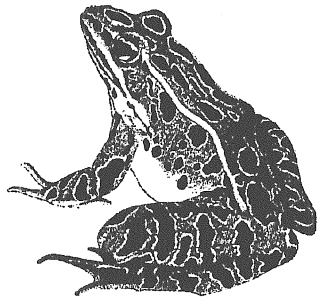
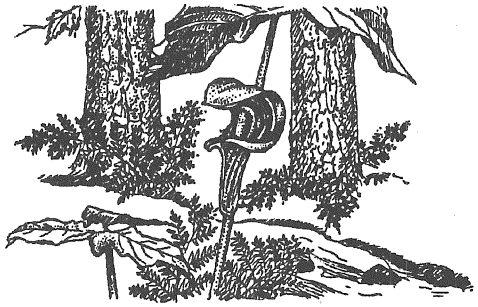
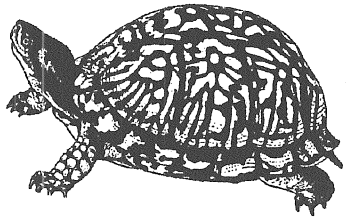
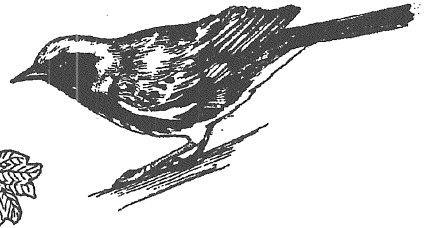
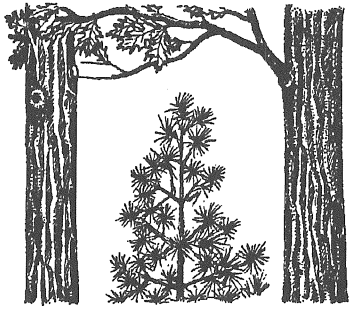
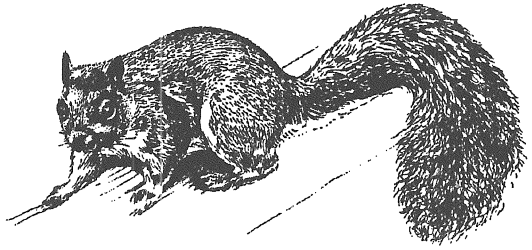





Regional School District #4 Open Space

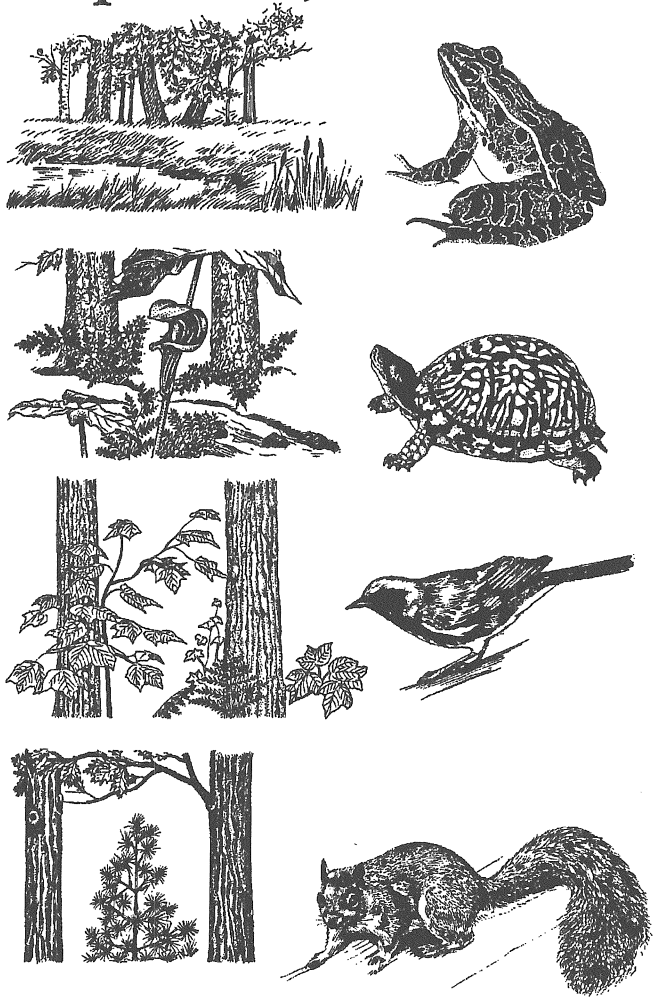
Deep River, Connecticut
July 1993

Eastern Connecticut Environmental Review Team Report

Eastern Connecticut
Resource Conservation and Development Area, Inc.

Regional School District #4 Open Space

Deep River, Connecticut



Eastern Connecticut Environmental Review Team

Eastern Connecticut Resource Conservation & Development Area, Inc.

P.O. Box 70, 1066 Saybrook Road
Haddam, CT 06438
(203) 345-3977

Review Date:
March 25, 1993

Report Date:
July 1993

Requested by:
The Deep River Conservation & Inland Wetlands Commission

Environmental Review Team Report
on

Regional School District #4 Open Space
Deep River, Connecticut

This report is an outgrowth of a request from the Deep River Conservation and Inland Wetland Commission to the Middlesex County Soil and Water Conservation District (SWCD). The S&WCD referred this request to the Eastern Connecticut Resource Conservation and Development (RC&D) Area Executive Council for their consideration and approval. The request was approved and the measure reviewed by the Eastern Connecticut Environmental Review Team (ERT).

The ERT met and field checked the site on Thursday, March 25, 1993. Team members participating on this review included:

Ann Hadley	District Manager Middlesex County Soil and Water Conservation District 345-3219
Joe Hickey	State Park Planner DEP - Bureau of Outdoor Recreation 566-2304
Stacy Kingsbury	Environmental Analyst DEP - Natural Resources Center 566-3540
Brian Murphy	Fisheries Biologist DEP - Eastern District Headquarters 295-9523
Alan Page	District Conservationist USDA - Soil Conservation Service 345-3219
Peter Picone	Wildlife Biologist DEP - Wildlife Division 584-9830
Rob Rocks	Forester DEP - Cockaponsett Forest Headquarters 345-8521
Janet Stone	Geologist U.S. Geological Survey 240-3060
Elaine Sych	ERT Coordinator Eastern CT Resource Conservation & Development Area, Inc. 345-3977

Prior to the review day, each Team member received a summary of the proposed project, a list of the town's concerns, a location map, a topographic map, and a soils map. During the field review the Team members were given maps and information. The Team met with, and were accompanied by the Superintendent of Schools, the Jr. High School Science Department Chairman, a representative for the Conservation and Inland Wetland Commission and a representative from the Doane Engineering Company. Following the review, reports from each Team member were submitted to the ERT Coordinator for compilation and editing into this final report.

This report represents the Team's findings. It is not meant to compete with private consultants by providing site designs or detailed solutions to development problems. The Team does not recommend what final action should be taken on a proposed project — all final decisions rest with the Town and landowner. 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 Town. The results of this Team action are oriented toward the development of better environmental quality and the long-term economics of land use.

The Eastern Connecticut RC&D Executive Council hopes you will find this report of value and assistance in making your decisions on this open space/conservation land.

If you require additional information, please contact:

Elaine A. Sych
ERT Coordinator
Eastern Connecticut RC&D Area
P.O. Box 70
Haddam, Connecticut 06438
(203)345-3977

* Cover art taken from *New England Wildlife: Management of Forested Habitats*, USDA - Forest Service, General Technical Report NE-144.

Table of Contents

Introduction

The Deep River Conservation and Inland Wetland Commission has requested an environmental review of a ±45 acre parcel of land located in Deep River. This property has been deeded and entrusted to the Regional School District #4 (which encompasses the towns of Deep River, Essex and Chester). The intention is for the land to be kept as open space for conservation and education purposes.

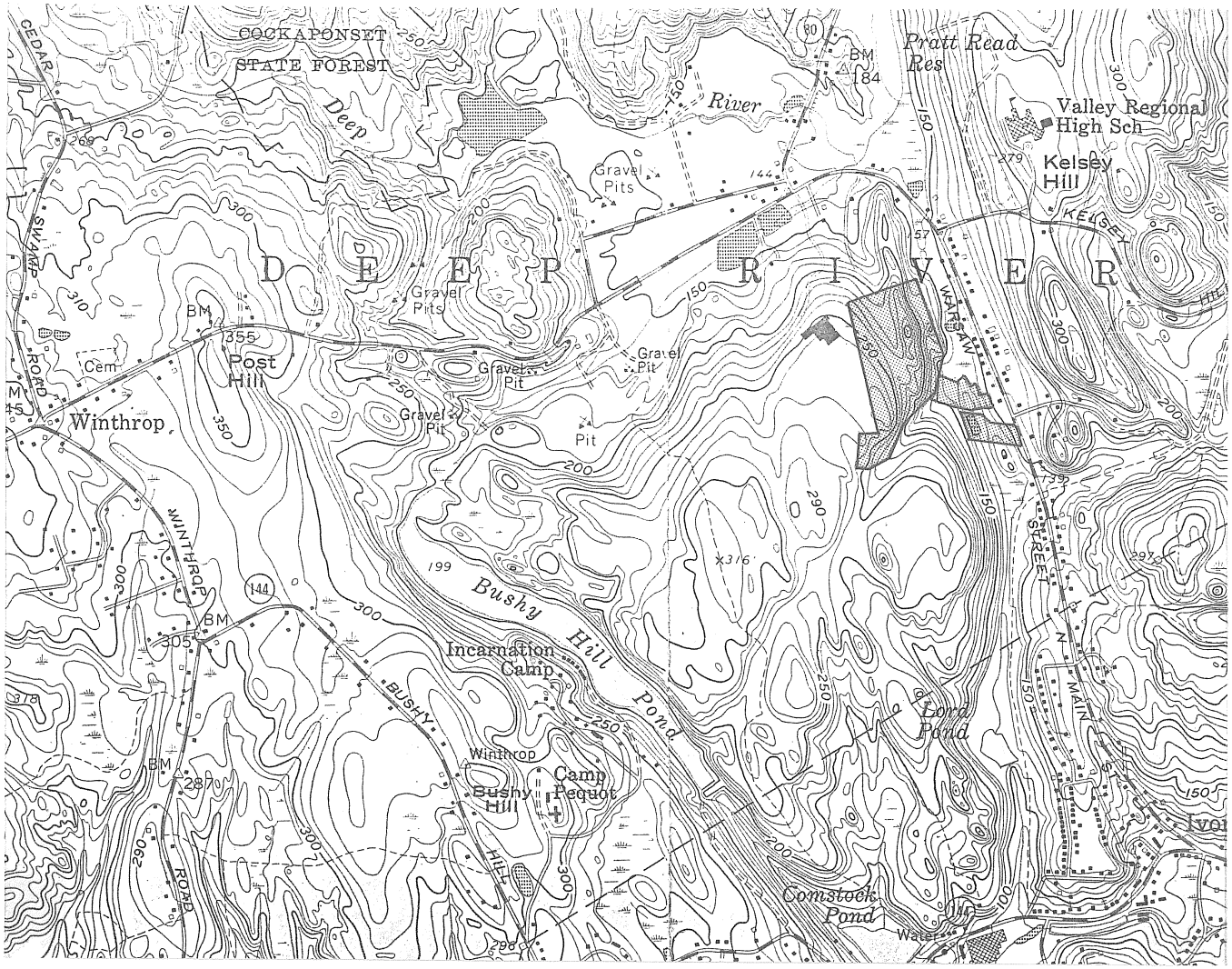
The property is located adjacent to John Winthrop Jr. High School, which will provide the primary access to the site. Access can also be obtained from Warsaw Street via the new subdivision road, Rosemont Drive. Property uses adjacent to the site are residential and undeveloped to the south, east and north and the Jr. high school to the west. The property contains areas of steep slopes, rock outcrops, wetlands, streamcourses and ponds making it an excellent site for environmental education and nature study. The site does contain some informal trails which may be old logging trails and deer runs.

The purpose of this review is to be able to provide the educators of Regional School District No. 4 with a natural resource inventory and recommendations for trail development, land management, and environmental education opportunities. This basic information and ideas will be used to develop curriculums for students, particularly seveneth and eighth graders. The high school is also located nearby, and it is hoped that through education and preservation of this open space that a conservation ethic will be instilled in the students, and that adults as well, will learn more about the environment.

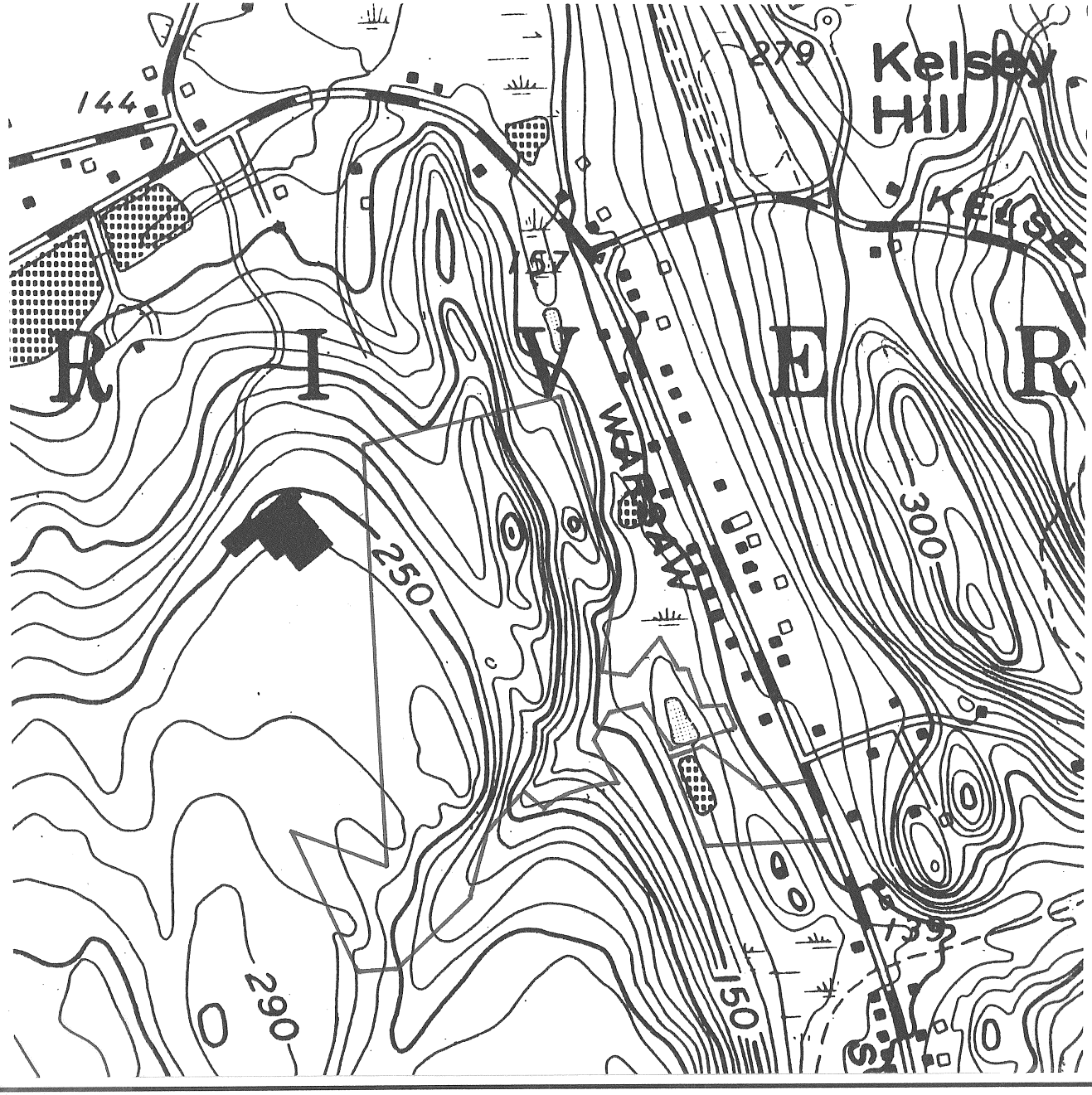
Location Map

Scale 1" = 2000'

Approximate Site



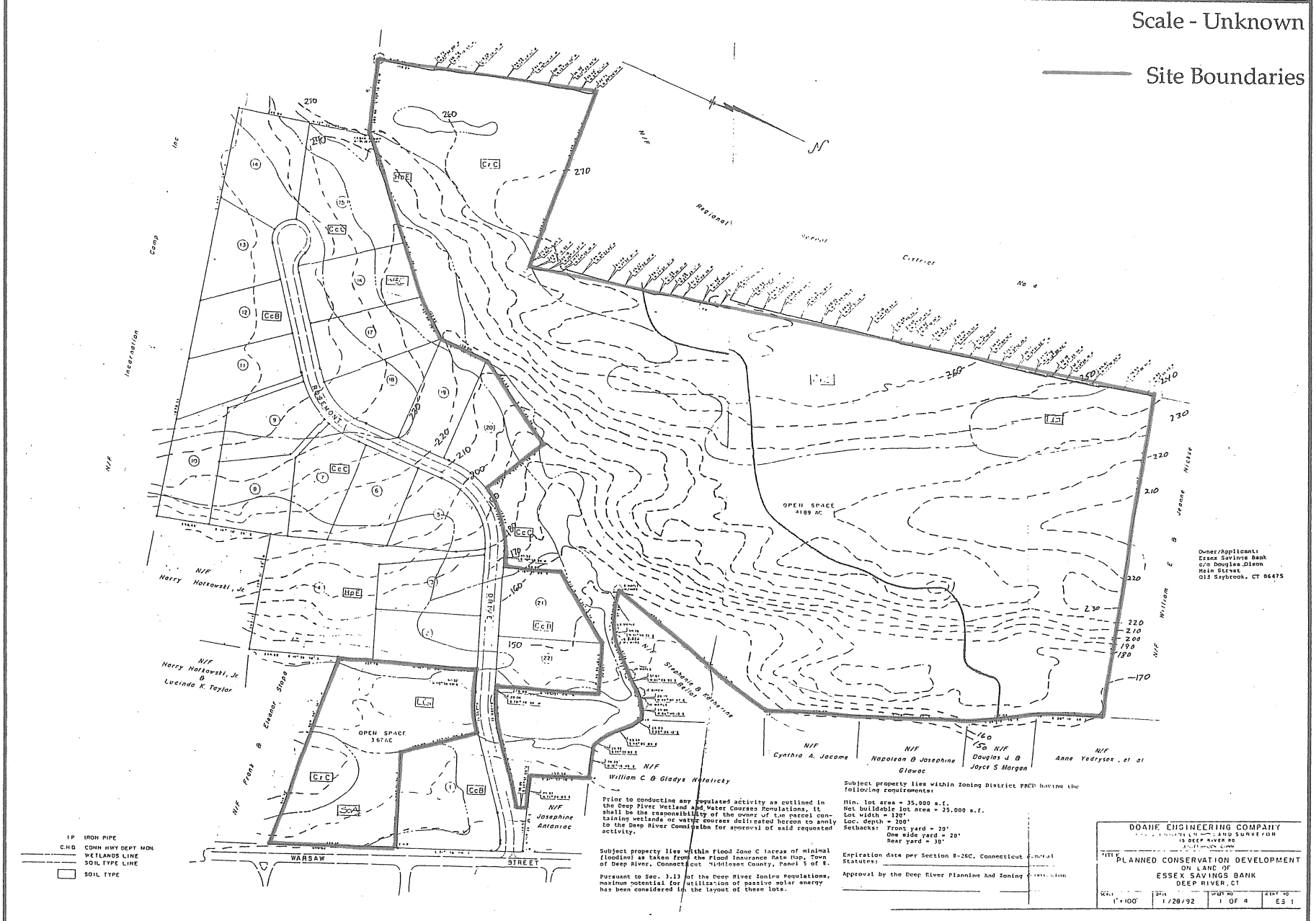
Topographic Map



Scale 1" = 667'

Approximate Site Boundaries —

Site Map


Scale - Unknown
Site Boundaries
N
OPEN SPACE 4189 AC
OPEN SPACE 367 AC
ROSEMONT
DRIVE
WARSAW
STREET
N/F Harry Hatkowski, Jr.
N/F Harry Hatkowski, Jr. & Lucinda K. Taylor
N/F Cynthia A. Jacome
N/F Napoleon & Josephine Glowac
N/F Douglas J. & Joyce S Morgan
N/F Anne Yedrysek, et al
N/F William C & Gladys Natolicky
N/F Josephine Antoniac
N/F Frank & Eleanor Stopa
N/F Stephanie B. Reiter
N/F William E & Jeanne Nickse
Owner/Applicant:
Essex Savings Bank
c/o Douglas Dixon
Main Street
Old Saybrook, CT 06475
IP IRON PIPE
C.H.D. CONN HWY DEPT MON.
WETLANDS LINE
SOIL TYPE LINE
SOIL TYPE
Prior to conducting any regulated activity as outlined in the Deep River Wetland and Water Courses Regulations, it shall be the responsibility of the owner of the parcel containing wetlands or water courses delineated hereon to apply to the Deep River Commission for approval of said requested activity.
Subject property lies within Flood Zone C (areas of minimal flooding) as taken from the Flood Insurance Rate Map, Town of Deep River, Connecticut Middlesex County, Panel 5 of 8.
Pursuant to Sec. 3.13 of the Deep River Zoning Regulations, maximum potential for utilization of passive solar energy has been considered in the layout of these lots.
Subject property lies within Zoning District PRCD having the following requirements:
Min. lot area = 35,000 s.f.
Net buildable lot area = 25,000 s.f.
Lot width = 120'
Loc. depth = 200'
Setbacks:
Front yard = 20'
One side yard = 20'
Rear yard = 30'
Expiration date per Section 8-26C, Connecticut General Statutes:
Approval by the Deep River Planning And Zoning Commission
DOANE ENGINEERING COMPANY
LAND SURVEYOR
15 DEEP RIVER RD
DEEP RIVER, CONN.
TITLE
PLANNED CONSERVATION DEVELOPMENT
ON LAND OF
ESSEX SAVINGS BANK
DEEP RIVER, CT
SCALE 1"=100'
DATE 1/28/92
SHEET NO 1 OF 4
DRAWING NO ES 1

Geology

The site is in the Essex 7.5′ topographic quadrangle (U.S. Geological Survey). The site contains parts of a valley-side upland and valley floor of a south-flowing, unnamed tributary of the Falls River. The surficial geology is shown in a map and report by R.F. Flint (1975) and the bedrock geology is shown in a map and report by L. Lundgren, Jr. (1964), both of which were published by the Connecticut Geological and Natural History Survey. More regional information on surficial and bedrock geology is available on the Surficial Materials Map of Connecticut, by J.R. Stone and others (1992, U.S. Geological Survey) and the Bedrock Geological Map of Connecticut, by J. Rodgers (1985, Connecticut Geological and Natural History Survey). Another reference for Connecticut geology designed especially for general audiences is The Face of Connecticut, People, Geology and the Land,. by M. Bell (1985).

The site consists of three physiographic areas that are related to the underlying geologic materials. These areas are: 1) the two north-south trending **elongate ridges** that extend south from the northern boundary of the site and which have maximum altitudes of 260 ft. and 200 ft., 2) the **smooth hillslopes** at the west end of the site that extend from the site of John Winthrop Junior High School south to maximum altitudes of 280 ft. in the west side, and 260 ft. in the west-central part of the area, and 3) a **low terrace and floodplain area** on the southeast and southern boundary of the site. Each of the three physiographic areas of the site are characterized by a unique combination of bedrock geology and surficial geology. Bedrock that underlies the entire site consists of metamorphic rocks, chiefly gneiss, and igneous pegmatite rocks. Glacial deposits cover the bedrock in the smooth hillslopes and in the low terrace; bedrock is exposed on the elongate ridges.

Elongate Ridges.

Two elongate ridges on the eastern part of the site are underlain by bedrock, which crops out in large ledges on the ridge crests and along their eastern sides. Thin glacial till deposits cover other parts of the ridges, and several large glacially transported boulders are on the surface of the western ridge. Bedrock underlying both ridges are in the Middletown Formation. The Middletown Formation is a rock unit with distinctive color, grain size, and origin that on the bedrock geologic map of Connecticut extends from Stafford, Connecticut, south through Deep River to Ivoryton. The Middletown Formation consists of light gray quartz-feldspar gneiss and dark amphibolite rock. Gneiss is a metamorphic rock that contains alternating bands of fine - to coarse grained, light and dark-colored minerals. Amphibolite is a dark gray or black metamorphic rock containing

mostly hornblende or other amphibole-group minerals. Large, red garnet crystals are scattered through the layers of rock. Nodules of intergrown quartz and sillimanite are in outcrops near the southern boundary of the site. Other minerals that can be seen in the rock throughout the site are biotite mica, anthophylite, cummingtonite, cordierite, plagioclase feldspar, tourmaline, magnetite, and pyrite.Due to the presence of iron-bearing minerals such as biotite and garnet and the iron-sulfide mineral pyrite, the rocks are stained by a rust-colored coating where they have been exposed to chemical weathering. In places, the Middletown Formation rocks were intruded by molten rock that has formed lenses of coarse-grained, light-colored igneous rocks that are called pegmatites. These lenses are rick in minerals such as quartz and orthoclase feldspar, and large crystals of muscovite mica.

Rocks in the western ridge are light gray quartz-feldspar gneiss, rust-stained, and well layered. The quartz-feldspar layers dip about 40° toward the east. Pegmatite is exposed in the east side of the ridge. The pegmatite body cuts through the gneiss layers, which indicates that the pegmatite is younger than the gneiss. Rocks in the eastern ridge are similar gneiss, but also include finely layered, pale red to purple garnet-quartz rock, known as coticule. Coticule, an old Scottish name, is a fine-grained metasedimentary rock consisting mainly of quartz and manganese-rick garnet. Folded layers of coticule crop out on the north side of the crest of the eastern ridge.

A review of recent geologic reports and mapping studies shows that the bedrock units that underlie the site originated as muddy and sandy sediments and also as volcanic sediments in an ancient ocean (Iapetus) that separated the ancient North American continent and a smaller continental mass (Avalonia) to the east. The dark amphibolite rock units that are characteristic of the Middletown Formation formed from volcanic lava that spewed out on the ocean floor. Between volcanic eruptions, muddy sediments washed into the ocean depths from the adjacent continents. Quartz-rich sand was carried into the ocean basin by flowing currents from the continental margins. Silica sediments, perhaps derived from skeletons of plants in the ocean also accumulated on the ocean bottom.These silica-rich sediments combined with manganese-rich volcanic sediments to form alternating beds of quartz and mangniferous debris. The manganese probably was formed as nodules on the bottom of an ancient ocean. The quartz may have been derived from silica skeletons of organisms in the ocean. The age of the ocean sediments is known from dating of radioactive minerals that were in the original sediments or that formed by heat and pressure after the rocks were hardened. The present interpretation of these radiometric dates indicates that the rocks of the Middletown Formation are early Paleozoic in age. After accumulation of sediments in the ocean, the ocean grew smaller as the continental

masses moved together in early episodes of closing of the Iapetus ocean. The oceanic sediments were exposed to intense heat and pressure in this process and underwent metamorphism in the Devonian period, between 410 and 370 million years ago. During final continental collision about 250 million years ago, rocks of the Avalonian continent (now in southeastern Connecticut) were jammed against and slid beneath rocks of the ancient ocean in the central Connecticut area and rocks of the ancient North American continent in the western part of the State. The zone along which slipping and fracturing took place is known as the Honey Hill fault. The Honey Hill fault has been traced from east to west across south-central Connecticut to Chester and then southward into the Village of Deep River, about a mile east of the site.

Smooth Hillslopes

The broad, smooth hillslopes in the western part of the site are underlain by till, a glacial sediment consisting of nonsorted matrix of sand, silt, and clay and scattered gravel fragments and some large boulders. Till was deposited directly beneath or melted out of glacial ice without being sorted by glacial meltwater. As a result, the till is generally nonsorted, homogeneous, and compact. Beneath the smooth hillslopes, the till is probably 10 to 30 ft. thick. The till deposit is continuous and thick enough to completely cover the underlying bedrock surface. The hill on which John Winthrop Junior High School is located and the hillslope which extends southward from the south end of the site are relatively smooth because they are mantled with thick deposits of till that were shaped by the moving ice sheet. In these areas, the till accumulated at the base of the ice sheet on the north sides of small bedrock hills.

The upper two to five feet of the till in these areas is locally more sandy and contains more stones and boulders than the lower parts of the till. Large surface boulders are scattered on the slopes. The shallow upper zone of till was deposited from melting debris-rich ice. This zone has been extensively mixed by soil-forming processes, burrowing animals and insects, and uprooting of trees.

The till was deposited by the latest Pleistocene-age ice sheet which covered the area from about 23,000 years until about 17,000 years ago. This ice sheet was the last of several continental glaciers to advance into the State. These ice sheets eroded large volumes of old weathered rock and soil zones from the bedrock surface, leaving behind smoothed, locally polished ledges of rock outcrop. As the last ice sheet moved over the area, thick till deposits accumulated on the north sides of bedrock hills. The base of the glacier rode up over the hills, slipping and melting over debris-clogged masses of ice. As the ice melted, till deposits built up and the deposits were further compacted by the weight of the overlying ice. The final stages of ice melting left behind

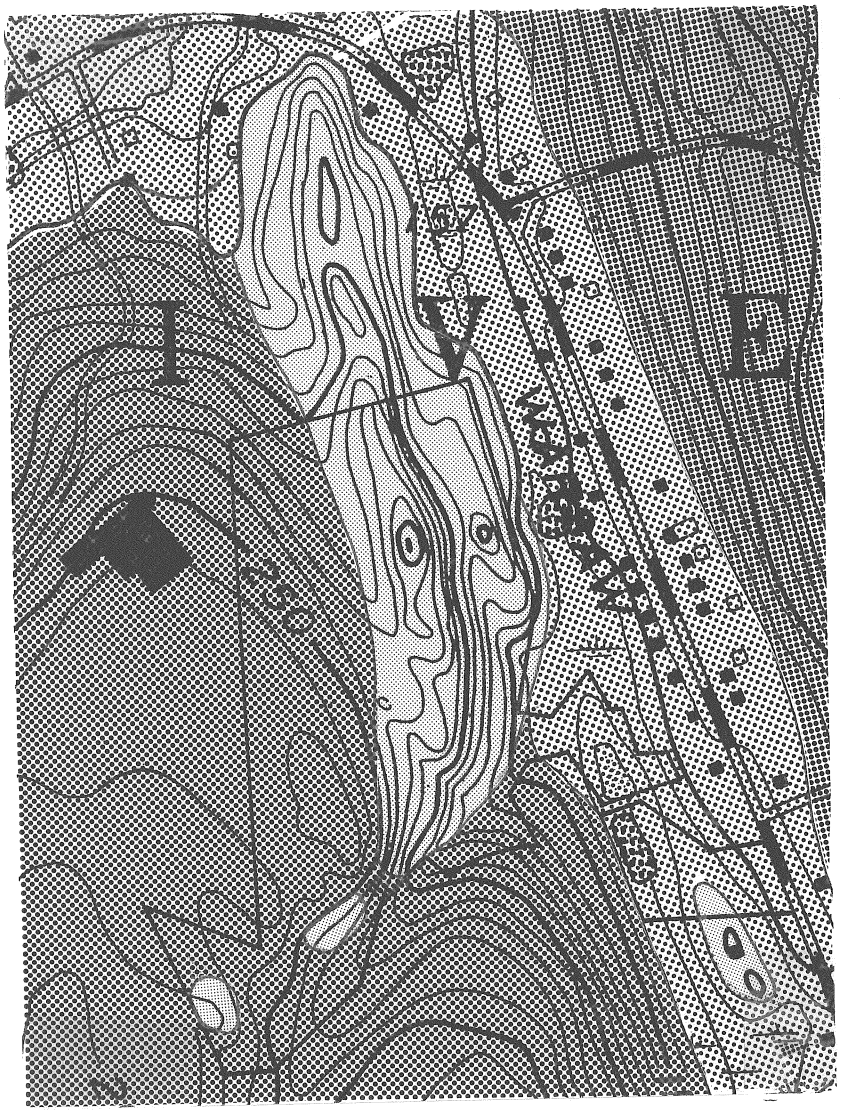
sandy till and boulders at the surface.

Low terrace

The low terrace on the eastern side of the site is part of a stratified glacial meltwater deposit that fills the valley east of the site. Sediments in the low terrace are sand and gravel, sorted and stratified by meltwater that flowed from the front of the melting ice sheet. During final retreat of the last ice sheet, the ice at the margin of the glacial became inactive (stagnated). Meltwater carried rock debris away from the stagnant ice masses, depositing it in valleys. Sand and gravel were deposited on top of and around large blocks of ice. When these blocks finally melted, the glacial sediments collapsed downward to form kettles. Following disappearance of the ice sheet, the kettles filled with sediments and vegetation. The deposits are products of glacial streams that flowed from the ice sheet margin when it stood at the north end of the valley near the junction of Warsaw Street and Kelsey Hill Road. The streams flowed south over and around ice blocks in the narrow valley and into Falls River valley to the south. As the ice margin melted further north and ice blocks in the valley melted, water from a small glacially dammed lake in the Deep River valley flowed in the bottom of the valley east of the site. The flow from these escaping lake waters eroded into the bottom of the valley, probably into till deposits that underlie the stratified sediments. The flow formed irregular depressions on the valley floor, which through time filled with fine-grained sediments and vegetation.

In postglacial time, processes of seasonal freezing and thawing, wetting and drying, bioturbation and accumulation of organic debris have produced a modern soil zone in the upper 2 to 3 feet of the glacial deposits.

Geologic Map



Approximate site boundaries

Areas where bedrock (Middletown Formation) is at or near the surface.

Areas where glacial till, generally greater than 10 ft. thick, overlies bedrock.

Areas where sand and gravel (glacial meltwater deposits) overlie till and bedrock.

Scale 1" = 667'
Contour interval 10 ft.

SOILS

The soils within the proposed ERT area include: Canton and Charlton (CcB, CcC, CdC), Charlton-Hollis (CrC), Hollis-Charlton (HpE), Leicester, Ridgebury and Whitman (Lg), and Woodbridge (WzC). These soils are described below:

Soil Map Symbol	Description
CcB	**CANTON AND CHARLTON VERY STONY FINE SANDY LOAMS, 3 TO 8 PERCENT SLOPES.** This unit consists of gently sloping, well drained soils. The Canton soil formed in sandy deposits over friable sandy gravelly till and the Charlton soil formed in friable loamy till. It is on the side slopes and crests of upland hills and ridges. Stones and boulders cover 2 to 10 percent of the surface. Bedrock is commonly more than 60 inches below the surface. The water table is commonly below a depth of six feet. The permeability of the Canton soils is moderately rapid in the surface layer and subsoil, and rapid in the substratum. The permeability of the Charlton soils is moderate or moderately rapid throughout. The surface runoff is medium and the available water capacity is moderate. A limitation for trail development is stoniness, large stones which are found both on and below the soil surface.
CcC	**CANTON AND CHARLTON VERY STONY FINE SANDY LOAMS, 8 TO 15 PERCENT SLOPES.** This unit consists of sloping, well drained soils. The Canton soil formed in sandy deposits over friable sandy gravelly till and the Charlton soil formed in friable loamy till. It is on the side slopes of upland hills and ridges. Stones and boulders cover 2 to 10 percent of the surface. Bedrock is commonly more than 60 inches below the surface. The water table is commonly below a depth of six feet. The permeability of the Canton soils is moderately rapid in the surface layer and subsoil, and rapid in the substratum. The permeability of the Charlton soils in moderate or moderately rapid throughout. Surface runoff is rapid and the available water capacity is moderate. Limitations for trail development are stoniness and slope.
CdC	**CANTON AND CHARLTON EXTREMELY STONY FINE SANDY LOAMS, 3 TO 15 PERCENT SLOPES.** This map unit consists of

gently sloping to sloping, well drained soils. The Canton soil formed in sandy deposits over friable sandy gravelly till and the Charlton soil formed in friable loamy till. It is on the side slopes of upland hills and ridges. Stones cover 10 to 35 percent of the surface. Bedrock is commonly more than 60 inches below the surface. The water table is commonly below a depth of six feet. The permeability of the Canton soils is moderately rapid in the surface layer and subsoil, and rapid in the substratum. The permeability of the Charlton soils is moderate or moderately rapid throughout. Surface runoff is medium to rapid, and the available water capacity is moderate. Limitations for trail development are stoniness and slope.

CrC **CHARLTON-HOLLIS VERY STONY FINE SANDY LOAMS, 3 TO 15 PERCENT SLOPES.** This map unit consists of very deep and shallow gently sloping to sloping, well drained and somewhat excessively drained soils on hills and ridges of glacial till uplands. The areas of this map unit are mostly irregular in shape. Slopes are mostly complex and 100 to 200 feet long. Stones cover 1 to 8 percent of the surface, which is marked by a few narrow, intermittent drainage-ways and small, wet depressions. This map unit is about 55 percent Charlton soils, 20 percent Hollis soils, 15 percent other soils, and 10 percent exposed bedrock. The Charlton and Hollis soils are in such a complex pattern that it was not practical to map them separately. The water table in this unit is commonly at a depth of more than six feet. The available water capacity is moderate in the Charlton soils and very low or low in the Hollis soils. Both soils have moderate or moderately rapid permeability and medium to rapid runoff. Hard unweathered schist bedrock is at a depth of 14 inches in some areas. Limitations for trail development are stoniness, slope, and depth to rock.

HpE **HOLLIS-CHARLTON EXTREMELY STONY FINE SANDY LOAMS, 15 TO 40 PERCENT SLOPES.** This map unit consists of very deep and shallow moderately steep to steep, well drained and somewhat excessively drained soils on hills and ridges of glacial till uplands. Areas of this map unit are mostly long and narrow or oval in shape. Slopes are mainly convex and 100 to 500 feet long. Stones and boulders cover 1 to 8 percent of the surface. This map unit is about 55 percent

Charlton soils, 20 percent Hollis soils, 15 percent other soils, and 10 percent exposed bedrock. The Charlton and Hollis soils are in such a complex pattern that it was not practical to map them separately. The water table in this map unit is commonly at a depth of more than six feet. The available water capacity is moderate in the Charlton soils and very low or low in the Hollis soils. Both soils have moderate or moderately rapid permeability and medium to rapid runoff. Hard unweathered schist bedrock is at a depth of 14 inches in some areas. Limitations for trail development are stoniness, slope, and depth to bedrock.

Lg **LEICESTER, RIDGEBURY, AND WHITMAN EXTREMELY STONY FINE SANDY LOAMS.** These nearly level, poorly drained and very poorly drained soils formed in compact and friable loamy glacial till. They are in depressions and drainage ways of glacial till uplands. Depth to bedrock is commonly more than 60 inches below the surface. From 8 to 25 percent of the surface of these soils are covered with stones and boulders. The soils were mapped together because they have no significant differences in use and management. These soils have a seasonal high water table at or near the surface from fall through spring. Permeability is moderate or moderately rapid in the surface layer and subsoils of these soils. The permeability is slow to very slow in the substratum of the Ridgebury and Whitman soils and moderately rapid in the substratum of the Leicester soils. Runoff is slow. The available water capacity is moderate in these soils. Lg is a wetland soil. Limitations for trail development are stoniness and wetness.

WzC **WOODBRIDGE EXTREMELY STONY FINE SANDY LOAM, 3 TO 15 PERCENT SLOPES.** Woodbridge series consists of very deep, moderately well drained soils on uplands. They formed in glacial till. In undisturbed areas, the surface is commonly very stony or extremely stony. The soil has a seasonal high water table at a depth of about 18 inches. There is a dense layer of soil at about 24 inches in depth. Cut slopes are likely to have seeps flowing during wet periods. Permeability is moderate in the surface layer and subsoil and slow or very slow in the substratum. The surface runoff is medium and the available water capacity is moderate. Limitations for trail development are stoniness, wetness, and slope.

Additional information for these soils are available within the Soil Survey of Middlesex County, CT (1979).

Trail Development Recommendations

The limitations identified above which may be associated with trail development do not preclude development. The following recommendations will address the limitations and provide guidance to minimize disturbance to the soil resources, these should be incorporated into the planning process.

DEPTH TO ROCK: In some areas, the depth to bedrock may be within 3 - 6 inches below the soil surface or exposed on the surface. While bedrock may provide a firm base for trail development, it may create other problems such as placement of trail signs or safety concerns during wet periods. Wood chips or bark may be used to protect areas where the soil depth is quite shallow over bedrock.

SOIL EROSION: Depending on the projected annual trail use and the physical trail location, addressing potential soil erosion should be an essential component of the planning process. This is critically important on steep slopes. Stable, natural ground is recommended to maximize trail location and development, reduce maintenance, and help to keep soil erosion at a minimum. If possible, incorporate existing trails or roadways into the overall trail system. However, areas showing signs of soil erosion may be stabilized by either replacing natural vegetation or using alternative materials such as wood chips or bark.

SLOPE: Soil erosion, safety and general trail planning concerns are greater on steep slopes (greater than 8 percent) compared to gentle slopes (less than 8 percent) or level ground. To address these concerns and minimize damage to the natural resources, locate a trail across the slope rather than up and down the slope.

STONINESS: The main concern with disturbing or removing large stones (greater than 6 inch diameter) for trail development, especially on moderate to steep slopes, is soil erosion. Leaving large stones in place will help to keep erosion to a minimum. If stones are removed, refer to the soil erosion recommendations above.

WETNESS: Trail development within wetland soils should require critical planning to minimize disturbance to the soil resources in particular and the total resources in general. A wooden footbridge is recommended for stream crossing to minimize bank erosion and sediment deposition directly into the stream. High water periods, such as spring and fall, may have an affect on trail location.

Trail development in Woodbridge soils, approximately 12 - 24 inches below the surface, may create wetness seeps onto

the trail and create a continuous problem. Restricting development to no more than 12 inches below the surface should help to eliminate potential wetness problems.

Summary

Limitations for trail development within the proposed area include: depth to rock, soil erosion, slope, stoniness, and wetness. These limitations do not preclude development, but require careful consideration during the planning process to minimize disturbance to the soil resources in particular and the total natural resources in general.

Campsite Development Recommendations

Soil Map Symbol	Limitations for Campsites
CcB	Stoniness
CcC	Stoniness and slope
CdC	Stoniness and slope
CrC	Stoniness and slope
HpE	Stoniness, slope and depth to bedrock
Lg	Stoniness and wetness
WzC	Stoniness

The limitations identified above, which may be associated with campsite development, do not preclude development. The following discussion and recommendations will address the limitations and provide guidance to minimize disturbance to the soil resources during the planning process.

DEPTH TO ROCK: The discussion and recommendations identified for trail development are also applicable for campsite development.

STONINESS: The discussion and recommendations identified for trail development are also applicable for campsite development. Large stones and boulders can add a positive aesthetic quality or a functional quality (seating) to a campsite.

SLOPE: The discussion and recommendations identified for trail development are also applicable for campsites. Campsites are usually long term structures. Therefore, potential damage to the soil resources by locating campsites on steep slopes (greater than 8 percent) can potentially become long term problems too.

WETNESS: The discussion and recommendations identified for trail development are also applicable for campsite development. "Wetness" was identified for Lg only, which is also a wetland soil. Campsite development is not recommended in a wetland soil. Since wetlands serve as areas for, but are not limited to, flood control and wildlife habitat, campsite development may not be compatible with, and in

some instances, create a negative impact to the wetland, and reduce its functional capabilities.

Summary

The above limitations for campsite development do not preclude development, but require careful consideration during the planning process to minimize disturbance to the soil resources in particular and the total natural resources in general.

SOILS MAP

Scale 1" = 1320'

THE NATURAL DIVERSITY DATA BASE

The Natural Diversity Data Base maps and files have been reviewed regarding the open space property. According to our information, there are no known extant populations of Federal or State Endangered, Threatened or Special Concern Species occurring at the site in question.

Natural Diversity Data Base information includes all information regarding critical biologic resources available to us at the time of the request. This information is a compilation of data collected over the years by the Natural Resources Center's Geological and Natural History Survey and cooperating units of DEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site specific field investigations. Consultation with the Data Base should not be substituted for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as enhance existing data. Such new information is incorporated into the Data Base as it becomes available.

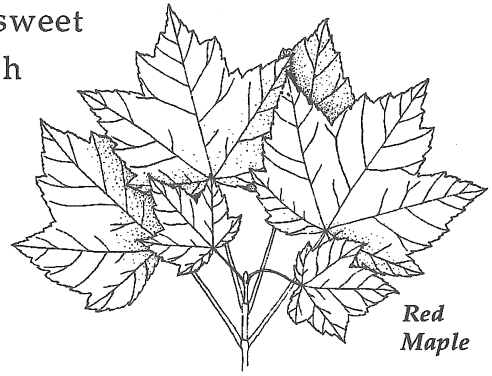
VEGETATION

The 42 acre property deeded and entrusted to Regional School District #4 for conservation and open space has excellent potential for the environmental education of all ages. The vegetation present on this tract of land falls into four broad categories. These include Mixed Hardwoods, Hardwood Swamp/Inland Wetland, Old Field and Oak Ridge *(see Vegetation Type Map)*. The location and acreage of these areas were obtained from aerial photographs and are only approximate.

Vegetation Types

A. Mixed Hardwoods: The Mixed Hardwood type totals approximately 28 acres and is made up of reasonably healthy sawtimber size trees (11.1" in diameter at breast height (d.b.h.) and larger) and pole size trees (6.1" to 11" d.b.h.) 60 to 120 years of age. Black oak, red oak, black birch and red maple are the dominant overstory tree species. White oak, scarlet oak, hickory, and American beech are present throughout along with scattered eastern hemlock. Tulip tree, sugar maple, white ash and yellow birch are intermixed in the valleys and near the wetlands. Understory vegetation includes hardwood tree seedlings (black birch and black cherry are especially dense in the larger openings which were left after the last timber harvest), mountain laurel, maple leaved viburnum, eastern red cedar, ironwood, blue beech, azalea, beaked hazelnut, American chestnut sprouts, witch-hazel, highbush blueberry, Lowbush blueberry, huckleberry and barberry. Ground cover vegetation includes poison ivy, Virginia creeper, green briar, raspberry, dewberry, Canada mayflower, Indian cucumber, false solomans seal, wild sarsaparilla, club moss, evergreen wood fern, hayscented fern, cinnamon fern, Christmas fern, and many species of grasses, sedges and wild flowers.

B. Hardwood Swamp/Inland Wetland. There are approximately 5 acres of hardwood Swamp/inland wetland present within this property. These wetland areas are somewhat variable with all size classes and age classes of trees represented. Each wetland is dominated by red maple with occasional black gum, white ash, yellow birch and tulip tree intermixed. A high proportion of the larger trees in these areas have cavities which make excellent den sites for many species of wildlife. Understory vegetation includes spice bush, sweet pepperbush, highbush blueberry, swamp azalea, mountain laurel, arrowwood, winterberry, swamp rose, speckled alder and gray birch. Skunk



Red Maple

cabbage, false hellebore, tussock sedge, club moss, sphagnum moss, poison ivy, green briar, cinnamon fern, Christmas fern, sensitive fern, spirea, wild geranium, solomons seal, trillium, violets, Jack-in-the pulpit and other wild flower species are present as ground cover.

C. Old Field. The old field vegetation type occupies on about 4 acres of this tract. The vegetation which is present in these areas is extremely variable. This is primarily due to the timing of agricultural abandonment. The area to the northwest is dominated by an understocked overstory of sapling and pole size eastern red cedar, with occasional large black oak, white ash and cankered black birch. The area to the east near the ponds is more open with a mix of red maple, black oak, red oak, apple trees, sugar maple, black birch and black cherry which are beginning to dominate the site. Flowering dogwood, gray birch, quaking aspen, multiflora rose, highbush blueberry, autumn olive, arrowwood, alternate leaf dogwood, choke cherry, barberry, bayberry, gooseberry, raspberry, Japanese honeysuckle, poison ivy, grape vines, green briar and bittersweet are present throughout this vegetation type. Ground cover is comprised of grasses, sedges, Canada mayflower, false solomons seal, dewberry, goldenrod, blackeyed Susan, steeplebush, daisy fleabane, daisy, bluets, violets, buttercup, cinquefoil, hayscented fern, sensitive fern, cinnamon fern and club moss.

D. Oak Ridge. The excessively drained shallow to bedrock knolls that are present total approximately 4 acres. The vegetation which dominates these sites is made up of somewhat stunted and malformed pole sized chestnut oak, scarlet oak, white oak, and black oak with scattered mockernut and pignut hickory. Red maple, sassafras, hemlock and eastern red cedar are also present in the overstory, but in lesser numbers. Understory vegetation includes hardwood tree seedlings, choke cherry, witchhazel, maple leaved viburnum, Lowbush blueberry, huckleberry and green briar. Ground cover consists of Pennsylvania sedge, Canada mayflower, pink ladyslipper, club moss, poison ivy, Virginia creeper, hayscented fern and bracken fern.

Limiting Conditions and Potential Hazards

Currently there are several conditions which limit the health and vigor of the trees on this property. One condition is the saturated soils that created the hardwood swamp areas and the wetland areas. The high water tables in these areas restrict the depth of root development, limiting the stability and therefore the size trees can attain. Trees in these areas are usually slow growing and very susceptible to windthrow. Another condition that limits the potential for tree health and vigor are the droughty shallow to bedrock soils located on the oak ridge knolls. The trees in these areas

are stunted in growth and malformed in appearance due to the lack of moisture and shallow soils. Insect infestations, specifically the Hemlock Woolly Adelgid, the Woolly Beech Blight Aphid and various insects which attack oak such as the Gypsy moth and the Two Lined Chestnut Borer which are present on the property may cause a decline in health and even mortality in their host species.

Potential hazards on this property relating to the vegetation include poison ivy and trees that have a high risk of injuring people that are utilizing the property. Trees with their roots exposed, dead trees, dead tree parts and those trees which have a high probability of falling due to excessive decay or lean would be considered hazardous, especially if located near areas of high use such as hiking trails.

Management Considerations

The removal of risk and hazard trees and the maintenance of healthy vigorous trees which are less likely to be adversely affected by insect and disease infestation should be of major concern in the management of this property. Improvement thinnings focused on the removal of unhealthy damaged trees which are competing with trees of high potential could be implemented within the mixed hardwood area. The effect of these thinnings if properly administered could be used for the purpose of educational demonstration especially if non managed control areas are set aside for comparison.

An experienced professional forester should be retained to determine which trees are hazardous to life and property, which trees should be retained as standards for their aesthetic appeal and which trees should be removed to maintain the overall health of the forest.

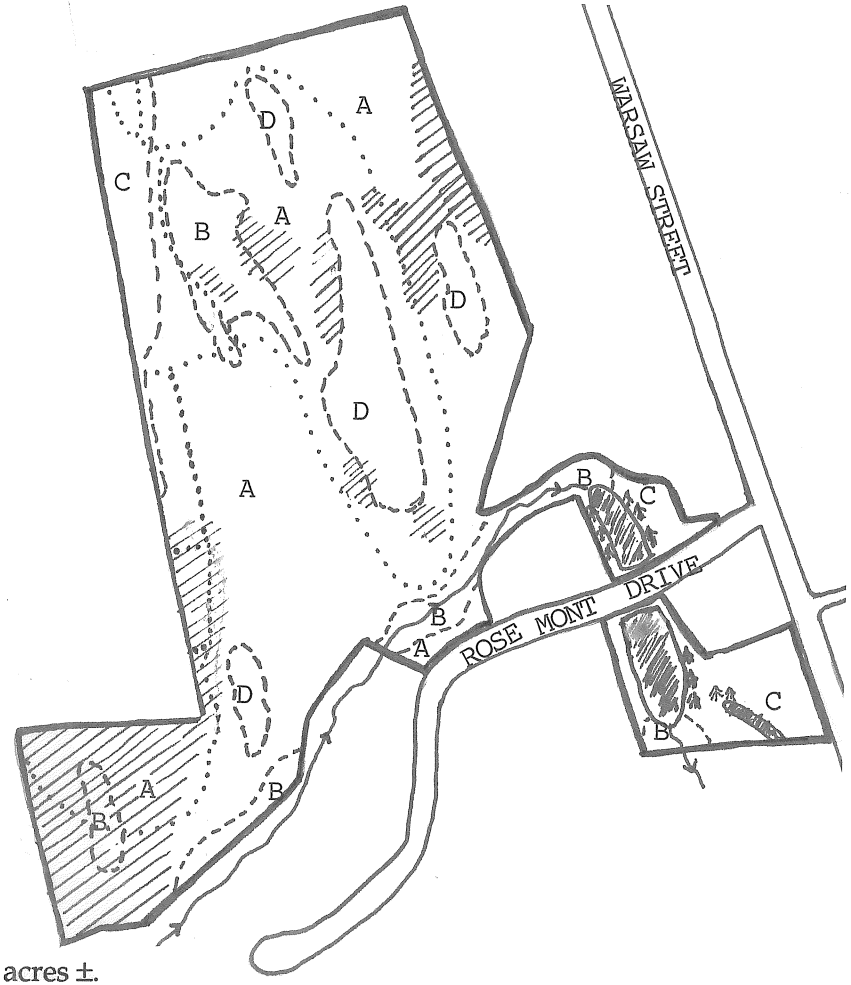
As this property has excellent potential for educational purposes, the Department Of Environmental Protection's Division of Environmental Education should be contacted (Alberto Mimo, 566-8108). Project Learning Tree, Project Wild and Project Aquatic are administered by this office and are excellent environmental education tools tailored to all levels.

VEGETATION TYPE MAP

Legend

- Vegetation Type Boundary
- Property Boundary
- Road
- Trail
- Stream
- Conifers (Norway spruce, white spruce, white pine)
- Ponds (1 acre)
- Dense Mountain Laurel

Scale 1" = 500'



Vegetation Type Descriptions

A. Mixed Hardwoods. Fully stocked. Pole to Sawtimber size. 28 acres ±.

B. Hardwood Swamp/Inland Wetland. Fully stocked. Sapling to sawtimber size. 5 acres ±.

C. Old Field. Under stocked. Seedling to sapling size. 4 acres ±.

D. Oak Ridge. Under to fully stocked. Pole size. 4 acres ±.

Seedling Size - trees less than 1" in diameter at 4 1/2' above the ground (D.B.H.)

Sapling size - trees 1" to 5" in D.B.H.

Pole size - trees 5" to 11" in D.B.H.

Sawtimber size - trees 11" and greater in D.B.H.

FISH RESOURCES

Stream Resources

A small unnamed tributary of Falls River flows through the property. The stream is best characterized as a small headwater stream or a stream in the uppermost section of a watershed. One of the more important functions of a headwater stream is to provide clean and unpolluted waters to downstream areas of a watershed which contain an increased diversity of aquatic organisms. The stream is intermittent, meaning that it flows in direct response to precipitation or is seasonally dry.

The stream does not support a fish community. A field survey of streambed substrate revealed that the stream does support aquatic invertebrates (animals that do not have a backbone). Caddisfly were most abundant; water striders were also observed. Aquatic invertebrates live in stream riffles or areas of fast moving, turbulent water that provide high levels of dissolved oxygen. A good source of information regarding the life histories of aquatic invertebrates can be found in a book entitled "Freshwater Invertebrates of America" by Robert W. Pennak. Another good source is "A Guide To The Study Of Freshwater Biology" by James G. Needham. To learn more about fishes that live in Connecticut waters, the following publication may be of interest: "Freshwater Fishes of Connecticut" by Walter R. Whitworth.

Pond Resources

Two man-made ponds, created by impounding waters of the unnamed tributary are found on the property. The pond north of the road crossing for the subdivision is extremely shallow. It has been lowered or drawn down approximately 2 feet in elevation. This condition has likely been created by activities associated with roadway construction. The entire pond bottom is covered with one species of submerged aquatic vegetation. Although not positively identified, the vegetation appears to be a member of the stonewart family, an advanced form of algae. The pond supports a very small population of warmwater freshwater fish. Redbreast sunfish are the dominant species in the pond. A small number of Yellow perch were documented.

The southern pond contains a diversity of deep and shallow water habitat. Fallen trees provide good cover or areas in which fish can hide to avoid predation. Filamentous algae is prevalent in the pond along with small concentrations of watershield (a floating aquatic weed) and stonewarts. Due to diversity of habitat, this pond has an abundant and diverse warmwater fish population. Species that were observed during the field review are as follows: largemouth bass, redbreast sunfish, bluegill sunfish, and members of the stickleback family.

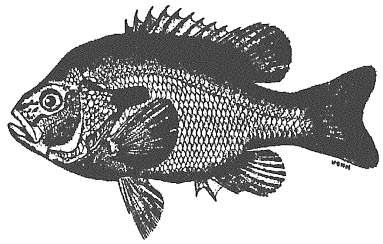
Aquatic Education

The unnamed watercourse and two ponds could serve as a valuable ecological study area for the regional school district. Aspects of stream ecology such as water quality and the aquatic invertebrate community could be monitored in the seasonal watercourse. Identification of streamside riparian vegetation and the important role riparian ecosystems play in protecting watercourses could also be studied.

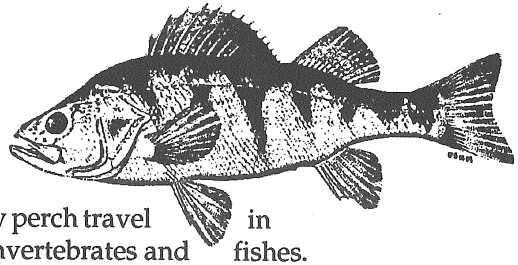
The two ponds provide multiple opportunities to study the pond eutrophication or aging process through water quality analysis. Identification, abundance, and life history of aquatic vegetation, zooplankton, phytoplankton, and fish populations could be investigated. Food web and trophic relationships could be identified. Water quality and aquatic community comparisons could be made between stream and pond habitats.

A nature/hiking trail system could be developed on the property which follows through various aquatic and terrestrial habitat types. The established trail system should follow a closed-loop, that is, begin and end at the same point and be well marked.

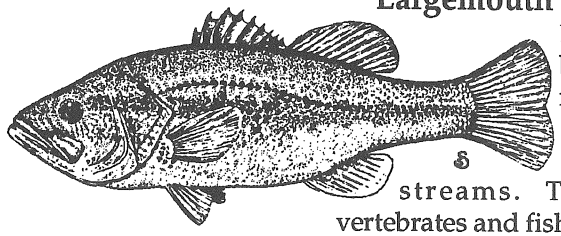
Illustrations and information (on the right) from "Freshwater Fishes of Connecticut", by Walter R. Whitworth, Peter L. Berrien, and Walter T. Keller, DEP, Bulletin 101, reprinted 1988.



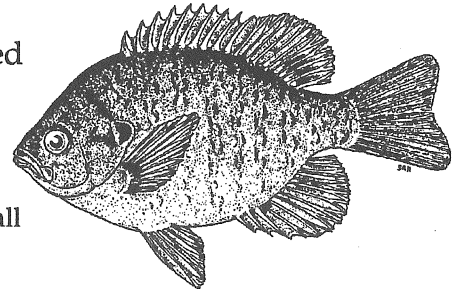
Redbreast Sunfish - native
Lengths of 1 ft. are reached by this species. Redbreast sunfish prefer rivers and streams but are found in lakes and ponds. They eat invertebrates and small fish.



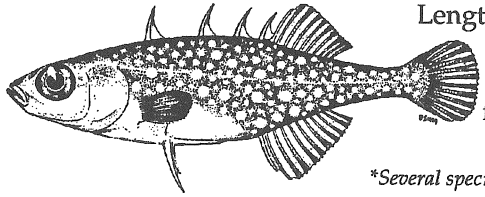
Yellow Perch - native
Lengths up to 1.5 ft. are reached by this species. Yellow perch are found in clear lakes and in the sluggish parts of streams. Yellow perch travel in large schools and feed on invertebrates and fishes.



Largemouth Bass - introduced
Lengths of 2 ft. are reached by this species. Largemouth bass are found in weedy, mud-bottomed lakes and in sluggish streams. Their food consists of invertebrates and fishes.



Bluegill Sunfish - introduced
Lengths of about 1 ft. are reached. Bluegills prefer lakes and ponds and the sluggish parts of rivers. They are usually found in schools and feed on invertebrates and small fishes.



Brook Stickleback* - introduced
Lengths of 3 in. may be reached. The brook sticleback prefers boggy streams and lakes. Sticklebacks feed on a variety of small plant and animal materials.

**Several species of stickleback are found in Connecticut.*

WILDLIFE RESOURCES

The 45 acre parcel of land that has been entrusted to the Regional School District #4 has innumerable possibilities for providing learning experiences for students. As an outdoor classroom, it could be utilized to help educate the students in general wildlife habitat concepts. This report will focus on making recommendations on the following questions that relate to wildlife and education:

(1.) What are some concepts, habitat features, or points of interest that may be valuable for incorporation into an educational curriculum as part of the nature trail/outdoor classroom?

(2.) What are some "hands on" wildlife habitat management techniques that could be employed to both enhance the site for wildlife and also serve as an educational experience?

(3.) What are some practical wildlife censusing techniques that can be undertaken on a yearly basis to learn about the use of the area by wildlife?

(1.) Concepts, Habitat Features, and Points of Interest

A trail system should revolve around the theme that wildlife needs food, water, cover and space to survive. There are roughly 16 components of wildlife habitat that the Team wildlife biologist feels should or could be pointed out to students in order to understand the needs of wildlife. The 16 components are as follow:

COMPONENT	FOOD/COVER HABITAT COMPONENTS	EXAMPLES
A	Summer Fruit/Cover Plants	High bush blueberry, Huckleberry
B	Fall Fruit, Grains/Cover	Arrowwood viburnum, silky dogwood
C	Winter Fruit/Cover	Bayberry, Red Cedar
D	Conifers/Evergreens	Eastern hemlock, Mountain Laurel
E	Nut & Acorn-bearing Plants	White oak, shagbark hickory
F	Grasses & Forbs	Little blue stem, golden rods
G	Nectar Plants for Butterflies & Other Insects	
H	Nectar Plants for Hummingbirds	Jewelweed

COMPONENT	STRUCTURAL HABITAT COMPONENTS	EXAMPLES
I	Dead or Decaying Trees	Snags, den trees
J	Nest Box Placement	Bluebird, Screech owl, squirrel boxes
K	Water Sources	Vernal pools, streams
L	Brush Piles/Rock Piles	Man made brush piles
M	Dust or Grit Areas	Along stream banks
N	Salt or Mineral Licks	Provide salt licks
O	Unique Caves or Crevices	Bedrock geologic resources
P	Artificial Feeders	Suet feeders, sunflower seed feeders

When laying out the trail system any or all of the sixteen habitat components can be identified and their function or value as wildlife habitat can be explained.

(2.) "Hands On" Wildlife Habitat Management

Some of the sixteen components can be made available through construction of physical structures, planting or cutting of vegetation to enhance a particular site. Examples of construction are:

- Building, placement and maintenance of nest structures
- Construction of brush piles or rock piles
- Construction of artificial feeders

Examples of planting or cutting vegetation

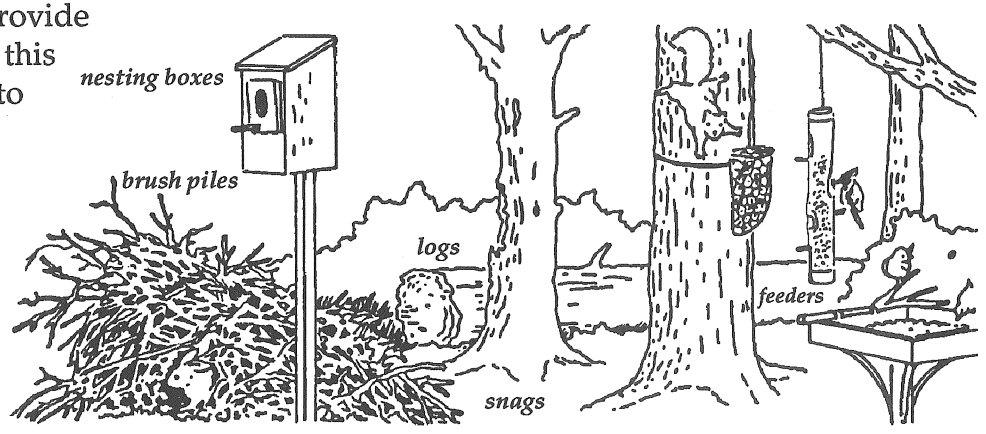
- Planting shrubs that have persistent winter fruit
- Planting nectar plants for butterflies or hummingbirds
- Hand cutting undesirable non-native plants
- Enhancing the understory shrub plants to increase fruit production.

(3.) Practical Wildlife Censusing Techniques

Techniques for censusing wildlife can teach students many different lessons. It can teach them the value of record keeping, identification of wildlife (directly and indirectly), and long term population changes both in terms of numbers and types of wildlife. Students can learn where wildlife species are typically found. Examples are as follow:

- Establish permanent transect lines that can be walked after snowfall (snow tracking) or other times, to listen for sounds of birds, or locate droppings along the transacts.
- Set small mammals live-traps along transect lines in varying habitats.
- Locate nests and document type of wildlife and the habitat it is found in and plot it on a cover type map of the area.
- Spotlight edge of fields at night to determine the number of deer feeding there.
- Maintain seasonal records of nest box use by species.
- Locate vernal pools and document use by amphibians.

The aforementioned ideas are only a handful recommendations that can be utilized in an outdoor classroom situation. Nature's classroom has almost endless amounts of learning opportunities. The key is to get the trail system in place with a trail guide (pamphlet) as a first phase. Following the completion of the trail system and guide, teachers should develop an ongoing wildlife habitat study curriculum that takes into account the four basic needs of wildlife and their respective 16 habitat components. The Team wildlife biologist (Peter Picone) is available to provide technical assistance at any phase of the development of this nature classroom. The project leaders may also want to consider visiting Sessions Woods wildlife management area to view field demonstrations relating to wildlife habitat enhancement (by appointment call Dave Kubas, Conservation Education Specialist, C.E.D.A.R.S. Project, tel. 584-9828).



OUTDOOR CLASSROOM ACTIVITIES

The following ideas are offered concerning using the Regional School District #4's open space as an outdoor classroom.

First of all, there are a number of references which the school can utilize in developing the outdoor classroom activities. The Middlesex County Soil and Water Copnservation District Manager District, as part of her responsibilities, can confer with anyone from the school who is interested in this project. The following references for school use have been given to the requesting agency as part of this completed report:

◆ "Investigating Your Environment", USDA Forest Service. Series of lesson plans with activities.

◆ "A Teacher's Manual for Outdoor Classrooms: How to plan, develop and use them", USDA Soil Conservation Service, Alabama.

For the following reference, you should contact the Conservation District (345-3219) so they can order copies for you.

◆ "Conserving Soil", 1990, National Association of Conservation Districts. Resource packet with 24 curriculum activity sheets, teachers, guide and overheads.

Specific to the site in Deep River, there are a number of subject areas which ideally suited for special outdoor classroom activities.

1. Geology - Activities can revolve around the difference between bedrock and glacial geology at the site.

A. The bedrock was formed millions of years ago while the glacial deposits were emplaced thousands of years ago. A discussion of geologic time and differences in geologic history of the two formations will be appropriate (bedrock deformation vs. glacial deposition of sediments).

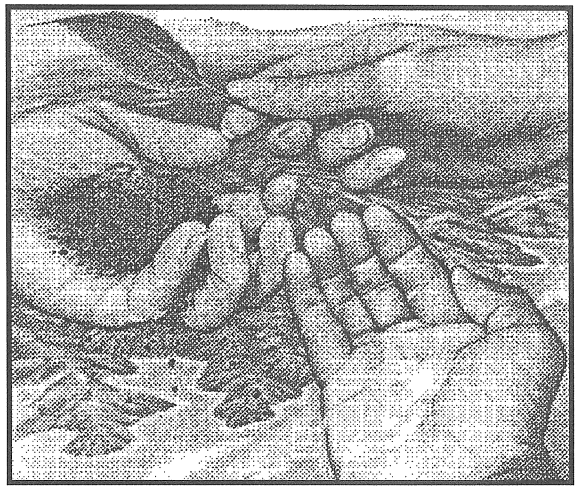
B. The geology controls the topography of the area. The bedrock in this area (refer to geologist's report) contains much quartz, which is erosionally resistant to chemical and physical weathering. The bedrock controlled where the glacial deposits would most likely be placed.

C. Bedrock and glacial deposit differences are responsible for the formation of different soil types and soil depths. The bedrock here is highly resistant to chemical and physical erosion, thus a shallow soil development. The glacial outwash deposits lend themselves to better soil development.

D. Students could undertake an investigation of the mineralogy of the bedrock and the chemical and physical conditions under which this rock was formed.

2. **Pond Investigations** - Pond investigations could include exploring the following parameters:

water chemistry
aquatic life organisms (benthic and in the water column) light penetration
aquatic plants
temperature stratification and seasonal variations



3. **Soil Testing**

pH
textures
organic content
soil depth
slope
soil formation
soil erosion
land uses based on soil type

4. **Activities involving discussion of the area as a community ecosystem;** study members of a food chain and how variables in their environment affect the ecosystem.

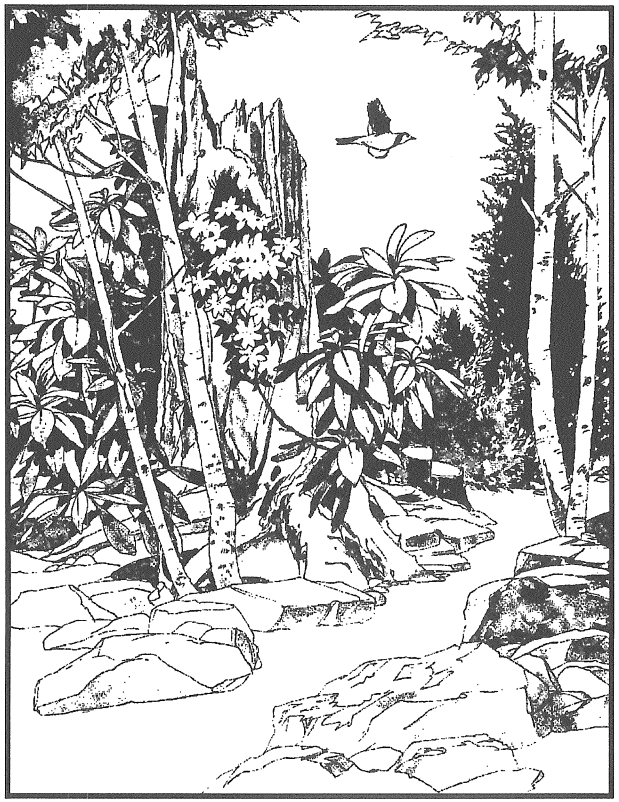
5. **Teachers should become involved in Project Learning Tree and Project Wild through the State DEP education department (566-8108).** These programs provide teacher training and curriculum guides. Also, the District is trying to acquire more information on Project WET (Water Education for Teachers).

State Park Planner Comments

(These comments are based soley upon map analysis.)

The Regional School is fortunate to have an adjoining open space area readily available for educational purposes, especially one possessing some degree of variety in its physical character. Although much of the tract is steeply sloping and generally quite stony, it would seem to lend itself to development of informal "single track" nature trails (not graded "double track" trails). Wet soils should be a minor constraint to such trail development, except perhaps in the swale found in the northern portion of the tract, where a short stretch of board walk may be appropriate. Indeed the damp areas found along several swales/seasonal streams at the north and south end of the property should add educational variety and thus be of educational value.

Aside from suggesting a basic loop trail around the property, it is recommended that a detailed inventory be undertaken of all examples of botanical and geologic interest located therein. With these located, a trail system could be developed to include them. In addition, simple signs naming and in some cases describing these points of interest should be emplaced.



A Listing Additional Materials

Adopt-A-Tree Album, 4-H Forestry

"The Catalyst", A report from the Natural Resource Conservation Education Program, USDA- Forest Service, Spring-June 1992, Fall 1992.

Connecticut Arbor Day Teachers Guide

Connecticut Native Shrubs Availability List

Connecticut Native Trees Availability List

Connecticut Outdoor and Environmental Education Association Membership information

"Connecticut Wildlfe", newsletter of the CT DEP, Wildlife Division, May/June 1993

Investigating Your Environment, USDA-Forest Service

"Kudos for Mr. T", **Down East, The Magazine of Maine**, April 1993, p. 28.

Natural Diversity Data Base brochure

Project Learning Tree information

A Teachers Manual for Outdoor Classrooms - How to Plan, Develop, and Use Them, USDA-Soil Conservation Service

Trail guides and information from Northwest Park, Windsor, CT

"Trillium", newsletter of environmental education, CT DEP, Spring issue 1993

About the Team

The Eastern Connecticut Environmental Review Team (ERT) is a group of professionals in environmental fields drawn together from a varety of federal, state and regional agencies. Specialists on the Team include geologists, biologists, foresters, soil specialists, engineers and planners. The ERT operates with state funding under the supervision of the Eastern Connecticut Resource Conservation and Development (RC&D) Area — an 86 town region.

The services of the Team are 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, landfills, commercial and industrial developments, sand and gravel excavations, 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 official 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 and the ERT Coordinator. A request form should be completely filled out and should include the required materials. 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 and request forms regarding the Environmental Review Team please contact the ERT Coordinator: 203-345-3977, Eastern Connecticut RC&D Area, P.O. Box 70, Haddam, Connecticut 06438.