# Naugatuck River Greenway Project Phase II

*Photo: Don Mysling*

## Harwinton, Litchfield and Thomaston
Connecticut

# King's Mark Environmental Review Team Report

King's Mark Resource Conservation & Development Area, Inc.

# Naugatuck River Greenway Project
# Phase II

## Harwinton, Litchfield and Thomaston
## Connecticut

*Photo: Sean Hayden*

**Environmental Review Team Report**

**Prepared by the**
**King's Mark Environmental Review Team**
**of the**
**King's Mark**
**Resource Conservation and Development Area, Inc.**

**For the**

**Litchfield Hills Council of Elected Officials**

**Report #328**

**November 2005**

**CT Environmental Review Teams**
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# Acknowledgments

This report is an outgrowth of a request from the Litchfield Hills Council of Elected Officials with support of the Harwinton, Litchfield and Thomaston officials to the Northwest Conservation District (NWCD) and the King's Mark Resource Conservation and Development Area (RC&D) Council for their consideration and approval. The request was approved and the measure reviewed by the King's Mark Environmental Review Team (ERT).

The King's Mark 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, November 3, 2004.

| | |
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**He is longer with the DEP.*
*[#]Written in consultation with Judy Wilson.*

I would also like to thank Rick Lynn, director, Litchfield Hills Council of Elected Officials, Sam Gold, planner, Council of Governments of the Central Naugatuck Valley, Vincent Gaultieri and Mickey Howe, U.S. Army Corps of Engineers, Laura Cleminshaw, vice-chair, Litchfield Planning and Zoning Commission, and Leo Paul, Litchfield, 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 study corridor, topographic and state and federal lands maps. During the field review Team members were given additional information and later received color maps base maps of property ownership along the study area. Some Team members conducted a map review only. 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 towns and landowners. This report identifies the existing resource base and evaluates its significance to the proposed use, and also suggests considerations that should be of concern to the towns. The results of this Team action are oriented toward the development of better environmental quality and the long term economics of land use.

The King's Mark RC&D Executive Council hopes you will find this report of value and assistance in the review of this phase of the proposed greenway.

If you require additional information please contact:

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# Introduction

The Litchfield Hills Council of Elected Officials (LHCEO) with the support of Harwinton, Litchfield and Thomaston officials has requested assistance from the King's Mark Environmental Review Team (ERT) in conducting a natural resource inventory and opportunity assessment for Phase II of the Naugatuck River Greenway Project. The ERT study is seen as an important component of this multi-town endeavor.

The ERT completed a study for Phase I of the project in May 2003. The Phase I ERT report encompassed the area from Stillwater Pond in Torrington south to the Route 118 crossing in the town of Litchfield, an approximate five mile section of the river. Phase II, a continuing study of the Naugatuck River Greenway, begins at the Route 118 river crossing in Litchfield and continues south through Litchfield and Harwinton to the Thomaston Dam in Thomaston. This is an approximate six mile section of the river. (See following maps.)

## Objectives

The purpose of the ERT study is again to provide a natural resource inventory, identify problem areas contributing to water quality degradation, and be of assistance in developing an action plan for improving water quality and in the preparation of a concept plan for improving enjoyment and passive recreational use of the river. Specific areas of assessment and information requested include: soils, erosion and sediment control, watershed planning, wetlands, fisheries and wildlife habitat, and recreational opportunities.

## The ERT Process

Through the efforts of the Litchfield Hills Council of Elected Officials, this environmental review and report was prepared for the towns of Harwinton, Litchfield and Thomaston.

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

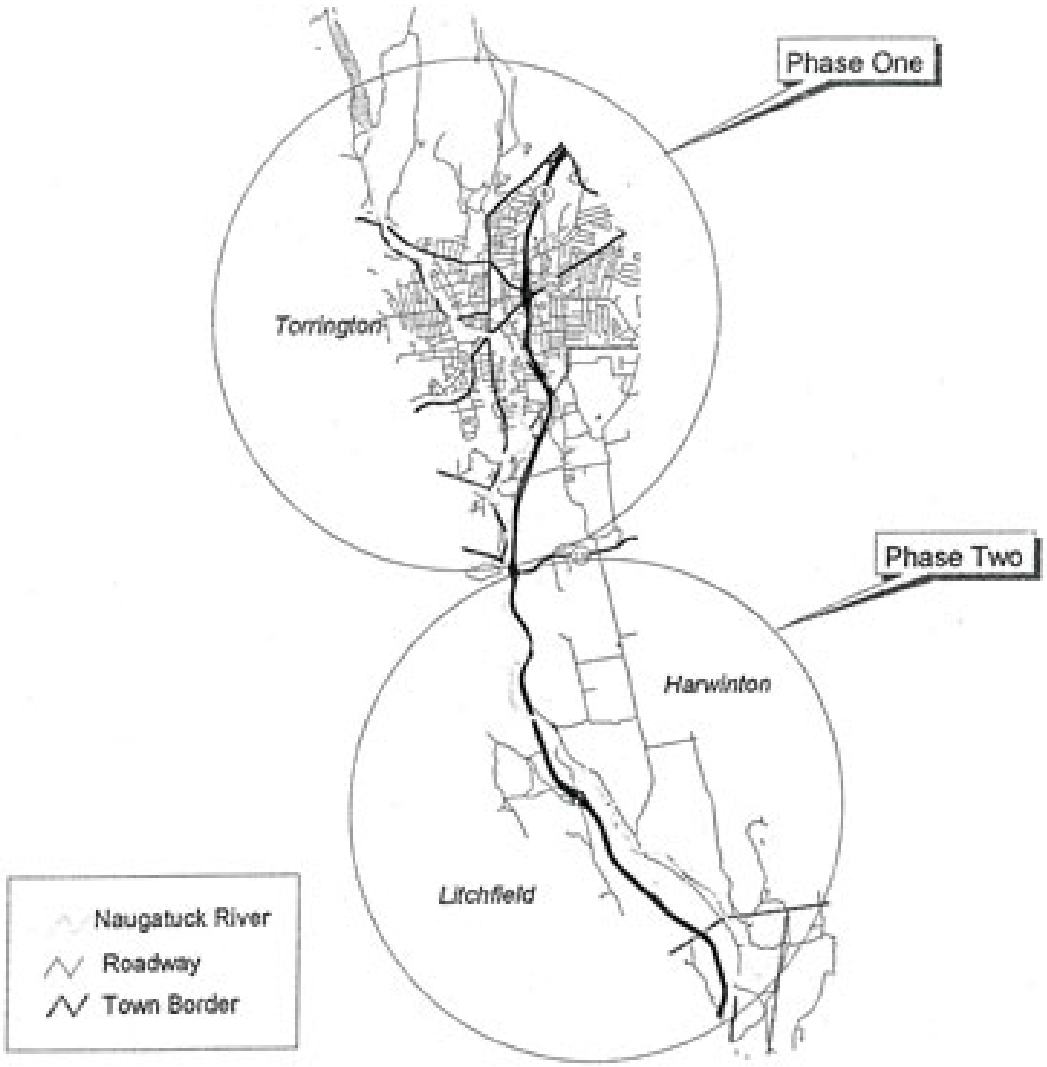
The review process consisted of four phases:

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 Wednesday, November 3, 2004. The emphasis of the field review was on the exchange of ideas, concerns and recommendations. Some Team members made separate and/or additional site visits. The field review 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.

# Naugatuck River Greenway Study



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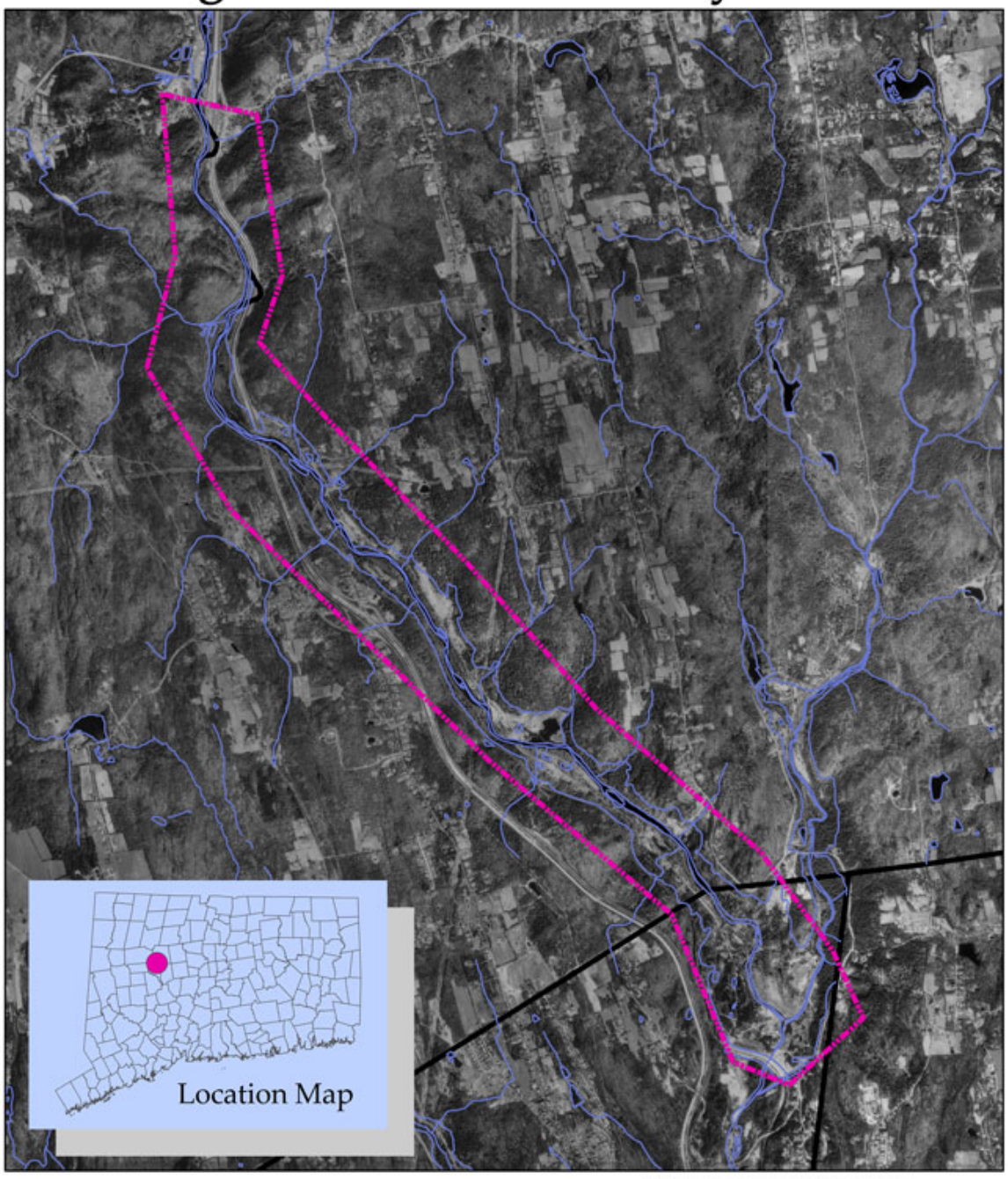

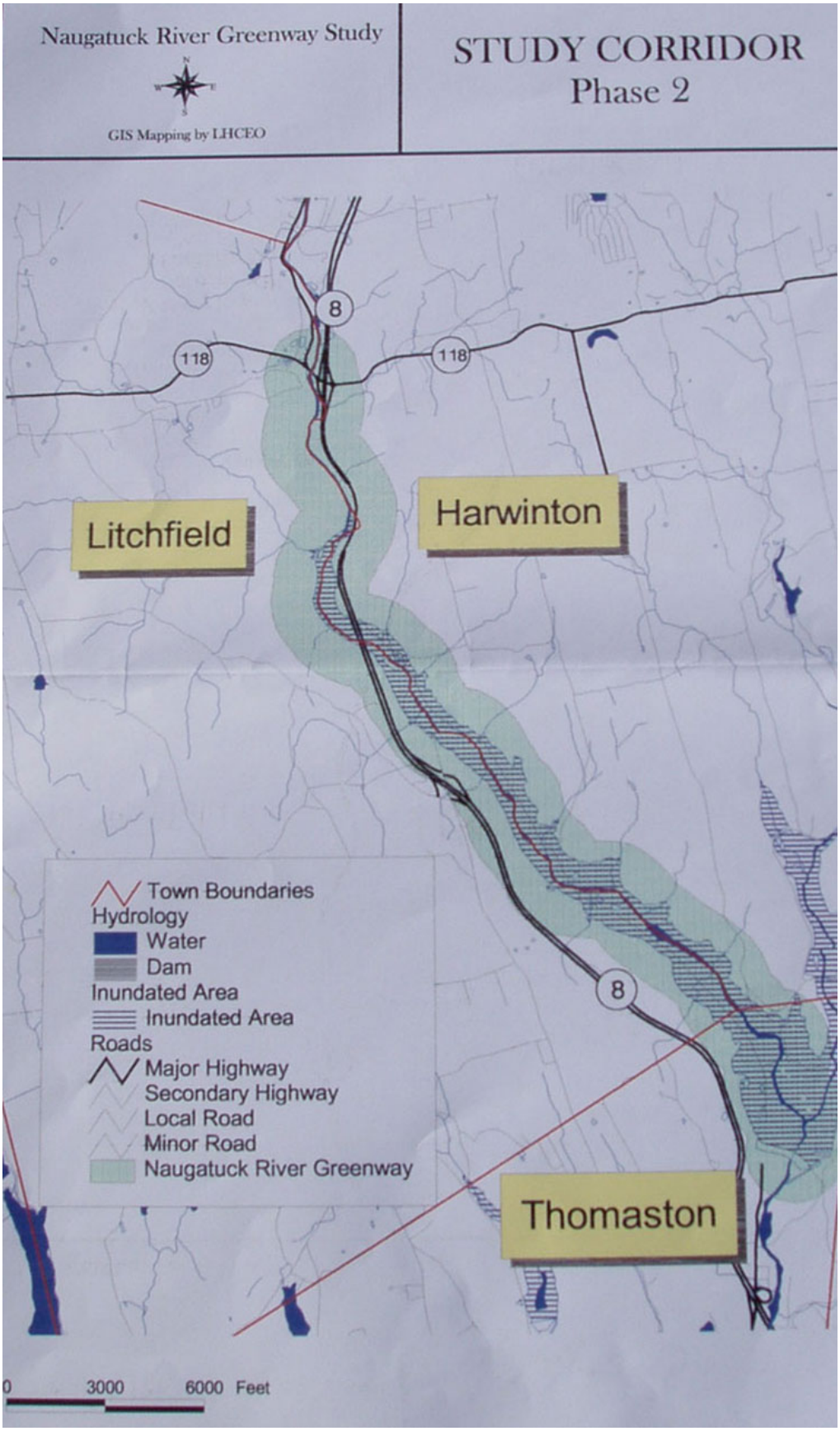
Naugatuck River Greenway Study
GIS Mapping by LHCEO
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Phase 2
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Litchfield
Harwinton
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Town Boundaries
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Water
Dam
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Major Highway
Secondary Highway
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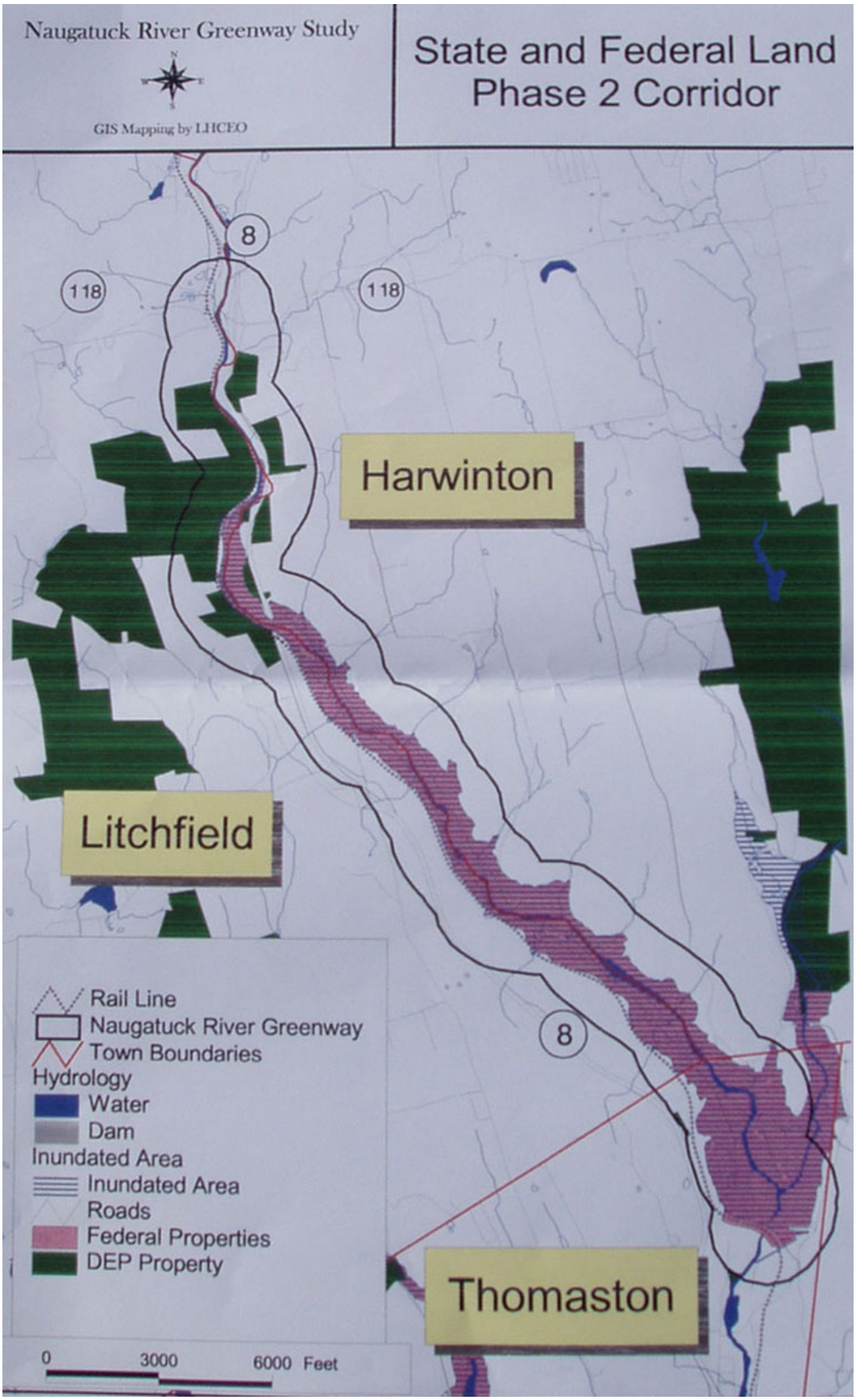
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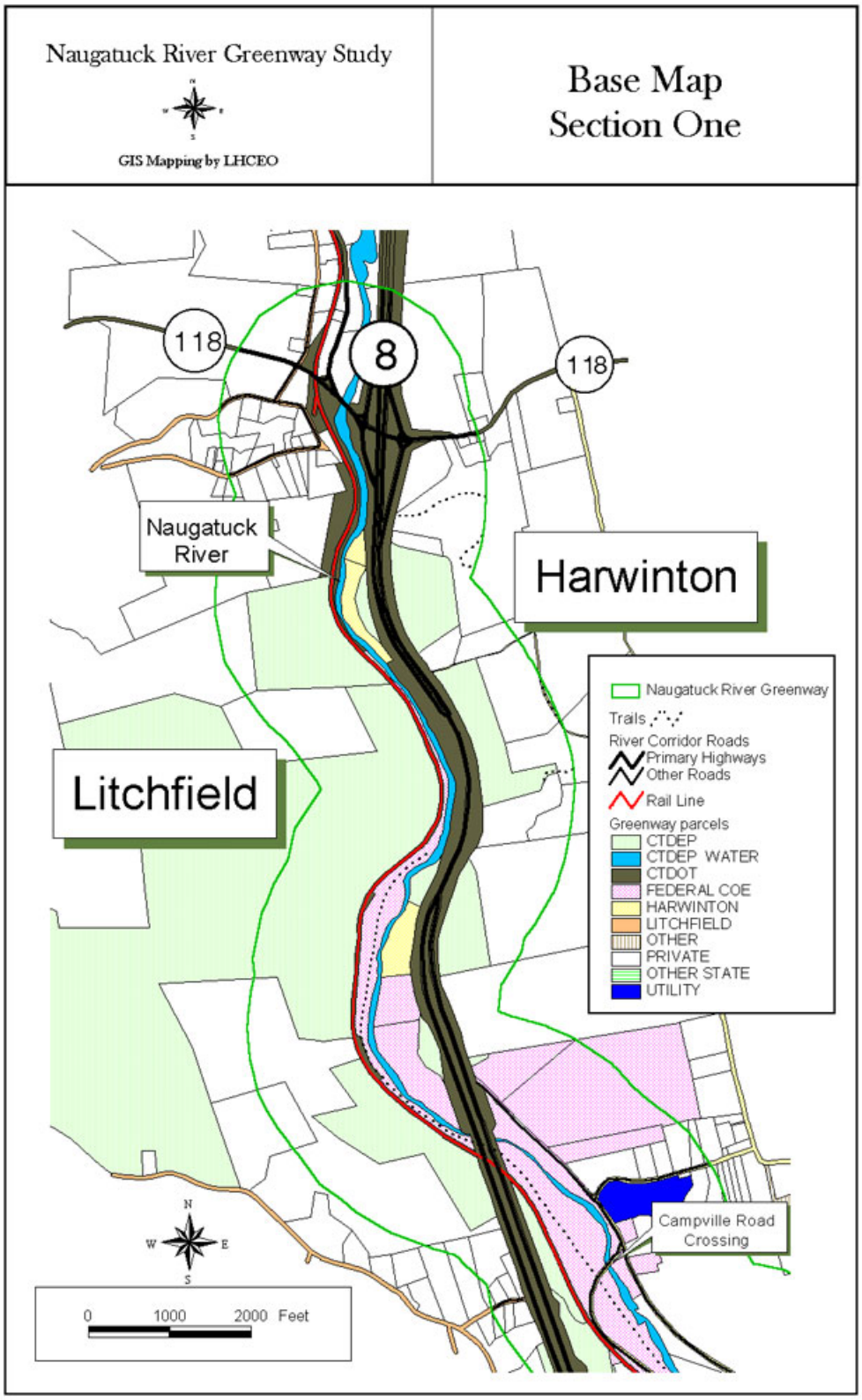
Naugatuck River Greenway Study
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Naugatuck River
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CTDEP
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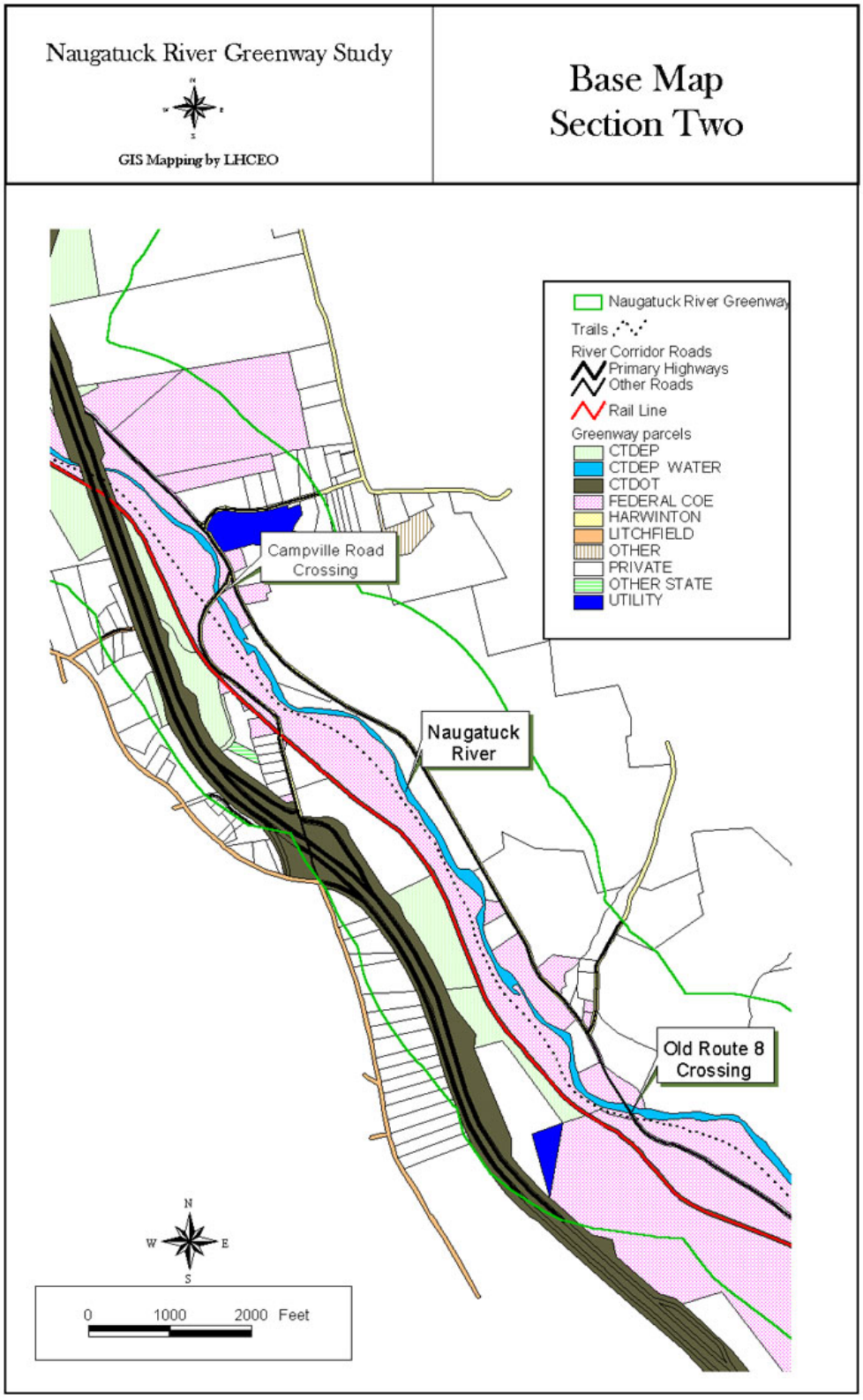
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Campville Road Crossing
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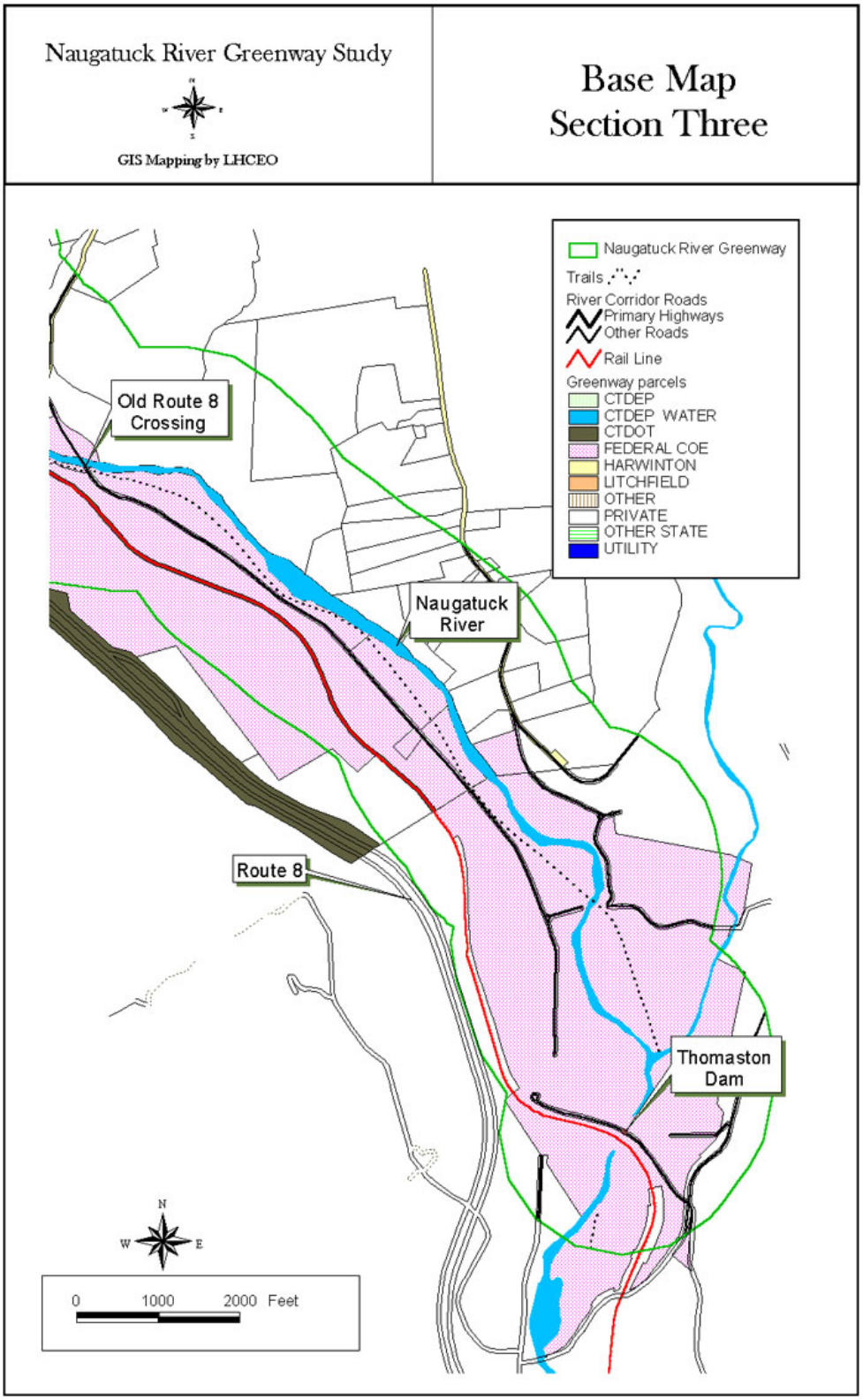
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Old Route 8 Crossing
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# A WATERSHED PERSPECTIVE

## Introduction

This section of the report provides an overview of water resources and related matters within the Naugatuck River Greenway Project – Phase II area (Greenway Project) and is based upon Connecticut Department of Environmental Protection (CT DEP) data and knowledge of the region. These comments are given from the perspective of improving and maintaining water quality and supporting designated uses of the State's waters per the State of Connecticut Water Quality Standards[1]. This information also reflects CT DEP's growing commitment to address water resource concerns from a watershed perspective, taking into account the cumulative impact that various land use policies and activities within a given watershed may have upon water resources. Suggestions are also offered as to how this information may be applicable to the Greenway Project.

Some of these comments may overlap with those of other Environmental Review Team (ERT) members who are dealing with more specialized aspects of the review (i.e. - fisheries, etc.). In such cases, these comments are meant to support or supplement these specialized reviews, not supplant them.

## Drainage Basins

The Greenway Project area commences in the vicinity of the Route 118 – Route 8 interchange in Litchfield and Harwinton and follows the mainstem of the Naugatuck River for approximately 6.5 miles south to the Thomaston Dam, in Thomaston. For roughly the first 5.5 miles, the river serves as the town demarcation line between Litchfield and Harwinton; the final mile lies entirely within Thomaston.

[1] CT DEP Bureau of Water Management – Planning and Standards Division. Effective 2002 & 1996. Water Quality Standards. CT DEP. Hartford, CT.

Within the Greenway Project area, two main tributaries enter the Naugatuck River. Approximately 1.3 miles south of where the Route 118 bridge crosses the river, Spruce Brook flows into the Naugatuck River from the west. The other main tributary is Leadmine Brook which joins the Naugatuck from the east just 0.2 miles above the Thomaston Dam.

As a way of describing Connecticut's water resources in terms of the landscape, CT DEP has divided the state along natural drainage divides into eight "major basins" or watersheds. These, in turn, are divided into increasingly smaller watersheds which are described as "regional", "subregional" and "local" drainage basins. At each level, these watersheds are named after the brook, river or waterbody into which all of the water within that topographically-defined area ultimately flows. In other words, every water feature, no matter how small, has its own distinct watershed. Smaller watersheds make up larger watersheds which, in turn, make up even larger watersheds.

According to this scheme, the Greenway Project area lies almost entirely within the Naugatuck River Mainstem Subregional Basin (No. 6900). Portions of the Spruce Brook Subregional Basin (No. 6906) and Leadmine Brook Subregional Basin (No. 6908) also lie within the Greenway Project area at the mouths of where these brooks flow into the Naugatuck. All three of these subregional basins lie within the Naugatuck Regional Basin (No. 69) which, in turn, lies within the Housatonic Major Basin (No. 6).[2]

The Naugatuck River is the largest and eastern-most tributary of the Housatonic River. Draining water from more than 311 square miles of land in 27 towns, the Naugatuck River flows approximately 40 miles southward from the center of Torrington to Derby where it empties into the Housatonic River. The Housatonic River, in turn, drains into Long Island Sound between the towns of Milford and Stratford. In other words, what happens in the Greenway Project area has the potential to affect the water conditions further downstream in the Naugatuck, the lower Housatonic and Long Island Sound.

[2] Connecticut Geological and Natural History Survey. (Compiled by Marianne McElroy). 1981. Natural Drainage Basins in Connecticut (Map). CT DEP Natural Resources Center in cooperation with the USGS. Hartford, CT.

### Greenway Project Considerations

By examining water resource issues from a watershed perspective, one is better able to understand and assess the cumulative impacts that assorted land use activities or policies along the entire length of the river and throughout the watershed may have upon water quality and quantity. While this ERT review only focuses on a short segment of the Naugatuck River and its corridor, what occurs in and along this 6.5 mile stretch of river has important implications with regard to the ecological health of the Naugatuck River as a whole. In support of their undertaking, the proponents of the Greenway Project may wish to identify the water resource benefits provided by creation of a greenway area along this upper portion of the Naugatuck River.

## Water Quality

Per Connecticut's Clean Water Act, the State has adopted Water Quality Standards which establish policy for water quality management throughout the state. The State classes surface and ground water quality based upon these standards and describes water quality goals in terms of designated uses and criteria for each water quality class. Using these classifications, the State's water resources have been broadly evaluated and assigned a classification based upon presumed or known water quality as well as desired use goals. These classifications are used to make decisions as to how these water resources will be managed and what sorts of water-related withdrawals or discharges will be allowed or not allowed. According to water quality classification maps, the surface waters within the proposed Naugatuck River Greenway Project area are classified as Class B[3]; ground waters are classified as Class GA[4].

The Class B surface water quality classification also indicates that the Naugatuck is a wastewater receiving stream.

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[3] **Class B surface waters** have good to excellent water quality and the following designated uses: recreational use, fish and wildlife habitat, agricultural and industrial supply and other legitimate uses including navigation.

[4] **Class GA ground waters** have overall excellent water quality and the following designated uses: existing private and potential public or private supplies of water suitable for drinking without treatment; baseflow for hydraulically connected surface water bodies.

To determine whether the State's surface water resources are meeting designated use goals per the water quality classifications assigned to them, CT DEP conducts aquatic use support assessments of selected water bodies throughout the state. The entire length of the Naugatuck mainstem has been included in this assessment program. For the purposes of the assessment, the river has been subdivided into eight segments. The Greenway Project area lies within portions of two of these segments. The upstream-most segment starts above the project area, at the Torrington Water Pollution Control Facility (WPCF) and ends downstream, within the project area, at the mouth of Spruce Brook. The next segment starts at the mouth of Spruce Brook and ends downstream, below the project area, at the Thomaston WPCF.

Generally, three parameters are used to assess water quality in river segments: fish consumption, aquatic life support and primary contact for recreation. The degree to which these different uses are being supported by the river, in turn, determine "overall use support." Each designated use is evaluated according to the degree to which the water is suitable for that use and is assigned one of the following use support descriptors: fully supporting, threatened (fully supporting but threatened), partially supporting, not supporting, not attainable or not assessed.[5]

The two segments of the Naugatuck mainstem that overlay the Greenway Project area have been assessed for designated use goals associated with Class B surface waters. In 2002, the segment between the Torrington WPCF and Spruce Brook was found to be fully supporting for fish consumption but only partially supporting for aquatic life, this latter parameter being based on surveys of the aquatic invertebrate community. Primary contact recreation was not assessed for this segment. Because at least one of the designated use goals was determined to be only partially supporting, this river segment has been included on the "2004 List of Waterbodies Not Meeting Water Quality Standards", also referred to as the "303(d) List"[6]. Although the actual cause of this water quality impairment is unknown, it is attributed to one or more of several potential sources which include: flow regulation/modification; hydromodification; industrial point sources; municipal point sources; and urban runoff and storm sewers.

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[5] More information about the Connecticut's water quality assessment program can be found in the most recent "Water Quality Report to Congress", also known as the 305(b) report: CT DEP Bureau of Water Management. April 2004. 2004 Water Quality Report to Congress (prepared pursuant to CWA Sec. 305(b)). Hartford, CT.

[6] CT DEP. April 2004. 2004 List of Connecticut Waterbodies Not Meeting Water Quality Standards. (Appendix A). (Prepared pursuant to CWA Sec. 303(d)). Hartford, CT.

In 2004, the river segment between Spruce Brook and the Thomaston WPCF was found to be fully supporting for fish consumption but threatened in terms of aquatic life and primary contact recreation. As described earlier, "threatened " is considered a subcategory of "fully supporting" and therefore the water quality is not considered impaired. However, the "threatened" designation basically places that segment on a "watch" list as water quality conditions are approaching a turning point where they would be considered impaired. The causes which have resulted in this "threatened" status have been identified as: pathogens, indicator bacteria and toxics, as well as unknown causes, which have emanated from industrial point sources as well as unknown sources.

With regard to the foregoing water quality information, there are at least two important things to note. First, the factors affecting surface water quality seem to be primarily a result of sources and activities above, not within, the project area. For example, there are no facilities with point source discharges to the river within the project area. Furthermore, the CT DEP database does not indicate any problematic non-point sources of discharge within this section, either. (However, this does not mean that the latter sources do not exist.) It is assumed that the primary discharge point source influencing water quality in this portion of the river is the Torrington WPCF, just 1.3 miles upstream of the Route 118 bridge where the Greenway Project area begins. However, there are also other upstream point and nonpoint sources to consider such as the backwash water discharge from the O&G facility just below the Torrington WPCF as well as urban stormwater run-off.

The second important piece of information to note is the influence that Spruce Brook appears to have on water quality in the Naugatuck River. As indicated above, the mouth of Spruce Brook on the west side of the river is the demarcation point between the upper and lower segments of the Naugatuck River that have been assessed with regard to water quality and designated uses. In the segment above Spruce Brook, certain designated uses have been identified as impaired whereas, in the segment below Spruce Brook, certain designated uses have been identified as fully supporting but threatened. This perceived difference between the upstream and downstream segments could be the result of certain pollutants being assimilated by the time they

pass through the downstream segment. However, the difference may also be attributed to the influence of Spruce Brook which is contributing a substantial amount of high quality water to the Naugatuck River at this juncture[7]. As such, the mouth of Spruce Brook also serves as an important thermal refuge for fish in the Naugatuck River.

Leadmine Brook which enters the Naugatuck River just a short distance above the Thomaston Dam, the lower boundary of the Greenway Project area, is also a source of high quality water[8]. This has important implications for downstream water quality.

The above being said, there are certain land uses and activities within or adjacent to the Greenway Project corridor that could potentially impact the proposed greenway area and contribute to water quality degradation in the Naugatuck River. These land uses and activities include: Route 8 which runs parallel to and crosses the river; the motorized bike trail on Army Corp of Engineer (ACOE) Thomaston Dam Flood Control Project lands; and sand and gravel mining operations which have historically existed along this stretch of river. Associated impacts with each of these land uses and activities include: stormwater pollution as well as erosion and gullying associated with discharge of stormwater from Route 8 drainage; erosion associated with use of the ACOE motorized bike trails; changes in hydrology because of landscape modification from sand and gravel excavation. While these current and past land uses and activities were noted in passing during the 11/3/04 ERT field review, the extent to which any of these things actually impact or have the potential to impact the Greenway Project area and Naugatuck River would need to be evaluated in greater detail.

Compared to other sections of the Naugatuck River, this Greenway Project area seems to be in a rather unique position in that considerable stretches of the shoreline area are under federal or

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[7] Spruce Brook has a water quality classification of Class A. **Class A surface waters** have overall excellent water quality and the following designated uses: potential drinking water supply; fish and wildlife habitat; recreational use; agricultural, industrial supply and other legitimate uses, including navigation.

[8] The lower reaches of Leadmine Brook (closest to the Naugatuck River) have a water quality classification of Class A while the upper reaches are Class AA. **Class A surface waters** have overall excellent water quality and the following designated uses: potential drinking water supply; fish and wildlife habitat; recreational use; agricultural, industrial supply and other legitimate uses, including navigation. **Class AA surface waters** have overall excellent water quality and the following designated uses: existing or potential drinking water supply; fish and wildlife habitat; recreational use; agricultural, industrial supply and other purposes, (recreational uses may be restricted)

State control which confers some degree of natural resource protection and control over adjacent land uses. Northern portions of the project area are bordered by Mattatuck State Forest lands while southern portions of the project area are part of the ACOE Thomaston Dam Flood Control Project. (With regard to the latter, it is important to distinguish which lands are actually owned in fee by ACOE versus which lands are private and under easement.) The railroad line, as well as Route 8, runs parallel and close to the river throughout the entire project area. While these particular land uses have certain environmental impacts associated with them, there may also be opportunities to work with the CT Department of Transportation with regard to the property they control and build Greenway protection and enhancement measures into their land management and maintenance practices.

## Greenway Project Considerations

It appears that the major point and nonpoint sources of pollution influencing water quality in this section of river are upstream of the Greenway Project area and thus beyond the scope of this undertaking. There may be some water quality impacts associated with land uses and activities within the Greenway Project area but these will require further investigation. If problems are identified, proponents of this Greenway Project can help protect and improve water quality by working with adjacent landowners to correct or improve the situation. Stabilizing erosion sites caused by human activities, re-establishing vegetative buffers along the river corridor, identifying detrimental stormwater discharges and addressing them, and protecting existing open space are examples of how the Greenway Project can contribute to water quality improvement and protection. As part of this, it will be important to identify adjacent landowners and develop cooperative working relationships with them.

In general, this Greenway Project can contribute toward improving the water quality of the Naugatuck River by raising public awareness about the effect that our everyday activities and land use decisions have on water quality. For example, this Greenway Project area may help people recognize the importance of high quality tributaries such as Spruce Brook and Leadmine Brook and the need to be thoughtful about the types land uses and activities that take place in the watersheds of each of these brooks.

# Thomaston Dam Flood Control Project

As a result of the devastating effects of the 1955 flood, the Thomaston Dam Flood Control Project was constructed between 1958 and 1960 by the U.S. Army Corps of Engineers (ACOE). This dam, along with a number of other flood control projects throughout the Naugatuck River Basin, were constructed to control and reduce the effects of future flooding events similar to that experienced in 1955.

In terms of area, the Thomaston Dam flood control project consists of 849 acres of land owned in fee and 482 acres of land under easement. The boundaries of the flood control project are defined by this entire 1331 acre area. Unlike the land owned outright by the ACOE, the boundaries of the land under easement are determined by a specific contour elevation which is 499 ft. NGVD. This is equal to the elevation of the dam spillway crest (494 ft.), plus 5 ft. The easement gives the ACOE the right to flood the lands under easement up to this elevation. The ACOE easement restricts the building of structures within this area. Beyond this, most other activities proposed within the easement area are subject to normal local, state and federal permits.

The Thomaston Dam Flood Control Project boundaries extend north of the dam to approximately ¼ mile above the mouth of Spruce Brook. This northern-most end of the boundary is about 1 mile south of the Rtes. 8 and 118 interchange which is where the Greenway Project begins. In other words, the Thomaston Dam Flood Control Project is the major controlling feature throughout almost the entire length of this Greenway Project area.

The ACOE allows certain public recreational uses of its property. In support of one of these activities, ACOE maintains a trail system dedicated specifically to motorized trail bikes and snowmobiles. This trail system is located within an approximately four mile corridor which runs parallel to the west side of the Naugatuck River. In the 11/3/04 ERT meeting preceeding the field review, ACOE staff noted that they try to keep on top of and address erosion problems associated with the trail system as they occur. They have also been discussing some different scenarios, such as pushing some sections of trail back from the river, in an effort to reduce these type of problems.

### Greenway Project Considerations

The ACOE is obviously an important partner, and the Thomaston Dam Flood Control Project lands a significant feature with regard to this Greenway Project area. In order to establish a greenway in this area, one of the necessary tasks will be to clarify which lands within the flood control project boundary are owned outright by ACOE, and which lands are under flowage easement. As for the lands under flowage easement, it will be important to determine who owns these properties as well as identify more specifically the restrictions that apply as per the easement. This information will be key in terms of working with these property owners in creating a greenway.

According to an ACOE informational brochure on the Thomaston Dam Flood Control Project, there is a volunteer program which provides members of the public with opportunities to assist ACOE staff in land stewardship activities such as trail maintenance[9]. This volunteer program would seem to be an important nexus with the ACOE for proponents of the Greenway Project to explore.

## Naugatuck River Restoration Project

The CT DEP, in cooperation with federal agencies, municipalities, private industries and local citizen organizations, has been engaged in a comprehensive initiative to restore the water quality and ecological integrity of the Naugatuck River. Clean-up of the Naugatuck has been underway since state and federal clean water legislation was enacted in the late 1960s and early 1970s. Initial efforts focused on cleaning up discharges from industries and the eight municipal water pollution control facilities (WPCFs) located on the Naugatuck and its tributaries. In more recent years, attention has been focused on upgrading industrial wastewater treatment systems, reducing or eliminating industrial end-of-pipe discharges, and cleaning up stormwater discharges from industrial and construction sites. Between 1992 and 2000, per State pollution abatement orders, five of the larger municipal WPCFs upgraded their facilities to advanced wastewater treatment

[9] U.S. Army Corps of Engineers – New England Division. February 1995. Thomaston Dam. NEDEP-360-1-40 (Informational brochure)

and a sixth facility's flow was redirected to the new Waterbury WPCF. The City of Torrington WPCF, located on the Naugatuck mainstem approximately 1.3 miles above the Route 118 bridge, was upgraded in 1994 and was the second of the six facilities to be upgraded.

In addition to these undertakings, CT DEP has also assigned a fulltime field inspector to the Naugatuck Watershed who regularly inspects approximately 40 industrial facilities for compliance. In conjunction with the Waterbury WPCF upgrade, five dams on the Naugatuck mainstem have been removed or breached and plans are underway to construct a fish passage and recreational bypass around another. These efforts are part of a larger plan to restore anadromous fish passage to approximately 30 miles of the lower Naugatuck River up to the Thomaston Dam. As water quality in the river has improved over the years, CT DEP Fisheries has also expanded its fish stocking program of trout and broodstock salmon on certain sections of the river, and has designated the Naugatuck Mainstem - from the confluence of the East and West Branches in Torrington to the Kinneytown Dam in Seymour - as a Trophy Trout Stream.

In addition to CT DEP's activities, regional planning organizations, communities, environmental organizations and citizen groups are working to improve the quality of the Naugatuck River and reconnect people with the river. Most notable is a growing vision among these entities to create a greenway along the entire length of the Naugatuck River from Torrington to Derby. As per efforts of the Council of Governments Central Naugatuck Valley and the municipalities within their region, the section of the Naugatuck River from Thomaston to Derby was designated as an official State greenway in the Spring of 2001. (This designation does not automatically protect the river corridor but has implications with regard to the State Plan of Conservation and Development.) Meanwhile, the City of Torrington is considering the creation of a greenway area along the Naugatuck River as part of their downtown redevelopment plans.

## Greenway Project Considerations

The significance of the Litchfield and Harwinton Naugatuck River Greenway Project should not be underestimated, especially since these communities are located in the northern portion of the basin where the headwaters of the Naugatuck originate. The land use and management decisions made in these areas ultimately affect downstream water quality and the overall success of the

Naugatuck River Restoration Project. Creation of a greenway area offers an important opportunity to maintain and improve the ecological integrity of river corridor and reconnect these communities with the river. In moving forward with this project, the Towns of Litchfield and Harwinton may wish to consider pursuing official State greenway designation for this stretch of river corridor, and thereby extend the Naugatuck River Greenway northward of Thomaston.

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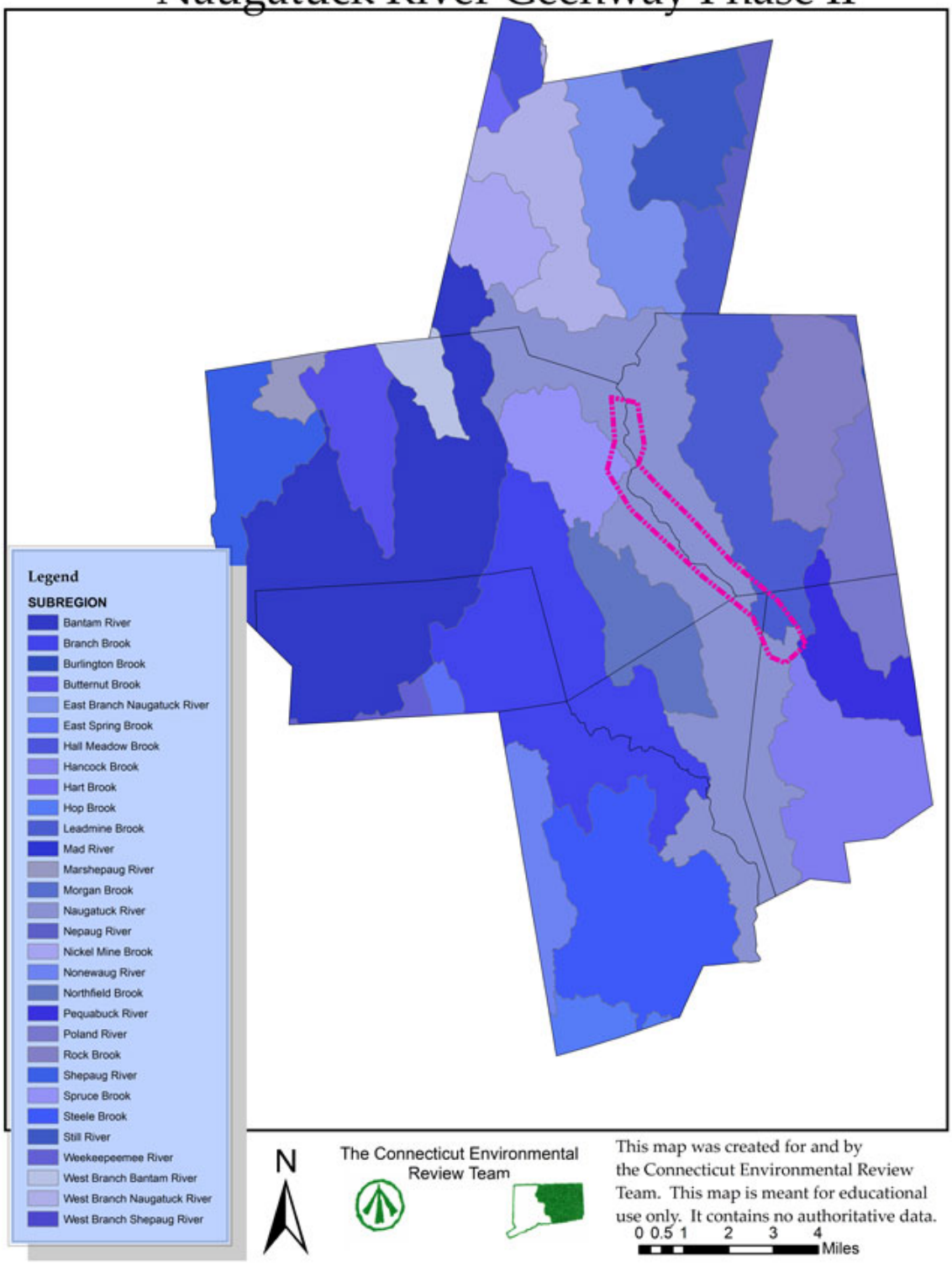
# Naugatuck River Geenway Phase II

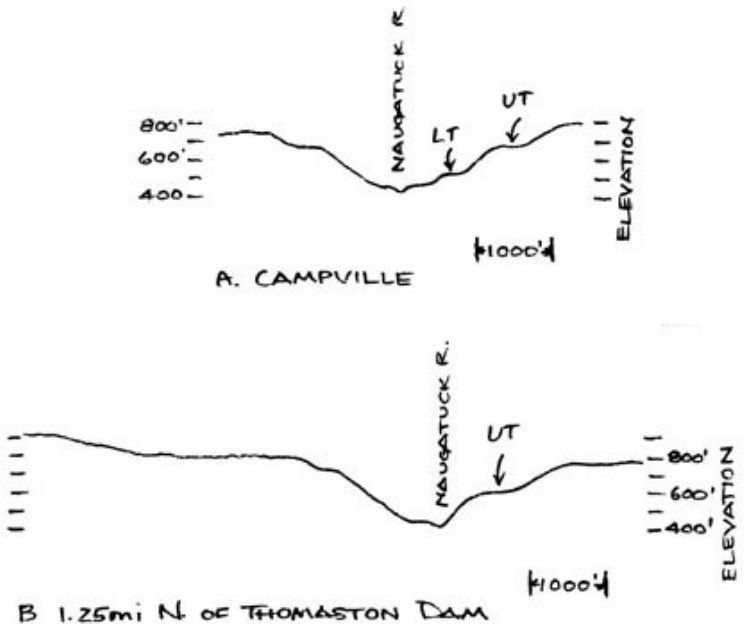


# Topography and Geology

In the Naugatuck River Greenway Project Area Phase II (from the Route 118 crossing of the river south of Torrington southward to the Thomaston Dam) the Naugatuck River occupies a gorge eroded into the relatively "soft" bedrock (dominantly schist).

## Topography

The Naugatuck River occupies a steep sided canyon/valley that is cut into a maturely dissected "plain" (see Bell, 1985, p.77) of 850-900' (msl) elevation (the ridge-top elevations decrease toward the coast). The canyon walls are cliffed in numerous locations and many bedrock outcrops occur. Gently rolling hills, some with local steep sides, surround the valley. Ridge top elevations of the immediate




Topographic profiles across the Naugatuck River Valley at A. Campville and B. a mile and a quarter north of the Thomaston Dam. Notice terraces (UT in the Figure) on both profiles between 600-700' elevation and a lower terrace (LT) at Campville about 530' elevation. Vertical exaggeration in both profiles 2.5x.

surrounding hills are about 850' but increase to about 1000' five miles distant. A few local hills *(i.e.* Scoville Hill outside of Torrington) stand at a higher elevation.

The valley floor has a flood-plain elevation of 490' at the northern part of the proposed greenbelt (Rte. 118 crossing) and about 380' at the Thomaston Dam. Numerous small terraces line the valley (see figure above). A lower set of terraces are formed in sand and gravel that was deposited by glacial melt-water streams at the close of the last Ice Age. A higher set of terraces has an elevation of 650-750'; the higher terraces likely were formed by river action during the erosion of the canyon.

## BEDROCK

Bedrock consists of silvery-grey to dark grey schist with local areas of grey gneiss and granofels. Foliations in the north part of the valley dip steeply to the northwest. At the south end of the Greenway area the foliation dips toward the west. The change in dip from north to south is gradual. The schist is referred to as the Hartland Formation by geologists who produced the first maps of the area (Martin, 1970; Cassie, 1972). The formations were renamed Rowe Schist of Cambro-Ordovician age (-510 million years ago; abbreviated m.y.a) and Ratlum Mountain Schist of Ordovician age (-475 m.y.a) by Rodgers (1985). In Devonian time (~375 m.y.a) the schists were intruded by the Nonewaug Granite which crops out north and east of the Greenway.

The schist were initially formed as muddy sediment on the floor of an ancient, long-vanished ocean referred to as the Iapetus Ocean by geologists (Bell, 1985, ch.8). The mud was deposited on an ancient continental slope east of the Proto-North American continental coast, possibly within a few tens of kilometers of the edge of the ancient continental shelf. The Iapetus Ocean was formed by plate-tectonic processes about 600 m.y.a. The ocean closed about 275 m.y.a. when the Afro-Eurasian plate collided with North America forming the super-continent Pangaea (Bell, pp. 152-156 and maps on p. 148). By the time of the collision, the muddy sediment had been covered by younger sediment and hardened to shale. The shale was pushed several kilometers beneath the surface during the collision processes where the rocks were heated and metamorphosed into schist.

# Surficial Geology

In more recent geologic history large ice sheets formed numerous times covering portions of the northern hemisphere with glaciers during periods (cyclical) of global cooling. These ice sheets moved south-southeastward and as they did they eroded preexisting soil and bedrock over which they flowed. Thus abundant debris was available for transport and deposition. Some of the debris was deposited under the ice in the form of glacial till (lodgement-till). Some debris was deposited on the ground surface (melt-out till) when the glaciers melted and some was carried away by melt-water streams when the ice age ended approximately 15,000 years ago.

## Till

Uplands surrounding the Naugatuck River canyon are blanketed by till. It is a non-sorted mixture of mud, sand and gravel and forms the rocky soil common to all of Connecticut. Till in the Torrington area is generally about 20' thick (Colton, 1971) and is light olive gray in color. The composition of the till depends on the rock types over which the glacier flowed, but it generally is reflective of the local rock on which the till was deposited. Thus, where the bedrock is composed of schist, the till is compact, clayey, and micaceous but may contain non-schist rock fragments derived by erosion of other rocks over which the glacier flowed enroute; where the underlying rock is granite the till is loose, sandy and gravelly. Although till may cover the upper valley walls, it was not observed during the ERT field review because much till may have been eroded by melt-water streams that flowed through the valley at the end of the last Ice Age.

## Stratified Sand and Gravel

Melt-water streams transported large amounts of glacial debris derived either directly from the melting glacier or from erosion of till deposited by the glacier. The muddy portion of the debris was carried all the way to Long Island Sound and beyond but some of the sand and gravel was deposited on the valley floor as outwash (Colton) or glacio-fluvial sand and gravel (Warren, 1972). The sand and gravel deposits are stratified and as much as fifty feet thick. They have been mined just north of the Thomaston Dam. Small

terraces have been formed at various elevations above the flood plain by action of the melt-water streams on the gravel deposits: the roads on the valley floor utilize these terraces.

### *Eolian Deposits*

Most of the glacial deposits are covered by a discontinuous mantle of windblown silt that is grayish-orange or light brown in color (Colton). The eolian mantle was probably derived during a short period of time between when the ice melted and the area became vegetated.

## Erosion of the Naugatuck River Valley

Erosion of the Naugatuck River Valley was likely a function of several different agents during Quaternary time. Some of the erosion likely occurred during the most recent episode of deglaciation when sediment-laden melt water-streams coursed through the valley. The presence of ice-contact deposits north of the area suggest, however, that ice occupied the valley during the last glaciation which in turn suggests that some valley erosion also occurred prior to the last glacial epoch. The high level terraces cut into bedrock are likely artifacts of river erosion at a higher level prior to the last glacial epoch. The terrace preservation supports the contention of Colton, among others, that pre-glacial topography was not changed significantly by erosion associated with passage of the last Ice Age glacier.

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# Conservation District Review

## An Introduction

The purpose of this section of the Naugatuck River Greenway assessment is to identify soil erosion and sediment control issues as they relate to the establishment of a greenway corridor. Characterizing the river corridor and developing a preliminary plan to stabilize eroding soils are an integral part of implementing a successful greenway. This section will also provide some typical technologies used to stabilize erosion adjacent to the river. Soil types, land use, unmaintained drainage swales and public accesses all play major roles in the erosion problems on this section of the Naugatuck River. The information compiled in this report will be useful in the further development of the Naugatuck River Greenway concept and implementation.

## Methods and Materials

To assess the river corridor a six mile segment was visually inspected for erosion. Photographs of severe erosion locations are included throughout this section. The greenway assessment was accomplished by walking on the river banks along the entire six mile segment. Much of the information contained in this report is a result of those visual inspections. In addition, the following materials and methods were used to perform this assessment.

- Aerial Photography
- USGS 7 1/2 minute series topographical quadrangles
- Compiled Geographic Information Systems Natural Resource Maps (CT DEP, EGIC)
- Inspection and documentation of river corridor conditions
- Interviews with the Department of Army (ACOE) personnel

# STATE OF THE RIVERBANK

To better understand the condition of the land adjacent to the River through the 6 mile corridor this reviewer broke it into these three segments.

Segment One = The 1.5 mile stretch between the State Route 118 Bridge and the State Route 8 bridge crossing.
Segment Two = The 2 mile segment between the State Route 8 Bridge and the Valley Road Bridge (use discontinued and bridge dismantled).
Segment Three = The 2.5 mile segment from the (closed) Valley Road Bridge to the US Department of Army Flood Control Dam.

***Segment One - the 1.5 mile stretch between the State Route 118 bridge and the State Route 8 Bridge.***

This section of the river is characterized mostly by a steep western bank with a railroad (RR) grade cut into, and perched just above the river. There is little potential (and none witnessed) for erosion through this area. The large stone aggregate used to stabilize the RR grade completely stabilizes the river bank (see Photo 1). This perched RR grade situation leaves little room for a greenway starting at the Route 118 Bridge crossing and ending approximately one mile south at the point just above where Spruce Brook crosses underneath the RR and empties into the Naugatuck River (see Photo 1) .

Photo 1

The eastern bank through this one mile section appeared to be a flood plain with no visible trail network. In addition there were no visible erosion sites. The potential for erosion on the first one mile section of the east bank is small given soil types, flat topography, dense vegetative cover and lack of public access (such as ATVs).

The ½ mile section of river between Spruce Brook and the Route 8 flyover is very different than the previous mile. Starting from just above the confluence of Spruce Brook and the Naugatuck River the RR begins to trend away from the river. It is at this point where a terrace begins to form (see Photo 2) between the river and the RR creating a level area being accessed regularly by ATVs. This terrace width expands as you move down toward the Route 8 flyover and a network of trails begin to occupy the expanding river terrace. The soils of the terrace are well drained, course grained and developed in a level area which make them very resistant to erosion. There were no visible locations where these trials cut down to the river and exposed soils were contained to the trail network only.


Photo 2

***Segment Two - The 2 mile segment between the State Route 8 Bridge and the former Valley Road Bridge.***

At the beginning of this segment Route 8 crosses to the west side of the River and both the highway and the RR are perched on the valley wall above. Stormwater runoff pours uncontrolled down the valley wall and into the River. This was first witnessed immediately after Route 8 crossed to the steep slopes of the valley above the river (see Photo 3).

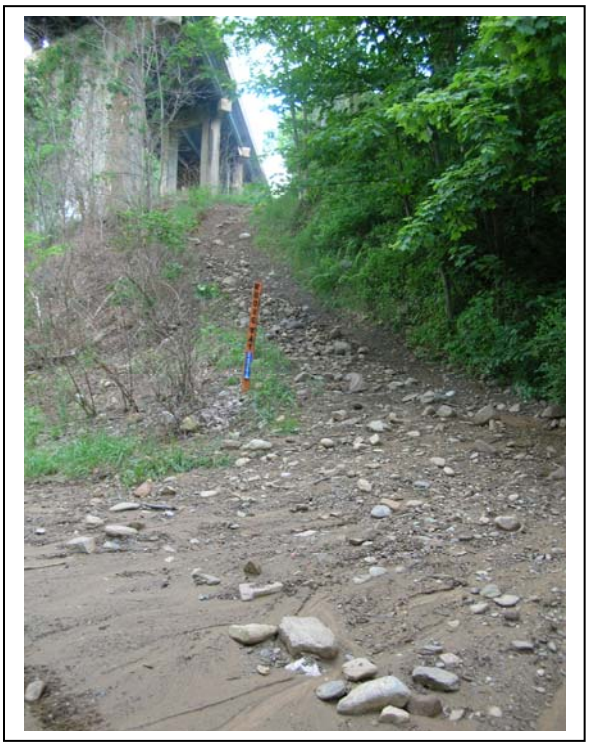


Photo 3

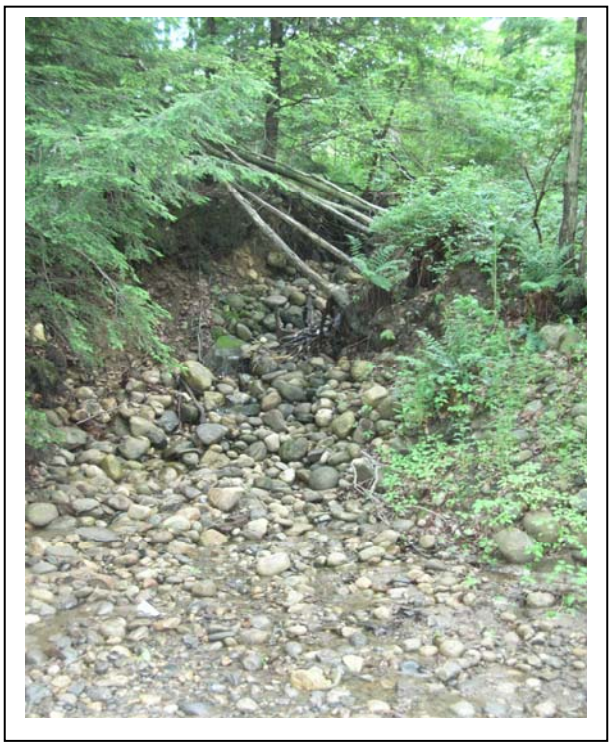


Photo 4

***Approximately 10 acres of impervious surface (~0.5 mile section of Route 8) drains to the areas pictured above. Allowing stormwater from such a large impervious area to run uncontrolled has created a severe erosion problem. Erosion is not only affecting river water quality and the bank, but also a long distance up the valley wall. Erosion problems are being caused by the flashy stormwater runoff that is collected from the surface of the highway. There are two basic methods of resolving erosion problems created by this section of Route 8. The first is to capture and pipe the stormwater runoff directly to the river thus avoiding any***

***erosion soil erosion issues, or contain (store in a basin) the stormwater runoff and meter it into a system of drainage swales that are designed to carry a measured amount of water without erosion.***

There are a number of very similar erosion gullies along the west side of the valley wall that are transporting large amounts of sediment into the Naugatuck River (see Photo 5 and 6). Photo 5 illustrates a stormwater runoff erosion gully cutting down to the River and Photo 6 is the same gully looking up towards route 8.

***Photo 5***

***Photo 6***

Segment 2 also contains a large network of ATV trials that are heavily used. However, very rarely did this trail network course directly to the river. The trails mostly ran parallel to the river. This reviewer was impressed by the lack of erosion beyond the foot print of the ATV trials. The flat topography of the river terrace, established vegetative cover and coarse structure of the soil mitigated many of the negative effects that you would expect to see with heavy ATV use. Again the number one erosion and sediment deposition threat were the erosion gullies cutting across the

existing trail network from stormwater flow off the valley wall. These gullies flow perpendicular to the Naugatuck River transporting large amounts of sediment directly into the river (see Photo 5 and 6).

***Segment Three - The 2.5 mile segment from the (closed) Valley Road Bridge to the US ACOE Dam.***

This Segment can be categorized as a broad flood plain on both sides of the River. This segment also has a network of motorized trails; however there is a large paved section of road. The topography is flat and there is a network for drainage swales and small ponds that do not show signs of heavy sedimentation. Given the flat topography and stable soil types there was very little evidence of erosion to the Naugatuck River. If erosion problems arise within this segment, they will be easy to mitigate because even though many of the soil types in the floodplain are classified as wetlands they are mostly excessively well drained and well drained.

# Conclusions

Most of the major erosion problems are originating from flashy stormwater flow off Route 8 within segment two. To better understand the best methods to stabilize these erosion drainage gullies it is important that each one be traced back to its source and mapped so that preliminary conceptual design ideas can be assigned to each problem gully. Even though there are many erosion sites that are severe, stabilizing and mitigating there impacts as part of a greenway corridor development, would not be difficult. This is because the source of the stormwater and erosion, and the subsequent effects, are plainly visible. In addition, many common design alternatives already exist to address just these sorts of problems.

# Wetland Review Comments

The nature of the river is one that is confined by the topography. That is, many hills crowd the river giving it very little side-to-side opportunity to meander or to flood. While normal flow remains in the channel, storm flows rise up vertically and inundate the terraces within the floodplain. Thus, large storms are likely to result in vertical water elevation increase rather than horizontal flooding because of the topographic limitations on the flood waters.

In the distance of the study area the river drops from ~495 feet above sea level to ~390 feet. This is a drop of 105 feet over the stream distance of 33,543 feet for a stream gradient of .3, three tenths of one per cent.

The ERT Team toured the project area by car and on foot on November 3, 2004. There were four stops of note along the way from Route 118 to the Thomaston Dam. These were:

**1.** The west side of the river at the old railroad station just below the Route 118 bridge.

**2.** East side of the river just below the Route 8 crossing. Large pond up by the bridge.

**3.** Site of the former bridge crossing. Now abutments and open grassy level floodplain below.

**4.** West of the river just north of the Route 8 crossing

## Issue: Road Sand

Connecticut has a no tolerance level for snow and ice on its roads, so large quantities of road sand is applied every winter to keep the travel ways safe. The DEP estimates* that 44,500 pounds (22 1/4 tons) of road sand are applied on every mile in every year in urban settings. Of that total, approximately 30-50% is collected in the spring. Thus, ~12 tons of sand is left on every mile of road annually.

Because of the nature of the Naugatuck Valley, both automobile roads and rail roads are in close proximity to the river. So it is quite likely that over time most of the uncollected sand works its ways downslope into the watercourse. For example, the island opposite the Team's first stop appeared to be made up almost exclusively of road sand. The impact of sand deposition on spawning streams is well documented. Sediment itself also can destroy aquatic habitat and fill in water bodies. The impacts can be worse when the road sands are collected late in the season. This is because the sand particles are reduced in size through the constant grinding of automobile tires and these finer particles are held in suspension in the water longer.

In addition, road sand can be a major pollutant source by carrying nutrients, oil, and metals with it to the rivers, streams, and lakes.

***Possible solution :*** Urge the towns in the study area to sweep the roads as soon as possible in the spring and ask about their catch basin clean out policy and schedule. Road sand sweepings can be reused for construction purposes.

* (DEP road sand documentation is on the Web at http://dep.state.ct.us/wst/solidw/street_sweepings.pdf)

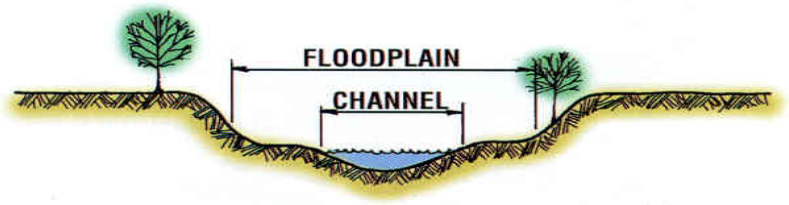
## Issue: Preservation of floodplain forest

One of the threats to the river is the impact of growth in the watershed. Even "normal" population growth will increase the amount of impervious surface and the potential resulting pollution in the contributing watershed. The floodplain acts as a transition zone between the stream channel and the uplands where the land influences the stream and the stream influences the land. The floodplain as it exists is an asset to the river in its ability to filter surface water flow, reduce water temperatures by sheltering and shading, provide wildlife habitat, protect and create aquatic habitat, provide detritus (leaves and woody debris) which is the basic source of energy for the stream ecosystem, and offer the potential for groundwater recharge. Observing the 100 year floodplain and municipal setbacks or review areas provides a continuum for the river to defend itself against encroachment.

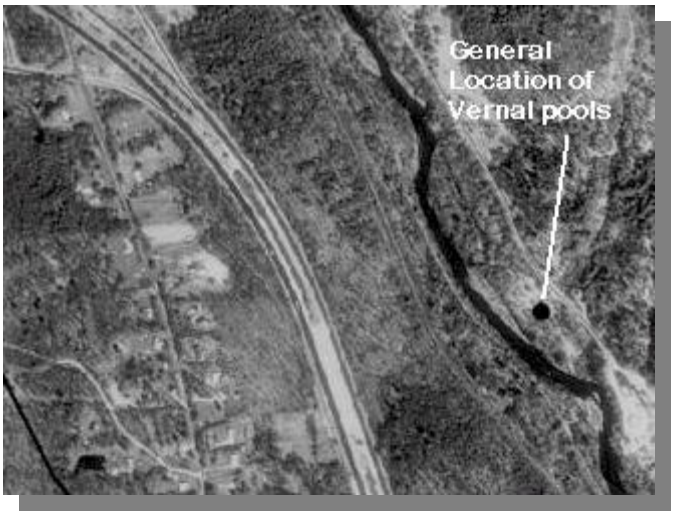
# Issue: Vernal pools

Vernal pools were observed on the drive along the river. Whether or not they were breeding pools can only be established by field observation in the spring of the year. But the potential for breeding pools does exist.

Two specific locations were observed. In the area along the road just north of the power line, pools existed on the benches or terraces of the floodplain above the channel way. See figure below:




**The floodplain that exists parallel to the river but slightly above the channel was where vernal pools were observed (from: *The River Book,* James G MacBroom).**




*This area from a 1990 aerial photograph showed potential vernal pools on the floodplain benches.*

Another larger pool was visited at stop number two. Here a pool approximately 100 by 50 feet exists and the Team was told that spring peepers are abundant in the spring. While the Spring peepers are not obligate vernal pool species certainly the opportunity exists for other amphibians to breed here. Inventory and documentation of these possible sites should be undertaken. Once documented, any trails or linear corridors can be planned to give these areas a wide berth.

The largest integral part of the vernal pool ecosystem is the upland area neighboring the pool. This typically extends away from the pool uphill or upslope to drier soil types. The slopes often vary from gentle to steep. It is in these slopey areas that amphibians spend over 90% of their adult lives. They travel up hill to the well drained soils to burrow. In places, some usable slopes can approach 45 or more degrees. The drainage areas for these pools are typically located on till-based soils and measure 2-3 to 5-6 acres. Thus, local impacts can have dramatic, damaging impacts to the vernal pool ecology, especially since vernal pools are fed primarily by precipitation and surface water runoff.

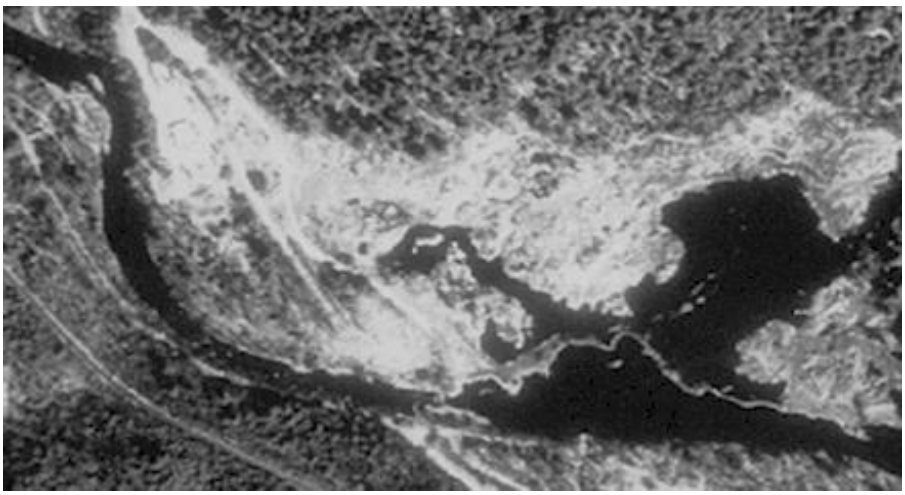
*There is extensive information in print about vernal pools. Much of it points to the fact that the reduction of more than a certain percentage of critical habitat and adjacent upland will have telling impacts on the pool ecology.*

Dr. Michael Klemens suggests in his recent book, co-authored with Dr. Aram J.K. Calhoun, entitled: "*Best Development Practices – Conserving Pool Breeding Amphibians in Residential and Commercial Developments in the Northeastern United States*" that there be no development in the 100 foot buffer around the vernal pool and no more than 25% in the critical terrestrial habitat, that is, the distance from 100 feet to 750 feet away from the pool. Indeed, the upland use by various vernal pool amphibians can range from 386 feet from the pool for spotted salamanders to 1,550 feet from the pool for juvenile wood frogs (3,835 feet for adults). (This document may be obtained from the DEP Store: http://www.dep.state.ct.us .)

## Issue: Restoration of historic areas of degradation

There is a need for stream bank stabilization to minimize erosion and sediment problems. Land use within the immediate watershed has varied over time. As the two images show below, surface excavation has taken place to a great extent in the area of the former bridge crossing. It is easy to see here the opportunity for erosion and sediment problems. Less subtle areas no doubt exist within the study area as well. These could very easily be mapped and have a subsequent strategy compiled to ensure stabilization or reclamation.

This 1934 aerial photograph shows the old bridge crossing



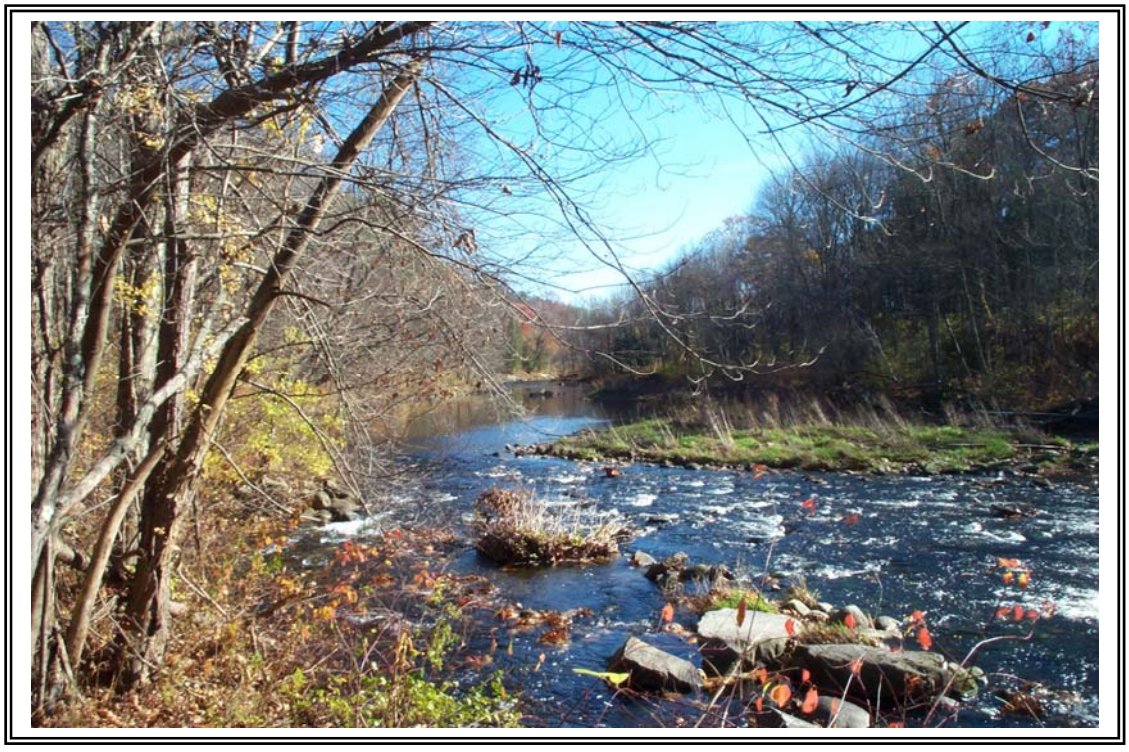
1990 aerial photograph of the same area. Note the bridge is out and the extensive white areas that represent probable areas of sand and gravel removal.

# AQUATIC HABITATS AND RESOURCES

## Aquatic Habitat

The Naugatuck River Greenway Project-Phase II (the "Phase II Project") has set focus on the Naugatuck River reach from the Route 118 crossing, Harwinton/Litchfield, southerly to the Thomaston Flood Control Dam, Thomaston. Approximately 6 miles of river are within the bounds of the Phase II Project.

Within the Phase II Project bounds, the Naugatuck River channel is of a moderate grade that creates a series of deep pools and riffles. The riffle-pool sequence and diverse instream habitat features (i.e. a heterogeneous mix of streambed materials, fallen and/or overhanging vegetation, undercut banks,) would classify the river segment as coldwater. The watershed draining to this segment of river remains primarily forested. The forested corridor along the river is afforded protection from land use change as it is under the ownership of either Federal or State agencies.



**Typical section of the Naugatuck River within the Phase II project bounds.**

Although the corridor along the Naugatuck River is presently protected forested land, prior physical alteration has long impacted significant sections of this Naugatuck River reach. The Naugatuck Valley Railroad constructed a rail line westerly along the river in 1850

followed several decades later by the State's building of Connecticut Route 8 ("Old Route 8") in the early 1920's. Fill for railroad and roadway embankments was apparently excavated from the river as currently evidenced by long, straight segments of the channel that lack physical habitat diversity. Mounds of excavated material remain visible in the floodplain easterly along the river downstream of the Route 118 crossing.

**A straight, featureless segment of the Naugatuck River, Harwinton-Litchfield.**

Physical alteration to the river channel occurred more recently at the site of a commercial sand and gravel operation located southerly of the Wildcat Hill Road intersection with Valley Road, Harwinton. Material was removed from the Naugatuck River and on

**Flow-through pond on the Naugatuck River created by sand and gravel excavation; Harwinton.**

approximately 50 acres of upland adjacent to the eastern river bank. Excavation at the site ceased during the early 1990's. Since that time the berm separating the Naugatuck River from the upland excavation breached and has resulted in the creation of a $20^{\pm}$ acre flow-through pond.

The Thomaston Flood Control Dam was constructed across the Naugatuck River in the late 1950's to early 1960's following a devastating flood of August 1955. The dam was designed to prevent future flooding of the lower Naugatuck River Valley. Although the

**The Naugatuck River within the Thomaston Flood Control Dam, Thomaston**

"footprint" of the dam has eliminated a somewhat minimal segment of riverine habitat (546 linear feet) and does not permanently impound a pool of standing water, it does have the ability to store 13.7 billion gallons of water and create a 960-acre lake at full capacity. At the maximum flood storage, approximately 5 miles of 6-mile river segment within the Phase II Project bounds would be temporarily transformed from riverine to lake habitat.

Industrialization along the Naugatuck River corridor through Torrington and use of the river for municipal sewage disposal and a wide variety of industrial discharges historically had degraded river water quality. Water quality conditions have since improved due to the elimination or upgrade of waste water effluent. The Department of Environmental Protection classifies the Naugatuck River as a *Class Bc* surface water. Surface water of this classification is known or presumed to meet the following designated uses: recreational use, coldwater fish and wildlife habitat, agricultural, industrial and other

legitimate uses including navigation. Further improvement to water quality is anticipated, as the Torington wastewater treatment plant, presently an advanced treatment facility, will be upgraded in the near future.

## Aquatic Resources

Prior to wastewater discharges and the alterations associated with instream sand and gravel excavation, the Naugatuck River reach within the Phase II Project bounds likely provided excellent habitat for a coldwater riverine fish assemblage. Physical habitat and water quality degradation are theorized to have reduced the river's ability to support a diverse fish community and in particular to have reduced support for cold water species such as trout. Beginning in the early 1990's, the Inland Fisheries Division ("Division") has conducted biennial fish surveys in the Naugatuck River reach centrally located in the Phase II Project. The initial surveys were conducted to obtain baseline fish population data; subsequent surveys were conducted to assess the fish population response to water quality improvement and/or fish management strategies.

The multi-year surveys revealed a somewhat unvarying fish community of the following species: blacknose dace *(Rhinichthys atratulus)*, longnose dace *(Rhinichthys cataractae)*, cutlips minnow *(Exoglossum maxillingua)*, creek chub *(Semotilus atromaculatus)*, fallfish *(Semotilus corporalis)*, common shiner *(Luxilus cornutus)*, tessellated darter *(Etheostoma olmstedi)*, and white sucker *(Catostomus commersoni)*. These riverine species are commonly associated with either cool- or cold water riverine systems.

Also collected in the surveys were largemouth bass *(Micropterus salmoides)*, bluegill *(Lepomis macrochirus)*, pumpkinseed *(Lepomis gibbosus)*, rock bass *(Ambloplites rupestris)*, fathead minnow *(Pimephales promelas)*, golden shiner *(Notemigonus crysoleucas)*, yellow perch *(Perca flavescens)*, and brown bullhead *(Ameiurus nebulosus)*. These species inhabit warmwater lakes and ponds and large, slow moving rivers; they are considered a transient species in rivers such as the Naugatuck River.

The continual improvement to water quality and the corresponding long-term stability of the fish community had factored in the Divisions' decision to manage the Naugatuck River for adult-aged trout. Since the mid-1900's, approximately 4,000 brook trout *(Salvelinus fontinalis)*, brown trout *(Salmo trutta)* and rainbow trout *(Oncorhynchus mykiss)* have been allocated yearly for the Naugatuck River reach within the Phase II Project bounds. In 2002 the Division had designated this river reach a *Trophy Trout Stream*. This designation limited the daily creel limit of trout to two fish. A regulation change in 2005 now designates the river reach as a *Trout Management Area*. The change allows year-round trout fishing however, anglers will be required to release the trout they catch. The number of adult-aged trout stocked annually has been reduced to approximately 3,500 as the survival rate of stocked fish is anticipated to increase.

The Naugatuck River is one of two rivers in Connecticut (the Shetucket River being the other) into which the Division liberates adult Atlantic salmon *(Salmo salar)* broodstock for

angling. The total number of salmon stocked is dependent upon their availability from State and Federal salmon hatcheries. For the past several years, approximately 400 salmon have been released annually in the fall in the Naugatuck River reach from Route 118 downstream to the Thomaston Flood Control Dam. The Atlantic salmon broodstock has been found to be extremely popular with anglers even though there are strict restrictions pertaining to fishing method, open dates for fishing, and harvest limits, anglers are able to keep one salmon per day during the open season.

# Habitat Enhancement Recommendations

### *Naugatuck River Habitat Enhancement*

The objectives of the Inland Fisheries for the Naugatuck River within the Phase II Project bounds have always focused on the management for adult-aged trout beginning with put-and-take harvest then establishing a regulated *Trophy Trout Area*. However, very few of these spring-stocked trout are collected in the mid-summer, biennial fish surveys. While anglers harvest may account for a portion of the trout loss, greater numbers should be expected in the surveys. As water quality in the Naugatuck River has improved to support a stable, species diverse fish community, the density-poor trout component is likely reflective of physical habitat limitations.

The Division has recently designated this Naugatuck River reach as a *Trout Management Area*; fishing will be allowed year-round however, anglers will be required to release all trout caught. The success of the *Trout Management Area* is dependent upon optimal trout habitation. This requires physical habitat with an appropriate mix of water depth and velocity, cover, and visual isolation. Adult trout require deeper (>1 foot) faster flowing water; this requirement is largely related to the amount of food that is regularly carried by the higher-velocity flow. These locations are either in shear zones (where a swift water mass flows next to a slower water mass) or in eddies or slow current areas (where water moves counter to the main water flow). Either area allows the trout to be close to the food-carrying current without expending large amounts of energy to maintain their stream position.

Cover can be defined as any object or area providing the trout protection from the effects of high current velocities and predation. Cover can be provided by overhanging riparian vegetation, undercut banks, boulders, logs, or debris accumulations. Studies indicate that the most effective cover for trout are those objects or areas that are in water that is greater than 1 foot in depth and are either greater than 1 foot in dimension or provide more than 1 foot of overhead shelter.

Researchers have determined that adult trout tend to be territorial and that their total number in a given reach of river tends to be increasingly proportional to the degree of visual isolation from other fish (including other trout). Visual isolation can be provided by the topography of the riverbed or large items such as boulders, logs, or debris accumulations.

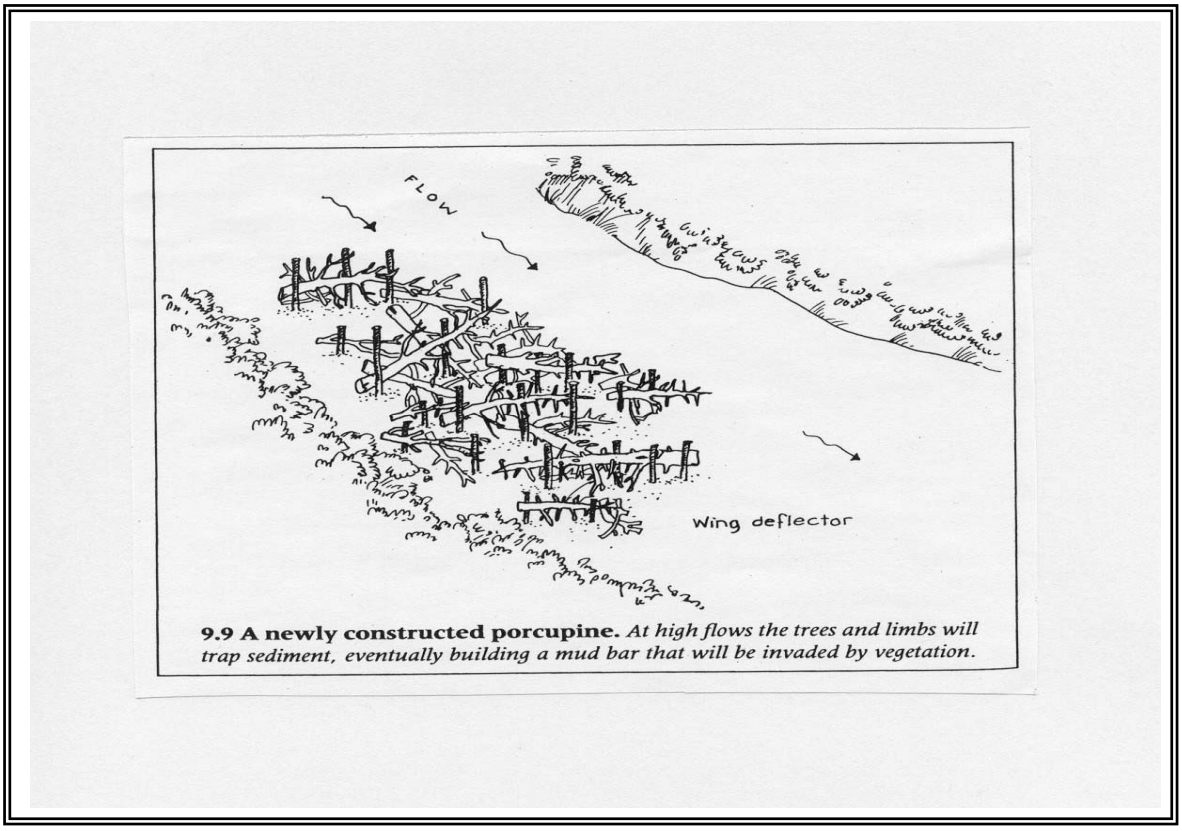
In review of aerial photographs it appears that approximately one-third to one-half of the total length of Naugatuck River within the Phase II Project bounds has been altered. The alteration, attributable to sand and gravel excavation, had occurred in a number of isolated areas within the river. The excavation had removed most if not all of the large cover from the river and had broadened the river channel. The most suitable technique to restore large cover to the structure-less, sandy channel segments would be the installation of engineered log jams and/or log flow deflecting structures known as “porcupines.

*Engineered log jams* are intended to replicate natural accumulations of large woody debris. These structures consist of a skeleton of logs secured with aircraft cable or steel rod with the internal pockets filled with woody debris that is nailed or lashed together. To be effective, the structures be approximately 30 feet in length and be either parallel to the riverbank or angled downstream into the river channel. The jams should be supported approximately 2 feet above the streambed. The jams are placed either in areas of natural debris accumulations or in those areas where there are suitable anchor points (such as large diameter trees or boulders along the riverbank).

Examples of naturally occurring log jams.

*"Porcupine"* structures are constructed of tree branches, limbs or Christmas trees woven between wooden posts driven vertically into the riverbed. The completed structures are usually triangular in shape although linear shaped structures have also been utilized. The porcupine structure traps sediment and debris that creates a growth medium for plants. Overtime the structure becomes quite solid.

The porcupine structures can be placed in an alternating or opposing sequence along the banks of a reach of river. They should extend into the river at a distance of one-quarter to one-third of the channel width. The structures are intended to narrow the river channel, cause a scour of soft sediments at their apex, provide cover for fish and habitat for aquatic insects. When installed in an alternating pattern, the porcupines will induce a meandering pattern to the river flow.




**9.9 A newly constructed porcupine.** *At high flows the trees and limbs will trap sediment, eventually building a mud bar that will be invaded by vegetation.*

Porcupine design taken from C.J. Hunter: Better Trout Habitat, 1991.

A linear porcupine would be a fitting structure to restore the berm once separating the Naugatuck River from the upland excavation at the site of a commercial sand and gravel operation located off Wildcat Hill Road and Valley Road, Harwinton. Observations at two cursory site reviews show active, natural sediment deposition atop or within close proximity of the former berm. The installation of a porcupine structure in this area will make use of the active sediment deposition that in turn will accelerate the re-development of a stabile berm and segregate the Naugatuck River from the ponded excavation.

## Tributary Habitat Enhancement

Spruce Brook is the most significant of the numerous tributary streams entering the

Naugatuck River within the within the Phase II Project bounds. The brook discharges from the west into the river at a point approximately 1.25 miles south of the Route 118 bridge. Division fish surveys and water temperature monitoring indicates the inflow of cooler water from Spruce Brook provides an important thermal refuge for trout within the Naugatuck River at the point of confluence. Trout seek cooler tributary water to escape from the warm and low-oxygenated water of the Naugatuck River during low-flow periods of summer. However, the immediate area of confluence requires a certain

**Spruce Brook confluence with the Naugatuck River.**

amount of modification to enhance its ability to function as a thermal refuge. A deposit of cobbles and gravel currently forces approximately one-half of the Spruce Brook flow upstream into the Naugatuck River. The immediate mixing of the flows reduces the thermal refuge area.

To increase the thermal refuge area simply requires creating a channel through the cobble/gravel deposit at the confluence. The depth and width of the excavation should be similar to the dimension of the Spruce Brook channel immediately upstream of the confluence. Excavated material should be placed to create a low berm to direct Spruce Brook flow downstream into the Naugatuck River.

Similar thermal refuge enhancements were recently completed in the Farmington River (Burlington) and the Naugatuck River (Naugatuck). The sites are shown in the following photographs. The enhancement at the Farmington River site was completed in 2000 and at the Naugatuck River site in 2004.

**Beacon Hill Brook at the Naugatuck River, Naugatuck**

**Burlington Brook at the Farmington River, Burlington**

## Riparian Habitat Enhancement

Despite widespread landscape alteration during the 18th and 19th centuries, forests have regenerated and now dominate the watershed of the Naugatuck River within the Phase II project bound including the riparian are adjacent to the river. A large portion of the watershed and corridor along the river is under ownership of municipal, state, and federal agencies and is protected from future development.

There are however, numerous private properties easterly along the Naugatuck River in Harwinton. While most of the properties remain forested with limited development, there lies the threat of large scale land use change such as the sand and gravel excavations that had occurred over the past few decades. Private property along the river corridor should either be purchased or be preserved by easement to maintain or to provide an opportunity to enhance the integrity of the riparian habitat. As research indicates, a vegetated riparian area within 100 feet of perennial watercourses provides critical functions for the overall "health" of the watercourse.

The construction of the Thomaston Flood Control Dam resulted in the clearing of riparian vegetation easterly along the Naugatuck River. Approximately 3,100 linear feet of river has been affected. Current management of the dam maintains the impoundment bed as mowed field and low shrubs. Although the vegetation management offers stability to sediments in the impoundment and provides habitat for certain wildlife species, limited benefit is afforded to the habitats and resources of the Naugatuck River.

The restoration of a riparian corridor along the Naugatuck River has been previously discussed between Corps of Engineers and Division staff. Staffs were in agreement that the vegetation should: be a species-diverse mix of trees and shrubs; be native and non-

invasive; have suitable root structure to stabilize the soft riverbanks and impoundment bed; and be able to withstand periodic inundation.

It is also recommended that the removal of discarded materials be included in plans for riparian habitat enhancement. While local groups sponsor annual trash removals along the river, large-scale debris accumulations in the riparian area persist. Efforts should be made to identify these sites and establish a schedule for their removal. One such site is a tire "dump" located easterly along the river near the Pickett Brook confluence. This site was recently identified by a member of a local land use commission.

## Trail Development/River Access

There are three large contiguous parcels of property that form the riparian corridor westerly along the Naugatuck River from Route 118 south to the Thomaston Dam. The parcels are owned by the U.S. Army Corps of Engineer, Connecticut Department of Environmental Protection and the Connecticut Department of Transportation. A formal trail network has been established on the Corps property from the Thomaston Dam northerly to Spruce Brook. The Department of Transportation is the sole owner of the parcel along the remaining 1.25 mile segment from Spruce Brook to Route 118. Formal trail access has not been established on this parcel.

It is seemingly most practical to maintain the existing trail system westerly along the river and enter into an agreement with one property owner, the Department of Transportation, to extend the trail northward to Route 118 rather than gaining easements with the multitude of property owners easterly along the Naugatuck River. However, U.S. Army Corps of Engineers staff have indicated that the trail system (in particular the trail segments south of the Campville Road crossing) are quite heavily used by both pedestrians and motorized off-road vehicles. They had expressed an apprehension of potentially increasing use of this area with the greenway designation.

An alternative trail layout offered for consideration is to locate the southern terminus of the trail easterly along the Naugatuck River near the Leadmine Brook confluence. The trail would then continue easterly along the river north to the Campville Road bridge. The trail would then cross the bridge and continue westerly along the river to the Route 118 bridge. Although the trail extension would require crossing Spruce Brook (ideally a bridge of a width and weight bearing capacity to allow travel by a fully loaded fish hatchery tanker), the costs should be far less than constructing a 6+ mile long trail located entirely east along the river.

Regardless of the location chosen, the trail should incorporate the following:

- Create formal pedestrian access points to the river.
- Signage should be erected along the Naugatuck River at select, readily accessible

vantage points atop the river banks to describe the function of key features of a stream such as pools, riffles, and the riparian area. Suggested verbiage for such signage includes:

*Stream Habitat Overview.* A key characteristic of any productive in-stream habitat is diversity. It is imperative that the proper blend of water depths, water velocities, and substrate types be present together to form the necessary food production, spawning-incubation, and cover areas that combine to form a complete stream habitat.

*Pools.* Loosely defined, a pool is a region of deeper, slower moving water with fine bed materials. With overhanging banks and vegetation, pools provide cover, shelter, and resting areas primarily for larger finfish. During low flows pools can become isolated pockets of water which allow survival of finfish and other aquatic organisms.

*Riffles.* Areas of shallower, faster moving water with coarser bed materials. Riffles are most often associated with white water, a turbulence that adds oxygen to water. Riffles tend to support higher densities of aquatic insects and are thus important areas of finfish food production. Riffles also serve as a spawning site for most stream finfish. Due to competition and predation, juvenile and small sized finfish tend to inhabit riffles.

*Riparian area.* The riparian area is that section of land that adjoins the river channel. A well vegetated riparian area is critical to the health of the river ecosystem. Roots of trees, shrubs, and grasses bind the riverbank soils and provide a resistance to the erosive forces of flowing water. Stems and leaves of riverbank vegetation provide shade which prevents high water temperatures. Leaves, stems, and other plant parts that fall into the river provide food for aquatic insects. Large woody debris that fall into the river enhance physical habitat. Abundant riparian vegetation softens rainfall and enables the riparian area to serve as a reservoir storing surplus runoff for a gradual release to the river during low flow periods of summer and early fall. The riparian area is a natural filter that removes nutrients, sediments, and other non-point source pollutants from overland runoff.

# Wildlife Resources

## Introduction

A site visit was conducted to evaluate existing wildlife habitats on a six-mile stretch of the Naugatuck River. A variety of habitat types were identified: hardwood forest interspersed with conifers (softwoods), old orchard and riparian type habitat.

Wildlife habitat is said to be the complex of vegetative and physical characteristics that provide for all the requirements of wildlife; that is, food, shelter, resting, nesting and escape cover, water and space. Generally, the greater the habitat diversity and degree of interspersion of various habitat types, the greater the variety of wildlife there will be using an area. Conversely, while there may be fewer wildlife species, large unbroken expanses of one habitat type provide important habitat for many species of wildlife including those that avoid edges. Still other species require shrub lands or large expanses of grasslands to maintain viable populations. There are many factors to consider when determining habitat use and quality of an area for different species, including habitat types, size of habitat types and their quality, overall size of the study area, location, degree of isolation, diversity, and juxtaposition with other neighboring habitat types, etc.

This greenway is important to wildlife from a landscape perspective due to the amount of development along the Naugatuck River just south of this stretch. Identifying important resources along the river and in the watershed as well as developing a conservation strategy (a good example would be the Farmington River Watershed Biodiversity Project) would be invaluable as development pressures increase.

# Existing Wildlife Habitats and Use

## Riparian Habitat

Riparian habitat, or riparian zone, is the greenway of trees, shrubs and herbaceous plants that follow the edge of streams, rivers, lakes and ponds. It provides habitat for many aquatic-based organisms such as frogs, salamanders, toads, ducks, herons, beaver, muskrats, otters, and mink. The greater the vegetative diversity along the edges of watercourses, the greater its value to wildlife in general. This zone of vegetation provides valuable cover, nesting sites, roosting sites and, in many cases, abundant food for wildlife. The vegetation found in this habitat is tolerant to periodic flooding and its presence causes floodwater to slow down and allows the soil to absorb the excess water.

Rivers provide important habitat for various birds, reptiles, amphibians and mammals. The Naugatuck River is an important migration and stopover corridor for avian species. A river is a highly visible landscape feature utilized by birds for navigation during migration and provides essential food and cover for resting and refueling. A recent three-year study by the DEP Wildlife Division has documented migrant use along the Naugatuck River corridor. Analysis of results and final report are expected to be available in late 2005.

Rivers also provide important travel corridors for small and large mammals. This zone of vegetation along a stream or river is often the only remaining contiguous vegetation within a developed area, especially in a densely populated state like Connecticut. It may continue for miles through cities, suburbs and farmland, providing an important travel corridor for wildlife and connecting one habitat to another.

## Hardwood Forest Habitat

Hardwood forests provide an abundance of food in the form of mast (berries, buds, acorns, seeds and catkins). In the Northeast, acorns are very important to wildlife. Mast produced by oaks provides excellent forage for a variety of animals such as white-tailed deer, gray squirrels, wild turkeys, white-footed mice and eastern chipmunks.

Cover value for wildlife is greatly enhanced by the presence of snags (dead standing trees), cavity trees and large-diameter den trees. Wildlife likely using the mature hardwood forest includes scarlet tanagers, white-breasted nuthatches, black-capped chickadees, black and white warblers, eastern wood-peewees, American redstarts, barred owls, broad-winged hawks, red-backed salamanders, and black rat snakes.

### Conifer Forest Habitat

Areas of conifer or evergreen trees, such as hemlock and pine, provide food in the form of cones for squirrels, chipmunks and small mammals. They provide year- round cover for songbirds, hawks, owls, turkeys, deer and many other species. This cover is of particular importance during the winter because it provides shelter from severe weather.

### Old Apple Orchard

An old apple orchard is an important food source for many wildlife species such as ruffed grouse, white-tailed deer, cottontail rabbits and gray squirrels. Additionally, apples or apple seeds have been found in the stomachs of fox, fishers, porcupines, bobcats and red squirrels. Old apple orchards provide good habitat for woodcock and many species of songbirds, such as bluebirds, flycatchers, robins, and orioles.

### Early Successional Areas at Thomaston Dam

This area is known to contain dense tangles of shrubs and vines, providing a high-quality source of food for many bird and mammal species including gray catbirds, cedar waxwings, chestnut-sided warblers and cottontail rabbits. Furthermore, current management includes use of food plots as an additional source of nutrition. Annual food plots of corn, white proso millet or sunflowers may be planted as a fall and winter food source. Perennial food plots can also be established as a fall and winter food source. Native shrubs such as viburnums, dogwoods and winterberry are good choices.

## General Recommendations for Habitat Management for Wildlife

- Large blocks of a habitat type are generally more valuable to wildlife than smaller areas, so, if possible, increase the acreage of the greenway.
- Riparian buffers should be a minimum of 100 feet.
- Manage for diversity of forest classes if increasing wildlife diversity is the goal.
- Manage large areas of sawtimber for area-sensitive species.
- Where possible, manage land in conjunction with surrounding landowners.
- Maintain old apple orchards to produce fruit for wildlife.
- Keep motorized vehicle trails away from the river to prevent erosion.
- Artificial nesting structures, such as wood duck boxes and bluebird boxes, should be cleaned out (old nesting material should be removed) at the conclusion of the nesting season.

## General Forest Management

In the Northeast, our forests are predominately the same age, around 60 to 80 years old, (containing mostly sawtimber size tress), because of our history of clearing for agriculture and charcoal in the late 19$^{th}$ early 20$^{th}$ centuries. In the Northeast, we lack old growth forest (trees at least 100 years old) and young forest (seedling/sapling and brushy/shrubby growth). In the Northeast, 77% of bird species and 88% of mammal species use various combinations of trees size classes, which are seedling/sapling, pole and sawtimber size (Scanlon 1992). In general, most species of wildlife, be it bird, mammal, reptile or amphibian, need a variety of tree size classes or age classes to ensure their survival.

Some species of Neotropical migrant birds, such as ovenbirds and wood thrushes, are considered "area-sensitive." These species need large blocks of mature forest (500 to 1000 acres) to reproduce successfully (and therefore maintain a viable population). However, it should be noted that other Neotropical migrants such as blue-winged warblers, prairie warblers, and chestnut-sided warblers require seedling-sapling and/or brushy-shrubby areas of habitat. There is a need for both large expanses of unbroken forestland and areas of "early successional

habitat," which includes fields, old fields, grasslands, seedling-sapling, and brushy-shrubby areas.

One way to create forest diversity is through forestry operations. The two basic forestry silvicultural methods used in Connecticut are "uneven-age management" and "even-age management." Each system produces both positive and negative impacts for wildlife species. In general, under the even-aged management system, all the trees in an area are cut and a new forest is grown from existing sprouts/seedlings and new sprouts that occur after cutting. This produces the seedling-sapling habitat that is so important for many species of wildlife. Under the uneven-aged management system, certain trees are selected, creating temporary gaps in the forest, which are beneficial to some species.

## Recommendations for Managing Forest Habitat for Wildlife

- Use best management practices for forestry operations.
- Use forestry practices to benefit both forest health and wildlife.
- Leave snag trees (a standing dead or dying tree) at a distribution of 3 to 4 per acre.
- Leave den trees (a large diameter tree, 15 inches or greater dbh (diameter at breast height), with a cavity in it) at a minimum distribution of 1 per acre.

## Literature Cited

Scanlon J. 1992. Managing forests to enhance wildlife diversity in Massachusetts. Northeast Wildlife Vol. 49, pp 1-9.

# The Natural Diversity Data Base

The Natural Diversity Data Base maps and files for the project area have been reviewed. According to our information, there are known extant populations of State Special Concern *Empidonax alnorum* (alder flycatcher) that occur within the vicinity of this project.

The alder flycatcher is a songbird that can be found in Connecticut during the breeding season (approximately May through July) and also during spring and fall migration. As a nesting species, it only regularly occurs in northwestern Connecticut. The alder flycatcher prefers areas with a shrubby understory that are near streams and open water. They most often select alder or buttonbush for nesting.

Without additional information on what the greenway project entails, it is not possible to comment on potential impacts. However, it is important to note that this area is an important migratory corridor and stopover area for numerous avian species. A recent three-year study by the Wildlife Division has documented migrant use along the Naugatuck River corridor. Analysis of results and final report and expected to be available late in 2005.

The Wildlife Division – North Franklin Office has not made an on-site inspection of the project area. Consultation with the Wildlife Division should not be substituted for on-site surveys required for environmental assessments. This is a preliminary site review and is not a final determination. A more detailed review may be conducted as part of nay subsequent environmental permit applications submitted to the DEP for the proposed project. Please be advised that should state permits be required or should state involvement occur in some other fashion, specific restrictions or conditions relating to the species discussed above may apply. In this situation, additional evaluation of the proposal by the Wildlife Division should be requested and species-specific surveys may be required.

Natural Diversity Data Base information includes all information regarding critical biological 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 substitutes 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.

# Forestland Review

The study area is a 3,000-foot wide corridor along the Naugatuck River extending 32,770 feet (6.2 miles) from the CT Route 118 Bridge in Litchfield to the US Army Corps of Engineers' Thomaston Dam in Thomaston. The project area totals 2,261 acres of which approximately 1,776 acres (78%) can be considered forested. The area's forest cover can be broken down into two broad types, Mixed Hardwood and Softwood/Mixed Hardwood. The Mixed Hardwood Cover Type occupies 1,181 acres (66%) of the total forested acreage. The Softwood/Mixed Hardwood Cover Type occupies 595 acres (34%) of the total forested acreage.

## Forest Cover Type Description

The **Mixed Hardwood type** is defined, as a forest cover type that has at least 60 percent of the main tree canopy comprised of deciduous trees. The predominant species are black oak, chestnut oak, red oak, scarlet oak, white oak, red maple, beech, black birch, and hickory. Other hardwood species can occur in a lesser extent, or on specific sites such as floodplains, riverbanks, sites disturbed by human activities, and enriched sites at the base of slopes. Those tree species are black locust, eastern cottonwood, northern catalpa, silver maple, boxelder, sugar maple, Norway maple, elm, sycamore, willow, tree-of-heaven, white ash, aspen, black cherry, gray birch, yellow birch, white birch, swamp white oak, yellow polar, basswood, flowering dogwood, and shadbush. Softwood species present in the main canopy are eastern hemlock, white pine, pitch pine, and eastern red cedar. The predominant shrub species are mountain laurel and witch hazel. Other shrubs present are staghorn sumac, multiflora rose, Japanese barberry, autumn olive, honeysuckle, alder, spicebush, winterberry, high bush blueberry, dogwood, willow, and elderberry. Vines present are grape, Asiatic bittersweet, poison ivy, and Virginia creeper.

**Softwood/Mixed Hardwood type** is defined, as a forest cover type that has at least 60 percent of the main tree canopy comprised of coniferous trees. The predominant species are eastern hemlock and white pine. The predominant hardwood species present are red maple, black birch, black oak, red oak, white oak, scarlet oak, beech, and hickory. Shrub and vine species found in

the Mixed Hardwood type also occur in this type but to a lesser extent due to the heavy shade from the main canopy. The hemlock is infested with two exotic sap-sucking insects, the hemlock wooly adelgid and the elongated hemlock scale.

# Study Area Description

The study area is broken down into three sections. A description of each section follows.

### Section One

Section One begins at the CT Route 118 Bridge in Litchfield and ends at the Campville Road Bridge in Harwinton. The total length of the section is 12,777 feet. The area is 880 acres of which 756 acres (86%) could be considered forested. Mixed Hardwood type occupies 476 acres (63%) and Softwood/Mixed Hardwood type covers 280 acres (37%) of the forested area in the section.

The predominate land use of the section is forestland. There is some industrial and residential development in the northern portion and residential use in the southern end of the section. A transportation corridor extends through the center of the section. The aspect on the western side of the section is easterly, while the eastern side has a westerly aspect. The slopes on both sides are steep, in excess of 20 percent. Elevations range from 900 feet on the western side to 468 feet at the Campville Road crossing. There is little access to the area except for the northern and southern portions.

### Section Two

Section Two begins at the Campville Road Bridge and ends at the site of the old Route 8 crossing in Harwinton. The total length of the section is 8,388 feet. The area of the section is 578 acres of which 433 (75%) can be considered forested. Mixed Hardwood type occupies 262 acres (60%) while the Softwood/Mixed Hardwood type covers 171 acres (40%) of the section's forestland.

The predominant land use on the west side of the section is the transportation corridor and light residential development. The east side of the section is forestland and scattered residences. The aspect is the same as Section One. The slopes are more moderate, under 20 percent. The elevation ranges from 750 feet on the western side to 450 feet at the old Route 8 crossing. Both sides of the section have good access.

### Section Three

Section Three begins at the old Route 8 crossing in Harwinton and ends at the Thomaston Dam in Thomaston. The total length of the section is 11,605 feet. The area of the section is 803 acres of which 587 acres (73%) can be considered forested. Mixed Hardwood type occupies 443 acres (75%) while the Softwood/Mixed Hardwood type covers 144 acres (25%) of the section's forestland.

The predominant land use on the west side is forestland. The east side of the section is forestland and scattered residences. The section's aspect is southwest in the eastern side and northeast in the western side. The slopes are moderate to steep in the northern portion and slight on the southern portion of the section. The elevations range from 750 feet in the western side to 400 feet at the foot of the dam.

Access to the section is restricted in the western portion by the Route 8 and railroad corridor. The access in the eastern portion is limited.

## Vegetation Management Considerations

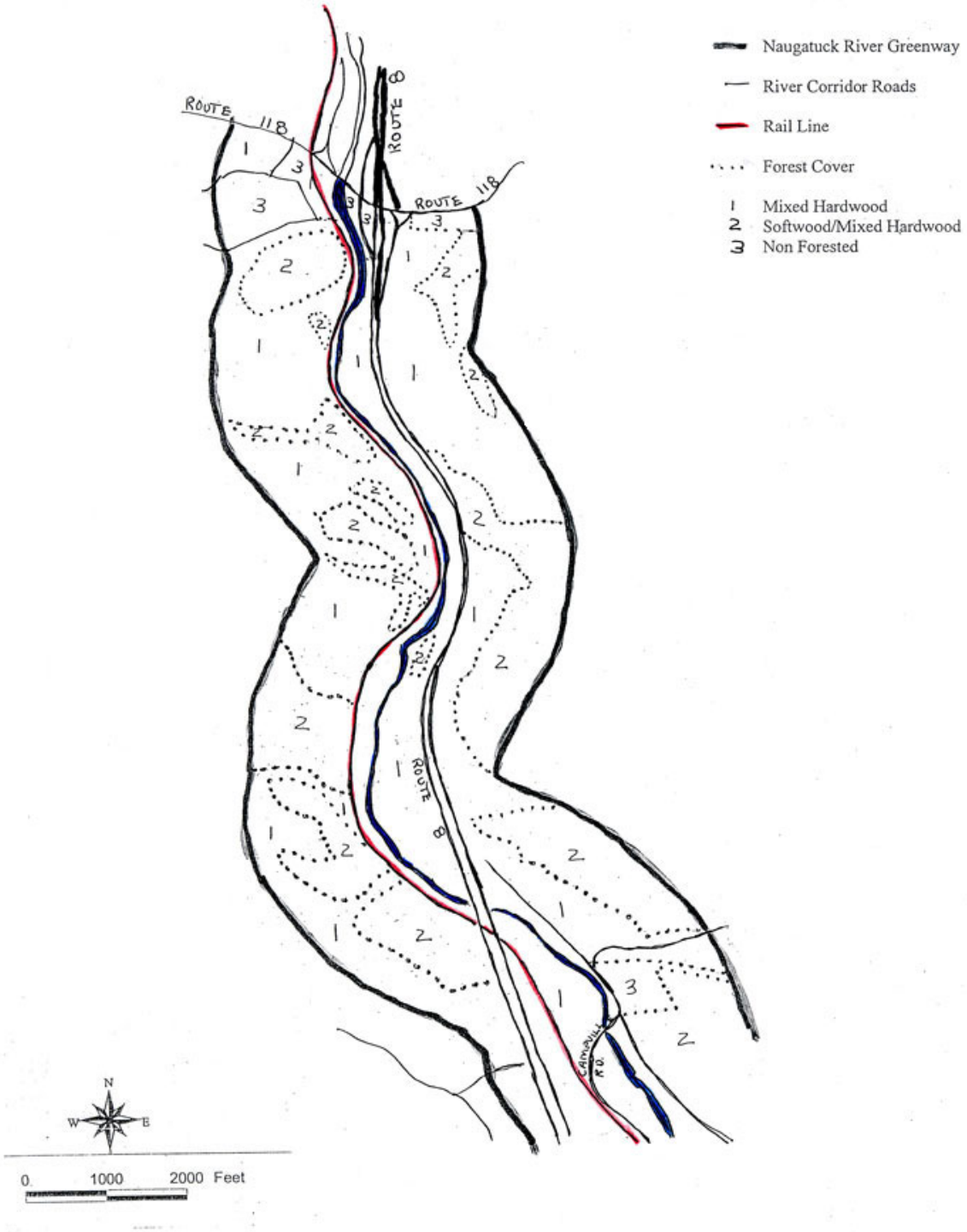
The ownership patterns of the study area reveal that at least 50 percent of the area is under public ownership. In the western portion of the study area, nearly all land between the river and the rail line is publicly owned.

Active forest management is restricted to portions outside the flood zone designated by the Army Corps of Engineers. The terrain and limited access will further restrict management opportunities.

The percentage of forest cover in the study area should remain stable due to its landownership patterns, the limited access, and restrictive terrain.

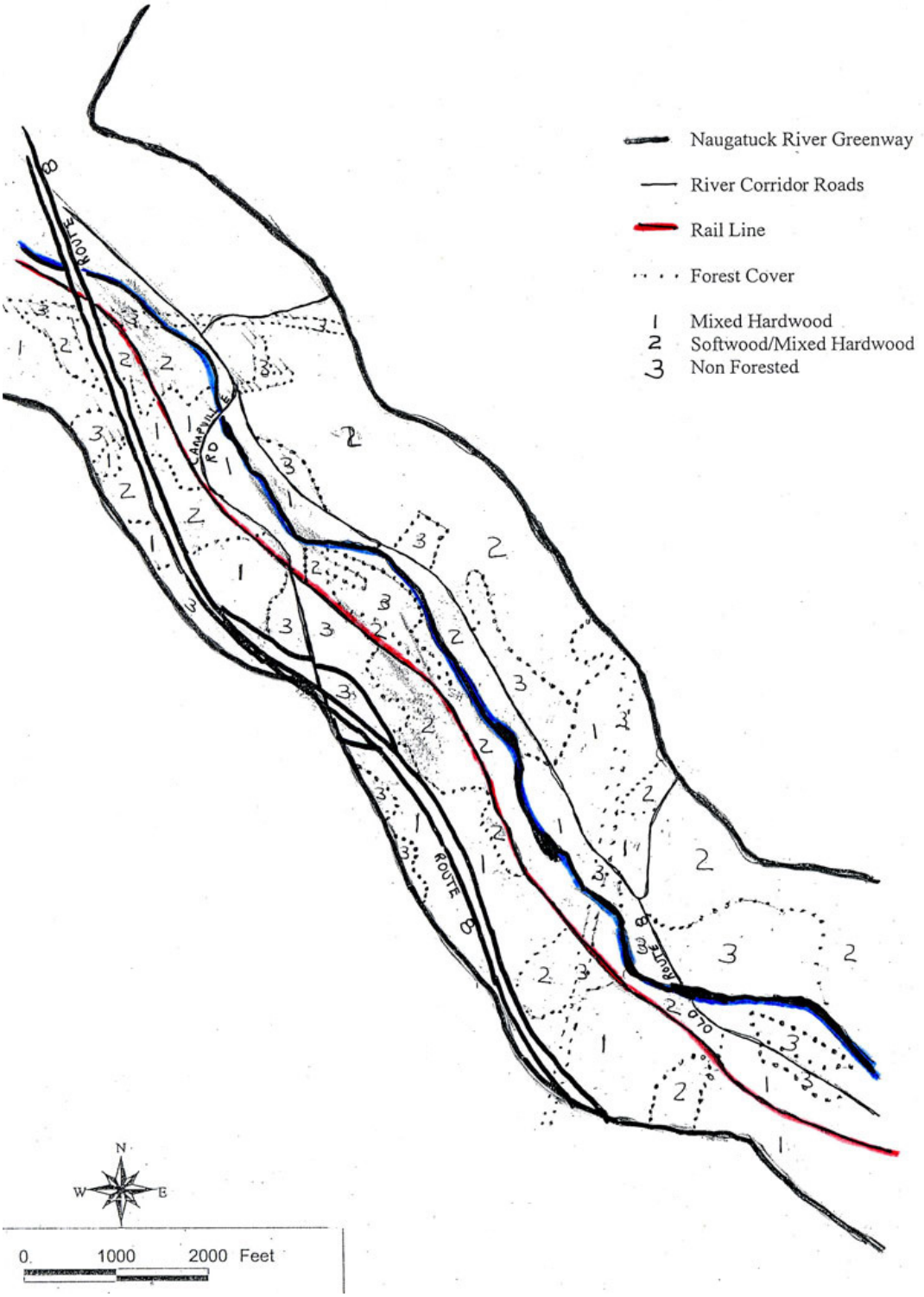
Naugatuck River Greenway Study

**Forest Cover Map**
**Section One**



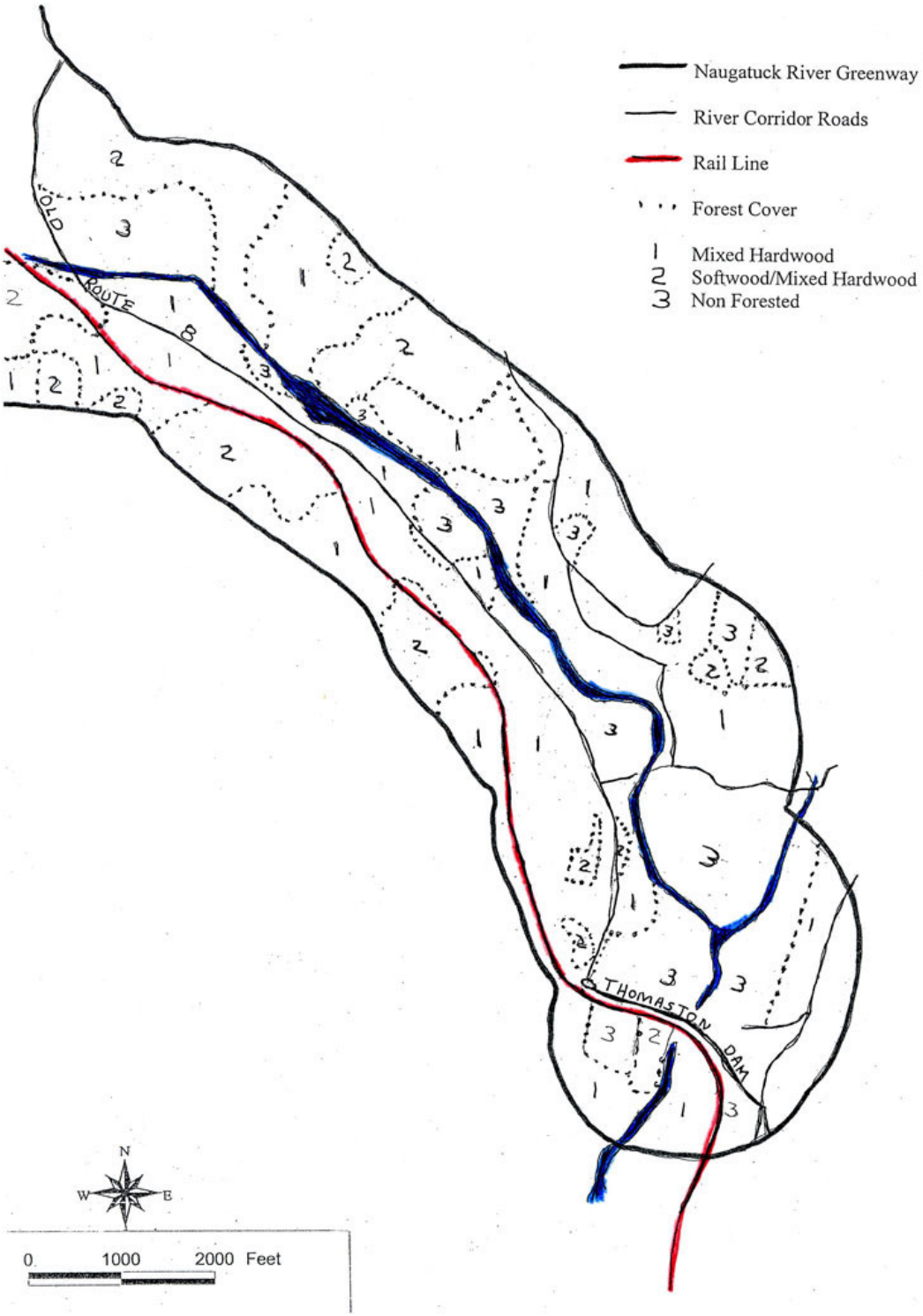
Naugatuck River Greenway Study

**Forest Cover Map**
**Section Two**



Naugatuck River Greenway Study

**Forest Cover Map**
**Section Three**



# Natural Resource
# Conservation Service Review
# Recreational Use of the River

The +6 mile segment of the Naugatuck River Greenway provides an excellent resource for passive recreational use of the river. There is more than 2000 acres of combined federal, state and private land in this area. The US Army Corps of Engineers (US ACOE) land at the Thomaston Dam has a large amount of acreage it manages as a special use area with public access. Several recreational activities occur on this land. They include:

**Trail Bike Riding** - The US ACOE has designated a trail area on the west side of the reservoir permitting use of motorized trail bikes and snowmobiles. Other three and four wheeled all terrain vehicles are currently prohibited from using the site. Trail bike visitation usage is very high on weekends. The trails for two wheeled trail bikes are open from May 1st through October 14th. There is interest from the public in expanding the recreational use of the site to ATVs.

**Radio Controlled Model Aircraft** - There is an area maintained under a cooperative agreement with a local club. The flight area is open to the public and groups through the Corps special use permit program.

**Picnicking** - A small day use picnic area with twenty tables, with a restroom, is located near the US ACOE Project Office. A public telephone is located at the US ACOE Project Office on the east side of the dam. There are no overnight camping facilities at Thomaston Dam.

**Winter Recreation** - Winter sport activities on the US ACOE land includes - cross country skiing, ice fishing, snow shoeing, and snowmobiling.

**Hunting** - Bow Hunting is permitted on the US ACOE land. There is stocked pheasant and upland game and white tail deer. The US ACOE has a Forestry Management Plan that calls for wildlife food plots, apple orchard management, wood duck house establishment and management.

**Fishing** - The Naugatuck River is classed as a Trophy Trout Steam in this area. Anglers fish for the stocked and native species of fish in the Naugatuck River and smaller brooks.

## Passive Recreation Opportunities

- **Good Existing Trail System** - The existing trails along the River in this section are gentle in grade, well drained and fairly wide. They are suitable for use by hikers, people fishing, mountain bikers, cross country skiers, and horseback riders.

- **Connect to Planned Greenway** - Connect a trail system to the planned Naugatuck River Greenway.

- **Connect to Adjacent Preserved Open Space** -
    - Connect a trail system to the existing trails through the Roraback Wildlife Management Area in Harwinton, and to the Town of Harwinton's Conservation Area on Route 118. The Conservation Area has an established parking area.
    - Connect a trail system to the Pine Cobble section of the Mattatuck State Forest in Litchfield. The closest established parking area is at Topsmead State Park on Buell Road in Litchfield.

- **Create Access by Railroad** - Use the trail system in conjunction with the railroad to facilitate access to biking, hiking or fishing. A scenic rail line has operated between Thomaston and the Waterville section of Waterbury, crossing Thomaston

Dam. The 18-mile roundtrip between Waterbury and Thomaston followed the Naugatuck River, crossing it three times. A “rails and trails” option may be possible along the rail line, which could extend into the northern Phase I section of the greenway. Slope stability north of the dam has been stated as a problem with operating this rail line.

## Passive Recreation Constraints

- **Limited Parking** - There are existing parking lots at the Thomaston Dam, the Old Litchfield Railroad Station, the commuter lot on South Main Street in Litchfield, Topsmead State Park, Harwinton Conservation Area, The CT DEP Headquarters at the Roraback WMA, and on South Road in Harwinton at Rock Brook.

    - Parking is full at the US ACOE Thomaston dam on cool days. Promoting alternative parking locations could provide additional access to this area.
    - Fishermen park at the Campville Road Bridge. Parking in this area could be expanded.
    - The parking at Topsmead State Park would require people to go by road from the parking to the Mattatuck State Forest. This would not be a problem for mountain bikers, who could take Buell Road, to Richards Road, to Redar Road, to Schoolhouse Road., to Kennedy Road in Litchfield to get to the existing trail system. These are mostly dirt roads.
    - The parking at the old railroad station East Litchfield Road in Litchfield is extremely limited. There is an existing commuter parking area located on South Main Street, however, there is currently only access by road (across Route 118) to the existing trail network near the Old Railroad Station. Perhaps pedestrian access can be considered in future Route 118 Naugatuck River bridge repair proposals.

- **Low Water Flows/ River Obstructions** - Small water craft can not go through the dam. The river above the dam is rocky and does not have enough flow most of the year to support water craft.

- **High Existing Usage** - the US ACOE site is already used heavily. Passive recreation activities that occur at off peak times could be encouraged. Peak times are May 1 through October 14, especially on weekends.

- **Limited River Crossings** - There are only limited areas where the Naugatuck River can currently be crossed to provide a loop trail on both sides of the River. These include – Route 118 in Harwinton, Campville Road in Litchfield, the Thomaston Dam. This is less of an issue for mountain bikers who could make a loop from the Old Litchfield Railroad Station, through the existing river trails, across the Thomaston Dam, through existing trails to Valley Rd, to Campville Road, to Mansfield Road., to Birch Hill Road, to Route 118. A section of Birch Hill Road is dirt.

- **Water Degradation** - There are few water quality problems arising along this section of the river.
    - There is some erosion along the dirt bike trails – A cooperative agreement for trail management is in place with a motorcycle club - culvert installation, crushed stone and rip-rap armoring are all planned to control this erosion.
    - There is some stream bank erosion near the dam, where water levels vary widely – the US ACOE is addressing this issue.
    - There is a private composting facility on River Road – it is following a CT DEP certified agricultural waste management plan to protect water quality.
    - There is one farm/forestry operation in this area with no known water quality issues
    - Trash flows from upstream - Trout Unlimited sponsors river cleanup days.

- There are pollution sources upstream of this river section as discussed in the Naugatuck River Study Phase I - ERT report.

## Soils

Soils maps and tables listing the potential of the different soils are located in Appendix B of this report.

# Recreation Planner Review

## Overview

The section of the Naugatuck River between the Rte. 118 Bridge and the Thomaston Dam lies almost totally within the project boundaries of the U.S. Army COE Thomaston Dam Flood Control Area. As a result, all former development within the flood storage basin has been removed and the river corridor is reverting to a more natural, scenic character.

Similarly, the river itself has been dramatically cleansed from its previously seriously polluted state. Indeed this reviewer can recall a riverside sand and gravel operator (Bartlett) at one time complaining that pollution contamination affected the salability of his earth materials. Because of this improvement in water quality, DEP is now actively stocking this stretch of river with Atlantic salmon!

Access to the river is limited by a combination of rough topography along this deep valley and by the limited access corridor of Rte. 8. As the former Castle Bridge on old Rte. 8 was removed, the only remaining river crossing within this corridor is found on Campville Road. Limited road access east of the river is also available between Campville and Castle Bridge and off Leadmine Road.

## West Bank

This is a steep wooded hillside involving fee ownership by COE. It also contains a state owned rail corridor which is at least potentially apt to become actively reused, if only as a tourist railroad. If so, this could reestablish limits on public crossing per FRA regulations. Currently the area contains a popular motorcycle use area south of Spruce Brook with parking presently at capacity per Vince Gualtieri, COE's project manager.

Some have suggested this area as a candidate for ATV use, as it is already hosting motorized recreation. Furthermore its isolated location with controlled access would simplify management problems, and specifically limit likely trespass impact on abutters. This reviewer concurs and feels that Thomaston Dam offers the best Connecticut site for this controversial activity, with the nearby COE Hancock Brook Property a second possibility. However, introduction of ATV use may necessitate increased parking capacity.

## East Bank

A mix of fee and flowage right ownership by COE limits public use potential. This area does contain permit hunting area near Campville plus a model airplane area near the Naugatuck River – Leadmine Brook confluence. Possible hiking trail opportunity along the East Bank should be explored to determine the potential receptivity of landowners retaining fee ownership.

## River

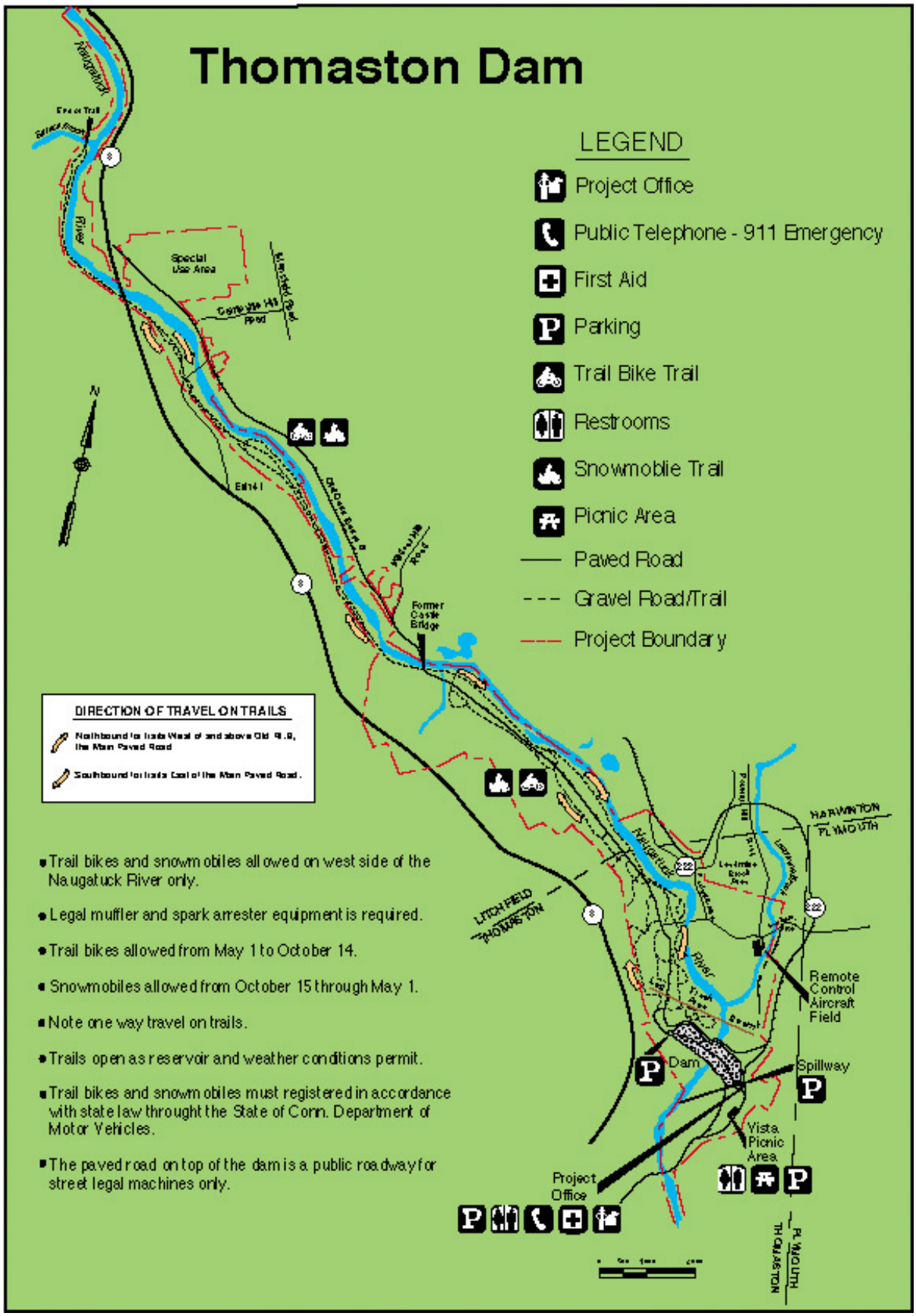
As already stated, water quality has dramatically improved, matching its generally very attractive physical character. Therefore it offers substantial public fishing opportunity including coldwater fishery potential. In addition long range speculation envisions possible anadromous fishery potential if issues involving fish passage through the dam can be feasibly addressed.

This reviewer also feels that this stretch of river has unrecognized potential for canoeing and kayaking. Although the Naugatuck River shares with many Connecticut streams substantial variability of flow limiting recreational boating opportunity, seasonal or post storm activity may well add a popular public use dimension. The possibility of seasonal flow augmentation from flood storage at upstream COE facilities such as Sunny Brook also may merit consideration.

# Miscellaneous Comments

- Possible linkages to enhance the use potential of the general area should be explored. Two possibilities include:
    - Linkage to the large adjoining DEP Roraback Property, offering opportunity for a non-vehicular Leadmine Brook trail.
    - Possible linkage on the West Bank to existing DEP, as well as to currently private property effectively landlocked by Rte. 8.

- Consideration of public parking at the East Litchfield Depot to provide public access to this portion of the river.


Thomaston Dam
LEGEND
Project Office
Public Telephone - 911 Emergency
First Aid
Parking
Trail Bike Trail
Restrooms
Snowmoblie Trail
Picnic Area
Paved Road
Gravel Road/Trail
Project Boundary
DIRECTION OF TRAVEL ON TRAILS
Northbound for trails West of and above Old Rt. 8, the Main Paved Road
Southbound for trails East of the Main Paved Road.
Trail bikes and snowmobiles allowed on west side of the Naugatuck River only.
Legal muffler and spark arrester equipment is required.
Trail bikes allowed from May 1 to October 14.
Snowmobiles allowed from October 15 through May 1.
Note one way travel on trails.
Trails open as reservoir and weather conditions permit.
Trail bikes and snowmobiles must registered in accordance with state law throught the State of Conn. Department of Motor Vehicles.
The paved road on top of the dam is a public roadway for street legal machines only.
Special Use Area
Former Castle Bridge
Naugatuck River
Remote Control Aircraft Field
Dam
Spillway
Vista Picnic Area
Project Office
HARWINTON
PLYMOUTH
THOMASTON

# Archaeological and Historical Review

A review of the State of Connecticut Archaeological Site files and maps shows a number of known archaeological sites listed for the Greenway area. These cultural resources represent prehistoric campsites of Native Americans origin dating to 4,000 years ago and located along the banks of the Naugatuck River. Archaeologists have recovered a number of stone tools including spear points and scrapers associated with Native Americans hunting and gathering activities within the area.

The Office of State Archaeology (OSA) and the State Historic Preservation Office (SHPO) both note that the project area possesses high sensitivity for prehistoric and historic archaeological resources. Therefore, it is strongly encouraged that the Litchfield Hills Council of Elected Officials (LHCEO) recommend and require that a professional reconnaissance survey be undertaken to identify and evaluate all archaeological resources when economic development applications are pending within the watershed. These surveys should be conducted in accordance with the Connecticut Historical Commission's *Environmental Review Primer for Connecticut's Archaeological Resources.*

The proposed plans for the Greenway Project should have no adverse effect on any of these archaeological resources, however, LHCEO should coordinate with the various town officials for the development of planning and zoning regulations that would serve to preserve and protect cultural resources within the Naugatuck River watershed. The OSA and SHPO are prepared to offer any technical assistance in development of the recommended regulations, as well as to review potential impacts to the area in the future.

# Appendix

## A. Information on Official Greenway Designation

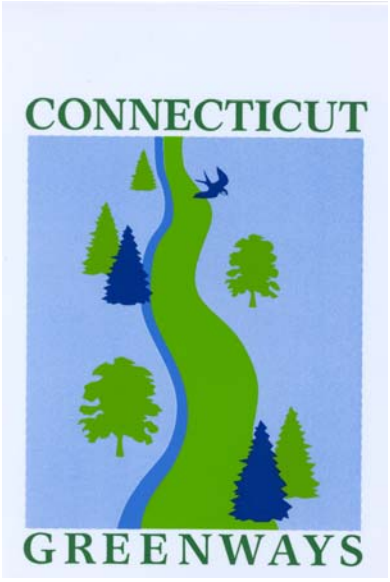
October 3, 2005

To: All Interested Parties

From: The Connecticut Greenways Council

Regarding: Officially Designated Greenways

The Connecticut Greenways Council is soliciting nominations for this year's official state greenway designation. Designated greenways, both for recreation and resource protection, will be listed in a subsequent revision of the State Plan of Conservation and Development and may receive increased consideration for a variety of grants. The Greenways Council will evaluate all nominated greenways for consistency with the attached designation criteria. Those selected for designation will be announced by the Council in the spring of 2006. Please use the attached form for your submittal. **Deadlines for nominations will be March 1, 2006.** For more information, please contact Leslie Lewis at the Department of Environmental Protection, (860) 424-3578 or email at leslie.lewis@po.state.ct.us.



## Nomination for Official Designation of Greenway

Name of Greenway_____

Sponsoring Organization_____

Contact Name_____

Contact Address_____

Contact Phone_____

Town/Towns in which greenway is located_____

Purpose of greenway (resource protection, recreation, etc)_____

Does the corridor connect existing open space, trail segments, historical/cultural assets; provide alternative transportation opportunities; connect neighborhoods to schools, town centers, parks and recreation areas, transportation centers, or open spaces? Yes ___ No __

If the greenway is a municipal project, is it included in local plan of Conservation and Development?

Has it been endorsed by the local government through a municipal resolution or compact? Yes___ No___ (If yes, please include copy)

If the greenway is a regional project, is it included in plans of relevant Regional Planning Agency, or Council of Governments, with endorsements by the affected municipalities; or, has an inter-municipal compact been developed between towns? Yes___ No___
(If yes, please include copies)

If the greenway is a non-governmental project, is it sponsored by an organization with a proven record of land use protection/recreational use, or with proven resources needed for project success; are licensing, easements, or other agreements for use of state, municipal, or private land on file? Yes___ No___ (If yes, please include copies)
Has it been endorsed by the local government through a municipal resolution or compact? Yes___ No___ (If yes, please include copy)

Is the segment submitted for designation a key link in emerging greenway, either for conservation or recreation purposes? Yes___ No___ (If yes, please provide name and location of said greenway)

Please include a description of the project including a map showing location, connections (existing or potential), and adjacent open space if applicable on a 1:24,000 scale USGS Topographic Map.

Nomination forms must be returned by March 1, 2006 to be considered for designation in Spring 2005.

Please return to: Leslie Lewis, Department of Environmental Protection, 79 Elm Street, Hartford, CT 06106. Phone (860) 424-3578 or email leslie.lewis@po.state.ct.us.

**What Does Official Greenway Designation Mean?**

In its enabling legislation, the Connecticut Greenways Council was charged with establishing criteria for designating greenways around the state. The Council took some time and thought to evaluate this charge, and the criteria were finalized in 2000. (They are attached for further information.) As part of Greenway Week 2001, the first 18 officially-designated greenways were announced by the Council and Governor Rowland.

What does designation as a greenway mean? For the first designees, it means that the Council, in consultation with the DEP Greenways Assistance Center, has determined that the greenway project has many of the qualities described in the criteria: connectivity, local support, a history of success. In addition, these projects were regional in scope, linking at least two or more towns.

Designation also offers a level of visibility for a greenway project. Each greenway will be listed in the next revision of the State Plan of Conservation and Development as prepared by the Office of Policy and Management. This plan serves as a "blueprint" for state agencies and state-funded projects. Greenways should not be adversely affected by these projects. Conversely, designation should attract state grant monies which may be available in the future. State recognition of greenways may also help in the pursuit of such federal designations and Wild and Scenic Rivers or National Scenic Trails. It should be noted that greenway designations do not restrict private property rights in any way.

In the future, communities will be able to nominate their greenways for official designation. For more information on the process, please contact Leslie Lewis, DEP Greenways Assistance Center, (860) 424-3578.

*NATIONAL RECREATIONAL TRAILS PROGRAM*

**TO: USER GROUPS,**
**MAINTAINERS &**
**DEVELOPERS OF RECREATIONAL TRAILS**

The Recreational Trails Program is an assistance program of the U.S. Department of Transportation's Federal Highway Administration. RTP is administered through the Connecticut Department of Environmental Protection (DEP). Recreational Trails Program funds may be used for:

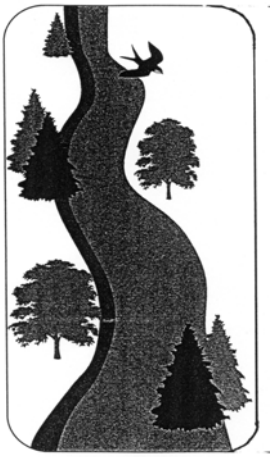
- Construction of new trails. (motorized and nonmotorized)
- Maintenance and restoration of existing recreational trails. (motorized and non-motorized)
- Access to trails by persons with disabilities.
- Purchase and lease of trail construction and maintenance equipment.
- Acquisition of land or easements for a trail, or for trail corridors.
- Trail Use Education, Environmental/Historical Trail interpretation.

DEP may award grants to private nonprofit organizations, municipalities and state departments. Sponsors may submit proposals for any of the permitted uses as listed. Grant awards are generally capped at $50,000. **These are reimbursement grants, with a federal share limited at 80% of the total project cost. Project sponsors must incur cost for work actually completed, and then submit vouchers to DEP for payment. No payment can be made for work done prior to a fully-executed grant agreement.** A project sponsor should tailor the project so that the project moves quickly into implementation after project approval. Projects must be reviewed by the State Historic Preservation Office and the Natural Diversity Date Base to avoid any negative impact to the State's natural, cultural or historic resources. Grants may be delayed or denied if such impact is detected. A checklist of issues is attached for your information.

DEP's funding level for this program for FY 2006 - 7 (federal) has not been finalized, but is expected to be about $900,000. Project proposals are being solicited for trail related projects. Proposed projects must have funding available, be located on publicly-accessible land and be open to the public. Necessary permits must be in place prior to beginning the project. If you would like to be considered for a grant, please complete the attached questionnaire and submit it to DEP before March 1, 2006 (post marked) for this grant round. Project proposals received after this date will not be reviewed for this funding cycle. **Final approval and dispersal of funds will occur in October of 2006.** If you have any further questions please feel free to contact Leslie Lewis at (860) 424-3578 or email at leslie.lewis@po.state.ct.us.

Revised 11-21-01

# RECREATIONAL TRAILS PROGRAM



## *GRANT QUESTIONNAIRE*

**PROJECT TITLE:**

_____

**SPONSOR**:

_____

**CHIEF EXECUTIVE OFFICER**

NAME & TITLE:_____
SPONSOR'S ADDRESS:_____

**PREPARER**

NAME & TITLE :_____
PHONE NUMBER: _____
E-MAIL ADDRESS_____
TOTAL PROJECT COST: $ _____(need to include labor)
TOTAL AMOUNT REQUESTED: $_____(up to 80% of total cost)
TOTAL PROJECT AREA: _____ACRES LENGTH OF TRAIL_____

circle appropriate term ACQUISITION DEVELOPMENT RENOVATION
MAINTENANCE EDUCATION
OTHER:_____

**Your response to the following questions will be used to evaluate and rank your proposed project. Responses, where appropriate, should be direct, concise and accurate, please include all appropriate requested supporting information. NOTE: Projects selected for funding under this program are subject to the requirements of the National Environmental Policy Act (NEPA), the Clean Water Act (CWA) and the National Historic Preservation Act (NHPA), each as amended. The requirements of Section 4(f) of the FHWA regulations do not apply to this program.**

1. **Project Description:** Describe the project as it relates to providing and/or enhancing a public recreational trail. If the project is a development or renovation, include a trail location map showing the proposed improvements. Trail project must be on publicly accessible land. Who holds principle interest of the land upon which the project is located? Provide proof of ownership. If you are a user group proposing improvements on the trail do you have

permission of the property owner to complete these improvements? If yes provide letter(s) of support. Will this be a first-of-a-kind recreation opportunity for the municipality or region? **YES____ NO____.**? Describe any unique or imaginative ways this project will meet the recreational need of the community. **A detailed scope of work must be included in this application**.

**REQUIRED MATERIAL**

**[ ] Topographic Map (USGS 1:24,000 scale (enlarged if possible))**
**[ ] Town Road Map (Mail-a-map, etc...)**
**[ ] Site Plan (Trail Location Map, Design Schematic)**
**[ ] Proof of ownership**
**[ ] Copy of Support\Permission letter(s)**

**2. Site Suitability:** Is the site, as it exists, suitable for the intended project or will major physical changes be required? Explain any required changes. If permits need to be obtained (Inland Wetlands, Conservation Commission, Recreation Commission, Corps of Engineers...etc), have they been obtained? If so provide copies. Describe consideration given to trail design and access onto and through the site. Describe both positive and negative impacts of the project on the environment. Pay particular attention to flood plains, wetlands, aquifers, prime or unique farmlands, endangered species, historical, geologic and archaeological sites, and coastal zones. Are there any reserved rights/restrictions or environmental intrusions (power lines, dumps, factories, roads, etc...) on or in close proximity to the trail? **YES____ NO____.** If yes, please give details. Are there any residential houses along the trail that would be affected by trail users? Have these resident owners been informed about the project scope?

**3. Site Convenience/Accessibility:** Convenience is defined as the location of this site with respect to the service area. Please identify the major service area(s) (neighborhood(s), city(ies), region) which would be affected by this trail. Indicate the approximate mileage the primary service areas would need to travel to access this site. Within the identified primary service area is there any elderly housing project, housing authority (public housing), ethnic community or low or very low income areas or neighborhoods? **YES____ NO____.** If yes, please describe the methods or means by which these user groups will access the site. What is the estimated population of this areas? Will this project be multi-use or single-use? Which user group or groups would be utilizing this trail? Provide some indication of use intensity expected (i.e. user/week) and method of transportation (pedestrian/hiker, mountain biker, trail bike)? Provide a list of user groups and their respective membership numbers that would utilize this trail. If this project is multi-use, is there the possibility of conflicting use? If so, how will these conflicts be resolved?

**4. Statement of Need:** Provide supporting justification that this project meets a documented need. Such Justification can be excerpts in a Municipal Plan of Development, Recreation Plan, Conservation and Development Plan, Regional and/ or State Plan. Explain how this project meets that need.

**REQUIRED MATERIAL**

**[ ] Relevant Excerpts**

**5. Public Participation:** Was public participation at the local level included in the planning this project? Please describe. Public participation can be defined as: special public meetings, reviewed by special interest groups or advisory councils and boards, public fund raising, construction or maintenance, etc... Evidence of this public participation should be provided, such as public notices, news releases, public surveys. minutes and news articles.

***In general, greater consideration will be given to those projects that provide maximum opportunity for community residents to volunteer in design , funding solutions, construction and continued operation & maintenance of the proposed project.***

**REQUIRED MATERIAL** **[ ] Evidence of public participation**

**6. Funding Mechanism:**: This is a reimbursement program, funds are to be expended within the approved project period before reimbursement is available. Provide documentation showing the source and availability of funds and cash flow to complete the project. Will the project be completed with the donation of land, cash or equipment from private organizations, agencies, companies or individuals? **YES____ NO____.** If yes, please list and explain the pledge or services which will be donated. **There will be no reimbursement for work undertaken prior to full execution of a contract agreement between the applicant and the State of Connecticut.**

***In general, greater consideration will be given to those project proposals for which individual, group and or corporate involvement in support, design, construction and continued operation of the proposed facility has been secured.***

**REQUIRED MATERIAL**
**[ ] Capitol Budget**
**[ ] Written Pledges**
**[ ] Special Fund Account**

**7. Project Cost Estimates:** **An itemized project cost breakdown must be provided**. Describe the means by which said cost was derived. List any engineers, appraisers, contractors or manufacturers that were consulted.

**REQUIRED MATERIAL**
**[ ] Itemized Cost Breakdown**
**[ ] list of Consultants**

**8. Operation and Maintenance Capabilities:** Please provide evidence of the capability to maintain and operate this proposed project.

**Added Request: As part of an on going process of recording and mapping public trails within the State of Connecticut, if the proposal is part of a trail system, please provide a copy of all public trails within the municipality on a 1:24,000 scale (topographic map) if available. The Department of Environmental Protection is the process of mapping trails with the state on a GIS data base. Thank you for your assistance and cooperation - happy trails**.

Please return this questionnaire postmarked by **March 1, 2006** along with required documentation to the following address:

**Leslie Lewis**

**Department of Environmental Protection**

***State Parks Division***

**79 Elm Street**

**Hartford, CT 06106-5127**

**(860) 424-3578**
**leslie.lewis@po.state.ct.us**

**Recreational Trail Grants**

1) This is a reimbursement program. Does the applicant have sufficient funds on hand to complete the project in a timely manner?

2) If the applicant is a club or association, do you have a current Federal Employee Identification Number (FEIN)? Do you have a completed Federal W- 9 form? DEP cannot process grant contracts without this information.

3) Does the project involve bridges, boardwalks, or work adjacent to watercourses? If so, you must check with you local regulatory agencies to determine if permits for wetlands, stream channel encroachment, or flood plains are necessary.

4) The State Historic Preservation Office (SHPO) must review and approve all projects for funding. You should forward a project summary and site map of your application to David Poirier at CT Commission on Culture & Tourism**,** History Division, 59 S. Prospect Street, Hartford, CT 06106

5) Funds for this grant round will not be released until October 1, 2006. All awardees will need to enter into contract agreements with DEP to receive the grants. Given the length of time it takes to process the contracts, projects will probably not be able to start until spring of 2007. Please remember that DEP does not reimburse for any work done prior to the full execution of the grant contract.

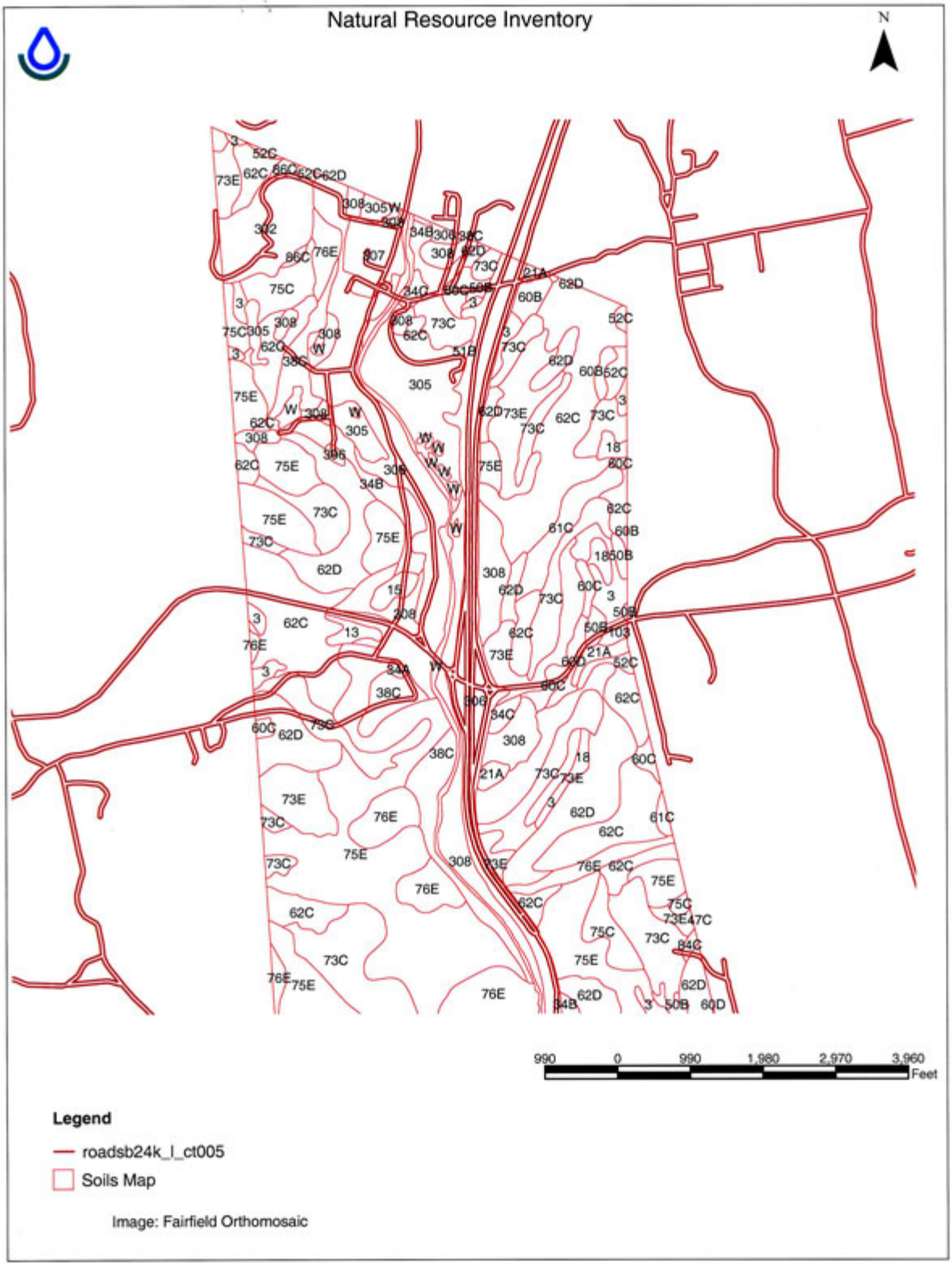
6) The Natural Diversity Data Base and the DEP Wildlife Division may further review and evaluate projects for their potential impact on endangered or threatened species. Project managers may need to conduct further studies to prevent any such impact.

7) Prior to all final payments on the grants, applicants must contact the DEP to let them know that the project is complete and to arrange for a site visit.

8) This grant program cannot fund planning projects. There may be other sources of funding for planning in the near future.

# Appendix B

## B. Soils Information


Natural Resource Inventory
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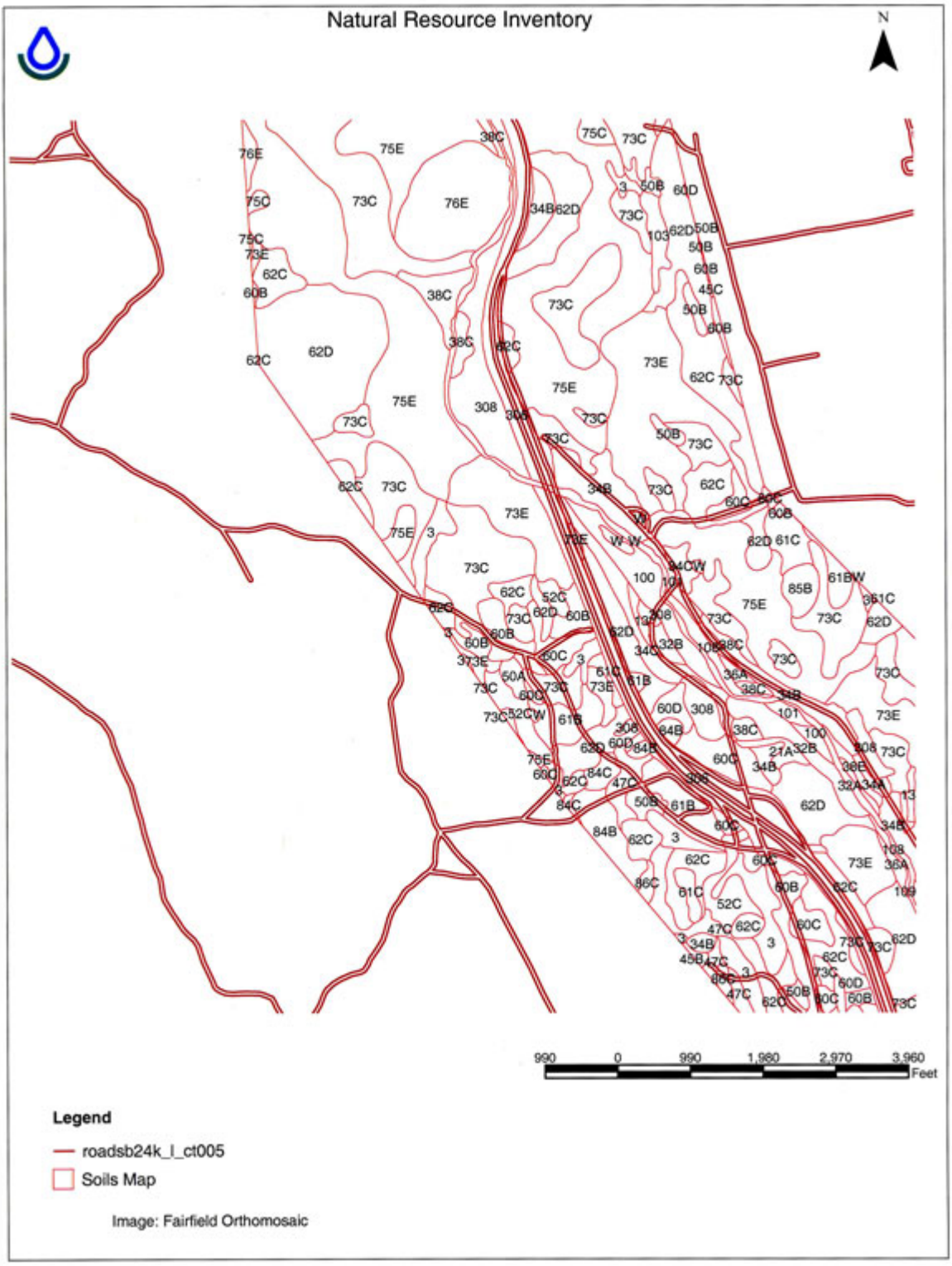
roadsb24k_l_ct005
Soils Map
Image: Fairfield Orthomosaic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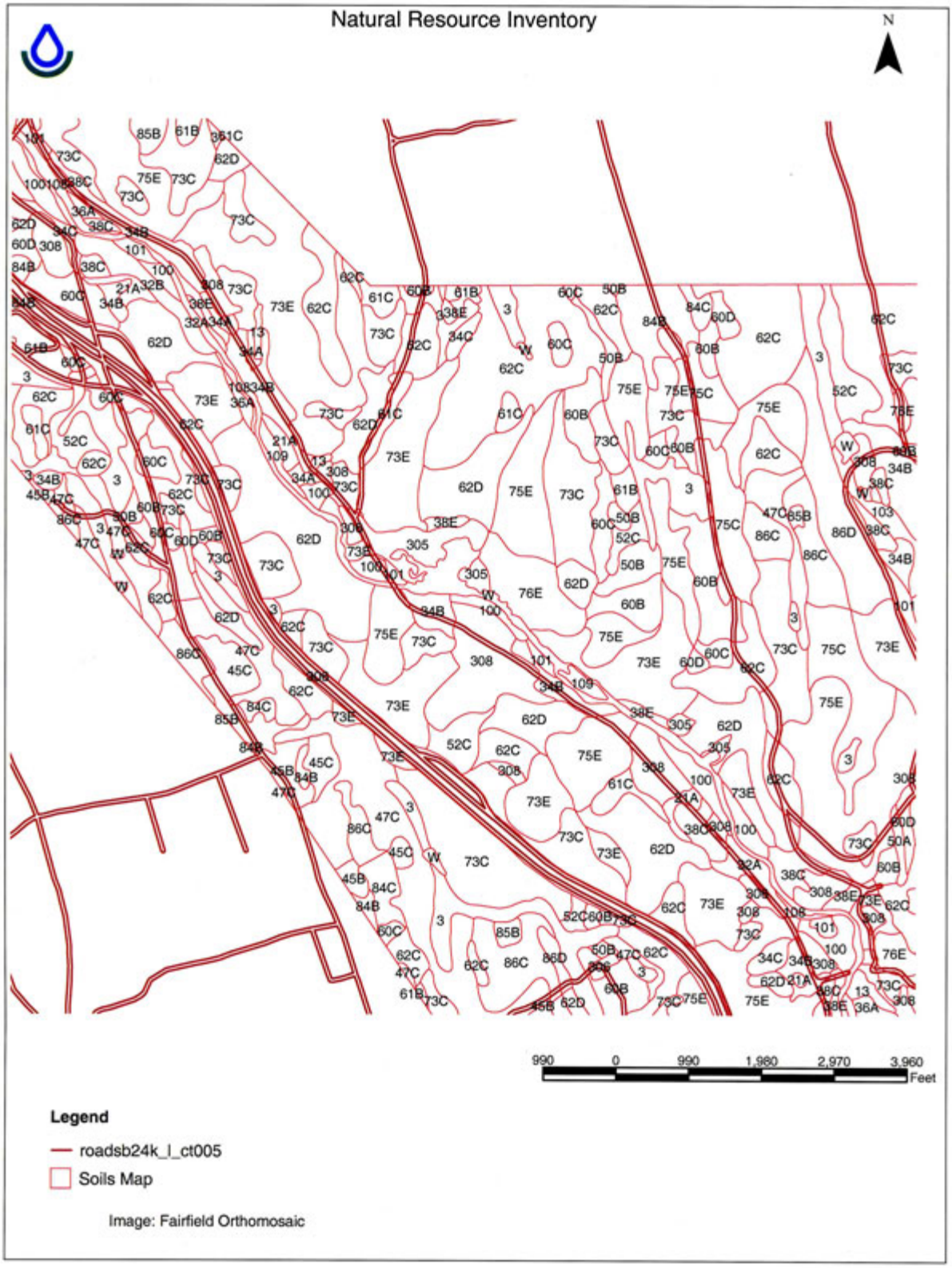
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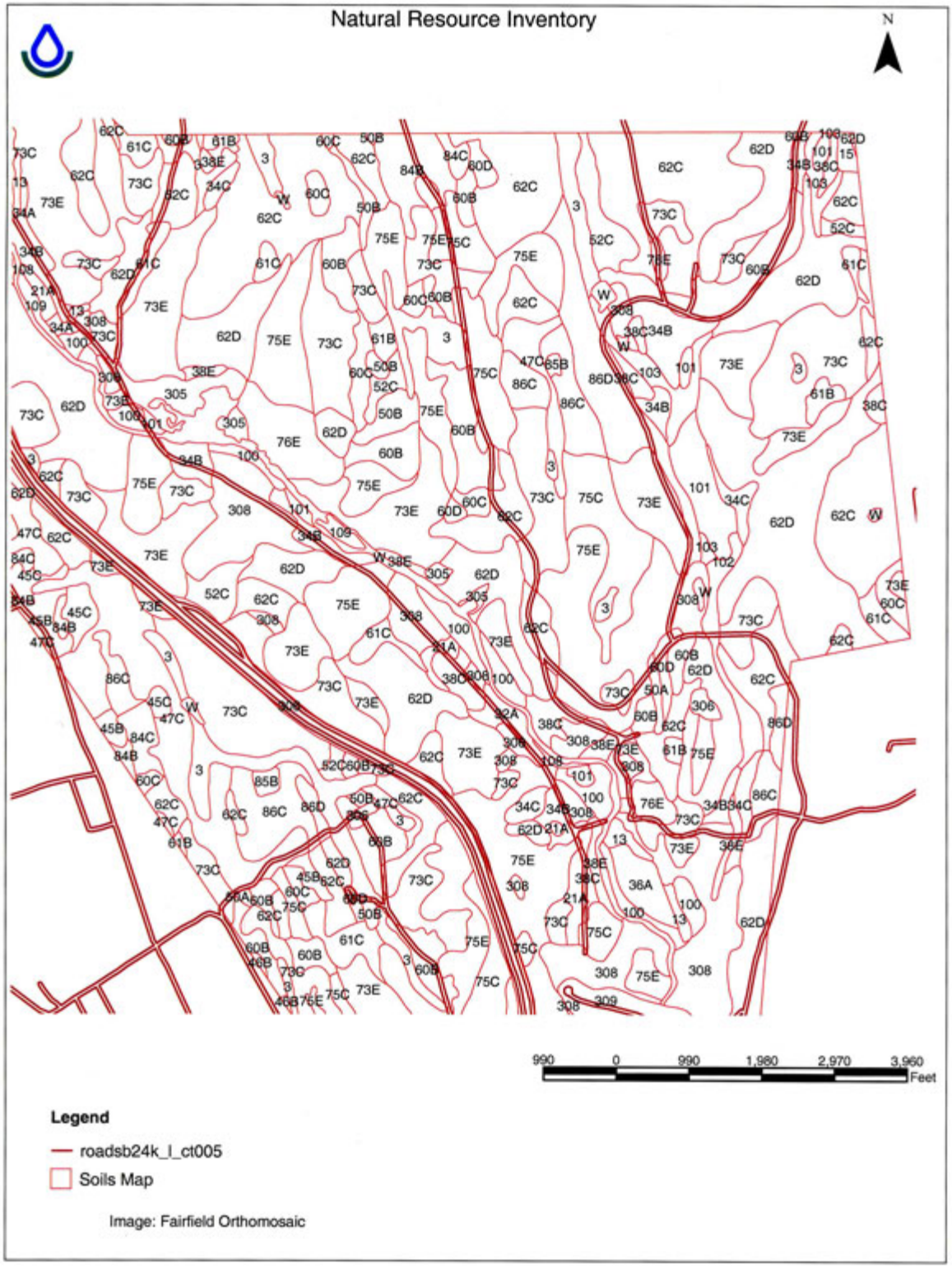
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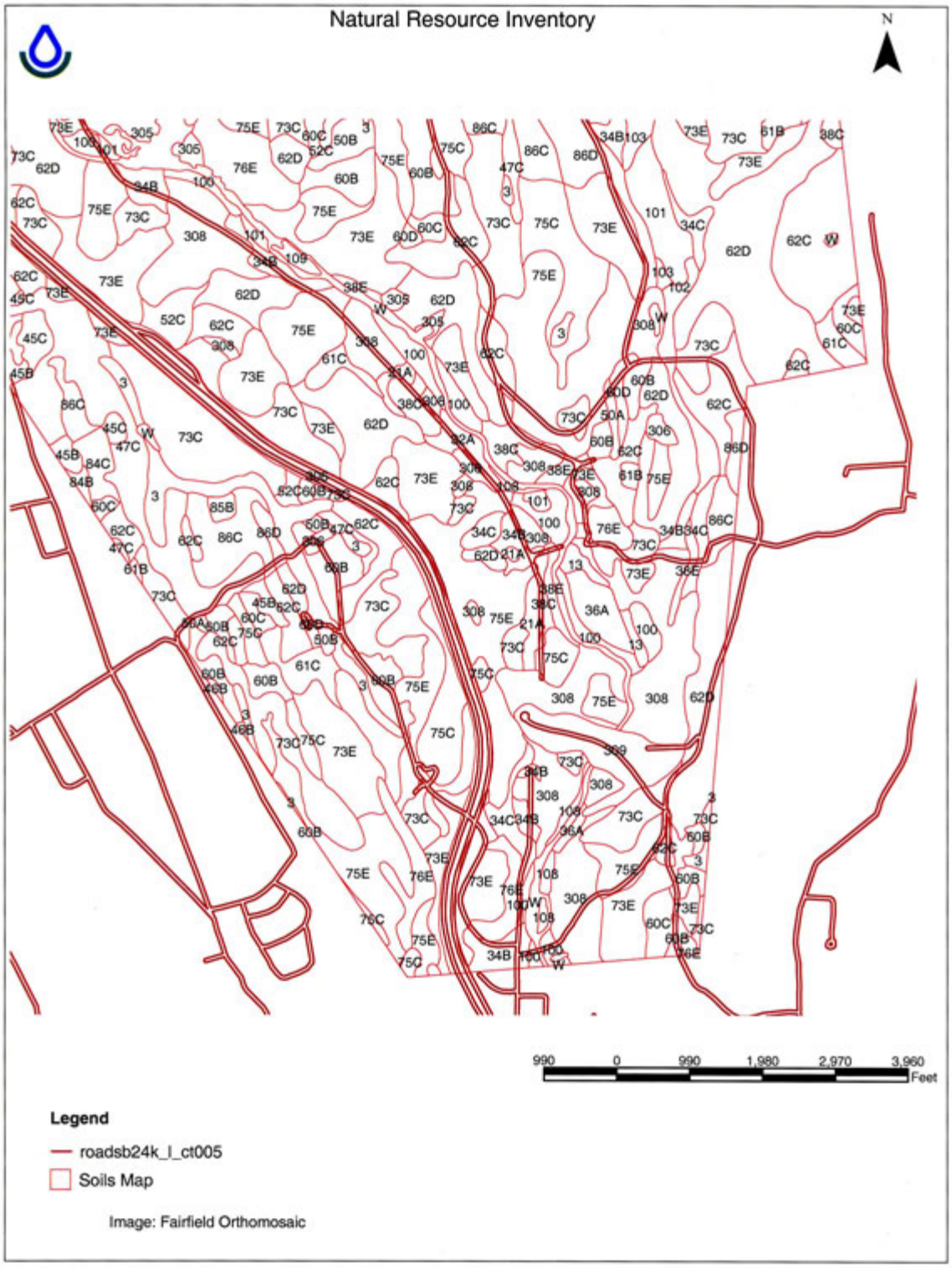
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Feet
Legend
roadsb24k_l_ct005
Soils Map
Image: Fairfield Orthomosaic

For soils tables please call the ERT (860) 345-3977.