WEST STAFFORD FIRE DEPARTMENT PROPERTY

STAFFORD, CONNECTICUT

Eastern Connecticut
Environmental Review Team
Report

Eastern Connecticut Resource Conservation & Development Area, Inc.

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Environmental Review Team Report

Prepared by the
Eastern Connecticut Environmental Review Team
of the Eastern Connecticut
Resource Conservation and Development Area, Inc.

for the
Stafford
Conservation Commission

February 1997

CT Environmental Review Teams
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ACKNOWLEDGMENTS

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

The Eastern Connecticut Environmental Review Team Coordinator, Elaine Sych, would like to thank and gratefully acknowledge the following Team members whose professionalism and expertise were invaluable to the completion of this report.

The field review took place on Wednesday, October 23, 1996.

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I would also like to thank Joe Neafsey, conservation commission member, Gloria Krol, conservation commission member, Robert Bourque, conservation commission member, Michael Magrone, West Stafford Elementary School principal, and Judy Sullivan, West Stafford Elementary School teacher for their cooperation and assistance during this environmental review.

Prior to the review day, each Team member received a summary of the proposed project with location and soils maps. During the field review Team members were given additional information. 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 plans 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. 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 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 creating your management plans for this town-owned open space.

If you require additional information please contact:

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Table of Contents

List of Figures

INTRODUCTION

Introduction

The Stafford Conservation Commission has requested assistance from the Eastern Connecticut Environmental Review Team in conducting a natural resource inventory and environmental review for a parcel of town-owned land.

The ±60 acre site is located behind the West Stafford Elementary School on West Stafford Road (Route 190). The property was acquired from the West Stafford Fire Department and the Stafford Conservation Commission will have stewardship responsibilities.

There is access to the parcel from a woods road off of Route 190 and from the elementary school property. The parcel is adjacent to an existing small undeveloped town park known as "Diamond Ledge" and undeveloped Board of Education property. The western property line is Diamond Ledge Brook, the northern boundary abuts Shenipsit State Forest and the eastern portion borders private undeveloped land. The Board of Education property behind the school contains a nature trail.

The site is presently undeveloped and use of the site has been limited to mineral collectors who have trespassed to dig illegally for quartz crystals at Diamond Ledge.

Objectives of the ERT Study

The Stafford Conservation Commission would like to prepare a land use management plan that would encompass all the properties (Board of Education parcel, Diamond Ledge Park and the West Stafford Fire Department Property) as a whole unit to benefit the elementary school and the citizens of the town. The commission has requested a natural resource inventory, a discussion of appropriate use for passive and/or active

recreation, direction for educational opportunities, and recommendations to curb vandalism of the properties.

The ERT Process

Through the efforts of the Stafford Conservation Commission this environmental review and report was prepared for the Conservation Commission.

This report provides an information base and a series of recommendations and guidelines which cover the topics requested by the commission. Team members were able to review maps and information provided by the applicant.

The review process consisted of four phases:

1. Inventory of the site's natural resources;
2. Assessment of these resources;
3. Identification of resource areas and review of plans; and
4. Presentation of education, management and land use guidelines.

The data collection phase involved both literature and field research. The field review was conducted on October 23, 1996. The emphasis of the field review was on the exchange of ideas, concerns and recommendations. Being on site allowed Team members to verify information and to identify other resources.

Once Team members had assimilated an adequate data base, they were able to analyze and interpret their findings. Individual Team members then prepared and submitted their reports to the ERT coordinator for compilation into this final ERT report.

Figure 1

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Location and Topographic Map

Scale 1" = 2000'

Approximate Site

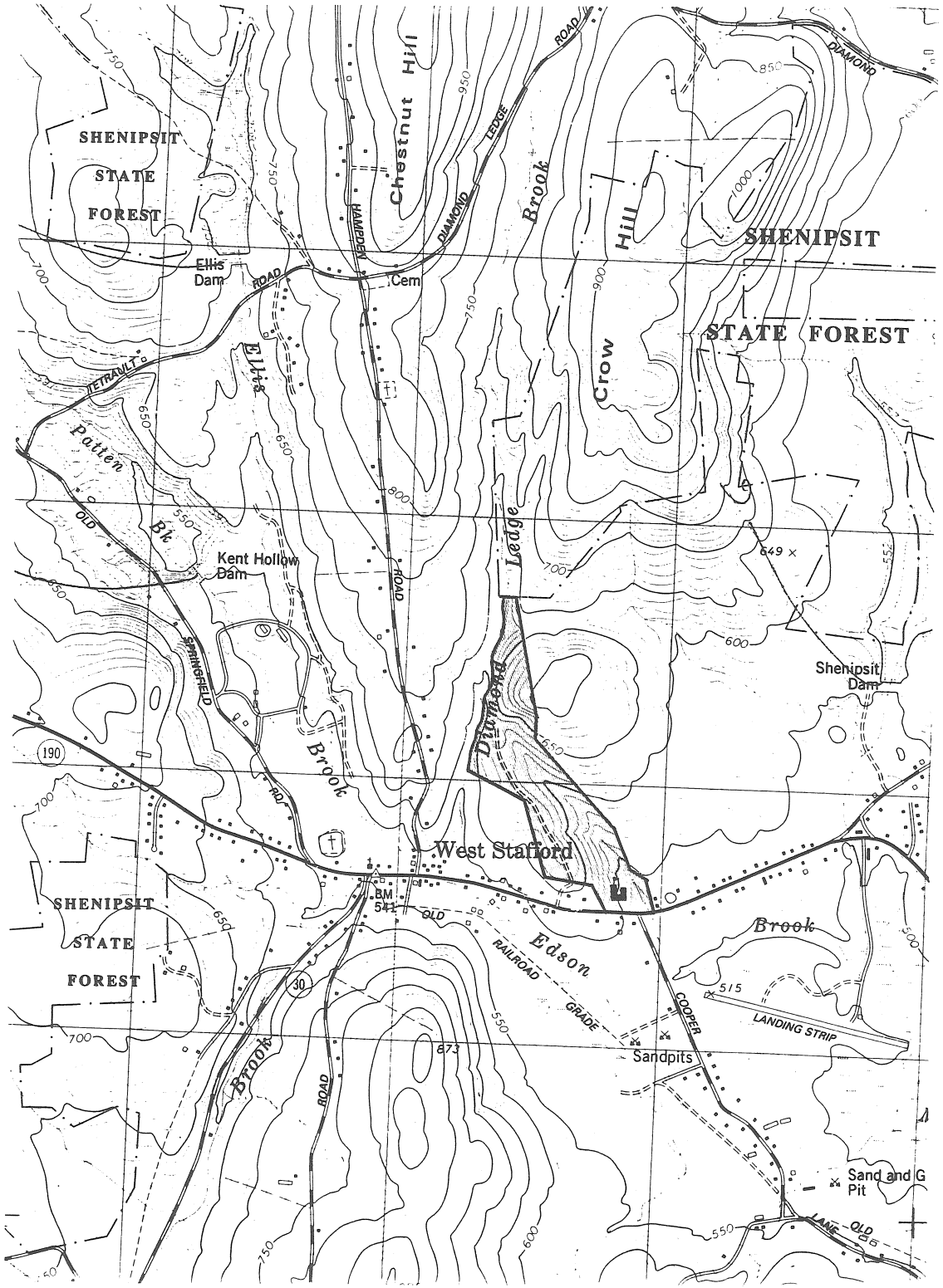

Figure 2

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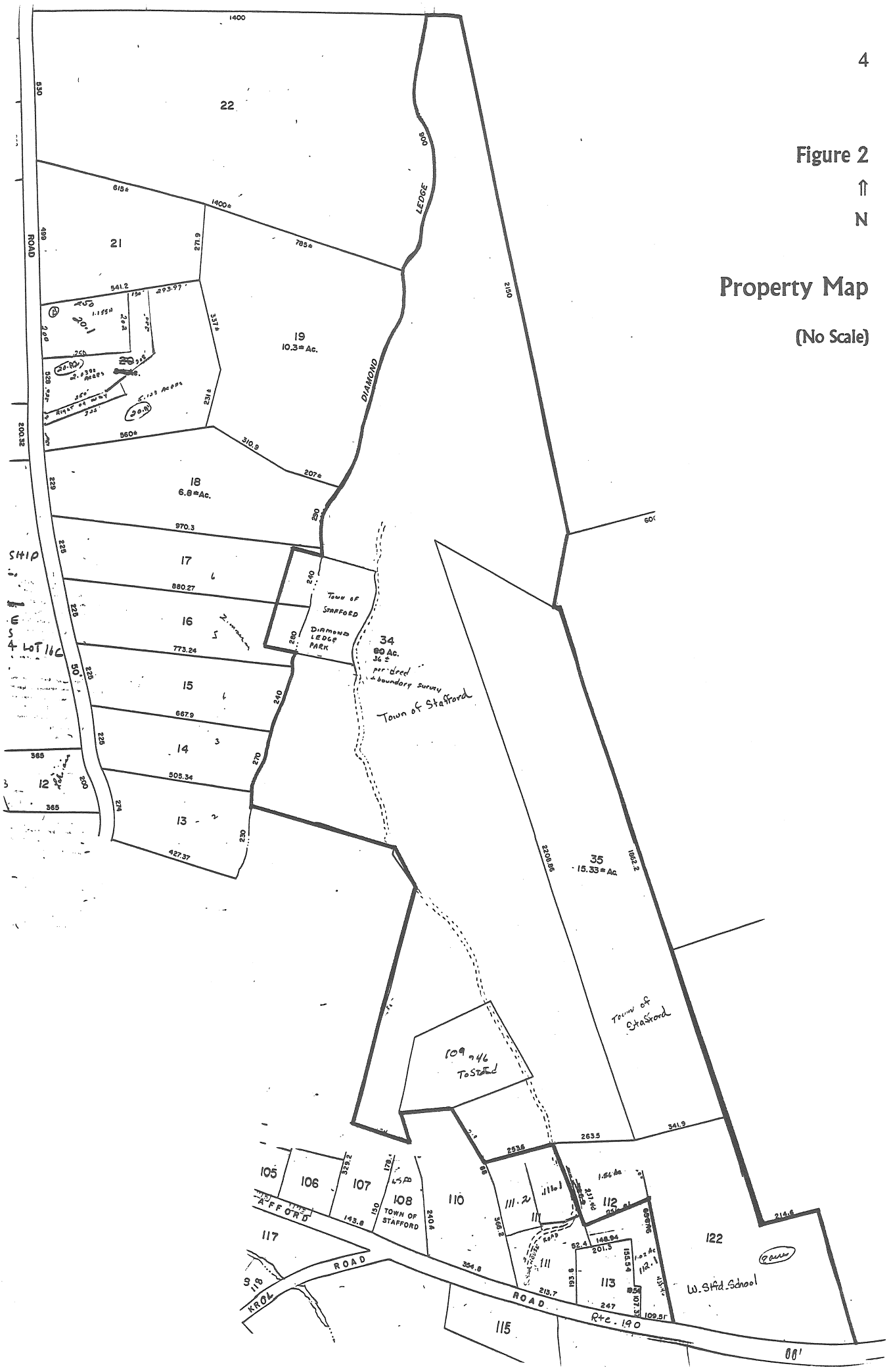
Property Map

(No Scale)



GEOLOGY and TOPOGRAPHY

The Diamond Ledge area of West Stafford has been an attraction to mineral collectors for years because of quartz veins that cut the bedrock. Many such veins may be found in the old stone quarry outcrops located on the West Stafford Fire Department property behind the West Stafford Elementary School.

Geologically, the area is dominated by the Bolton Syncline, a regional structure that extends from Portland, CT, into Massachusetts. A syncline is a downward fold or buckle in the rock layers that results when the rocks are subjected to strong compressive stresses. At the time of formation of the Bolton Syncline, the rock layers were deeply buried and subjected to high pressure and temperature, causing the rock materials to metamorphose. This occurred during one or more of the events that formed the Appalachian Mountains.

The bedrock beneath the soils at the West Stafford Fire Department parcel and adjacent areas is metamorphic in origin. The oldest rocks exposed on the parcel are felsic gneisses. Actual outcrops of these gneisses were not visited during the ERT site visit, but are mapped on the hill behind the elementary school by Pease (1975). Fragments incorporated in the soils are plagioclase-quartz-biotite gneiss that are light gray to yellowish weathering. Mafic gneisses are reported from rocks of this unit in adjacent areas. The unit was referred to as the Ammonoosic Volcanics by Pease (1975) but referred to as the Middletown Gneiss by Rodgers (1985). They are Ordovician in age.

The rock that makes up "Diamond Ledge" is quartzite of Silurian age. It is variably micaceous which allows it to split easily along parallel foliation planes. This characteristic makes the rock desirable as dimension stone and indeed it was quarried for such use in the past. The quartzite observed on the parcel has rusty weathering testifying to the presence of an iron sulfide mineral. The quartzite is referred to as the Clough Quartzite by Pease (1975) and Rodgers (1985). Fractures that cut the quartzite are particularly abundant in the northern part of the parcel opposite Diamond Ledge Park. Milky white and clear quartz crystals have grown in the fractures. Some of the fractures are completely filled with the quartz, others are

only partially filled and in these the quartz displays well-formed crystal faces. It is specimens of well formed quartz crystals that the mineral collectors seek. Hence, the mineral deposits constitute a resource. The quartz veins possibly are related to the cross faults shown on the geologic map (refer to Figure 3).

Orientation of the relict bedding planes in the Ordovician schists and gneisses diverge by as much as 35° to that of the Clough Quartzite. The contact between the Clough and the underlying Ordovician rocks is an angular unconformity.

Conformably overlying the Clough are quartz mica schists of the Littleton Formation. They are locally exposed in the stream bed, according to the map by Pease (1975). Outcrops of the Littleton Formation were not observed during the site visit.

An interesting geologic history can be interpreted from these rocks (the interested reader is referred to Michael Bell's The Face of Connecticut, p. 146-157, for an informative layman's-account of Connecticut's geologic history). They are roughly 375 to 460-million years old. They were not always metamorphic rocks; when originally formed they were mostly sedimentary and volcanic rocks.

The oldest rocks (Oa and Op on the accompanying map, Figure 3) were formed mainly from sediments and volcanic materials deposited during the Ordovician period of geologic time, roughly 460 million years ago, in a former seaway lying between the ancient North American continent and a volcanic island arc that lay to the east (the Sea of Japan is a modern analogue). At the end of the Ordovician period the rocks were intensely deformed by a small westerly-moving plate that collided with the island arc and North America to form the Taconic Mountains. The present Taconic Mountain area in New York state is a small remnant of the more extensive collision mountain belt that formed about 440 million years ago. Erosion of these mountains formed a broad erosion surface and fed enormous quantities of sediment into nearby seas. As the seas expanded in Silurian and Devonian time (about 420 to 375 million years ago), the sediment that was deposited on the erosion surface (a great unconformity similar to but older than the one discussed by Bell on p. 117-119) would become

the youngest rocks, the Diamond Ledge rock (Sc and Dl on Figure 3), found on the study parcel.

When the sea transgressed over the land, flooding the edge of the continent, sand and gravel, composed mostly of quartz, were deposited on beaches. As the transgression continued the beaches were submerged, and without the breaking waves to wash away any mud, the sand was smothered by a blanket of mud and finally limy mud. Those muddy sediments were lithified into sandstone and shale and, locally, limestone.

Following deposition of the Siluro-Devonian sediments a northerly moving micro continent, known as the Avalon Plate, collided obliquely with North America to produce the Acadian mountain belt in the late Devonian period approximately 365 million years ago. This was accompanied by regional metamorphism and the emplacement of numerous igneous intrusions.

The Acadian orogeny (mountain building) produced the major metamorphic event in New England. The Silurian and Devonian rocks were metamorphosed into quartzite, mica schist, and some "marble." The Ordovician rocks were metamorphosed into gneisses, schists, and some amphibolite.

Surficial geology of the site is fairly simple: most of the area is covered by a thin veneer of glacial till. The southeastern portion of the parcel has a thin wedge of sand and gravel, deposited in ice contact by glacial melt-water streams. Insufficient quantities of this material is present on the parcel to constitute a resource.

The topography of the larger area is dominated by a north-south trending ridge, extending from Crow Hill/Chestnut Hill on the north to Murry Hill to the south. A gap in the ridge exists at West Stafford where river flow (the modern Edson River and an ancient glacial melt-water stream) eroded a channel in bedrock that is locally fractured. Slopes along the ridge crest are moderate, even approaching the water gap. Slopes along the sides of the ridge are locally steep, especially within the ravine cut by Diamond Ledge Brook. The parcel itself is bounded on the west by Diamond Ledge Brook and that is the area of steepest slopes.

Slopes on the remainder of the parcel are moderate to gentle. Cross faults that cut the syncline result in fractured rock which is easier to erode. The stream behind the West Stafford Elementary School occupies a fracture controlled valley.

Previous quarrying activity has left appreciable area with disturbed topography. Quarrying along the east side of the ravine of Diamond Ledge Brook apparently removed dimension stone. Such an operation generally produces considerable excavated material that is unsuitable for building purposes. This waste material was piled up on the upper slope adjacent to the brook and later was used to back-fill the quarried area. At the time of the site visit most of the quarried area was covered by loose back-filled stone and soil-like material. Some of the slopes are steep and locally, as indicated by bent tree trunks, somewhat unstable, subject to slow down-slope movement. Local areas have been re-excavated by mineral collectors who have in places tunneled into the fill material in order to reach the bedrock ledges that contain the quartz veins, creating potentially unstable, near vertical and overhanging slopes in the unconsolidated back-filled material.

The area, thus, appears locally hazardous and if the parcel is developed the situation must be remedied. One possibility is to refill the old quarry area, grade it and plant grass and shrubs. Because the quartz veins are a resource, the Team Geologist cannot support that action although it probably is the least costly and least hazardous. The Team Geologist's recommendation is to find some way to keep the ledges accessible, perhaps removing the backfilled material so that tunneling is not required. This action, however, will leave precipitous exposures, themselves a hazard.

Groundwater hydrology of the area likely is influenced greatly by the presence of fracture zones that diagonally cut across the parcel. The fractures, many of which are partly open, not only lead to modification of the topography and but also provide possible conduits for groundwater flow. High yielding bedrock water-wells can probably be developed in these areas.

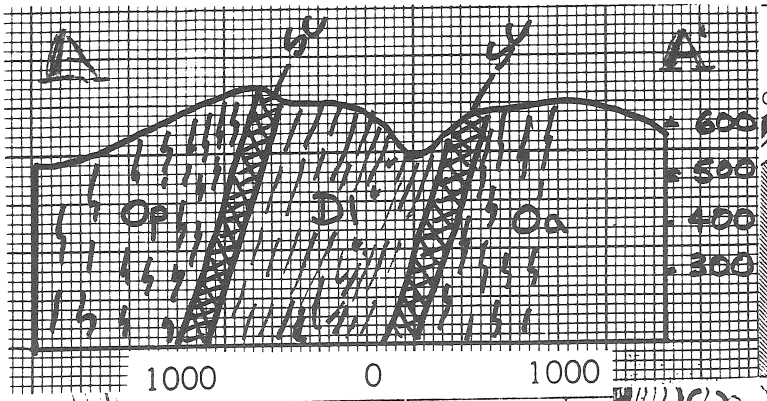
References

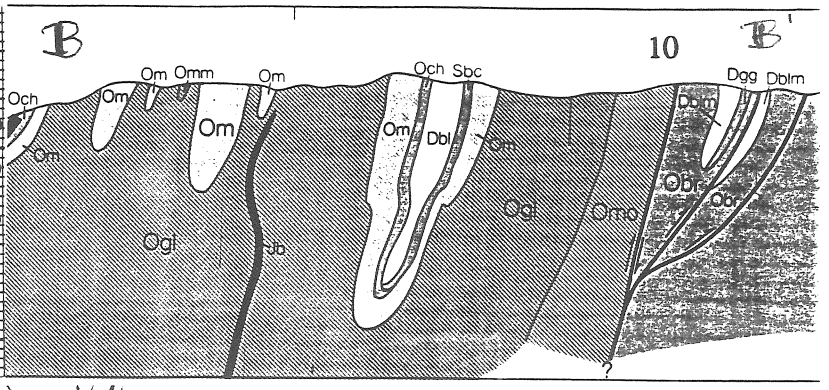
Bell, Michael, 1985, The Face of Connecticut, St. Geol. Natural Hist Surv., Bull. 110, 196p.

Pease, M.H., Jr., 1975, Surficial Geologic Map of the Stafford Springs Quadrangle, CT, U.S.G.S. Map, GQ-1216.

---, 1975, Bedrock Geologic Map of the Stafford Springs Quadrangle, Tolland County, CT, U.S.G.S. Open-file Report, 75-633.

Rodgers, John, 1985, Bedrock Geological Map of Connecticut, State Geological and Natural History Survey, CT Department of Environmental Protection.





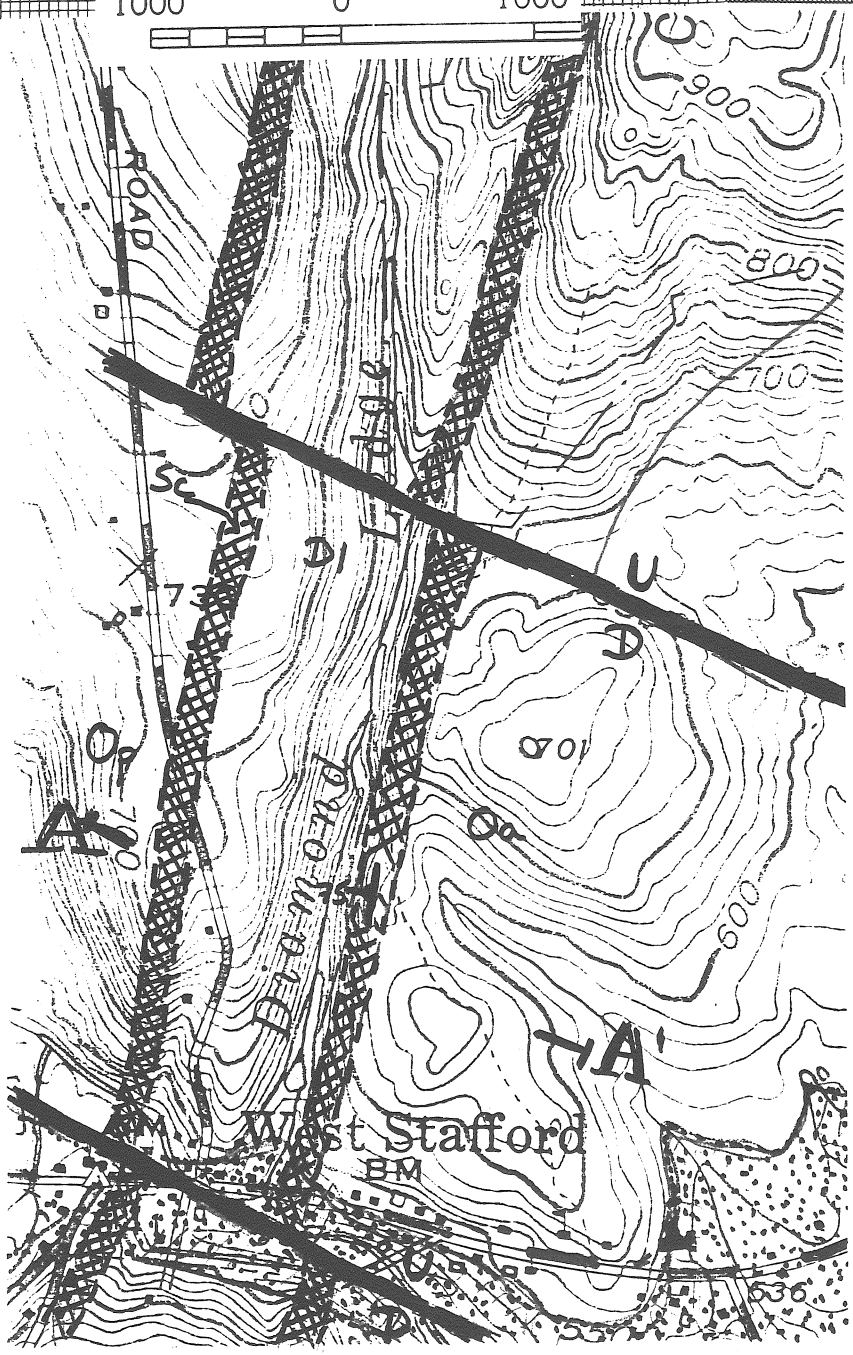


Figure 3

Geologic Map

Legend:

Pleistocene Epoch
Unconsolidated sand and gravel

Rock units

Devonian Period
Dl: Littleton Fm

Silurian Period
Sc: Clough Quartzite

Ordovician Period
Oa and Op: Ordovician metasedimentary and metavolcanic rocks.

Fault showing relative movement

Up

Down

Strike and dip of bedding and foliation.

75

Geologic map and cross sections illustrating, at two different scales, the nature of the Bolton Syncline. Geologic map, taken from Pease, 1975, shows the distribution of different rock units in and adjacent to the parcel. Note location of cross section A-A'.

Cross sections illustrate the nature of the Bolton Syncline at two different scales. Cross section A-A' was constructed by the author from the map data of Pease, 1975; vertical exaggeration: 2.5:1. Cross section B-B' was constructed by Rodgers, 1985, along the CT-MA border immediately north of the parcel and has a width of approximately 9 miles; vertical exaggeration is greater than A-A'.

WETLAND RESOURCES

In this section are observations of the wetlands and watercourse on the property, and how they may best be utilized as an educational resource.

Wetland and watercourse resources on this site are comprised of two major "systems." The first primarily consists of Diamond Ledge Brook as well as a limited amount of riparian wetlands which forms the western boundary of the parcel. System #2 is a broad linear deciduous forested wetland in the central and southwestern portion of the parcel.

Diamond Ledge Brook is contained within a largely undeveloped watershed most of which exists to the north of the subject parcel. This brook exhibited characteristics of a clean, undisturbed system with exceptional stream bottom habitats. A more complete description of the fisheries habitat associated with this watercourse can be found in the Fisheries Resources section of this report. Unfortunately, steep slopes bordering the brook may make recreational and educational access difficult. Diamond Ledge Brook is part of the Edson Brook sub-regional basin, Willimantic regional basin and Thames River major basin.

Just south of the northern property line, there is a fine example of a "riparian" wetland system. Riparian wetlands exist next to in-stream habitats and are under the influence of the watertable associated with that stream. They are an especially valuable type of wetland in that they serve as an interface and buffer between upland areas and aquatic habitats. This riparian area contains standing deadwood which can offer valuable habitat to cavity nesting mammals and birds. Another point of interest on the brook is an approximately 4 foot high waterfall. This waterfall can serve as a prime example of the erosional forces that a stream possesses. It appears as though the brook is performing a "headward cutting" process at this location. This is where the stream had initially flowed over a resistant bedrock rise and through geologic time is wearing a channel through the rise, slowly eroding this channel upstream through the bedrock causing the location of the waterfall to progress upstream.

The second wetland system dramatically begins as a spring located in the central portion of the parcel. The spring was flowing heavily at the time of the site visit. The spring flows through an excavated channel into a small, deep, excavated pond. During high flows, the pond water outlets into the northernmost portion of a high quality, forested swamp which extends to the southwest and ends at the school yard. Although the pond resembles a "vernal pool" because of its small, circular shape, it is unlikely to be a true vernal pool due to its depth and steep sides. These aspects make it difficult to establish the habitat necessary for the breeding of the amphibians and micro-invertebrates which characterize true vernal pools.

As a side note, approximately 400 feet due east of this pond, what appears to be an historical charcoal production area was discovered. Here was a very circular clearing in the forest, 40 feet in diameter, with very little ground cover present, and only pioneer vegetative species making a foothold. The upper soil layer was comprised primarily of charcoal particles. Its location next to extensive stands of oak, gathered in large quantities as a preferred species for the production of charcoal, makes it more likely that this is what the area was used for. Charcoal production was widespread in this area, especially during the Civil War period when the demand for charcoal, an ingredient of gunpowder, was high. Charcoal produced in this fashion was also used for the production of iron in the many small "furnaces" located throughout the northeast prior to the industrial revolution. If confirmed to be a charcoal burning area, this could have high educational value as an excellent history lesson.

Downstream of the pond, the northern portion of this wetland system forms a shallow forested swale with a central watercourse. This configuration continues for approximately 800 feet to where the wetland flattens out into a broad swamp approximately 150 feet wide which is unusually dominated by Swamp White Oak (Quercus bicolo): This area had no defined watercourses, and appeared to be subject only to a relatively even "sheet flow" movement of surface water. According to Ken Metzler of the DEP Natural Resource Center, Swamp white oak is not uncommon in our state's forested wetlands, however the high dominance in this particular stand is not common. He felt that perhaps this wetland had been harvested for timber at some time, this may have favored such growth of this tree species. This

broad forested swamp continued for approximately 1000 feet to the point where it had been displaced for the construction of the school yard. It appears as though the water from this system is piped or channeled underneath the school yard and State Route 190, where it shortly thereafter joins with Edson Brook.

In general, system #2 appears to have more educational opportunities than system #1 due to its proximity to the school and ease of access, however, for purely recreational purposes, the upper reaches of the Diamond Ledge Brook afford a very rewarding goal for the casual hiker. Efforts should be made to provide an established access trail off of the main access road to provide for safe passage to this aesthetically pleasing portion of the parcel. As discussed above, this area holds educational opportunities as well. In-stream collection of aquatic micro-invertebrates, studies of variation in stream flow volumes and velocities in response to daily weather and seasonal variations, geological processes, and even painting and sketching activities would make it worthwhile to provide good access for the students to this area.

Because of its broad, flat nature, the southern end of system #2 would lend itself very well to the construction of a raised "boardwalk" system to enable students to get "up-close and personal" with this unique and valuable wetland ecosystem. Recent technology in raised boardwalk construction makes it more affordable and easier to install. (Sources for further information on the Helical Pier Support System include : David Merrill, Milford, New Hampshire (603) 672-7260, he is a sales representative for the A. B. Chance Co. of Centralia, MO who manufacture this system, and Peter Jensen of Openspace Management (413) 528-6054, he has installed at least one of these systems.)

Studies of how the vegetation of the swamp varies with differences in soil saturation, historical accounts of past uses of the area, poetry describing the wetland area and production of wildlife sighting lists just begins to name the wide variety of educational opportunities available to the students as well as other residents. However, the issue of vandalism was brought up in connection with past development activities here. Hopefully these were isolated events and will not become a pattern if further improvements are initiated. Perhaps the more the Town involves its citizens in the development of this natural area,

enabling them to understand the purpose of the activities and take pride in them, the less likely that this type of vandalism will occur in the future.

Connecticut DEP's office of Communication and Education (860-424-4100) can provide more information on specific environmental education programs which can be utilized by the school to maximize the educational potential of this fine example of Town open space.

FISHERIES RESOURCES

Diamond Ledge Brook is a headwater stream that is tributary to Edson Brook. 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 within the town property is high gradient and characterized as containing step-pool habitat.

Surface waters of the Diamond Ledge Brook are classified by the Department of Environmental Protection (DEP) as "Class A". Designated uses for this classification are: potential drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply, and other legitimate uses.

Diamond Ledge Brook is expected to support a diverse community of aquatic invertebrates (animals that do not have a backbone). Aquatic invertebrates live in stream riffles or areas of fast moving, turbulent waters 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.

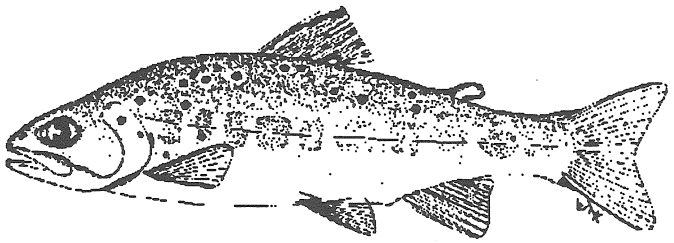
The CT DEP Fisheries Division has not sampled Diamond Ledge Brook; thus, no survey data are available. Based upon the stream's character, it is expected to support a typical headwater coldwater fish community which consists of native brook trout and blacknose dace.

Native brook trout (Salvelinus fontinalis) (Figure 4) spawn in late September and early October in Connecticut laying eggs in a gravel nest called a redd. Eggs incubate within the gravel substrate and usually hatch in February the following year. Fry stay under the gravel until their yolk-sac is absorbed. They become free swimming when they are about 1.5

inches in length. Brook trout reach sexual maturity in 1-3 years and attain lengths of 8-12 inches. They feed upon a variety of aquatic insects.

Blacknose dace (Rhinichthys atratulus) (Figure 4), a member of the minnow family, spawn in riffle areas during the spring (May-June). No nest is built. Eggs hatch in late spring. Sexual maturity is reached in one year. Males usually have reddish orange pelvic and pectoral fins and develop orange pigments on their sides during the spawning season. Dace do not usually get much larger than 3.5 inches. Similar to brook trout, dace mainly feed upon a variety of aquatic insects.

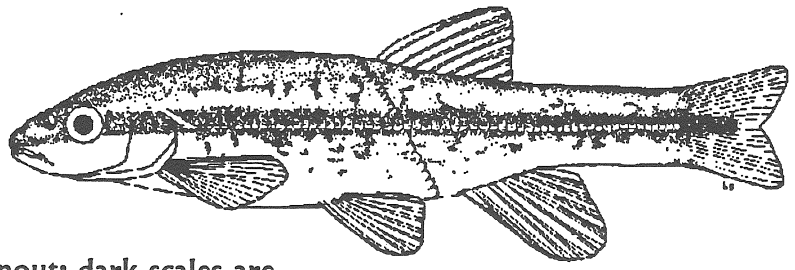
To learn more about fishes that live in Connecticut waters, the following publication may be of interest: "Freshwater Fishes of Connecticut" by Walter R. Whitworth.



Brook Trout
(Salvelinus fontinalis)

This species is olive green with grey mottled markings dorsally, lighter green laterally, and whitish ventrally, with red and yellow spots on the sides. The margins of the pelvic, pectoral, anal, and caudal fins are edged in white.

Blacknose Dace
(Rhinichthys atratulus)



The blacknose dace is olivaceous dorsally, lighter laterally, whitish ventrally; its sides have a dark lateral band extending around the snout; dark scales are commonly present on sides and back; pelvic and pectoral fins are yellow. During the breeding season, the males develop pads between the rays of their pectoral fins, the lateral band has orange pigment throughout, and the pelvics and pectorals are reddish orange.

(Taken from: Freshwater Fishes of Connecticut by Walter R. Whitworth, Peter L. Berrien, and Walter T. Keller, DEP Bulletin 101.)

VEGETATION

The ±60 acre tract of forest land, which is to be managed by the Stafford Conservation Commission, has excellent potential for passive recreation and the development of a model "Outdoor Classroom and Stewardship Demonstration Forest." This tract, if thoughtfully developed, could provide passive recreation and environmental education opportunities which would have value to all ages.

The vegetation present on this tract of land falls into several broad categories. These include Softwoods, Mixed Hardwoods, Hardwoods/Softwoods and Hardwood Swamp/Inland Wetland. The location and acreage of these areas were obtained from 1995 aerial photographs and are only approximate. They are depicted on the Forest Vegetation Map (Figure 5).

A. Softwoods

Description

The softwood vegetation type totals approximately 38 acres and is quite variable in terms of species composition and size class distribution. White pine, eastern hemlock and pitch pine are present in all size classes throughout this vegetation type. White pine is dominant on the southern portion of this property with numerous hemlock and scattered pitch pine intermixed. Hemlock is the dominant species on the northern section of this vegetation type with scarlet oak, black birch and occasional white pine inter-dispersed. Hemlock are also dominant along with red maple, yellow birch and white ash on the steep slopes adjacent to Diamond Ledge Brook. Patches of pole size (6.1" to 11" in diameter at breast height (d.b.h.)) red maple, black birch, white oak, black oak, scarlet oak and red oak have become established where disturbances have created gaps in the softwood canopy. In these areas an understory of mountain laurel, witch-hazel, highbush blueberry, lowbush blueberry and huckleberry have developed. Ground cover vegetation is sparse, however in some areas club moss, Canada mayflower and Indian pipe are present. Several charcoal mounds were located within this area which indicates that the softwoods became dominant after the hardwoods were removed for charcoal production.

Management Potential

Most of this vegetation type is crowded or becoming crowded and would benefit by receiving a thinning which would release "Crop Trees". Crop Trees are individual trees that have been selected to produce single or multiple benefits consistent with landowner objectives. These objectives may include general forest health, recreation, wildlife habitat, aesthetics, timber or other wood product production, diversity, water quality, air quality etc. Trees that are removed to release crop trees, if large enough may be harvested as sawtimber. Smaller nonmarketable trees that are competing with crop trees may be felled or deadened in place. This practice not only releases crop trees but it also creates habitat for wildlife.

When white pine are chosen as crop trees they should have a minimum of one third of their total height in live crown. Young white pine that are chosen for crop trees, especially if timber production is an objective should be pruned to approximately 17 feet.

Eastern hemlock is a dominant component of the northern portion of this vegetation type and is susceptible to infestation by the Hemlock Woolly Adelgid. The Hemlock Woolly Adelgid is a sucking insect that feeds on young Eastern Hemlock twigs during all seasons with the greatest damage occurring during the spring. The loss of new shoots and needles seriously impairs tree health and vigor. Defoliation and tree death can occur within several years after the initial infestation. At the time of the field investigation no infestation was observed. The hemlock should be monitored and if an infestation does occur, a salvage operation which removes sawtimber size (1 1.1" and greater in d.b.h.) hemlock should be considered. Unmerchantable hemlock could be left standing for wildlife.

A portion of this vegetation type could be left unmanaged to contrast managed and unmanaged areas.

B. Mixed Hardwoods

Description

The Mixed Hardwood type totals approximately 7 acres and is made up of seedling (1 " and less in d.b.h.) and sapling size (1.1 " to 6.0" in d.b.h.) black oak, scarlet oak, black birch, gray birch, black cherry, flowering dogwood, bigtooth aspen and red maple. Occasional white pine, hemlock and pitch pine seedlings are also present. The shrub layer is made up of old field juniper, mountain laurel, sweet fern, lowbush blueberry and huckleberry. The herbaceous vegetation which is present in this area includes club mosses, grasses and assorted wildflowers.

Management Potential

Portions of this vegetation type are in an early stage of successional development from open or disturbed land to mixed hardwood forest. This early successional stage is disappearing from the Connecticut landscape. Periodic clearing of portions of this type will keep this stage of development, which is particularly valuable to wildlife, present.

C. Hardwoods/Softwoods

Description

Approximately 6 acres of the hardwood/softwood vegetation type is present within this tract. Pole and occasional sawtimber size black oak, scarlet oak, white oak, hickory, red maple, black birch, white pine and hemlock form the overstory canopy. Mountain laurel, highbush blueberry and witch-hazel form a dense shrub layer. Ground cover vegetation includes club moss, hayscented fern, Pennsylvania sedge and several species of grasses.

Management Potential

Sections of this vegetation type are becoming crowded causing a general decline in tree health and vigor. A fuelwood thinning following the Crop Tree Selection method of thinning would help to reduce the crowding and allow the crop trees to improve in health and vigor over time. Approximately 100 trees per acre should be chosen as crop trees. These

trees should be released to full sunlight by removing competing trees from three out of four sides of their crowns. Trees that are removed may be utilized as fuelwood or deadened in place and left standing for wildlife. Openings which are made will also allow sunlight to reach the forest floor and stimulate the growth of herbaceous vegetation. Once again unthinned areas could be left for comparison.

D. Hardwood Swamp/Inland Wetland

Description

There are approximately 4 acres of Hardwood Swamp/Inland Wetland present within this property. There is also a small wetland associated with a small pond which is located in vegetation Type A. These wetland areas are somewhat variable with all size classes and age classes of trees represented. Red maple clumps are dominant with occasional swamp white oak, pin oak, white oak, black gum, white ash, hemlock, white pine and yellow birch. A few of the larger trees in these wetland areas have cavities which make excellent den sites for many species of wildlife. Understory vegetation includes mountain laurel, spice bush, blue beech, highbush blueberry, swamp azalea, arrowwood, winterberry and swamp rose. Skunk cabbage, tussock sedge, club moss, horsetail, sphagnum moss, poison ivy, cinnamon fern, Christmas fern and sensitive fern were noted during the field investigation. A more in-depth inventory of the herbaceous vegetation which is present should be made during the spring and summer seasons.

Management Potential

These areas provide wildlife with excellent wetland habitat. They also provide an excellent opportunity to study wetland ecosystems.

E. Hardwood/Softwood

Description

This area totals approximately 3 acres and was harvested of most of its sawtimber size trees when the property to the east was harvested. Sapling and pole size hemlock, white pine,

black oak, white oak, scarlet oak, red maple, black birch and American beech remain. Understory vegetation includes hardwood tree seedlings, mountain laurel, witch hazel, highbush blueberry, lowbush blueberry, huckleberry and sheep laurel. Club moss and hayscented fern dominate the ground cover vegetation along with numerous grass and weed species.

Management Potential

The harvest which occurred in this area left numerous damaged trees standing. These trees should be felled or deadened in place so that they do not impede the growth and development of higher quality trees with greater potential.

Model Demonstration Forest

As stated earlier this tract has excellent potential for passive recreation and the development of a model "Outdoor Classroom and Stewardship Demonstration Forest." Traditional forest management strategies may have to be modified to meet the new educational objectives. Areas that demonstrate forest stewardship could easily be developed along with trails which provide access to these areas. Forest management practices such as timber stand improvement, crop tree management, thinning for fuelwood and sawtimber production, forest regeneration, planting, enhancement of early successional stages of vegetation and erosion control could all be demonstrated. Wildlife habitat enhancement, tree identification and forest succession could also be demonstrated in this area.

Forests are dynamic, living systems that are ever changing through time. Planning, development and maintenance of the demonstration areas will be an on going project. Foresters are available from the Connecticut DEP Division of Forestry to assist with this project on a more in-depth technical level. Certified Consulting Foresters that charge a fee for services not provided by the DEP Foresters are also available.

Funding for the development of this project may be available from many sources. Educational grants, the Stewardship Small Grants Program, private gifts and revenues, however modest, from potential future sawtimber harvests should all be investigated.

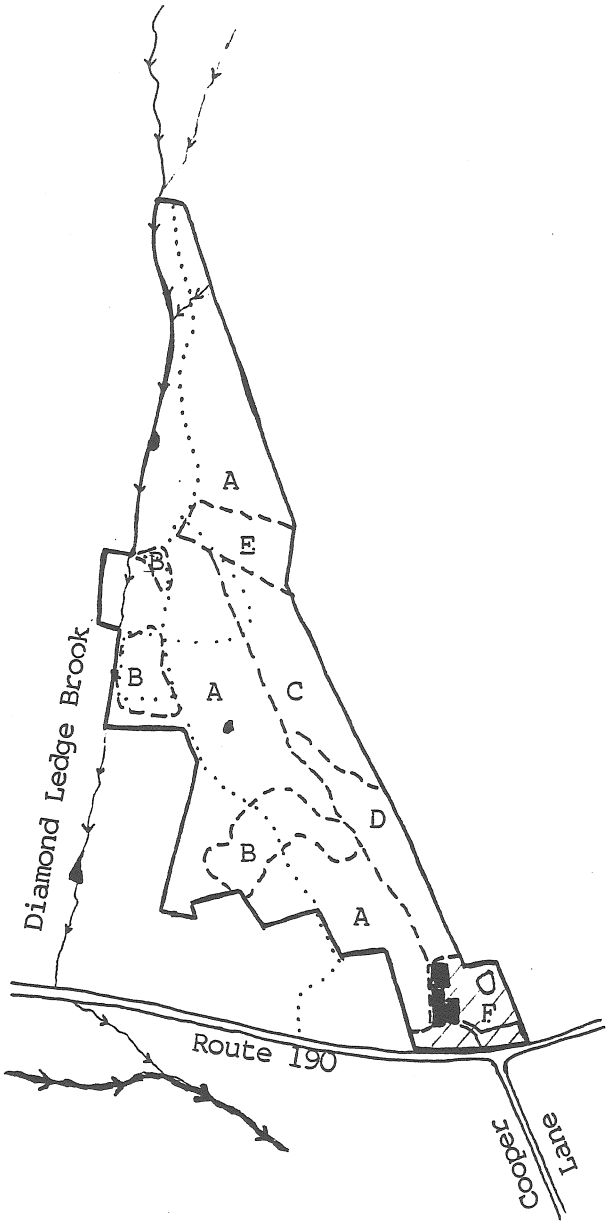
Figure 5

Forest Vegetation Map

NORTH

▲

SCALE 1"=1000'



VEGETATION TYPES

A. SOFTWOODS.....38+- ACRES

B. MIXED HARDWOODS.....7+- ACRES

C. HARDWOODS/SOFTWOODS...6+- ACRES

D. HARDWOOD SWAMP.....4+- ACRES

E. HARDWOODS/SOFTWOODS...3+- ACRES

LEGEND

PROPERTY BOUNDARY

STAND BOUNDARY

PAVED ROAD

WOODS ROAD/TRAIL

STREAM

POND

SCHOOL AREA (F) 4+- ACRES

WILDLIFE RESOURCES

This report will address the following wildlife resource issues: current conditions for wildlife; planning for wildlife; wildlife/nature trail potential and other considerations and conclusions.

Current Conditions

The following wildlife were observed during the site inspection either directly or indirectly and evidence of their presence was confirmed by identifying tracks, scat, calls, or other sign: bluejay (Cyanocitta crislata), American crow (Corvus brachyrhynchos), wild turkey (Meleagris gallopavo), tufted titmouse (Parus bicolor), black-capped chickadee (Parus atricapillus), downy woodpecker (Picoides pubescens), gray squirrel (Sciurus carolinensis), white-tailed deer (Odocoileus virginianus), eastern coyote (Canis latrans)(coyote dropping with gray squirrel fur in it). These are just a few examples of the wildlife species that can be found on this 60 acre parcel. Because the property is adjacent to larger forest blocks, one can expect it to be frequented by many of the common adaptable wildlife as well as some of the less known forest interior wildlife. As surrounding areas become developed and fragmented, this property will increase in its importance as habitat for wildlife.

Planning for Wildlife

As properties become developed, natural areas are divided into smaller, isolated pieces. Land that is public ownership can be managed for wildlife habitat for the long term. In contrast, private land, which consists of 88 percent of the land in Connecticut, usually changes ownership and is mostly not managed for wildlife for the long term. Wildlife habitat near suburban areas can be places for citizens to enjoy wildlife in close proximity to where they live. A public property, such as this one, can be managed as a natural area for the long term and provide habitat for wildlife. It can also be a place for students, teachers and the general public to learn about nature. In a survey of urban residents in five metropolitan areas of New York State, 96 percent of the respondents indicated that it was important for their

children to learn about nature and 73 percent were interested in wildlife in the backyard or neighborhood area (Brown et al. 1979).

Outdoor Nature Trail Potential

Wildlife habitat is represented by the collective summation of all the environmental factors that occur at a given location such as food, water, cover and their spatial arrangement. As West Stafford's natural areas become smaller and more isolated, the value of natural areas that are 25 acres or larger will increase in value for wildlife. The remaining natural areas will be important as refugia for wildlife and places to observe natural vegetation and the associated wildlife. The property can be useful in teaching the students and adults of the community how to recognize the various components of habitat and help them understand the function of habitat and the importance of habitat for the existence of wildlife.

A striking aspect of the property is the evergreen habitat component. There are many areas with dense understory development with Eastern Hemlock (Tsuga canadensis) and White Pine (Pinus strobus). This provides wildlife with valuable winter cover and predator avoidance and concealment. There is also a fair amount of natural seedling propagation and recruitment of Eastern Hemlock, White Pine and Pitch Pine (Pinus rigida) throughout the property.

A trail system should revolve around the theme that wildlife need food, water, cover and space to survive. Habitat can be broken down into various components such as:

1. Spring and early summer seeds
2. Summer berries
3. Fall berries
4. Winter persistent foods
5. Conifers and evergreens
6. Nuts and acorns
7. Grasses and forbs
8. Nectar plants

9. Dead or decaying trees
10. Artificial nest boxes
11. Brush and/or rock piles
12. Water sources

Each component of habitat has representative examples that that can be located on the property along the trail. The plants which supply the seasonal foods and cover for wildlife can be identified using trail signs or markers. Also a trail guide can be developed which corresponds to a number along the trail. This can reduce the maintenance of signs and requires the trail user to pick up a guide from the school or centralized trail head.

"Hands-on" Wildlife Habitat Management Ideas

Some habitat improvements can be established by planting native trees, shrubs or wild flowers to enhance or diversify food or cover. For example: if it is determined that there is a lack of persistent winter foods on the property ... then a planting of winter persistent shrubs such as winterberry (Ilex verticillata) or High bush cranberry viburnum (Viburnum trilobum) can benefit wildlife in the winter months. Another example of an enhancement might be to plant some early summer food sources such as: Red mulberry (Morus rubra) or High bush blueberry (Vaccinium corymbosum). Planting of wild flowers or maintenance of unmowed lawn areas can help attract butterflies and/or hummingbirds.

The students can also build nest boxes for House wrens, Black-capped chickadees, Gray squirrels, and Screech owls, to mention a few. They should be built to specifications and then placed into appropriate habitats. The students should be able to recognize the need for some wildlife to find dead or decaying trees for part of their habitat requirements and that artificial nest boxes are mimicking the natural cavities found on the landscape.

The students can construct brushpiles using cut brush from cleared areas or gather fallen limbs. They may also gather used real Christmas trees and pile them up in an area. They can learn about the importance of wildlife cover and how to provide it.

Practical Wildlife Censusing Techniques

Counting or documenting the presence or absence of wildlife along the nature trail can be both fun and educational for the students. It also teaches the importance of record keeping and identification of wildlife (directly and indirectly).

- Locate nests and other important wildlife occurrences
    - seasonally locate nests and plot locations on maps, and
    - find den trees and natural cavities in trees and find out what animal is using it.
- Owl hooting survey
    - play an owl hooting tape and listen for response.
- Bird Count

  learn to identify birds by sound and vision and document their presence in the spring, summer, fall and winter.
- Snow tracking
    - following a light snow (2-3 inches), animal tracks can be identified and followed to see where they are traveling to and from. Also, students may detect what the animal may be eating or doing.

Other Considerations and Conclusions

A boardwalk developed through wet areas directly behind West Stafford Elementary School could be valuable in showing students the importance of wetlands and help them see the type of vegetation and conditions of a wetland.

This property can be a valuable area for the school to further develop a nature trail and an outdoor classroom. The existing short trail directly behind the school should be continued and enhanced. A longer trail leading to the back of the property can eventually be developed. The trail system, however, should not criss-cross the entire property because

wildlife need places where they can avoid constant disturbance from hikers. This is especially important during the nesting season. Hikers should be encouraged to stay on well marked trails and avoid blazing additional unauthorized trails.

These are only a handful of techniques and ideas for the nature trail and outdoor classroom. Further consultation and technical assistance is available from the Team wildlife biologist upon request. A visit to the DEP Sessions Woods Wildlife Management Area on Route 69 in Burlington may be valuable to observe existing nature trails, signage, and habitat enhancement demonstrations (tel. 860-675-8170).

Literature Cited

Brown, T.L., C.P. Dawson, and R. L Miller. 1979. "Interests and attitudes of metropolitan New York residents about wildlife." Transactions of North American Wildlife and Natural Resource Conference. 44:289 297.

SOIL and WATER CONSERVATION DISTRICT REVIEW

Soils

Soils maps from the Tolland County Soil Survey are adequate for planning purposes on this parcel (Figure 6). Uses indicated for the property (primarily passive recreation and outdoor education) do not require a higher level of soils investigation. Should plans change for the use of the parcel, additional soils investigations may be indicated. Descriptions for each of the soils are included in the Appendix. Limitations for development are described in the last paragraph of each soil description.

Upland Soils on the site include the following: Borrow and Fill (school property), Charlton very stony fine sandy loam, Gloucester stony sandy loam (see sheet for GeE) Gloucester and Charlton very stony soils (see sheet for GeC), Hollis extremely rocky fine sandy loam, Hollis very rocky fine sandy loam and Sutton very stony fine sandy loam. There is only one wetland soil - Leicester stony fine sandy loam.

Erosion

The main trail is in good shape and does not show signs of excessive wear, compaction, or significant erosion. Markers should be erected along the trail to indicate it's location. In one section the trail splits and the west spur of the trail terminates in a small borrow area. To get back to the main trail one must go through the woods or backtrack. The existing path runs along the top of the gorge. Although access to the stream is limited and involves a steep decline, the stream can be seen in a number of areas along the path. If additional sight lines are desired, selective trimming of vegetation could be done. Ideally, this would involve leaving all existing root systems intact to secure the soil. Trails down to the stream should be discouraged.

The site presents a unique management problem in that the existing Diamond Ledge Park is a well known area to collect quartz. The most active collection area consists of a very steep slope along Diamond Brook. Numerous, deep excavations are cut into the slope and there are many waste soil piles. The loose piles of soil are exposed and could wash down the slope towards the stream. The soil is relatively stony and consists of large particles. As a result, it is not highly erosive. However, the slope should be stabilized before additional public use is encouraged.

Along with the existing erosion potential, there is a public safety hazard due to the steep slope and extensive excavations. The town attorney should be consulted regarding liability issues.

There are two approaches to managing the quartz area. One is to attempt to limit or eliminate access to site by installing a barrier and no trespassing signs. While this approach is appealing in that it conforms to the "leave as is" ethic of most natural areas/outdoor education facilities, the District Team member thinks it presents a massive enforcement problem for the town. The quartz source is well known, and apparently highly prized - it is suspected that real collector's will find a way to get it, regardless of the town's efforts.

The other approach is to allow collection of the quartz and attempt to manage the extent of it by installing signs etc. Liability may be the critical issue in deciding how best to handle the area.

A detailed survey of the entire slope and excavations was not conducted so no specific recommendations are given regarding stabilizing the loose soil and excavations. Although it would be labor intensive, the most effective approach would be to fill in the excavations and re-plant them. The District Team member is free to inspect the site again to look more specifically at the erosion on the slope and develop a plan. The District may also be able to provide some volunteer labor to assist.

Outdoor Recreation / Education

The area has a moderately diverse vegetative cover with some interesting land forms. The quartz deposit is obviously interesting to geologists. The area is also centrally located, so it provides a good area for passive recreation and outdoor education. Ideally, a new trail should be developed to form a loop trail through the property. This would involve cutting a trail eastward at the northern extent of the existing trail, and then looping it back southward towards the school. The trail could pass by the two ponds and then run down along the west side of the wetland.

There are a number of "outdoor classrooms" and nature trails in Connecticut that can be used as a model. There is one at the Hebron Elementary School and a newly completed outdoor classroom in an urban setting at the Mary Hooker Elementary School in Hartford. Members of the Conservation Commission may wish to visit these sites to get some real-life examples of what can be done. There are also a number of good guides available. The New Haven Soil and Water Conservation District has also produced a video guide to developing an outdoor classroom. It can be ordered by calling Nancy Gaumer at 203-269-7509, and may be copied for free. Somers High School is also developing an outdoor classroom and a number of teachers have been involved in planning the development of curriculums to use in conjunction with the classroom. In summary, there is no need to reproduce the wheel here - there are a number of similar efforts statewide and an abundance of materials available to assist with planning and implementation.

Figure 6

Soils Map

Scale 1" = 1320'

THE NATURAL DIVERSITY DATA BASE

The Natural Diversity Data Base maps and files have been reviewed for the study area and according to our information, there are no known extant populations of Federal or State Endangered, Threatened or Special Concern Species that occur 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. Consultations 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.

Please contact the Natural Diversity Base if you have further questions (424-3592). Also be advised that this is a preliminary review and not a final determination. A more detailed review may be conducted as part of any subsequent environmental permit applications submitted to DEP for the proposed site.

ARCHAEOLOGICAL REVIEW

New England archaeologists are interested in clues left behind by people that may reflect a part of their past culture. Not only is there interest in the way Native Americans lived, but also European colonists. This site has potential to contain cultural resources from both Native Americans, and farmers of European descent.

According to site files held at the Office of State Archaeology, there are no known cultural resources within the project area. However just north of the northern tip of the boundary, adjacent to Diamond Ledge Brook, is a prehistoric archaeological site and east of this, are unrelated historic foundations. When visiting the property during the ERT field review to determine the possibility of unrecorded cultural resources on the property, clues to human occupation were apparent. Diamond Ledge Park and the adjacent areas' outcropping of quartz may have been exploited by Native Americans as a source for lithic production. The natural springs located more centrally in the project area may have also been used by Native Americans. The recorded prehistoric site north of the project area is called Diamond Ledge Rock Shelter and is reported to be in relatively good condition. It is possible Native Americans used the rock shelter as a temporary camp while mining for good quality quartz for making projectile points and other stone implements. Although much of the project area is slightly to severely sloped, some prehistoric information may still be intact just below the topsoil.

At least one of the natural springs within the project area had been improved by digging out a small catchment pool and lining the spring's flow to the pool with rocks. Perhaps early farmers on the property used the pool for their livestock. Although the stone foundations are off the project area, it is possible the improved springs are associated with the buildings. It is also clear modern mining has occurred illegally in and around Diamond Ledge Park. Legitimate mining may have occurred contemporaneously with the historic structures and improved springs.

If there are plans to develop the area in a way which would create earth disturbance, it is recommended that an archaeological survey is conducted prior to construction. The survey may uncover more information concerning Native American occupation, early (or more recent) European farming and quarrying practices, or another cultural resource not yet apparent. It is also recommended if there are plans to alter or dismantle the improved spring(s) that they are first recorded in detail including black and white quality photographs.

Whether an archaeological survey is performed or not, the cultural information already apparent perhaps can be incorporated within the plans for the site. For example, if a nature trail is developed, cultural information about how the land may have been used in the distant or more recent past can be incorporated with descriptions of the natural environment. Contact the Office of State Archaeology (860-486-5248) with questions or for more information on educational opportunties.

STATE PARK PLANNER COMMENTS

The West Stafford Fire Department property is an approximately 60 acre tract adjoining an elementary school and several small town-owned parcels as well as a sizable section of the Shenipsit State Forest. Assets include the environmental education linkage potential with the school, frontage on Diamond Ledge Brook, and the Diamond Ledge natural feature. Liabilities include its long thin shape, areas of poorly drained or stony and/or steep soils, reported vandalism along the existing school nature trail, and the potential liability concerns from excavation holes made by quartz crystal hunters at Diamond Ledge.

Despite these significant problems and limitations, the property could be an asset to the community, especially if the access road to the Diamond Ledge is kept gated to prevent vehicular access. Basically the property should remain a wooded, undeveloped area, with trail usage being the primary activities, consisting of:

- A restored school nature trail, actively used by school science classes. Building student interest may help curb further incidents of vandalism.

- A marked trail along the old access road to Diamond Ledge and thence northerly along Diamond Ledge Brook to the state forest, offering potential for an extensive trail network developed in consultation with DEP.

PLANNING COMMENTS

Site

The property is located behind an elementary school and a recently constructed fire department facility on the north side of Route 190 in West Stafford. There is little frontage available except that used for the fire department facility and the school. The property extending north from the school rises between 50 and 100 feet from the elevation of Route 190. The site is almost entirely wooded with a typical New England woods roads and a small pond, which was perhaps dug by some persons working the site for various purposes. Existing timber is second or third growth of little commercial value.

The northern reaches of the property, bordering the stream on the west side of the property, have many unofficial, recently excavated and vandalized gem (quartz) mines. In this same vicinity are remnants of dams and sluices, which may have been used by the previous excavators for washing the diggings.

Site Advantages

This site is ideally situated for Town uses, almost all of which would have to be passive recreation and education. The teaching staff at the school has demonstrated the potential for nature trails and nature study. The pond, wetlands and brook could enrich any nature studies. The site of the quartz mines could be explored for further educational opportunities, e.g. geology and history.

The location of this site and its distance from the neighboring residences removes the possibilities of having active use of the site disturb other uses.

Site Disadvantages

Development of this site for active recreational use would appear to be difficult because of its narrow long shape, lack of frontage to allow proper access and adequate parking and the dangerous nature of the mining activity. Some of the digs are deep and dangerous. Although the gem mining activity is a plus for this site, all activity of this sort would have to be adequately controlled to minimize dangers to casual observers. The nature trails that the school developed are the optimal use of the property and some effort ought to be exercised to make such uses more secure, as there are considerable evidences of vandalism of the effort that the school has made.

Recommendations

Certainly, the Town should not let this site deteriorate and it should be made available for as much use by the residents as is possible. If the site is utilized for any kind of recreation facility it should be made safe for the residents and that means separating them from the dangerous aspects of the gem mining. The most advantageous manner of achieving this would be to contract with a gemologist, or other entrepreneur, with the understanding that they make the site safe at all times, allow certain use by the Town and grant the lessee permission to take out valuable minerals up to a certain amount every year. Without some sort of arrangement such as this the gem site would be too dangerous for easy access by the public and would have to be closed to all.

APPENDIX

CrC

62C

CrC - Canton and Charlton soils, 3 to 15 percent slopes, extremely stony

This mapping unit consists of gently sloping to sloping, well drained soils on ridges, hills, and side slopes of glacial till uplands. The areas are oval or irregular in shape. Slopes are mostly smooth and convex and are 100 to 600 feet long. Stones cover 8 to 25 percent of the surface. About 45 percent of this unit is Canton soils, 40 percent is Charlton soils, and 15 percent is other soils. Some areas of this unit consist almost entirely of Canton soils, some almost entirely of Charlton soils, and some of both. The soils were mapped together because they have no significant differences in use and management.

Typically, the Canton soils have a surface layer of very dark grayish brown fine sandy loam 2 inches thick. The subsoil is yellowish brown fine sandy loam, gravelly fine sandy loam, and gravelly sandy loam 21 inches thick. The substratum is pale brown gravelly loamy sand to a depth of 60 inches or more.

Typically, the Charlton soils have a surface layer of dark yellowish brown fine sandy loam 5 inches thick. The subsoil is yellowish brown fine sandy loam and sandy loam 20 inches thick. The substratum is light yellowish brown and light brownish gray sandy loam to a depth of 60 inches or more.

Included with these soils in mapping are small areas of somewhat excessively drained Gloucester and Hollis soils, well drained Paxton soils, and moderately well drained Sutton soils. Also included are a few nearly level areas and a few areas that have a compact substratum at a depth of 40 to 50 inches.

The water table in these Canton and Charlton soils is commonly at a depth of more than 6 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 moderately rapid. Both soils have moderate available water capacity and medium to rapid runoff.

Slope is the main limitation of these soils for community development, especially for onsite septic systems. Slopes of excavations in these soils are unstable. The stones on the surface hinder landscaping.

GeC

62C

GeC - Canton and Charlton soils, 3 to 15 percent slopes, extremely stony

This mapping unit consists of gently sloping to sloping, well drained soils on ridges, hills, and side slopes of glacial till uplands. The areas are oval or irregular in shape. Slopes are mostly smooth and convex and are 100 to 600 feet long. Stones cover 8 to 25 percent of the surface. About 45 percent of this unit is Canton soils, 40 percent is Charlton soils, and 15 percent is other soils. Some areas of this unit consist almost entirely of Canton soils, some almost entirely of Charlton soils, and some of both. The soils were mapped together because they have no significant differences in use and management.

Typically, the Canton soils have a surface layer of very dark grayish brown fine sandy loam 2 inches thick. The subsoil is yellowish brown fine sandy loam, gravelly fine sandy loam, and gravelly sandy loam 21 inches thick. The substratum is pale brown gravelly loamy sand to a depth of 60 inches or more.

Typically, the Charlton soils have a surface layer of dark yellowish brown fine sandy loam 5 inches thick. The subsoil is yellowish brown fine sandy loam and sandy loam 20 inches thick. The substratum is light yellowish brown and light brownish gray sandy loam to a depth of 60 inches or more.

Included with these soils in mapping are small areas of somewhat excessively drained Gloucester and Hollis soils, well drained Paxton soils, and moderately well drained Sutton soils. Also included are a few nearly level areas and a few areas that have a compact substratum at a depth of 40 to 50 inches.

The water table in these Canton and Charlton soils is commonly at a depth of more than 6 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 moderately rapid. Both soils have moderate available water capacity and medium to rapid runoff.

Slope is the main limitation of these soils for community development, especially for onsite septic systems. Slopes of excavations in these soils are unstable. The stones on the surface hinder landscaping.

GeE

62D

GeE - Canton and Charlton soils, 15 to 35 percent slopes, extremely stony

This mapping unit consists of moderately steep to steep, well drained soils on ridges, hills, and side slopes of glacial till uplands. The areas are mostly long and narrow. Slopes are smooth and convex and are mainly less than 200 feet long. Stones cover 8 to 25 percent of the surface. About 45 percent of this unit is Canton soils, 40 percent is Charlton soils, and 15 percent is other soils. Some areas consist almost entirely of Canton soils, some almost entirely of Charlton soils, and some of both. The soils were mapped together because they have no significant differences in use and management.

Typically, the Canton soils have a surface layer of very dark grayish brown fine sandy loam 2 inches thick. The subsoil is yellowish brown fine sandy loam, gravelly fine sandy loam, and gravelly sandy loam 21 inches thick. The substratum is pale brown gravelly loamy sand to a depth of 60 inches or more.

Typically, the Charlton soils have a surface layer of dark yellowish brown fine sandy loam 5 inches thick. The subsoil is yellowish brown fine sandy loam 20 inches thick. The substratum is light yellowish brown and light brownish gray sandy loam to a depth of 60 inches.

Included with these soils in mapping are small areas of somewhat excessively drained Gloucester and Hollis soils and well drained Paxton soils. Also included are a few large areas where stones cover less than 8 percent of the surface and areas with a compact substratum at a depth of 40 to 50 inches.

The water table in these Canton and Charlton soils is commonly at a depth of more than 6 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. Both soils have moderate available water capacity and rapid runoff.

Slope limits the soils of this unit for community development, especially for onsite septic systems. Slopes of excavations in the soils are unstable and the stones on the surface hinder landscaping.

HrE

73E

HrE - Charlton-Hollis complex, 15 to 45 percent slopes, very rocky

This complex consists of moderately steep to steep, somewhat excessively drained and well drained soils on hills and ridges of glacial till uplands. Areas of this unit are mostly long and narrow or oval in shape. Slopes are mainly convex and are 100 to 500 feet long. Stones and boulders cover 1 to 8 percent of the surface. This 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.

Typically, the Charlton soils have a surface layer of dark yellowish brown fine sandy loam 5 inches thick. The subsoil is yellowish brown fine sandy loam and sandy loam 20 inches thick. The substratum is light yellowish brown and light brownish gray sandy loam to a depth of 60 inches or more.

Typically, the Hollis soils have a surface layer of dark grayish brown fine sandy loam 2 inches thick. The subsoil is yellowish brown gravelly fine sandy loam 12 inches thick. Hard, unweathered schist bedrock is at a depth of 14 inches.

Included with these soils in mapping are small areas of well drained Canton and Paxton soils; and moderately well drained Sutton and Woodbridge soils. Also included are areas with bedrock at a depth of 20 to 40 inches and a few small areas with slopes of more than 35 percent.

The water table of these soils is commonly at a depth of more than 6 feet. The available water capacity is moderate in the Charlton soils and very low or low in the Hollis soils. Both soils have moderate to moderately rapid permeability and rapid runoff.

The slope, exposed rock, and the depth to bedrock in the Hollis soils limit these areas for community development, especially as a site for onsite septic systems and buildings.

HxC

75C

HxC - Hollis-Charlton-Rock outcrop complex, 3 to 15 percent slopes

This unit consists of gently sloping to sloping, somewhat excessively drained and well drained soils and areas of exposed bedrock. The unit is on hills and ridges of glacial till uplands in long and narrow or irregularly shaped areas. Slopes are mostly convex and 100 to 200 feet long. Stones cover 8 to 25 percent of the surface, which is marked by narrow, intermittent drainageways and a few small, wet depressions. The unit is about 35 percent Hollis soils, 30 percent Charlton soils, 15 percent exposed bedrock, and 20 percent other soils. The Hollis and Charlton soils and exposed rock are in such a complex pattern that it was not practical to map them separately.

Typically, the Hollis soils have a surface layer of dark grayish brown fine sandy loam 2 inches thick. The subsoil is yellowish brown gravelly fine sandy loam 12 inches thick. Hard, unweathered schist bedrock is at a depth of 14 inches.

Typically, the Charlton soils have a surface layer of dark yellowish brown fine sandy loam 5 inches thick. The subsoil is yellowish brown fine sandy loam and sandy loam 20 inches thick. The substratum is light yellowish brown and light brownish gray sandy loam to a depth of 60 inches or more.

Included with this unit in mapping are small areas of somewhat excessively drained Gloucester soils, well drained Canton and Charlton soils, moderately well drained Sutton soils, and poorly drained Leicester soils.

The water table in this unit is commonly below a depth of six feet. The available water capacity is very low or low in the Hollis soils, and moderate in the Charlton soils. Both soils have moderate or moderately rapid permeability and medium to rapid runoff.

Most areas of this unit are in woodland. A few small areas are in pasture.

This unit is too stony for cultivation. The stones on the surface, the areas of exposed rock, and the depth to bedrock in the Hollis soils make the unit poorly suited to woodland and are the major limitations for community development. Droughtiness in the Hollis soils causes a high rate of seedling mortality, and trees on the Hollis soils are subject to uprooting because of the depth to bedrock.

SxB

52C

SxB - Sutton fine sandy loam, 2 to 15 percent slopes, extremely stony

This nearly level to gently sloping, moderately well drained soil is on upland glacial till plains, hills, and ridges. Stones and boulders cover 8 to 25 percent of the surface. Areas are dominantly irregular in shape.

Typically, this Sutton soil has a very dark grayish brown, fine sandy loam surface layer 4 inches thick. The subsoil is yellowish brown, dark yellowish brown, and dark brown, mottled fine sandy loam and sandy loam 29 inches thick. The substratum is olive brown, mottled sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of well drained Canton and Charlton soils; moderately well drained Woodbridge soils; and poorly drained Leicester soils. Indluded areas make up about 10 percent of this map unit.

The Sutton soil has a seasonal high water table at a depth of about 18 inches. Permeability is moderate or moderately rapid. The available water capacity is moderate. Runoff is slow or medium. Sutton soil warms up and dries out slowly in the spring.

The major limiting factor for community development is the seasonal high water table. Onsite septic systems need special design and installation to prevent effluent from seeping to the surface. Foundation drains help to prevent wet basements. Stones and boulders need to be removed for landscaping. Quickly establishing a plant cover and using mulch, temporary diversions, and sediment basins help to control erosion during construction.

Le

3

Le - Ridgebury, Leicester and Whitman soils, extremely stony

This mapping unit consists of nearly level, poorly drained and very poorly drained soils in depressions and drainageways of glacial till uplands. The areas are mostly long and narrow or irregular in shape. Slopes range from 0 to 3 percent and are mainly 100 to 300 feet long. Stones cover 8 to 25 percent of the surface. About 40 percent of this unit are Ridgebury soils, 25 percent are Leicester soils, 15 percent are Whitman soils and 10 percent are other soils. Some areas of this unit will consist of one these soils and other areas will consist of two or three. The soils of this unit were mapped together because they have no significant differences in use or management.

The Ridgebury soils have a seasonal high water table at a depth of about 10 inches from fall through spring. The permeability of the soils is moderate to moderately rapid in the surface layer and the subsoil and slow to very slow in the substratum. Runoff is slow The Ridgebury soils have a moderate available water capacity.

The Leicester soils have a seasonal high water table at a depth of about 10 inches from fall through spring. The permeability of the soils is moderate or moderately rapid throughout. Runoff is slow. The Leicester soils have a moderate available water capacity.

The Whitman soils have a seasonal high water table at or near the surface from fall through spring. The permeability of the soils is moderate or moderately rapid in the surface layer and subsoil and very slow in the substratum. Runoff is slow. The Whitman soils have a moderate available water capacity.

The high water table and slow to very slow permeability are major limitations of the soils of these areas for community development. Steep slopes of excavations in these soils slump when saturated. The stones on the surface restrict landscaping and lawn areas are soggy most of the year.

Bk

N06

Bk - Udorthents, smoothed

This unit consists of nearly level to sloping, excessively drained to moderately well drained soils. The areas of this unit have been altered by excavating or filling. They are mostly irregular in shape or are rectangular or long and narrow. Slopes range from 0 to 15 percent.

Included with this unit in mapping are small areas of Agawam, Canton, Charlton, Paxton and Woodbridge soils. Also included are a few small areas covered by buildings and pavement and a few areas that have soil material mixed with logs, tree stumps and concrete fragments. Included areas make up about 25 percent of the unit.

Determination of the suitability of this unit for any use requires on-site investigation and evaluation.