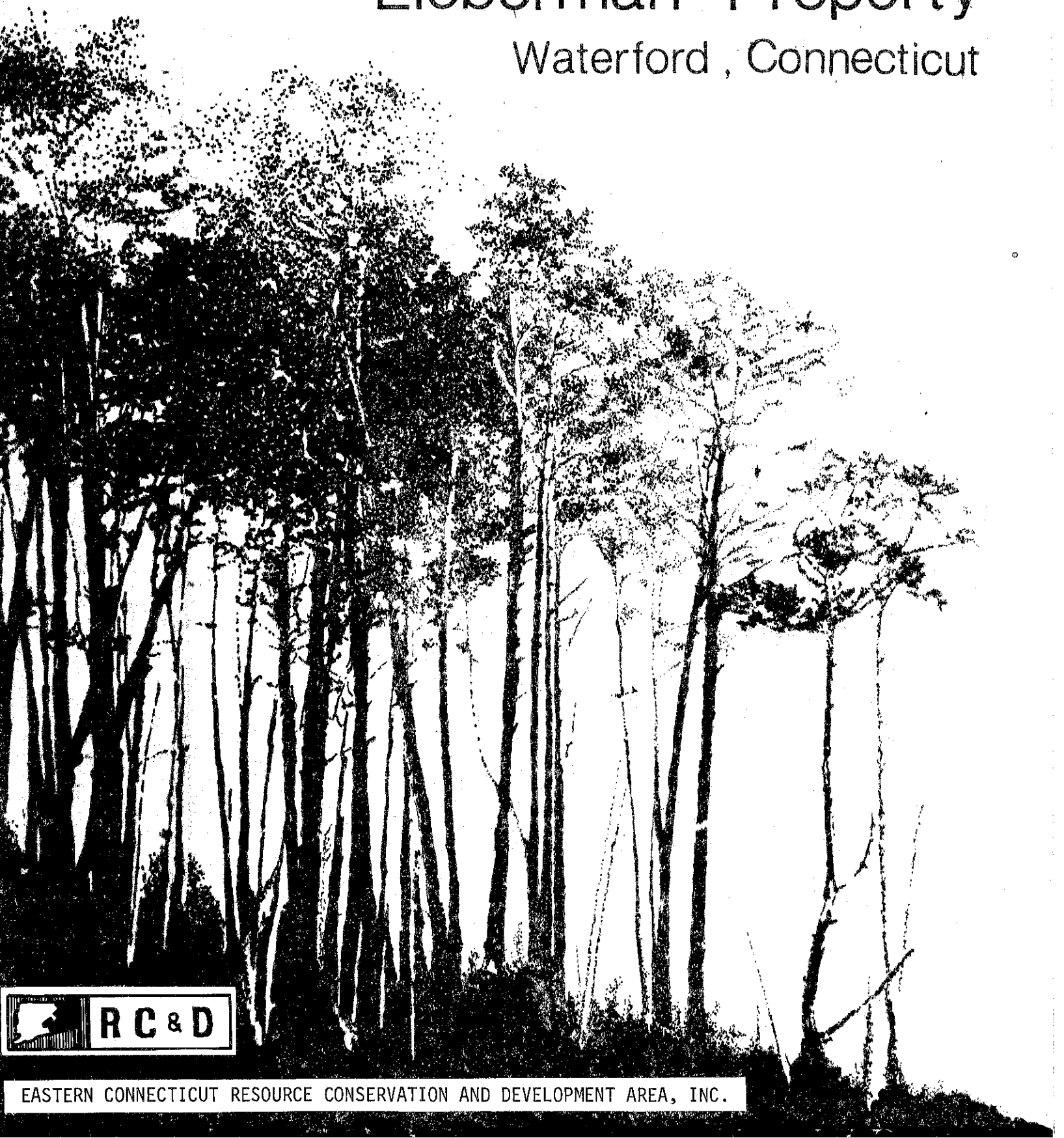
Environmental Review Team Report

Lieberman Property

Waterford, Connecticut



RC&D

EASTERN CONNECTICUT RESOURCE CONSERVATION AND DEVELOPMENT AREA, INC.

Environmental Review Team Report

on

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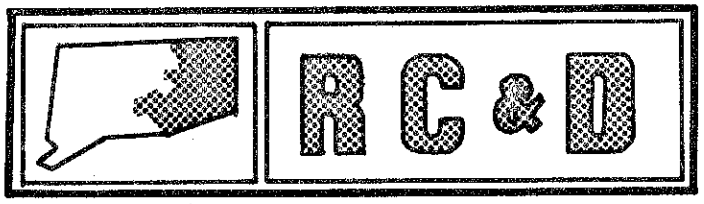
March 1979



eastern connecticut resource conservation & development area

environmental review team
139 boswell avenue
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ENVIRONMENTAL REVIEW TEAM REPORT
ON
THE LIEBERMAN PROPERTY
WATERFORD, CONNECTICUT

This report is an outgrowth of a request from the Waterford Conservation Commission to the New London 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 for the RC&D Executive Committee by David Syme, Committee President, 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 following agencies and personnel participated on the field review of this site: the Connecticut Department of Environmental Protection (Ron Rosza, ecologist; Robert Rocks, forester and biologist; Michael Zizka, geologist and acting Team coordinator); the United States Department of Agriculture, Soil Conservation Service (Richard Dykstra, engineering technician; Gary Parker, New London district conservationist); and the Southeastern Connecticut Regional Planning Agency (Gerhard Amt, planner).

The Team met and field checked the site on Thursday, January 11, 1979. Reports from each contributing Team member were sent to the acting 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 landowner and the Town of Waterford. 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 additional information concerning this review is needed, please contact: Michael Zizka, Department of Environmental Protection, Region 3 Headquarters, 209 Hebron Road, Marlborough, Connecticut 06447; 295-9523.

If additional information about the ERT is desired, please contact: Ms. Jeanne Shelburn, Environmental Review Team Coordinator, Eastern Connecticut RC&D Area, 139 Boswell Avenue, Norwich, Connecticut 06360; 889-2324.

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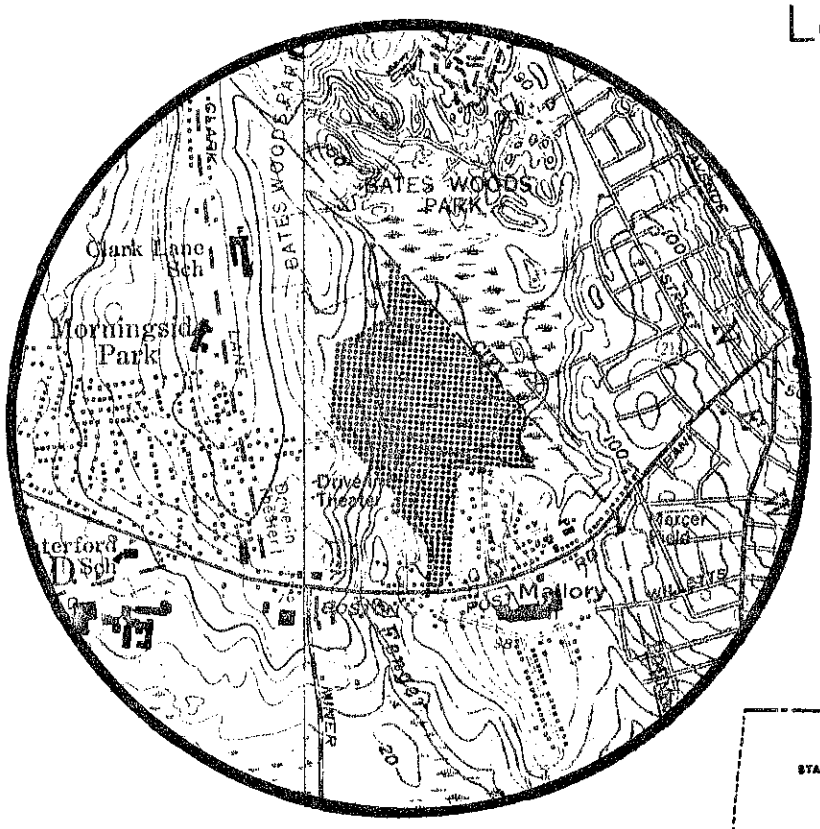
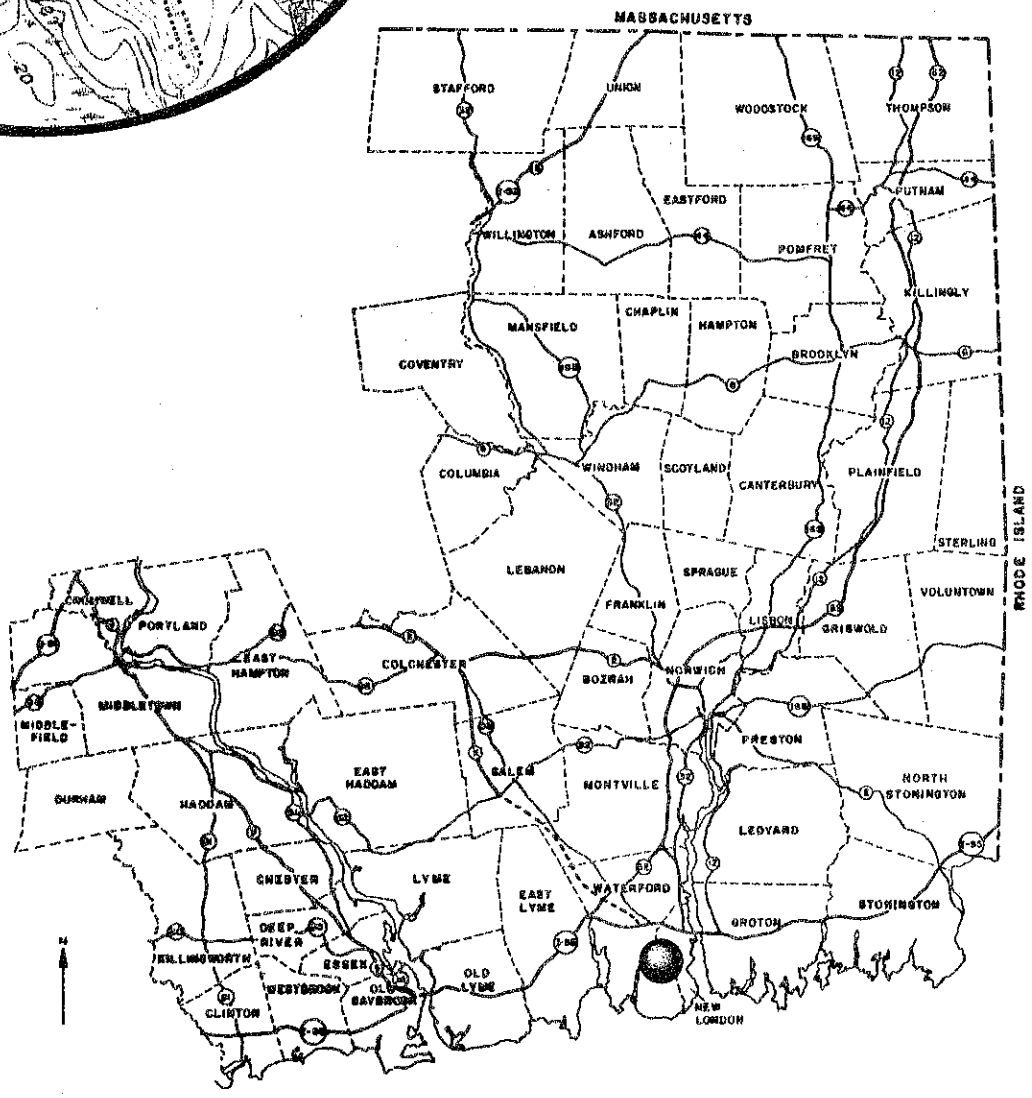
THE LIEBERMAN PROPERTY
WATERFORD, CONNECTICUT





EASTERN CONNECTICUT
RESOURCE CONSERVATION AND DEVELOPMENT PROJECT

INTRODUCTION

The review site (see Figure 1) consists of approximately 70 acres, presently in the private ownership of Dr. Leo Lieberman of Waterford. The property is located north of Boston Post Road (U.S. Route 1) in Waterford and is bounded on the northeast by the New London city line. Essentially, the site consists of several small highland areas surrounded by a wetland of the Fenger Brook system.

Dr. Lieberman has received two permits to fill portions of the wetland in order to allow access to the highland areas. A request for a third such permit was submitted recently, prompting this review. The latest proposal involves the construction of a causeway across Fenger Brook and part of the wetland. Although Dr. Lieberman has not submitted any other plans to date, it is anticipated that he will ultimately develop the highland sections in some manner. Current zoning regulations allow half-acre residential development in this area. The Team was asked to examine the site in terms of its potential for such development. The effects of the causeway and of the projected residential development on Fenger Brook and its wetlands were of particular concern. It should be noted here that public sewerage and water supply would be available to the site should development occur.

Because the actual development plans have not been finalized, and because the extent of wetlands on the site is relatively large, the Team was encouraged to undertake a more detailed and wide-ranging review than otherwise might have occurred. Consequently, this report contains a general summary of the significance of wetlands, as well as a rather detailed study of the vegetation on the site. It is hoped that this material will guide the landowner and the town in planning for the ultimate use of the site.

THE SIGNIFICANCE OF WETLANDS

Freshwater wetlands form an indispensable and invaluable ecological and hydrological system occupying valleys and depressions where the water table is at or near the land surface. The wetland is the surface manifestation of a larger and hydrologically more complex subsurface water mass. The nature and properties of both the wetland and its vegetation are intricately attuned to the properties inherent in the groundwater. These include nutrient concentrations, changes in water levels, and flooding durations. The alteration of any of these factors, either singly or in concert, may produce any one of a host of wetland plant communities that are commonplace in southern New England. Similarly, the damming, filling, or channelization of principal creeks can trigger a transformation of a wetland that is often irreversible and detrimental.

Urbanization or other types of development within the watersheds of wetlands often has serious consequences in terms of wetland water quality and quantity. In most cases, development will increase the volume of water that flows into the wetlands during periods of precipitation. In some cases, however, storm drainage

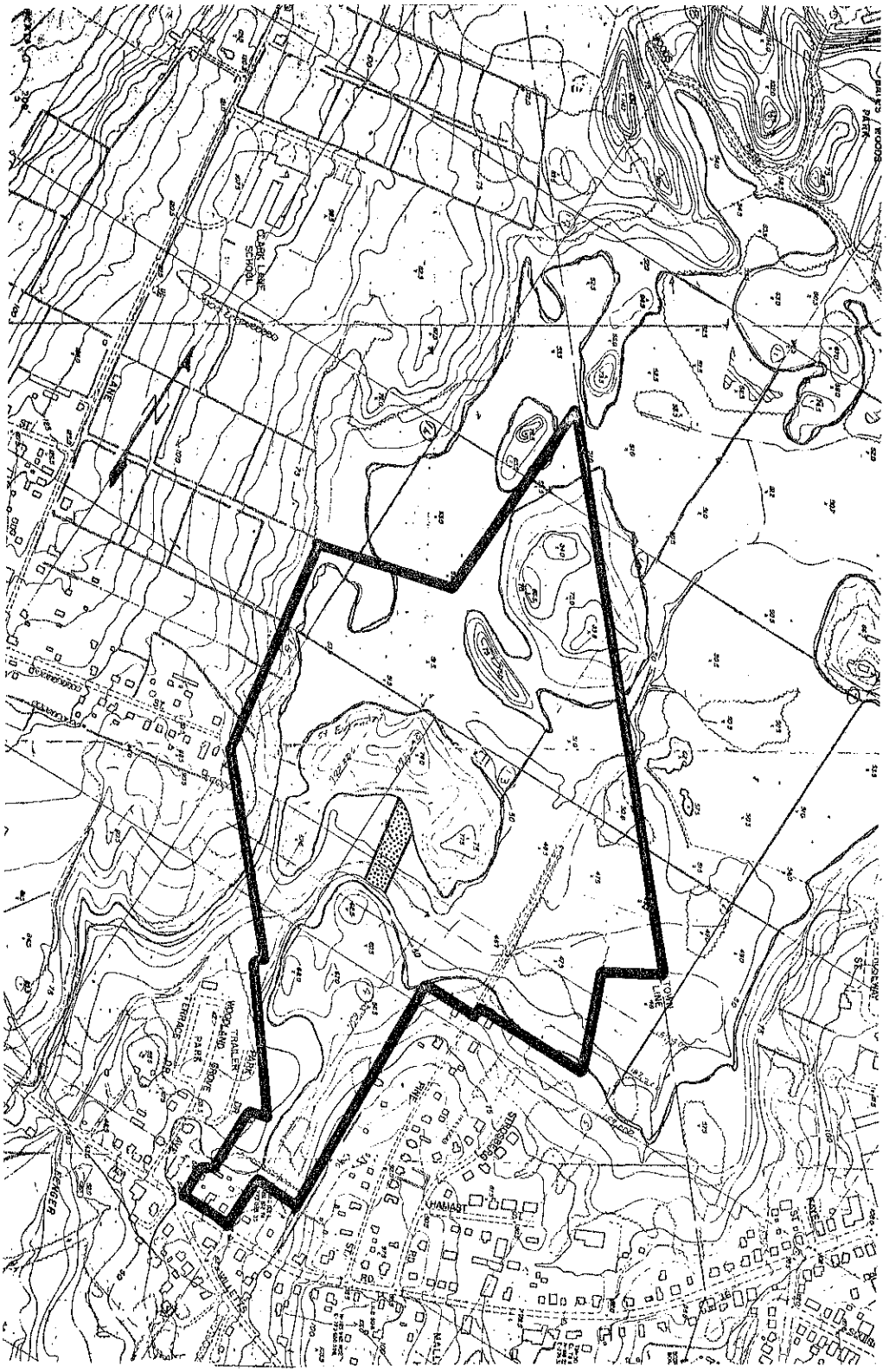


Figure 1.

Topography of the Lieberman property.

LEGEND

Approximate location of the proposed causeway.

channels that are created during development actually divert the flow from a portion of the watershed to a different outlet point, resulting in a decrease in the amount of water that passes into and through the wetlands. Of course, surface water and groundwater flowing through urbanized areas tends to be contaminated by salts, fertilizers, septic-tank effluent, hydrocarbon fuels, and/or other chemicals. These elements may in turn affect the plant and wildlife communities of those wetlands that ultimately receive this water. One of the more interesting modern environmental problems has been to determine which types of pollutants are readily removed from the water by the buffering effect of the wetlands, and which types do the most serious harm to wetland plant and animal life.

It may be stated unequivocally that wetlands provide a number of vital services that should not be taken for granted. These services include floodwater storage, wildlife protection, surface-water purification, oxygen production, and biological productivity. An important and frequently overlooked benefit of most wetlands is their ability to replenish streams during dry periods by serving as sites of groundwater discharge. A prudent wetlands management and protection plan must include consideration of watershed areas, as well as the wetlands themselves.

NATURAL RESOURCES OF THE SITE

GEOLOGY

The Lieberman property is located along the western boundary of the New London topographic quadrangle. Bedrock and surficial geologic maps of that quadrangle have been published by the U.S. Geological Survey (publication numbers GQ-574 and GQ-176, respectively). Both maps were drawn by Richard Goldsmith.

Bedrock underlying and cropping out on the site forms part of a unit known as the New London Gneiss. The rock is generally light gray, medium- to fine-grained, and massive (not prominently layered). The major mineral constituents are oligoclase, quartz, and microcline, with occasional biotite, magnetite, and lenses of amphibole. This bedrock unit has been used as a source of riprap and building stone.

The unconsolidated materials overlying bedrock on the site consist primarily of till, a glacial deposit whose composition is variable, incorporating a wide range of particle sizes and shapes. Till is composed of materials which were removed by glacier ice from preexisting rock exposures and soils and which were later redeposited directly from the ice. The till on the site is very thin: on most parts of the islands, it probably is less than 5 feet thick. Because of the granular nature of the parent rock materials, the till is very coarse, consisting largely of sand, and tends to be very loose. In some exposures along the sewer-line cut, the till resembled a relatively well-sorted glacial meltwater deposit.

On much of the site, the till is covered by swamp deposits, which consist primarily of clay, silt, sand, and decayed or decaying plant remains. Floodplain deposits of similar materials (minus the organic component) form a thin cover in some places. Raised areas of artificial fill are present at the ends of Monroe Street and Pine Street, as well as along a section of the new sewer easement.

FIGURE 2

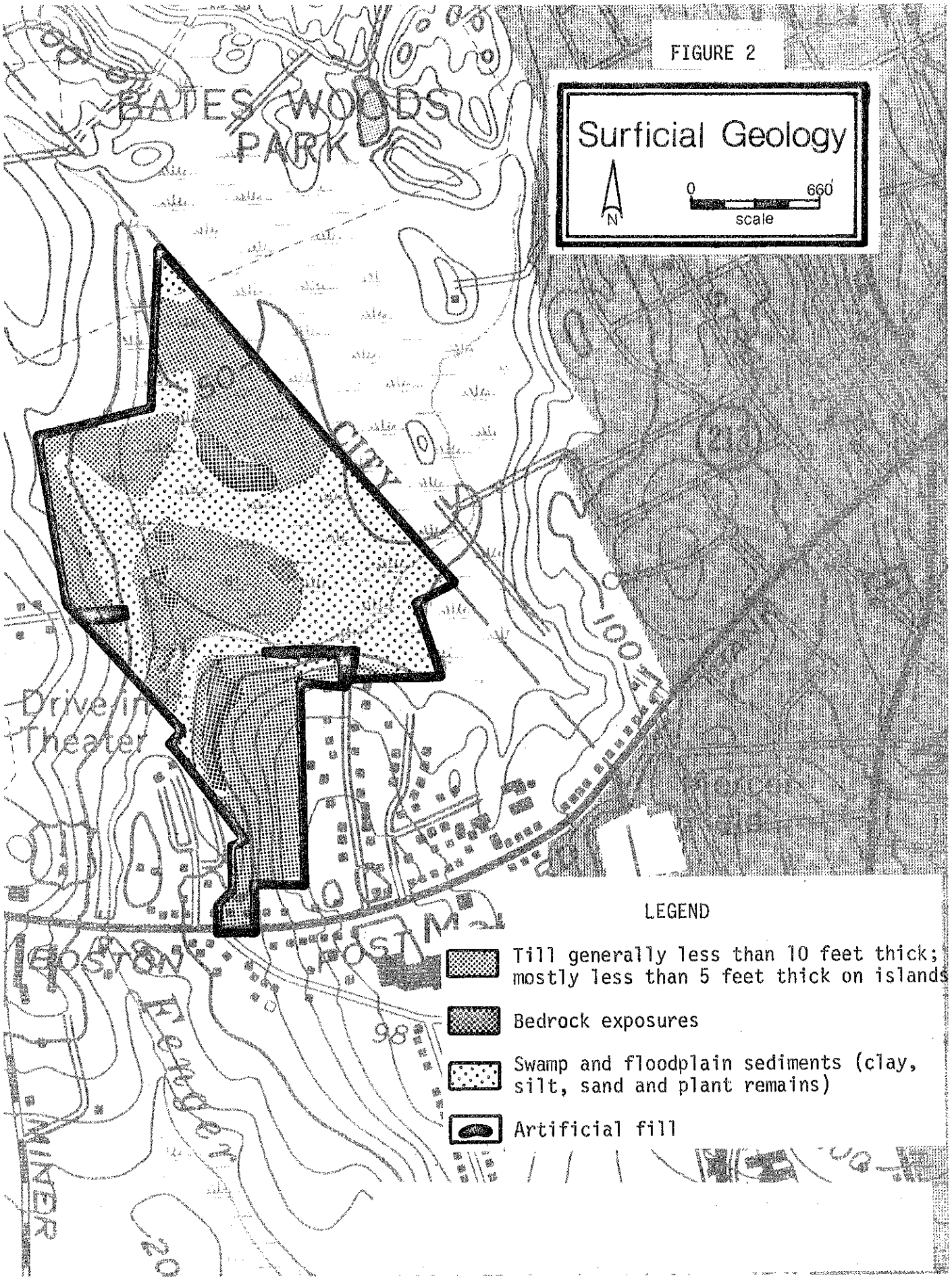

Surficial Geology
N
0
660'
scale
BATES WOODS PARK
Drive-in Theater
POST
POST
Floodplain
WATER
LEGEND
Till generally less than 10 feet thick; mostly less than 5 feet thick on islands
Bedrock exposures
Swamp and floodplain sediments (clay, silt, sand and plant remains)
Artificial fill

Figure 2 shows the surficial geology of the site. Although a U.S. Geological Survey topographic map was used as a base for Figure 2 in order to provide geographical reference points, the topography shown on that base is not completely accurate for the site. The reader should consult Figure 1 for the correct topography.

HYDROLOGY

The Lieberman property lies within the headwater region of Fenger Brook. This region consists of a large swampy area which contains numerous rocky "islands" and which is flanked by the two upper branches of the brook. Both branches have been modified by cutting, filling, and grading along the new sewer easement; the western branch has been channelized in part. The two branches merge near the western border of the site, and the brook continues flowing south for about three miles, finally entering Long Island Sound.

SOILS

Figure 3 shows the types and distribution of soils on the Lieberman property. A detailed description of individual soil series and a chart of their limitations for various urban uses may be found in the Appendix.

The following three soil complexes make up approximately 90 percent of the site: Charlton-Hollis, Hollis-Rock outcrop, and Ridgebury-Leicester-Whitman. The Charlton-Hollis complex consists of an intricate pattern of thin soils (Hollis part) and deeper soils (Charlton part). Whereas the deeper soils have mostly moderate limitations for urban uses, the thin soils have severe limitations. The Hollis-Rock outcrop complex has severe limitations throughout because of the proximity of bedrock to the surface. The Ridgebury-Leicester-Whitman complex also has severe limitations for urban uses, but these limitations are related principally to wetness.

The best soils in terms of development are the Canton-Charlton complex, which is found along the southeastern border of the site, and the Charlton portions of the Charlton-Hollis complex, which is found on the upland "islands". It is important to note that severe soils limitations do not necessarily preclude development, but large expenditures may be required to overcome these limitations.

VEGETATION

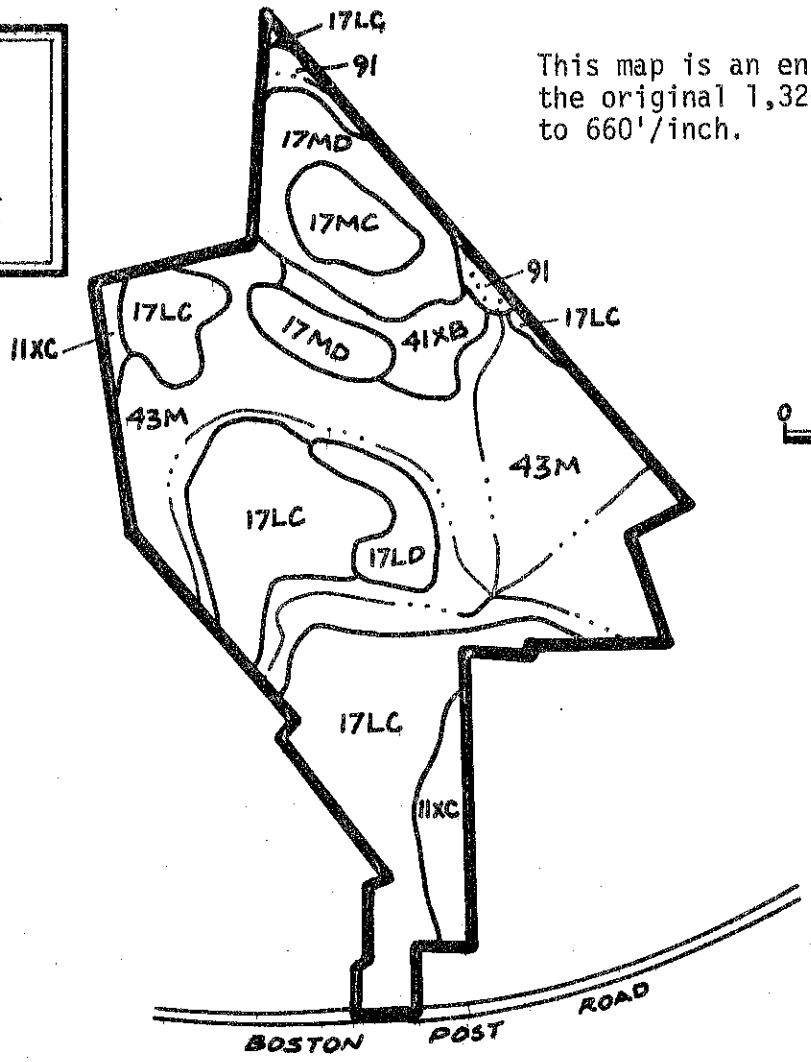
Introductory Note.

The Environmental Review Team that field-inspected the Lieberman site included a forester and an ecologist. These two members examined the site's vegetation from different perspectives; hence, their individual descriptions of the plant communities, although compatible, were unique. The vegetation map, Figure 4, was provided by the Team forester and shows the distribution of two types of stands: hardwood swamp and mixed hardwoods. Although no mapping was undertaken by the Team ecologist, his designations of "wetland communities" and "ridge communities" may be presumed to correspond in large part to the stands mentioned above, in the order given. Both Team members' descriptions are discussed below.

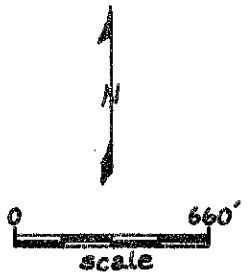
FIGURE 3

Soils

LIEBERMAN PROPERTY
WATERFORD, CONNECTICUT



This map is an enlargement from the original 1,320'/inch scale to 660'/inch.

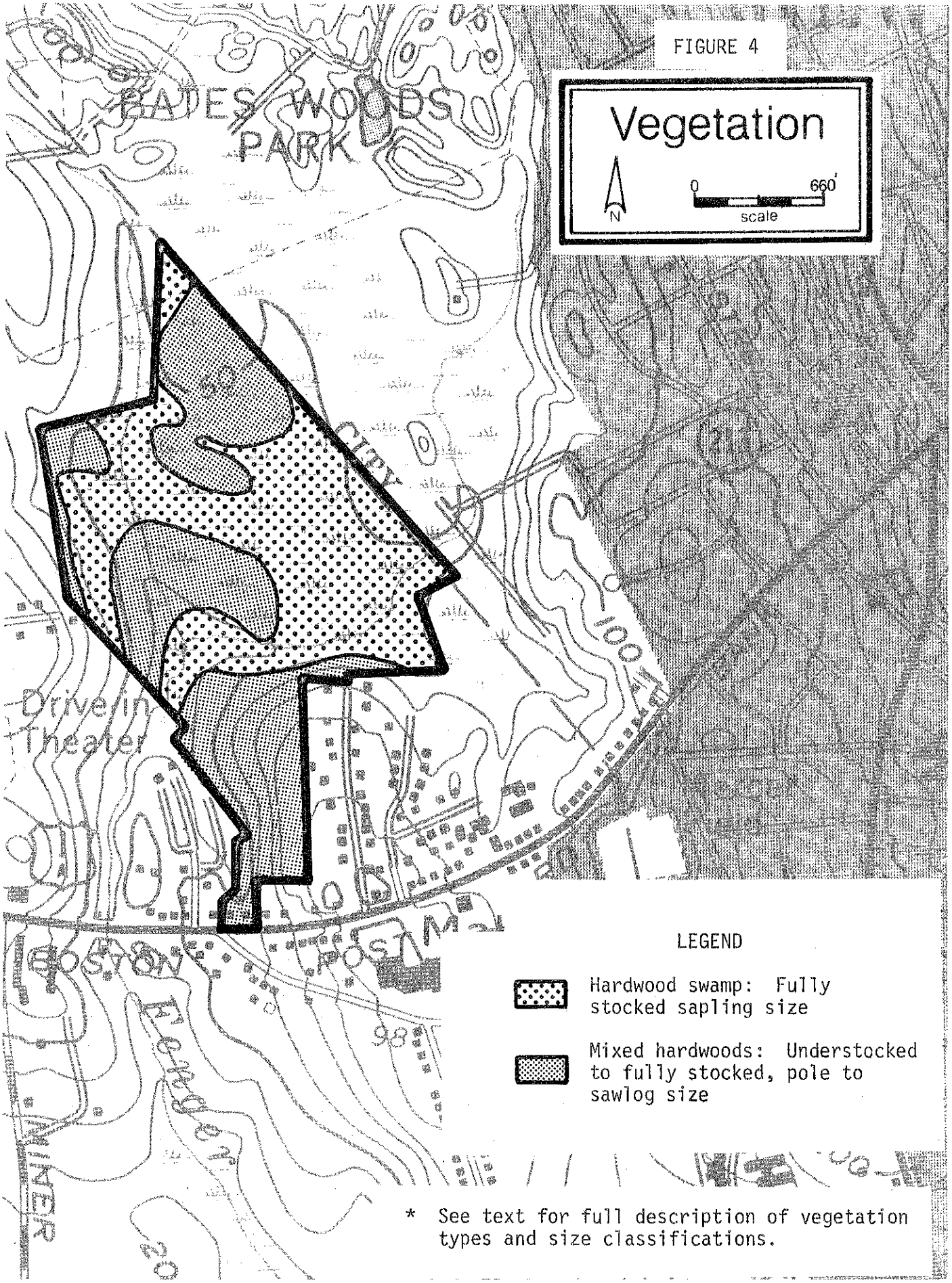


Soils Legend

Map Symbol	Soil Name
11XC	Canton and Charlton very stony fine sandy loam, 8-15% slopes
17LC	Charlton-Hollis fine sandy loams, 3-15% slopes
17LD	Charlton-Hollis fine sandy loams, 15-35% slopes
17MC	Hollis-Rock outcrop complex, 3-15% slopes
17MD	Hollis-Rock outcrop complex, 15-35% slopes
41XB	Sutton very stony fine sandy loam, 0-8% slopes
43M	Ridgebury, Leicester and Whitman extremely stony fine sandy loams
91	Adrian and Palms mucks

Information taken from: Interim Soil Survey Report, New London County, Connecticut, 1978; soil survey sheets Nos. 393, 430; published by the United States Department of Agriculture, Soil Conservation Service. Advance copy, subject to change.

FIGURE 4



* See text for full description of vegetation types and size classifications.

General Features.

Although the Lieberman property is several miles inland from Long Island Sound, it is considered to be within the Eastern Coastal Hills Ecoregion of the Connecticut Coastal Hardwoods Zone (see Figure 5). Ecoregions have been defined as areas "characterized by ...distinctive pattern(s) of landscapes and regional climate as expressed by the vegetation composition and pattern and the presence or absence of certain indicator species and species groups".[1] In the Eastern Coastal Hills Ecoregion, the proximity of the Sound has a moderating influence on the nearshore climate which controls the kind and number of plant species. Conspicuous seabreezes, penetrating 5-10 miles inland, produce a warming trend in the fall to winter months and a cooling effect in spring and summer.

Several factors prevented Team members from performing a complete investigation of vegetation on the site. Among these factors were time constraints, difficult access to many parts of the property, winter weather conditions, and the dormant state of the vegetation. For these reasons, direct observations of Team members are supplemented in this report with detailed studies of plant communities in comparable areas within the state. General comparisions may be made between these studies and the vegetation observed on the property; however, because of natural variations from site to site, the listing of plant species and their approximate percentages in the detailed studies cannot be expected to be completely representative of the plant communities found within the property.

Upland Areas.

The elevated portions of the site are, for the most part, dry, rocky ridges whose characteristic features include slope irregularities, variable soil depths, and scattered rock outcrops. Each of these microsites or microhabitats (small, specialized biological zones) supports unique microcommunities that together form complexes. Two such complexes, which may be classified generally as "ridge communities", are believed to exist on the site. Because of the preponderance of shallow soils, the Oak-Huckleberry Community, a dry woodland type, covers most of the upland areas. Along the lower slopes, where soils are well-drained and probably deeper, a complex known as the Oak-Viburnum Community is likely to exist. Because of the narrowness of this wetland-marginal zone, the rapid transition into wetland communities, and the dormancy of the vegetation at the time of the field review, a conclusive identification of the Oak-Viburnum Community was not possible. The typical character of both of these communities was further obscured by an overabundance of greenbrier, which forms dense, impenetrable tangles. This pattern often reflects historical land uses such as grazing. Perusal of the plant communities on the "double ridge" near the northwestern corner of the site revealed a vegetation influenced only slightly by greenbrier. Analysis of the communities on the "double ridge" during the growing season would illustrate the normal conditions that would prevail on the study site in the absence of greenbrier.

Herewith a listing of plant species observed within the Oak-Huckleberry Community on the property:

1. Dowhan, J.J., and Craig, R.J., 1976, "Rare and Endangered Species of Connecticut and Their Habitats"; Conn. Geol. Nat. Hist. Survey, Report of Investigations No. 6.

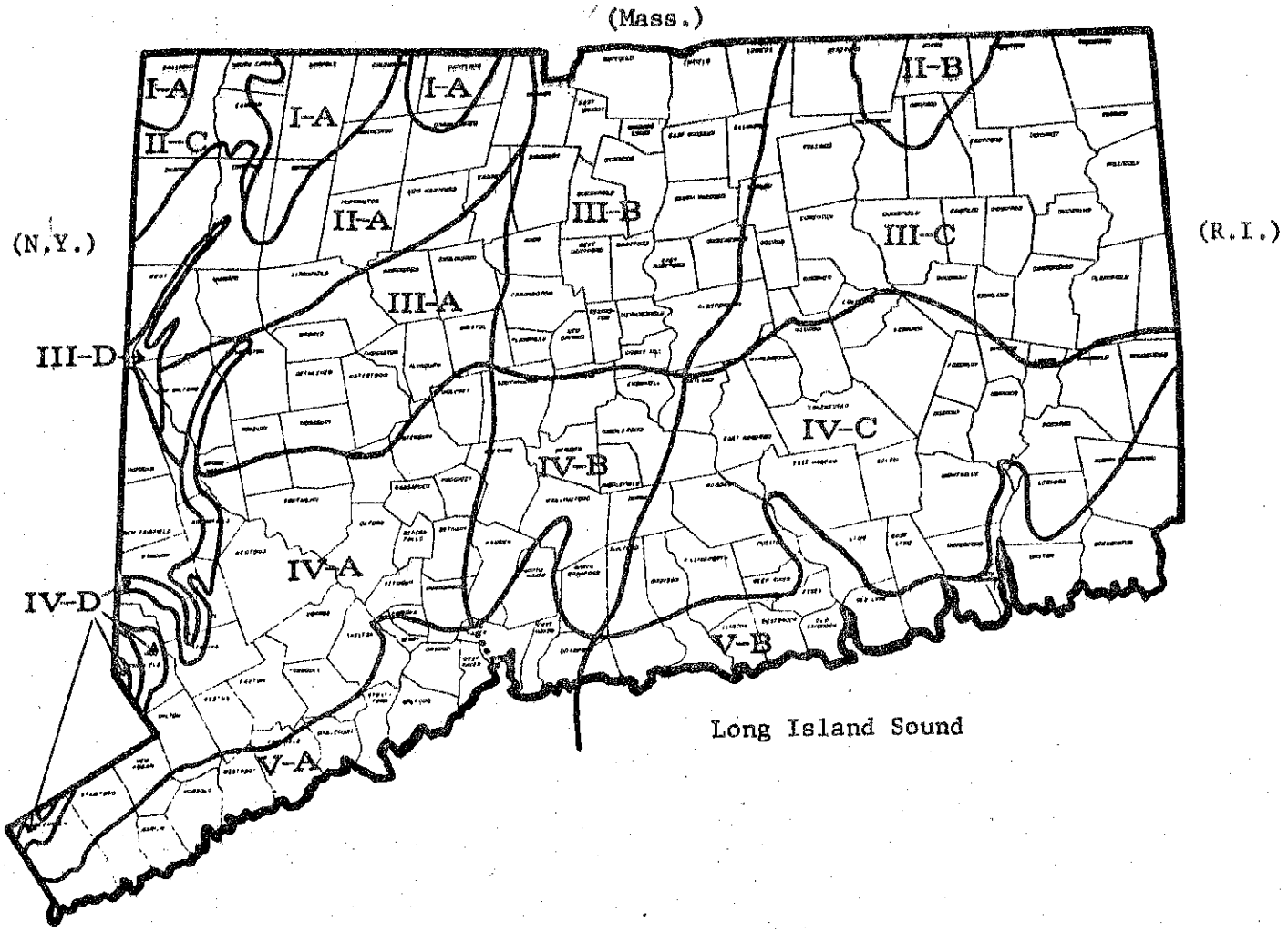


Fig. 5. Ecoregions of Connecticut

I. Northwest Highlands-Northern Hardwoods zone
   A. Northwest Highlands ecoregion

II. Northern Uplands-Transitional Hardwoods zone
   A. Northwest Uplands ecoregion
   B. Northeast Uplands ecoregion
   C. Northern Marble Valley

III. Northern Hills-Central Hardwoods-White Pine zone
   A. Northwest Hills ecoregion
   B. North-Central Lowlands ecoregion
   C. Northeast Hills ecoregion
   D. Central Marble Valley

IV. Southern Hills-Central Hardwoods zone
   A. Southwest Hills ecoregion
   B. South-Central Lowlands ecoregion
   C. Southeast Hills ecoregion
   D. Southern Marble Valley

V. Coastal Hardwoods zone
   A. Western Coastal ecoregion
   B. Eastern Coastal ecoregion

Source: 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, DEP, 1976; pg. 26.

Trees:
*White Oak (Quercus alba)
Black Oak (Quercus velutina)
Scarlet Oak (Quercus coccinea)
Red Oak (Quercus rubra)
Pignut Hickory (Carya glabra)
Shagbark Hickory (Carya ovata)
Black Birch (Betula lenta)
Sassafras (Sassafras albidum)
White Pine (Pinus strobus)
Red Maple (Acer rubrum)
Wild Black Cherry (Prunus serotina)
Black Gum (Nyssa sylvatica)

Shrubs:
*Greenbrier (Smilax species)
Mountain Laurel (Kalmia latifolia)
Sweet Pepperbush (Clethra alnifolia)

Herbs:
Pennsylvania sedge (Carex pensylvanica)
Hair Grass (Deschampsia flexuosa)
Bracken Fern (Pteridium aquilinum)

* dominant species

The oaks and hickories comprise the principal elements in the tree canopy of this low-statured woodland. Locally present are small, young stands of the light-demanding wild black cherry, which shortly will succumb to species such as the oaks and hickories, which are shade tolerant. An unusual element in this woodland, but by no means rare, is the occurrence of a few scattered northern white pines. This species is most prevalent in the northern half of the state. In the coastal area, white pine is a minor component, restricted to dry ridge tops and occasionally to peaty wetlands.

Under normal circumstances, the conspicuous features in this community, coupled with the dominance of the oaks, would be sparse to dense stands of ericaceous shrubs (broad-leaf evergreen shrubs), especially huckleberry (Gaylussacia baccata), low-bush blueberry (Vaccinium vacillans), and mountain laurel. However, the opportunistic nature of the greenbrier suppresses the abundance of these shrubs, as well as the ground flora. Locally present are small thickets of the wetland shrub, sweet pepperbush. This occurrence is not unusual, especially in the coastal area and in areas where the upland site abuts a wetland. The limited occurrence of the herbs hair grass, bracken fern, and Pennsylvania sedge attests both to the droughty nature of this habitat and to the identification of the community as Oak-Huckleberry.

For purposes of comparison, the Appendix to this report contains a listing of plant species that was derived from a more detailed survey of an analogous Oak-Huckleberry Community in a different coastal area. References to other pertinent publications may also be found in the Appendix.

As mentioned above, the Oak-Viburnum Community could not be readily identified during the field review, although the Team forester did note the presence of maple-leaf viburnum at the wetland margins. In the coastal region, prominent elements of this community typically include white, black, and scarlet oaks; black birch; and dense shrub thickets of mapleleaf viburnum. Associates include red maple, dogwood, mountain laurel, and northern arrowwood. The Appendix contains a detailed listing of an analogous coastal Oak-Viburnum Community, as well as references to other publications on the subject.

From a forestry standpoint, the upland vegetation may be described as a mixed hardwoods stand, containing generally pole-size (5 to 11 inches in diameter at breast height) to sawlog-size (11 inches or greater d.b.h.) trees. Seedling-size white and black oak are prominent in the understory. The stand comprises approximately 34 acres of the site. The trees are understocked on the droughty higher

sections of the uplands, where site quality is low, to fully stocked in the lower areas, where site quality is medium. The quality of the trees themselves is generally low, due to the droughty, thin soils and the intense competition for soil moisture. Water deficiencies are particularly problematic in early spring, and this condition limits the growth rates of the trees. Nevertheless, the stand could produce some forest products such as marginal-quality sawlogs or fuelwood.

Wetland Areas.

The seepage waters entering the wetland are derived from the adjacent hills and are rich in nutrients; hence, many of the wetland species are nutrient-demanding. The Team's investigation of the southern sector of this wetland indicated that a swamp composed of red maple is the major vegetation type. Associates include yellow birch and American ash. However, an unusual and localized element here is white pine. At the interface of the ridge and the swamp, greenbrier continues to form dense tangles. Further into the heart of the swamp, this is replaced by thickets of sweet pepperbush and spicebush with lesser amounts of high-bush blueberry. A number of swamp communities appear to exist, but the dearth of herbaceous plants during the winter season precluded a definite discussion and identification.

Cinnamon fern, localized stands of sensitive fern, and skunk cabbage were the only identifiable herbs. Clusters of tussock sedge were local in nature. An abundance of this sedge invariably indicates prolonged spring flooding, a condition that may prevail in this swamp as a result of current developmental activities in the wetland.

Conspicuous and characteristic of this and so many other wetland swamps is an intricate mosaic of raised mounds of soil and peat at the tree bases. Interspersed among these are depressions or hollows which may be vegetated or bare, or which may contain water during the summer season. Each of these microhabitats, including the raised hummocks, support specialized microcommunities. In fact, on the driest of these, the hummock type, it is not uncommon to find upland plants such as Canada Mayflower (Maianthemum canadense).

The peat moss, Sphagnum, forms a minor and discontinuous carpet in this swamp, unlike the prevalent condition in nutrient poor bogs.

The only other recognizable unit was a shrub marsh with a mixture of grasses that is juxtaposed between the "double ridge" and a young stand of red maple to the east. Along the western perimeter of this marsh is a narrow creek. Presumably, the final vegetation at this site will someday be the red maple-skunk cabbage community. This area is noteworthy in that it increases the structural and floristic diversity of the marsh. This, together with the creek, provides a unique habitat for wildlife (particularly waterfowl).

No rare plants were noted in the swamp, and historical collections at the University of Connecticut reveal no former occurrences of rare elements. Only a more detailed summer survey could indicate any unique plant species.

Plant species observed within the wetland communities on the site are listed on the following page.

Trees:
*Red Maple (Acer rubrum)
Yellow Birch (Betula lutea)
American Ash (Fraxinum americana)
White Pine (Pinus strobus)
Shadbush (Amelanchier arborea)

Shrubs:
*Sweet Pepperbush (Clethra alnifolia)
Spicebush (Lindera benzoin)
High Bush Blueberry (Vaccinium corymbosum)
Azalea (Rhododendron species)

Herbs:
Cinnamon Fern (Osmunda cinnamomea)
Skunk Cabbage (Symplocarpus foetidus)
Sensitive Fern (Onoclea sensibilis)
Tussock Sedge (Carex stricta)

Vines:
Wild Grape (Vitis species)
Oriental Bittersweet (Celastrus orbiculatus)

* dominant species

A listing of species found in a detailed survey of another coastal swamp community is given in the Appendix.

From a forestry standpoint, the wetland may be said to contain a hardwood swamp stand of approximately 36 acres. The stand is fully stocked and is made up principally of poor-quality sapling-size (1 to 5 inches d.b.h.) red maple. The high water table and poor soil aeration associated with hardwood swamps generally limit vegetative growth to species undesirable for timber management. The shallow-rooted trees present are usually slow-growing and are often of poor quality. Harvesting of wood products is often uneconomical in these areas because of the limiting effect of the high water table on the use of equipment.

WILDLIFE

The upland and wetland sections of the Lieberman property offer two distinctive wildlife habitats. The upland part of the site periodically produces abundant food in the form of mast, nuts, and berries. The greenbrier thicket covering this area is important to wildlife because it provides both browse and cover. The rocky hilltops and stone walls found on this tract provide homes for many small mammals, including mice and chipmunks. Numerous songbirds, woodpeckers, and creepers are present; ruffed grouse may also be present within the site, although none was observed. The mammal population includes many squirrels, and probably also includes opossum, skunks, and raccoons.

Wetland areas generally contain a more diverse wildlife population than any other habitat of comparable size. The dense shrubby vegetation provides excellent food and cover throughout most of the year. Wetlands associated with streams also provide small nocturnal mammals with corridors for feeding. Many species of birds, including songbirds and dabbling ducks, probably frequent the site. Shrews and mice inhabit the area, and muskrats, raccoons, and skunks are likely to be present at certain times.

DEVELOPMENTAL CONCERNS

PLANNING CONSIDERATIONS

The long-range Plan of Development for Waterford recommends that this area be used for a variety of purposes. The southern part of the site, including the frontage on the Post Road, is recommended for commercial use. The area north of that and extending to a point about 1500 feet into the site is proposed for moderate-density residential use. The remainder of the site is designated as a natural resource area and is recommended for very low intensity use at most. New London's Plan of Development recommends that the area abutting this subject property to the east be used for low-density residential purposes.

Zoning of the site does not reflect the Plan of Development. Waterford has zoned most of the site for residences on lots of at least 20,000 square feet. The southern 600 feet of the site, fronting on the Post Road, is zoned commercial. New London has zoned the abutting land to the east for industrial park use.

The development of this property for single-family detached residences as permitted by the zoning could prove costly and difficult, if not impossible, if a conventional approach to subdivision is followed. An acceptable development design that is closely related to the physical conditions might be possible under the provisions of the zoning regulations, which permit modifications of dimensional requirements and improvement standards under certain circumstances. The prospects of achieving an environmentally sound development scheme for this sensitive area are enhanced by the availability of public water and sewers on the site.

As for alternative uses, the most obvious seems to be open space. The site is varied in its physical features and vegetative cover, it is easily accessible to a large population, and it lies adjacent to New London's Bates Woods Park. Selective clearing and the establishment of trails would make this an attractive addition to the Park to the north.

TRAFFIC PATTERNS

Access to the site is presently provided by Monroe Street to the west and by Pine Street to the south. Both are residential streets that would be adversely affected by more than a modest increase in traffic. In addition, intersections with very heavily used traffic arteries occur on each street about 1000 feet from the site. These intersecting roads are Clark Lane and Boston Post Road, respectively. Any substantial increase in traffic on Monroe or Pine Streets would aggravate congestion at their intersections with Clark Lane or Post Road. The extent of congestion would, of course, depend upon the use of the subject site. Providing new access where the property presently fronts on Post Road offers no solution because this would create an additional intersection close to the present intersection of Post Road with Willetts Avenue. Furthermore, if the access roads from Pine Street and Monroe Street were ultimately joined under the final development scheme, a new thoroughfare would be created through the site, allowing motorists to bypass the traffic signals at and near the intersection of Clark Lane and Post Road.

The impact of constructing one or more causeways across the wetlands depends on the proposed use of the land to which access is extended. The use will deter-

mine the type of causeway needed, which might range from a simple structure capable of serving one or two homes to a major feature capable of accommodating a road built to the standards of the town's subdivision regulations. The latter would require not only substantial fill but also that a large percentage of the upland portion of the site be devoted to access.

CONSTRUCTION OPERATIONS

Causeway Construction.

All proposed roads and fills should conform to Connecticut State Highway standards. All organic and unstable soils should be removed from the causeway area before filling is begun. At the point of the proposed crossing, pollution should be kept at a minimum by installing appropriate sediment and erosion control measures as outlined in the Connecticut Erosion and Sediment Control Handbook.

Upland Development.

Because much of the property is underlain by wetland soils, any structures would have to be clustered on the islands of high ground. Such a cluster development would be feasible if municipal water and sewer were utilized. Any plans for development of this site should contain a sediment and erosion control plan. This plan should conform to the standards in the Connecticut Erosion and Sediment Control Handbook.

Sedimentation of the wetland should be of particular concern. The most serious potential impacts would accompany the actual construction. Therefore, to the fullest extent practicable, it would be desirable to establish a border or buffer of vegetation at least 100 feet wide at the wetland margins. The use of staked hay bales should also be considered.

HYDROLOGIC CHANGES

For a given amount of precipitation, the volume of surface runoff that flows into the wetlands from the upland areas of the site is controlled by slopes, soil types, vegetative cover, amount of impermeable surfaces, and other factors. Any development of the property will lead to an increase in runoff volumes. The increase will, of course, be greater for high-density development than for low-density development. Although no specific proposals for the property had been submitted to the town by the landowner at the time of the Team's field review, it was assumed for investigative purposes that development would be in line with current zoning regulations, which allow half-acre residential usage on part of the site.

The landowner's proposal to establish a new causeway across Fenger Brook included a plan to channel the brook through a 48-inch culvert at the bottom of the causeway. As long as the bottom of the culvert were placed no higher than the elevation of the present streambed, the establishment of the proposed new causeway would not result in a perceptible rise in the present water-surface level in the swamp. If the bottom of the culvert were placed above the present streambed, the causeway could have a damming effect in the wetland, causing the water surface to rise on the eastern side of the fill. Such a permanent rise could have a signifi-

cant impact on wetland vegetation and wildlife. This possibility is discussed in more detail in the following section of this report.

The Team's analysis of the drainage data provided by the landowner's engineer indicates the potential for temporary increases in wetland water levels. For a 50-year, 24-hour storm, the use of a 48-inch concrete culvert, as proposed, may necessitate a temporary flood storage in the wetland that would cause water levels to rise as much as three feet higher than the top of the culvert (seven feet higher than the elevation of the present streambed). This storage normally would dissipate quickly at the end of the storm. It must be noted that the methods used in the Team's analysis were those of the Soil Conservation Service; the landowner's engineer used alternate methods in preparing his calculations. In addition, certain assumptions were used in both sets of calculations that may not be valid under the final development scheme. With these limitations in mind, it can be safely concluded that a potential exists for significant, although temporary, water-level rises during large storms. The existence of this potential indicates the need for detailed flood-routing procedures to be used to determine flood elevations for any final design. These elevations should be compared with the elevations of all structures located near the wetland.

EFFECTS ON VEGETATION AND WILDLIFE

General Concerns.

The effect of development on wetland water levels was perhaps the most prominent concern of Team members. As mentioned in the preceding section, no permanent rise in these levels should occur from causeway construction alone so long as the bottom of the culvert is placed no higher than the present elevation of the streambed. However, the combined effects of the causeway and other grading and filling activities presently occurring or planned is less certain. Any permanent change in water levels could kill wetland trees, shrubs, and herbaceous vegetation, and could ultimately result in a low-diversity plant community. In particular, the tussock sedge may colonize vast areas of wetland, a condition that has occurred in many other Connecticut wetlands despite the fact that the wetland modifications were considered minor. Of course, significant changes in the plant population could lead to a reduction in the value of the wetland as a wildlife habitat.

Management Techniques.

At present, the dense growth of greenbrier over all but a few areas of the highland discourages the use and enjoyment of this part of the property. Control of greenbrier may be very costly. Several control practices are listed below:

1. Mechanical Control: Physically killing the greenbrier, using hand tools or more sophisticated equipment; trampling the brier with heavy equipment, such as tractor-crawlers; or controlled burning, which would require a permit.

2. Chemical Control: Herbicides may be used to control greenbrier; however, repeated applications and/or high concentrations are usually needed for effective control. Grazing should not be allowed after such treatment.

3. Biological Control: Certain animals, such as sheep, will eat briers. If these animals were grazed repeatedly in one area, control would be possible.

The introduction of other tree or shrub species may eventually shade out the greenbrier, producing long-range control.

An integration of control methods would have the best results. However, significant expenditures would be required.

Forest management should certainly be considered for this site. Although relatively small, the forest may have a positive impact on the quality of life for local residents. Among the benefits of forests are their potential for use as recreation areas or wildlife habitat, their ability to improve microclimates and air quality, their role in the environmental recycling of water, and their reduction of noise levels. During development, efforts should be made not to injure the trees that are to be saved. If possible, the soil under the crowns of the trees should not be disturbed. Unseen damage to root systems may be caused by soil alteration and may result in the death of those trees within 3-5 years.

A thinning in the fully stocked parts of the mixed hardwoods stand would increase the health and vigor of the remaining trees by giving them more room to grow. About one-third of the volume could be removed by concentrating on unhealthy, poorly formed or damaged trees and undesirable species such as red maple. This would produce between 3-4 cords of fuelwood per acre. Large openings in the canopy should not be made during thinning because the greenbrier will quickly take advantage of the increased sunlight.

To reinforce the understocked parts of this stand or to establish a softwood-hardwood stand, hemlock and/or white pine could be planted at the rate of about 100 trees per acre. If white pine are planted, releasing should be performed within twenty years. Control of the greenbrier prior to planting will increase the survival of the seedlings and will make planting easier. A consultant forester could be contacted to carry out any of the management practices discussed above.

SUMMARY

The Lieberman property comprises a large wetland area and several till-covered bedrock uplands, the latter occurring mostly as "islands" in the wetlands. Two branches of Fenger Brook flow through the site, merging near the southwestern border. Prominent soil groups include the Charlton-Hollis, the Hollis-Rock outcrop, and the Ridgebury-Leicester-Whitman complexes. Vegetation and wildlife form communities that are related to the two distinctive habitat types.

The current zoning of the site does not reflect Waterford's long-range plan of development. Development of the site in conformance with zoning is feasible, but it could be very costly and difficult. Fill materials needed for the causeway must reflect the intended uses of the site. The size of the culvert that has been proposed will be adequate if the required temporary storage can be obtained upstream without harmful effects on structures. More detailed flood-routing calculations that are keyed to the ultimate development scheme should be provided. No permanent water-level changes in the wetland are anticipated if the culvert is properly installed. Any such changes could cause irreversible effects on wetland vegetation

and wildlife. Increases in traffic on Monroe and Pine Streets may be deleterious to the roads and annoying to local residents.

The basic issues facing the town appear to be whether the new causeway is needed in view of existing access to the highlands, and whether the potential impact of wetland filling is justified in view of the fact that no specific development has been proposed.

Appendix

Descriptions of Typical Coastal Plant Communities

Note: In the following descriptions, the numbers appearing next to a plant name indicates its abundance as follows:

r, rare
1-, 1-2%
1+, 2-5%
2-, 5-12%
2+, 13-25%
3, 25-50%
4, 50-75%
5, 75-100%

Numbers appearing next to community names refer to the following source materials:

1. Damman, A.W.H. 1977. Floristic Composition and Topographic Distribution of the Forest Communities of the Gneiss Areas of Western Connecticut. Naturaliste Can. 104:23-45.

2. Egler, F.E. and Niering, W.A. 1965. The Vegetation of Connecticut Natural Areas. No. 1. Yale Natural Preserve, New Haven. Conn. Geol. Nat. Hist. Surv.

3. Niering, W.A. and Egler, F.E. 1966. The Vegetation of Connecticut Natural Areas. No. 2. The Natural Area of the Audubon Center of Greenwich. Conn. Geol. Nat. Hist. Surv.

Coastal Oak-Huckleberry Community (1, 2, 3)

Trees:

*Scarlet Oak, 3
*Black Oak, 2+
*White Oak, 2+
Red Oak, 1+
Chestnut Oak, r
Red Maple, 1+
Shadbush, 1-
Pignut Hickory, 1+
Mockernut Hickory, 2-
Shagbark Hickory, 1-

Shrubs:

*Huckleberry, 3
Mountain Laurel, 2-
Maple leaved Viburnum, 1+
White Oak (shrub), 1+
Red Maple (shrub), 1+

Herbs:

Hairgrass, 2-
Lowbush Blueberry, 2+
Pennsylvania sedge, 1+
Aster, 1-
Canada Mayflower, 1+

Coastal Oak-Viburnum Community (2, 3)

Trees:

*White Oak, 2+
*Scarlet Oak, 2+
*Black Oak, 2+
Red Oak, 2-
*Black Birch, 2+
Mockernut Hickory, 2-
Beech, 2-
Red Maple, 1+
Sassafras, 1+
Dogwood, 1+

Shrubs:

*Maple leaved Viburnum, 3
Mountain Laurel, 2-
Northern Arrowwood, 1+
Huckleberry, 1+
Hazelnut, 1+

Vines:

Catbrier, 2-
Virginia Creeper, 1+
Poison Ivy, 1-

Herbs:

Sarsparilla, 2-
Aster, 1+
Canada Mayflower, 1+
Pennsylvania sedge, 1+
Lowbush Blueberry, 1+
Dewberry, 1+
Bellwort, 1-
Whorled Lossestrife - 1-
Hay-scented Fern, 1-
Solomon's Seal, 1+

Coastal Red Maple - Skunk Cabbage Swamp

Trees:

*Red Maple, 4
Sourgum, 2-
Swamp Oak, 2-
Yellow Birch, 1+
American Ash, 1+
American Elm, 1-

Shrubs:

*Sweet Pepperbush, 3
*Spicebush, 3
Winterberry, 2-
Alder, 2-
Elderberry, 1+
High Bush Blueberry, 1+
Northern Arrowwood, 1+
Swamp Rhododendron, 1+
Red Maple (shrub), 1-

Herbs:

*Skunk Cabbage, 2+
*Cinnamon Fern, 2+
Touch-me-Not, 2+
Marsh Fern, 1+
Royal Fern, 1+
Sensitive Fern, 1-

* dominant species

SOIL DESCRIPTIONS

Adrian series

The Adrian series consists of nearly level, very poorly drained soils in depressional areas within outwash plains, lake plains, till plains and moraines. They formed in mucky organic deposits, 16 to 51 inches thick, over sandy mineral deposits. Adrian soils have rapid permeability, and a high water table at or near the surface 9 to 10 months of the year. Major limitations are related to wetness and low strength.

Canton series

The Canton series consists of gently sloping, sloping, moderately steep and steep, well drained soils on uplands. They formed in a fine sandy loam mantle underlain by friable gravelly sand glacial till. Canton soils have moderately rapid or rapid permeability. Major limitations are related to slope and stoniness.

Charlton series

The Charlton series consists of gently sloping, sloping, moderately steep, and steep, well drained soils on uplands. They formed in friable glacial till. Charlton soils have moderate to moderately rapid permeability. Major limitations are related to slope and stoniness.

Hollis series

The Hollis series consists of gently sloping, sloping, moderately steep and steep, shallow, well drained soils on uplands where relief is influenced by the underlying bedrock. They formed in glacial till less than 20 inches deep, over granite, gneiss,and schist bedrock. Hollis soils have moderate permeability. Major limitations are related to depth to bedrock, rockiness, and slope.

Leicester series

The Leicester series consists of nearly level, poorly drained soils on uplands. They formed in friable glacial till. Leicester soils have moderately rapid permeability and a high water table at or near the surface 7 to 9 months of the year. Major limitations are related to wetness and stoniness.

Palms series

The Palms series consists of nearly level, very poorly drained soils in depressional areas within outwash plains, lake plains, till plains and moraines. They formed in mucky organic deposits, 16 to 51 inches thick, over loamy mineral deposits. Palms soils have moderately slow permeability and a high water table at or near the surface 9 to 10 months of the year. Major limitations are related to instability and wetness.

Ridgebury series

The Ridgebury series consists of nearly level, poorly drained soils on drumlins, and rounded or elongated hills of uplands. They formed in compact glacial till. Ridgebury soils have moderate to moderately rapid permeability in the surface layer and subsoil, slow or very slow permeability in the substratum (fragipan), and a high water table at or near the surface 7 to 9 months of the year. Major limitations are related to stoniness, wetness, and slow permeability in the substratum.

Rock outcrop

Rock outcrop consist of exposed, weathered and unweathered granite, gneiss, and schist bedrock. There are also areas of reddish brown micaceous schist bedrock.

Sutton series

The Sutton series consists of nearly level and gently sloping, moderately well draining soils on uplands. They formed in friable glacial till. Sutton soils have moderate or moderately rapid permeability, and a seasonal high water table at 18 to 24 inches. Major limitations are related to stoniness and wetness.

Whitman series

The Whitman series consists of nearly level, very poorly drained soils on uplands. They formed in compact glacial till. Whitman soils have moderate to moderately rapid permeability in the surface layer and subsoil, slow or very slow permeability in the substratum (fragipan), and a water table at or near the surface 9 to 10 months of the year. Major limitations are related to slow permeability, wetness, and stoniness.

PROPORTIONAL EXTENT OF SOILS AND THEIR LIMITATIONS FOR CERTAIN LAND USES

Soil Series	Soil Symbol	Approx. Acres	Percent of Acres	Principal Limiting Factor	Urban Use Limitations* On-Site Sewage	Buildings with Basements	Streets & Parking	Land-Scaping
Canton-Charlton	11XC	3.5	5	Slope, large stones	2	2	2	2
Charlton-Hollis	17LC	21.5	31					
Charlton part				Slope, large stones	2	2	2	2
Hollis part				depth to rock	3	3	3	3
Charlton-Hollis	17LD	3.0	4	Slope, depth to rock	3	3	3	3
Hollis-Rock outcrop	17MC	2.5	3.5	depth to rock	3	3	3	3
Holli-sRock outcrop	17MD	7.5	11	slope, depth to rock	3	3	3	3
Sutton	41XB	2.5	3.5	wetness, frost action, large stones	3	3	2	2
Ridgebury-Leicester-Whitman	43M	28.0	40	large stones, wetness, frost action, slow perc	3	3	3	3
Adrian and Palms Mucks	91	1.5	2	wetness, floods, low strength, excess humus	3	3	3	3
		70.0	100.0					

Urban Use Limitations: 1 = slight, 2 = moderate, 3 = severe

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.

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.