Curtis Woodlands and Friendly Acres Farm

Natural Resource Inventories

Durham Connecticut

Eastern Connecticut Environmental Review Team Report

Eastern Connecticut Resource Conservation & Development Area, Inc.

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Natural Resource Inventories

Durham, Connecticut

Environmental Review Team Report

Prepared by the
Eastern Connecticut Environmental Review Team
Of the
Eastern Connecticut Resource Conservation & Development Area, Inc.

For the

Conservation Commission
Durham, Connecticut

Report # 592

January 2006

CT Environmental Review Teams
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Acknowledgments

This report is an outgrowth of a request from the Durham Conservation Commission to the Connecticut River and Coastal Conservation District (CRCCD) and the Eastern Connecticut Resource Conservation and Development Area (RC&D) Council for their consideration and approval. The request was approved and the measure reviewed by the Eastern Connecticut Environmental Review Team (ERT).

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

The field review took place on, Tuesday, May 24, 2005.

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I would also like to thank Adam Moore, Joe Dattilo, and Rick Terrill of the Durham Conservation Commission for their cooperation and assistance during this environmental review.

Prior to the review day, each Team member received a summary of the proposed project with location and soils maps. During the field review Team members were able to view additional maps and were given more information. Some Team members made separate or follow-up visits to the site, while others 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 town. 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 town. The results of this Team action are oriented toward the development of better environmental quality and the long term economics of land use.

The Eastern Connecticut RC&D Executive Council hopes you will find this report of value and assistance in the development of management plans for these town owned properties.

If you require additional information please contact:

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Introduction

Introduction

The Durham Conservation Commission has requested Environmental Review Team (ERT) assistance in reviewing two parcels of town conservation land.

Curtis Woodlands is 138 acre site located in the northwest corner of Durham with access from Dunn Hill Road. It abuts the Lyman Golf Course in Middlefield. In the fall of 2004 the Curtis Woodlands was formally dedicated to Gregory G. Curtis, who was an extension agent in Haddam for virtually his whole career.

The site is predominantly forested with a grassland that is mowed periodically by contractors. It is in need of a mowing now and autumn olive is growing abundantly in the meadow/grassland area. The property has frontage on both sides of Sawmill Brook. There is a hemlock grove that has suffered from wooly adelgid and its health must be addressed. There is also an area of cedars that is being taken over by hardwoods. With permission from the Conservation Commission, a local boy scout has cut some of the cedars to use on trail projects.

Friendly Acres Farm is located on Pent Road. The prime feature of this property is a newly constructed dairy barn. It is being leased to a local young farmer who intends to start a dairy operation. The dairy farm will have an educational component, thus enabling the town to meet the conditions of the grant with which the land was purchased. The property has a number of agricultural fields which will likely grow hay and silage to support the dairy operation. There are also extensive woodlands and shrublands associated with the property. Sawmill Brook also flows through this parcel. The land is on both sides of Parmelee Hill/Tri-Mountain Roads.

Objectives of the ERT Study

The Conservation Commission is developing comprehensive management plans for these properties and needs the natural resource information that the ERT can provide. The Commission has drawn up preliminary management plans for both parcels and a natural resource inventory is listed as either step 1 or 2. The natural resource information provided by the Team will serve as the basis for the plans. Areas of information requested include:

- Soils
- Topography and geology
- Wetlands
- Fisheries
- Wildlife
- Forestry
- Recreation and trail development
- Educational opportunities
- Archaeological and historical significance.

The ERT Process

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

This report provides an information base and a series of recommendations and guidelines which cover the topics requested by the town. 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 Tuesday, May 24, 2005 and some Team members made separate and/or additional site visits. The emphasis of the field review was on the exchange of ideas, concerns and recommendations. Being on site allowed Team members to verify information and to identify other resources.

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

Friendly Acres Farm
Preliminary Management Plan

Donor/seller:
Size: 200 acres
Location: Trimountain Road and Pent road
Acquisition Date:
Purchase Price:

1. Resolve barn issue immediately.
2. Conduct natural resource inventory (flora, fauna, fisheries, hydrology, soils, etc.) to serve as basis for management plan.
3. Prepare a management plan that addresses agricultural use, public access, parking, unauthorized uses, forest management, hunting, viewshed management and wildlife habitat.
4. Identify abutters and let them know that a management plan is being prepared and seek input.
5. Maintain fields with regular mowing and cutting of hay.
6. Consult town officials and town boards and any lessee of barn or any portion of the premises.
7. Obtain surveys and other maps on record at town hall for inclusion in management plan.
8. Determine if there are any deed restrictions, easements, and note in the management plan.
9. Locate and mark property boundaries and post as Durham Open Space. Address any encroachment issues and maintain existing signs.
10. Seek to develop loop trail on portion of the land where it will not interfere with agricultural use.
11. Designate a volunteer steward for the property.
12. Maintain fences, gates, roads and other structures.
13. Prohibit motor vehicle access except on any designated roads or parking areas, and except for property management or emergency purposes, and post property accordingly.

Curtis Woodland

Preliminary Management Plan

Donor/seller:

Size: 138 acres

Location: Dunn Hill Road

Acquisition date:

Purchase price:

1. Conduct natural resource inventory (flora, fauna, fisheries, hydrology, soils, etc.) to serve as basis for management plan.

2. Install sign on the property naming it "Curtis Woodland".

3. Prepare a management plan that addresses public access, trails, right-of-way management, agricultural use, fishing, camping, parking, hunting, viewshed management, forest management, wildlife habitat and the like.

4. Identify abutters and let them know that a management plan is being prepared and seek input.

5. Maintain meadow and roadside vista with mowing and cutting of hay and brush.

6. Consult town officials and other town boards in the preparation of the management plan.

7. Obtain surveys and other maps on record at town hall for inclusion in management plan.

8. Determine if there are any deed restrictions, easements, and note these in the management plan. Work in particular on a resolution to the right-of-way issue.

9. Locate and mark property boundaries and post as Durham Open Space. Address any encroachment issues.

10. Seek to develop loop trail or trail network for hiking and seek to allow such other uses as cross-country skiing, non-motorized bicycling, and horseback-riding if possible.

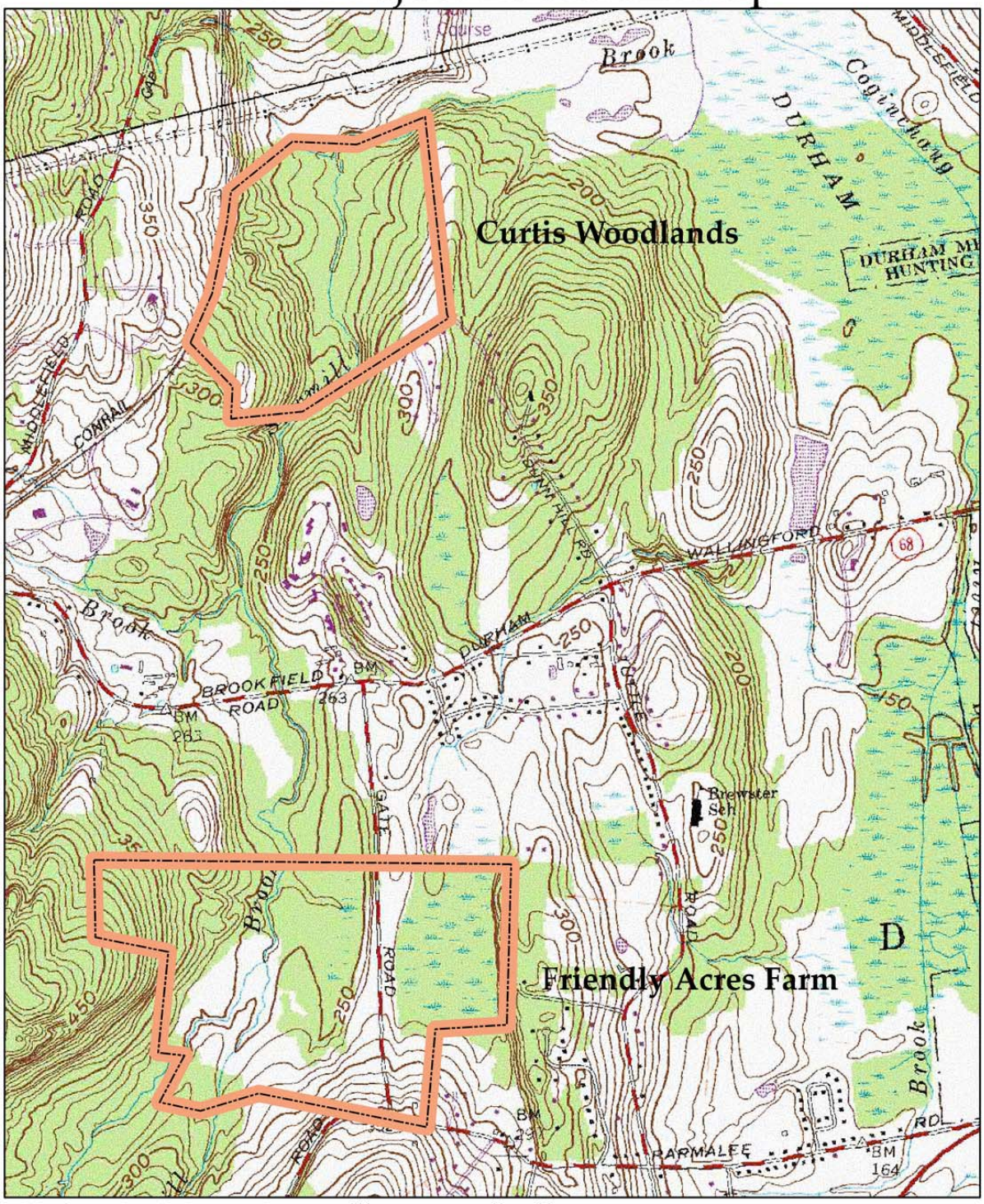
11. Work with scouting organizations on the provision and maintenance of campsites on the property.

12. Designate a volunteer steward for the property.

13. Maintain fences, gates, roads and other structures.

14. Prohibit motor vehicle access except on any designated roads or parking areas, and except for property management or emergency purposes, and post properly accordingly.

ERT Project Location Map



The Connecticut Environmental Review Team

This map was prepared by and for the Connecticut Environmental Review Team.
This map is for educational use only.
It contains no authoritative data.
November 2005.

Proposed Area for ERT

0.3 0.15 0 0.3 Miles

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TOPOGRAPHY, GEOLOGY and HYDROLOGY

Topography

Durham is located at the eastern edge of Connecticut's Central Valley (as in Bell, 1985). The Central Valley is a north-south oriented lowland situated in the middle of the state, stretching from New Haven, where it is only a couple miles wide, northward into Massachusetts, where its maximum width is more than 25 miles. On both sides of the Central Valley are the Eastern Uplands and the Western Uplands. Igneous and metamorphic rocks, which are relatively resistant to erosion, underlie the upland areas whereas the lowland area is underlain dominantly by sedimentary and volcanic rocks that are more easy to erode.

Within the Central Valley several low mountain ranges are found (Meriden Mountain, Talcott Mountain, Higby Mountain, Beseck Mountain, and Totoket Mountain are a few of the better known mountains within the ranges). They are underlain by volcanic rocks which resist mechanical erosion to a greater degree than the sedimentary rocks.

The boundary between the Eastern Uplands and the Central Valley cuts diagonally across the southeastern part of Durham. The boundary is marked by a major fault (long inactive) that is referred to as the Eastern Border Fault. Metamorphic rocks lie east of the border fault and sedimentary (and volcanic) rocks lie to the west of the fault. Both open space parcels, Curtis Woodlands and Friendly Acres Farm, lie within the sedimentary/volcanic terrain.

Sawmill Brook flows through both parcels. Its headwaters are south of Friendly Acres Farm on the flanks of Fowler Mountain and it flows northward into the Coginchaug River. Sawmill Brook appears to be a perennial stream.

Curtis Woodlands

The Curtis Woodlands straddle the valley of Sawmill Brook. The valley is about 100 feet deep with moderate to steep slopes. It opens somewhat to the north where valley slopes are moderate. The Brook has a well developed flood plain several hundred feet wide over most of the parcel. The flood plain contains numerous flood channels, some of which are swampy. Stream entrenchment during recent years, has isolated the higher portions of the flood plain creating a terrace that no longer floods.[1]

[1] As farmland becomes reforested less soil erosion occurs and less new sediment is washed into the rivers. Rivers are integrated systems that adjust their width, depth, gradient, flow velocity, and sediment load. Thus, if less sediment is washed into the river, it adjusts by eroding its channel and banks.

The western valley wall is somewhat steeper and rises to a high elevation than the eastern valley slope. The upper part of the western slope is underlain by volcanic rock (Hampden Basalt) while the eastern valley slope is underlain by sandstone and shale (Simpson, 1968b).

Friendly Acres Farm

Sawmill Brook flows through the western third of Friendly Acres Farm. To the west of the brook lies the moderate to steep, rugged slope of Fowler Mountain, which is underlain by volcanic rock (Holyoke Basalt). East of the brook, the land is low lying and partly occupied by swamps. The eastern boundary of the parcel is marked by a steep slope that is the eroded edge of the Hampden Basalt. The main part of the farm is along the southern part of the parcel which has a gentle north-facing slope.

Bedrock Geology

All but the southeastern third of Durham is located within the Central Valley. The Central is underlain by sedimentary and volcanic rocks of Mesozoic age (~190-200 million years ago). The rocks underlying both conservation parcels will be discussed after a brief geologic history.

Geologic History

The Mesozoic Era was an unusual time in geologic history (readable explanations of the geologic history are provided by Bell, 1985, ch.8 and McHone, 2004, ch.5). The ancient workings of the earth that we refer to today as plate tectonics brought together most of the continental landmasses and welded them together into a super-continent we call Pangaea. Pangaea has since broken up into the continents with intervening oceans that we know today. During the Mesozoic Era, the land that would become Connecticut lay near the center of Pangaea. Like modern-day central Asia, it was a long distance from a source of oceanic moisture and the climate was semiarid to arid.

During the early part of the Mesozoic, Pangaea began to break up and segments of the super-continent split apart and drifted away from each other in a process that would take millions of years. Along what is now the eastern seaboard of North America, this process created a series of topographic depressions which were manifest as narrow valleys stretching from South Carolina into Canada's Maritime Provinces. These valleys may have resembled the modern-day East Africa Rift Valley or possibly Death Valley in their topography. They were low areas into which streams and rivers washed debris, sand, gravel, and mud, which had been eroded from abutting high areas that most likely were mountainous. When the mountain streams flowed out of the canyons of the mountains and onto the valley floor, they spread out (became wider) and their water velocity diminished. Thus the streams deposited the sediments they carried. Coarser debris was deposited close to the edge of the valley and finer debris was washed into the center of the valley. With time, the coarse debris hardened into rock called conglomerate and the finer debris

hardened into rock called sandstone or shale. At times, lakes of various sizes and depths formed in the valley. Most of the lakes were ephemeral and quickly dried up, but periodically (approximately every 26,000 years) the lakes were long lasting. Mud, which eventually hardened into shale, was deposited on the lake bottoms.

The plate tectonic processes caused subsidence of the land and a zone of faults bounding the subsidence. Streams flowed into the depressions and tried to fill them with sediment as they subsided. The result, over several tens of millions of years, was a thick accumulation of sedimentary rock. Total subsidence in the Hartford Basin was greater than 3 miles as evidenced by sedimentary rock layers having a cumulative thickness of greater than 15,000 feet.

At least three times during the subsidence/sedimentation processes, fissures developed in the Earth's crust that extended deep enough to tap molten rock. The fissures provided conduits for basaltic magma to rise to the surface forming volcanic eruptions and incredible lava flows that nearly filled the valley and covered parts of the adjacent highlands. The hardened lava forms a rock we know as basalt or, colloquially, as trap-rock. Three fissures, filled with basalt, have been identified cutting the rocks of Connecticut and Massachusetts; these are associated with three major lava flows in the valley. Similar volcanic eruptions occurred all up and down the rifted part of Pangaea.

Geologic Map and Rocks Underlying the Parcels

Most of the ledge (bedrock) in the Central Valley has been covered by glacial debris (on which soil has formed), or material that has been deposited recently (last 15,000 years) by rivers or in swamps. Outcroppings of rock are scattered. Where exposed, the strata are not flat lying like they were when formed; instead they are tilted downward toward the east (northeast to east-southeast in this area). The trap-rock ridges in this part of Connecticut are the eroded, upturned edges of former lava flows. The layers are no longer continuous beds of sedimentary or volcanic rock as they were when formed; in addition to the erosion, they are broken by a series of northeast-southwest trending, high-angle normal faults. (These faults are inactive today and not known to produce earthquakes.)

Rocks from the four youngest formations underlie the parcels. The Holyoke Basalt is found forming the steep slopes along the western most part of Friendly Acres Farm. This basalt, when crushed, possesses many desirable properties for construction and it is quarried at Reed Gap and other locations throughout the Central Valley. A small abandoned quarry was located near the western boundary of Friendly Acres Farm during the ERT field trip. Along a ridge at the eastern boundary of Friendly Acres Farm the youngest of the basalt layers is exposed. It is not widely quarried. The Hampden Basalt is also exposed in the bed of Sawmill Brook at the southern boundary of Curtis Woodlands.

The East Berlin Formation lies between the overlying Hampden Basalt and the Holyoke Basalt. It is composed of alternating beds of fine-grained sandstone, siltstone, and shale. Most of the rocks are reddish brown in color. Some of the shale beds are gray or black.

Rocks of the East Berlin Formation are exposed on Parmalee Road and on the farm road/driveway that intersects Parmalee Road at the curve along the southern boundary of Friendly Acres Farm.

The Portland Formation overlies the Hampden basalt. It is not exposed on either parcel. In this part of the Central Valley it is composed of sandstone and siltstone and is similar to the East Berlin Formation. Toward the east it becomes coarser grained and along nearby Route 77 it is composed of conglomerate.

Surficial Geology

During the last Ice Age, Durham was covered with glacial ice approximately a mile thick. Ice is not a strong material and, if it is thicker than a few hundred feet, it deforms by slowly flowing at its base. It flows generally from areas where it is thick toward areas where it is thin. Because it is colder to the north, the glaciers were thicker in the north and they flowed in a general southward direction, as far as Long Island. When climate warming occurred at the end of the Ice Age the ice sheets melted in the south initially, but melting occurred increasingly farther north as the climate increasingly warmed. Ice completely melted in the Durham area between 16000-17000 years ago (B. Stone, cited in McHone, 2004). Flowing ice scrapes over the land and erodes soil and rock as it goes. When the ice melts the debris it eroded is left on top of the ground similar to the way snow plowed to the side of the highway in winter leaves a pile of road sand when the snow melts in spring. The debris left by the glacier is referred to as glacial till. Glacial till covers most of the land with only a few exceptions. One exception is on steep slopes where the till is either very thin or not present and ledge crops out. Another exception is in river-bottoms and other low areas where river alluvium or swamp and lake-bottom mud may be deposited on top of till. A third exception is where a glacial melt-water stream has deposited sand and gravel on top of the till. Glacial till is generally 15 feet or less thick. On the Curtis Woodlands the till is thicker over much of the area (Simpson, 1968a; Stone and others, 1992).

Melting ice formed numerous streams and rivers that deposited sand and gravel in channels throughout the state. One channel system, found between the two parcels, was formed by a meltwater stream that flowed through Reed Gap and filled the lower part of the valley of Asmun Brook with sand and gravel immediately upstream from its confluence with Saw Mill Brook. Stratified sand and gravel were deposited upon and against chunks of leftover ice of varying sizes. For example, sand and gravel were not deposited in the swampy areas of Friendly Acres Farm because a large chunk of leftover ice was in the way.

Hydrology

Bedrock aquifers exist beneath both parcels. The dominant porosity in these aquifers is created by fractures which are numerous in the basalts but are more widely spaced in the sandstone and shale.

Fractures are more numerous adjacent to faults. Fault-created fractures are in many places associated with high-yielding water wells (Wintsch and others, 2003). A number of faults cut across Friendly Acres Farm.

In addition, porosity is created in the basalts by gas and steam bubbles that were trapped in the cooling and congealing lava. The gas-bubble pores are called vesicles. Many vesicles are completely surrounded by rock and water has no way in or out. But some vesicles have been intersected by fractures. Those vesicles become storage places for water, and wells that are drilled into such zones usually produce high yields of water. Vesicles are more abundant near the tops of lava flows and might be encountered in the top of the Holyoke Basalt in the central and western portion of the Friendly Acres Farm parcel and from the top of the Hampden Basalt in the Curtis Woodlands parcel.

Intergranular porosity may be found in the sandstone, but it is uncommon. Most of the intergranular pores of sandstone in Connecticut have been filled with lime, silica or iron oxide.

Stratified sand and gravel contains excellent intergranular porosity and makes a good shallow aquifer. Unfortunately, neither parcel contains extensive sand and gravel deposits.

References Cited

Bell, Michael, 1985, *The Face of Connecticut.* Connecticut Geol. And Nat. Hist. Survey, Bull. 110, 196p.

McHone, Greg, 2004, Great Day Trips to Discover the Geology of Connecticut. Perry Heights Press, Wilton, CT, 207p.

Rodgers, John, 1985, Bedrock Geologic Map of Connecticut. Connecticut State Geol. and Nat. Hist. Survey, Atlas Series: Bedrock Geologic Map.

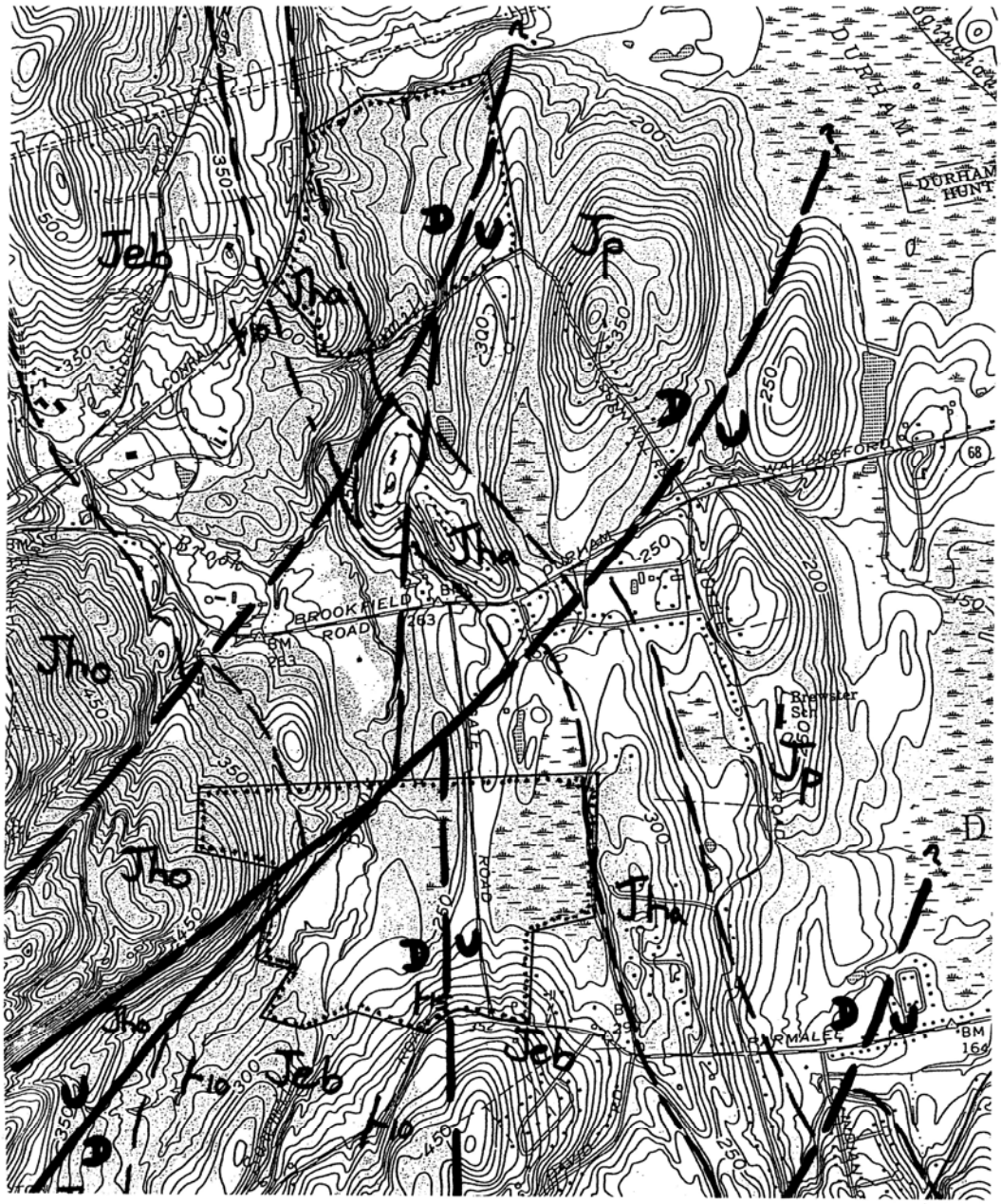
Simpson, H.E., 1968a, Surficial geologic may of the Durham Quadrangle, Middlesex and New Haven Counties, CT. U.S. Geol. Surv. Quad. Map #GQ756.

Simpson, H.E., 1968b, Preliminary bedrock geologic map of a part of the Durham Quadrangle, CT. Geol. and Nat'l Hist. Surv. File, unpub. Map.

Stone, J.R., Shafer, J.P., London, E.H. and Thompson, W.B., 1992, Surficial Materials Map of Connecticut. U.S. Geol. Surv. and Connecticut State Geol. and Nat. Hist. Survey, 2 sheets.

Wintsch, R. P., Roden-Tice, M,., Kunk, M. J., and Aleinikoff, J. N., 2003, Ductile to brittle Mesozoic overprint of Alleghanian structures, Bronson Hill terrane, Rockville area, Connecticut: in, Brady, J. B., and Cheney, J. T., Guide-book for geological field trips in the five college region:. 95th Annual Meeting of the New England Intercollegiate Geol. Conference, Department of Geology, Smith College, Trip A3, A1-A31.

Bedrock Geologic Map of part of the Durham Quadrangle surrounding the conservation lands. Map is modified from Simpson, 1968b, and Rodgers, 1985.



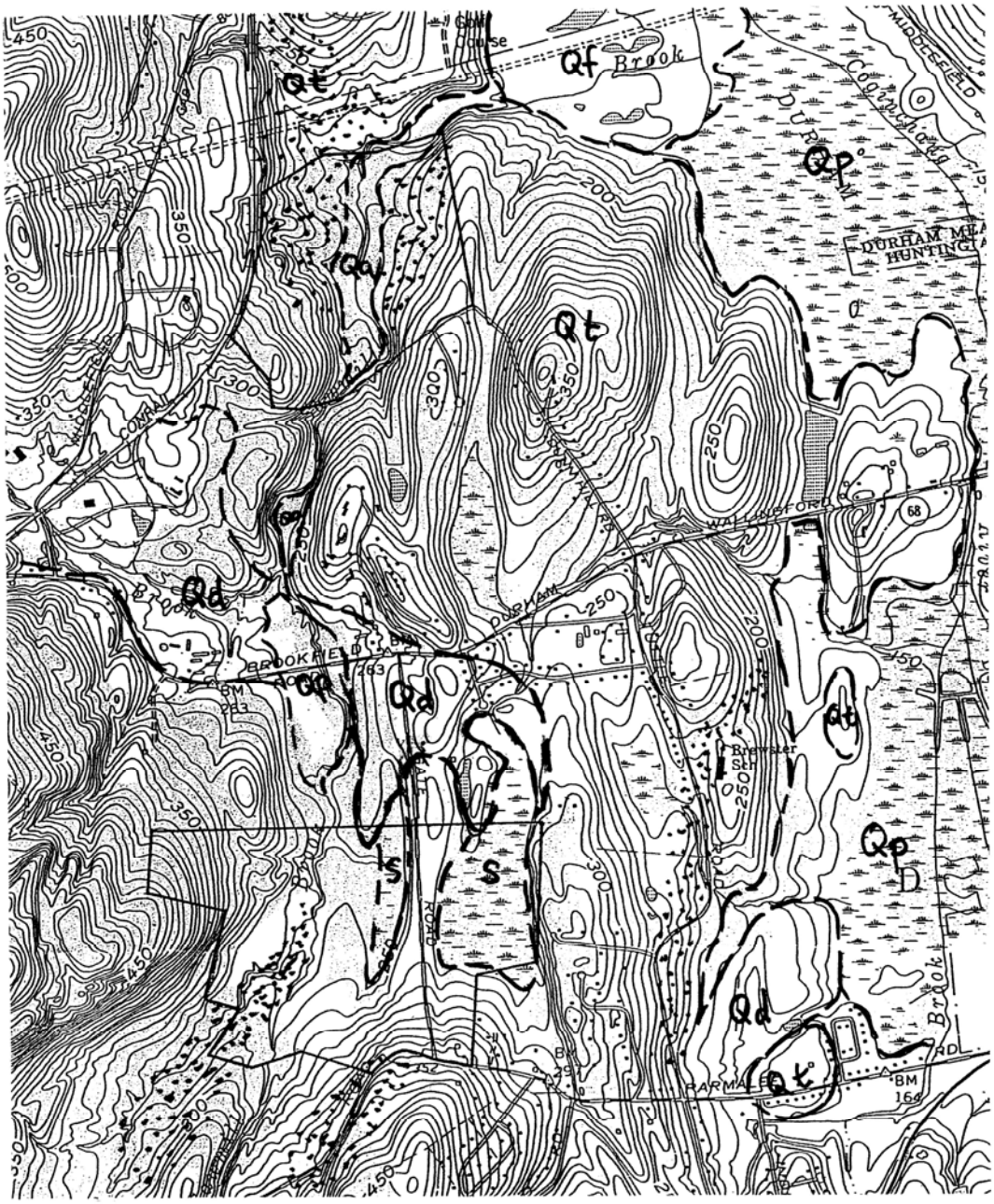
Jp **Portland Formation.** Not exposed on either parcel; pale reddish brown to light brown micaceous arkose. Conglomerate in east adjacent to Border Fault; siltstone and shale with fine-grained sandstone to west. Includes black or gray shale layers near base.

Jha **Hampden Basalt.** Dark gray to greenish gray; yellowish brown weathering basalt with plagioclase phenocrysts in a fine grained groundmass. Irregular vertical joints, vesicular at top. ~125 feet thick.

Jeb **East Berlin Formation.** Pale reddish brown micaceous arkose. Fine grained, cross-bedded sandstone interbedded with siltstone and shale. Includes layers of black and gray shale, some of which contain fossil fish at nearby localities. ~700 feet thick.

Jho **Holyoke Basalt.** Dark gray to greenish gray basalt, orangish brown weathering; fine to medium crystalline, even textured, vertical prismatic joints. ~350 feet thick.

Surficial Map of part of the Durham Quadrangle surrounding the conservation lands. Map is from Simpson, 1968a.



Qa Alluvium; sand and silt, local pebble gravel; local organic debris.

Qf Alluvial fan deposits; silt, sand and local pebble gravel.

Qp Pond bottom deposits; clay, silt, and very fine sand; moderate reddish brown. 3-5 feet thick.

Qd Collapsed stratified drift; chiefly sand and gravel with numerous cobbles and boulders; irregular topography, lacking distinctive landform, deposited by meltwater on or adjacent to ice and collapse as ice melted.

Qt Glacial till; non-sorted, non-stratified mixture of rock debris; particles ranging in size from clay to boulders, compact.

CONSERVATION DISTRICT REVIEW

The following are general comments and recommendations regarding the Town of Durham's Curtis Woodlands and Friendly Acre Farms open space properties. Information used to develop this report includes the Soil Survey Maps for Middlesex County (USDA/SCS; CT DEP Environmental GIS data including the USDA/NRCS soils coverage; Official Soil Series Descriptions from the USDA/NRCS Soil Survey Division; and a site visit conducted on May 24, 2005. This report is advisory in nature and is intended to assist the Durham Conservation Commission develop management plans for the two properties reviewed.

Current Site Conditions

Curtis Woodlands is a 138 acre parcel consisting of a small mowed grassland field, wooded uplands, floodplain wetlands, and a broad and varied stream corridor associated with Sawmill Brook. Friendly Acre Farms is a 200 acre parcel consisting of hayfields, a dairy farm, wooded uplands, a broad wooded marsh, an unnamed brook that joins with Sawmill Brook in the center of the property, and a stream corridor associated with Sawmill Brook. All of Curtis Woodlands and most of Friendly Acres Farms are located in the Sawmill Brook watershed (see Figure 1). A portion of Friendly Acres Farm east of Pent Road is located in the Coginchaug River watershed. Both of these watersheds are subregional drainage basins within the Mattabesset River regional drainage basin, which itself is within the Connecticut River major drainage basin.

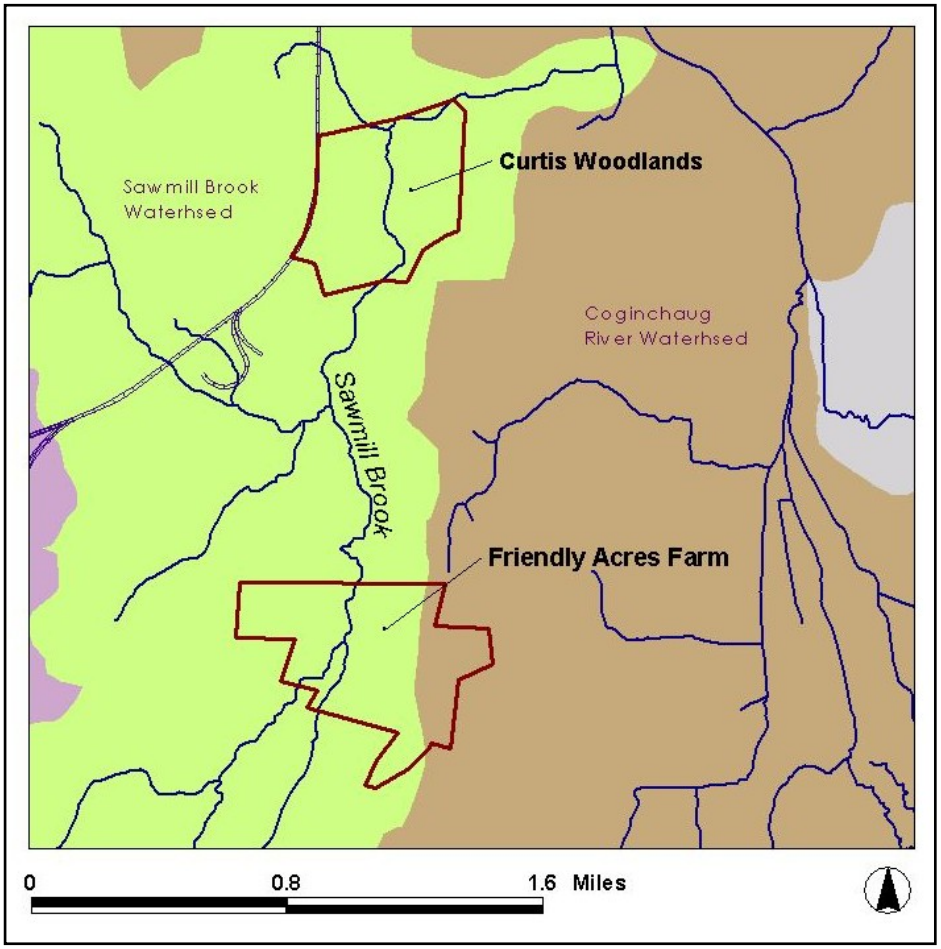


Figure 1. Curtis Woodlands is located with the Sawmill Brook subregional drainage basin while Friendly Acres Farm is located within the Sawmill Brook and Coginchaug subregional drainage basins.

The topography across the two parcels is varied, with moderately steep sloped east and west facing uplands that rise out of a centrally, north-south oriented, gently sloping wetland and stream valley associated with Sawmill Brook. The stream valley transects both parcels; with Sawmill Brook entering Friendly Acres Farm at the southern parcel boundary at elevation 260 and exiting Curtis Woodlands at the northern parcel boundary at elevation 180 (see Figure 2).

Most of the Curtis Woodlands uplands are strongly sloping (15% maximum slope) although there are some moderately steep areas (25% maximum slope). The central portion of the parcel associated with Sawmill Brook is nearly level to gently sloping (3-8% maximum slope, See Figure 3).

The northwestern portion of Friendly Acres Farm is steep to very steep (15-45% maximum slope), with a climb from the stream valley at elevation 260 to the highest point on the property at elevation 440. The central and northeastern portion of Friendly Acres Farm is nearly level to gently sloping (3-8% maximum slope) with an undulating topography. The southwestern portion of the parcel is strongly sloping to moderately steep (15-25% maximum slope), climbing from the stream valley at elevation 260 to approximately elevation 330 (see Figure 4).

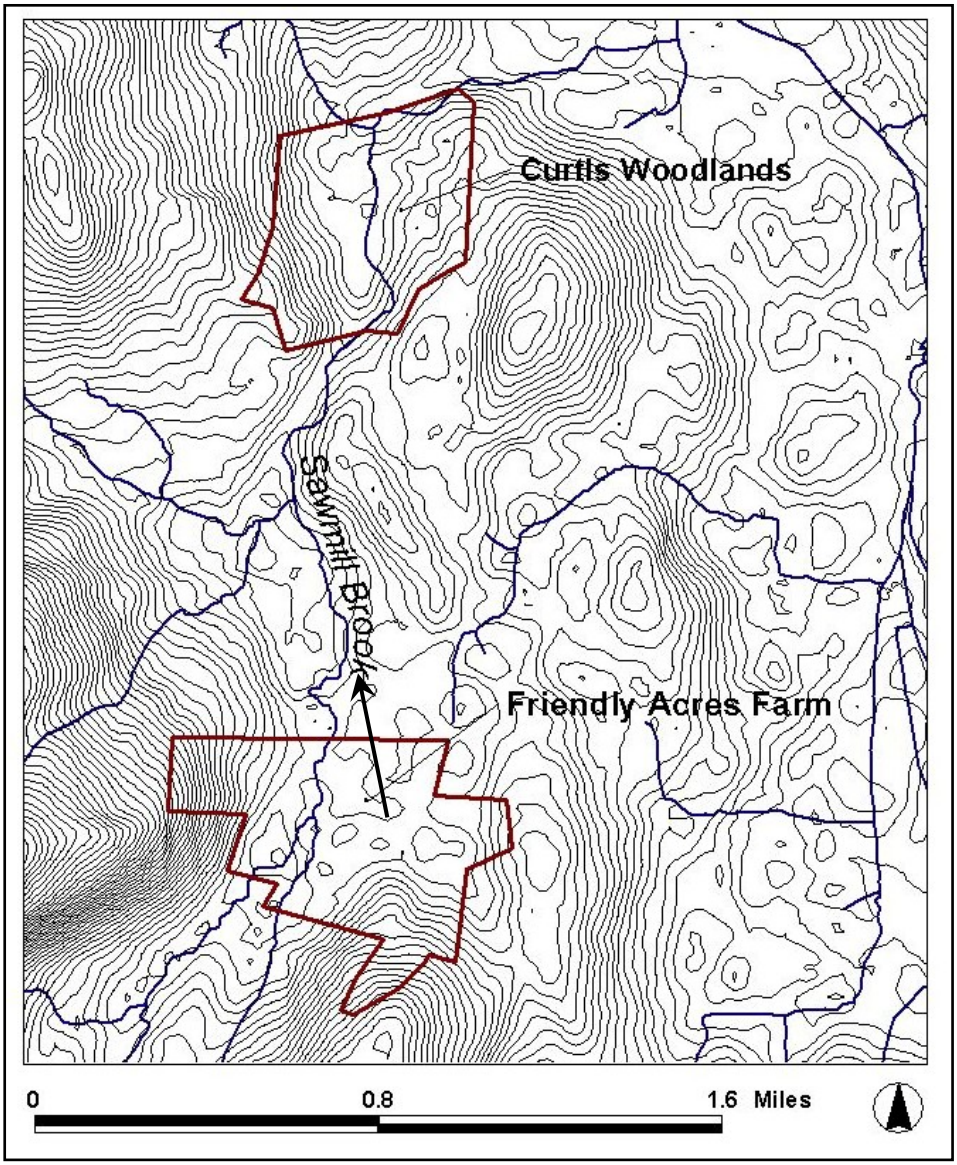


Figure 2. Topography varies across the two parcels, with Sawmill Brook flowing from elevation 260 at the southern border of Friendly Acres Farm to elevation 180 at the northern border of Curtis Woodlands (10 foot contours shown).

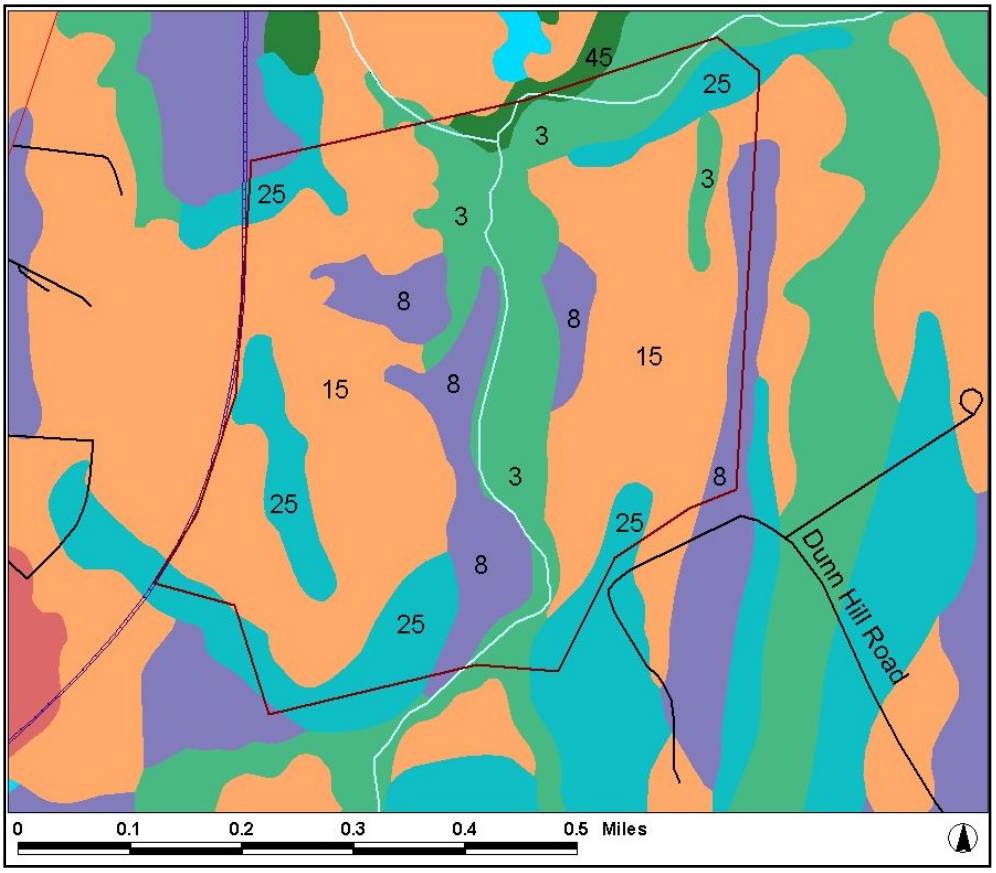


Figure 3. Maximum percent slope shown for Curtis Woodlands on the statewide GIS soils mapping (1:12,000-scale datalayer of soils in Connecticut, USDA/NRCS).

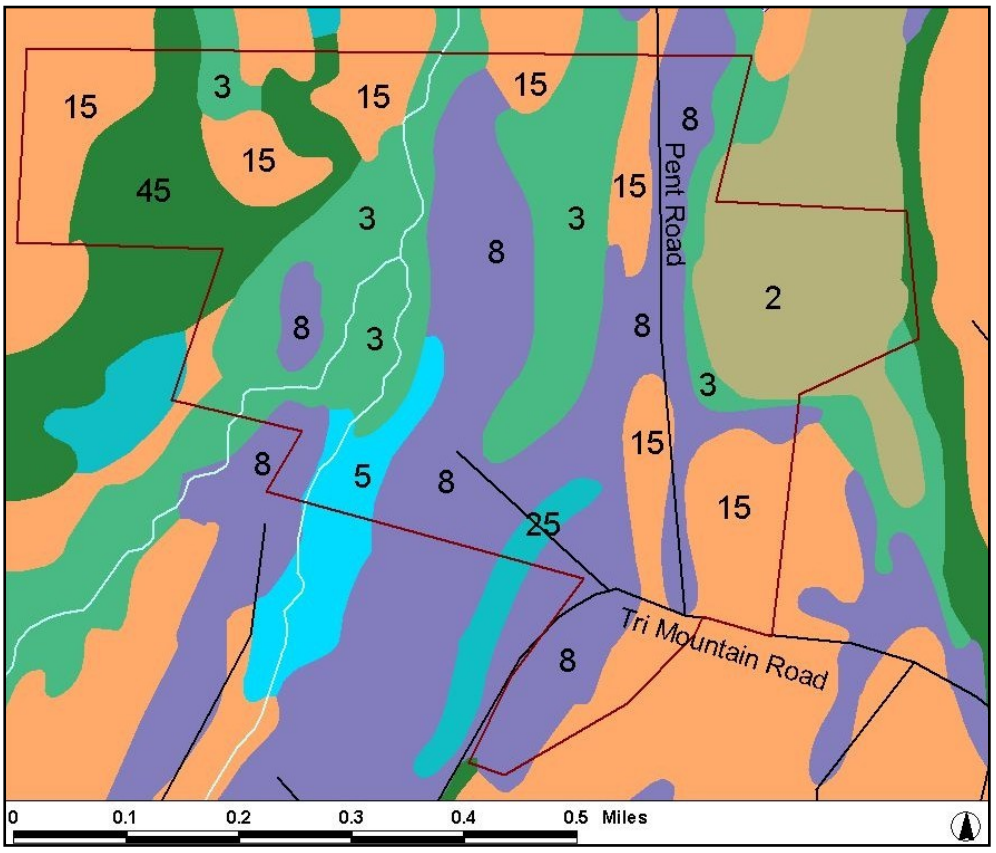


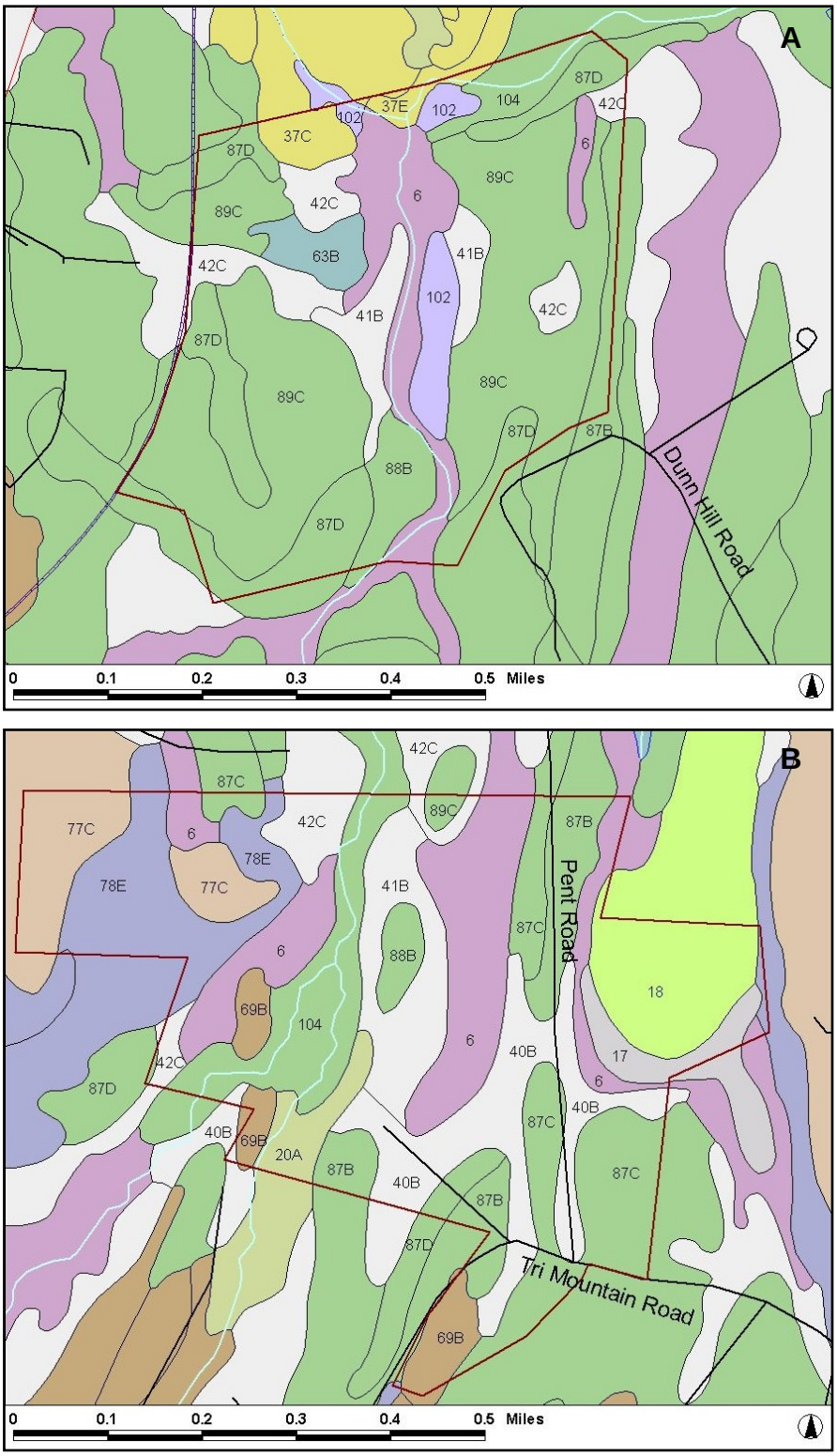
Figure 4. Maximum percent slopes shown for Friendly Acres Farm on the statewide GIS soils mapping (1:12,000-scale datalayer of soils in Connecticut, USDA/NRCS).

Soils

Soil types shown for Curtis Woodlands and Friendly Acres Farm are a mixture including those formed in dense glacial till, subglacial till, supraglacial till, sandy and gravelly glacial outwash, alluvial sediments and herbaceous organic material. The thirteen soils shown for the two parcels are listed in Table 1 and descriptions are provided in Table 2.

Five inland wetland soils (distributed across three map units), two alluvial and floodplain soils, and eight upland soils (or soil complexes) are shown for the two parcels on the USDA/NRCS soils GIS coverage (see Figure 5 and Table 1). These soils data are at a 1:12,000 scale, with the smallest area (polygon) delineated of approximately 3 acres. Caution should be taken when using soil survey mapping for site-level planning since at this scale soils in a single mapped unit can differ in slope, depth, drainage, and stoniness.

Soils on the two parcels are mainly limited by wetness, slope, and stoniness. Select properties and limitations of the predominant soil types are provided in Table 3 and Table 4 respectively.



5. Soil map units shown on the GIS soils mapping, a1:12,000-scale datalayer of soils in Connecticut, USDA/NRCS, for Curtis Woodlands (A) and Friendly Acres Farms (B).

Table 1. Map symbols, description, and location of the 20 soil map units shown for Curtis Woodlands and Friendly Acres Farm.

Map Symbol	Soil Map Unit Description	Open Space Parcel	Location
17	Adrian and Palm Soils*	Friendly Acres Farm	
18	Carlisle Muck*	Friendly Acres Farm	
6	Wilbraham and Menlo Extremely Stony*	Curtis Woodlands, Friendly Acres Farm	
104	Bash Silt Loam+	Curtis Woodlands, Friendly Acres Farm	
20A	Ellington Silt Loam	Friendly Acres Farm	
40B	Ludlow Silt Loam	Friendly Acres Farm	
41B	Ludlow Silt Loam Very Stony	Curtis Woodlands, Friendly Acres Farm	
42C	Ludlow Silt Loam Extremely Stony	Curtis Woodlands, Friendly Acres Farm	
102	Pootatuck Fine Sandy Loam+	Curtis Woodlands	
63B	Cheshire Fine Sandy Loam	Curtis Woodlands	
69B	Yalesville Fine Sandy Loam	Friendly Acres Farm	
87B	Wethersfield Loam	Curtis Woodlands, Friendly Acres Farm	
87C	Wethersfield Loam	Friendly Acres Farm	
87D	Wethersfield Loam	Curtis Woodlands, Friendly Acres Farm	
88B	Wethersfield Loam Very Stony	Curtis Woodlands, Friendly Acres Farm	
89C	Wethersfield Loam Extremely Stony	Curtis Woodlands, Friendly Acres Farm	
77C	Cheshire-Holyoke Complex Very Rocky	Friendly Acres Farm	
78E	Holyoke-Rock Outcrop Complex	Friendly Acres Farm	
37C	Manchester Gravelly Sandy Loam	Curtis Woodlands	
37E	Manchester Gravelly Sandy Loam	Curtis Woodlands	

** inland wetland poorly and very poorly drained soils*

+ alluvial and floodplain soils

Table 2. Description of the predominant soil types at Curtis Woodlands and Friendly Acres Farm

ADRIAN

The Adrian series consists of very deep, very poorly drained soils formed in herbaceous organic material over sandy deposits on outwash plains, lake plains, lake terraces, flood plains, moraines, and till plains. The organic materials are derived primarily from herbaceous plants, but some layers contain as much as 50 percent material of woody origin.

Geographic Setting

Adrian soils formed in herbaceous organic material over sandy deposits and occupy shallow closed depressions primarily on outwash plains, lake plains, lake terraces, and flood plains, but can occur within moraines and till plains. Slope gradients range from 0 to 1 percent and elevation ranges from 580 feet to 1,530 feet above sea level.

Drainage and Permeability

Very poorly drained. The potential for surface runoff is negligible. Permeability is moderately slow to moderately rapid in the organic material and rapid in the sandy material. The depth to the top of an apparent seasonal high water table ranges from 1 foot above the surface to 1 foot below the surface from September to June in normal years. In the flooded phase, areas are subject to frequent flooding for long periods between October and June.

Use and Vegetation

Most of this soil is in native vegetation. Much of it is in marsh grasses including sedges, reeds, grasses, and shrubs such as willow, alder, quaking aspen, and dogwood. Some areas have been drained to various degrees and are used for hay and pasture. A small proportion is used for cropland. Corn and truck crops are the principal crops.

BASH

The Bash series consists of very deep, somewhat poorly drained soils formed in recent alluvial deposits derived from reddish, acidic sandstone, siltstone, and shale.

Geographic Setting

Bash soils are nearly level soils on flood plains. Slope ranges from 0 to 3 percent. The soils developed in alluvium derived from reddish sandstone, siltstone and shale.

Drainage and Permeability

Somewhat poorly drained. Runoff is slow. Saturated hydraulic conductivity is moderately high or high. Pedons with sandy substrata below depths of 40 inches have moderately rapid permeability below that depth. These soils may be flooded in the spring each year.

Use and Vegetation

Most areas are forested or have a cover of woody or herbaceous plants. Some areas are cleared and used for hay or pasture. Native trees include maple, ash and hemlock.

Table 2. Description of the predominant soil types at Curtis Woodlands and Friendly Acres Farm

CARLISLE

The Carlisle series consists of very deep, very poorly drained soils formed in woody and herbaceous organic materials in depressions within lake plains, outwash plains, ground moraines, floodplains and moraines.

Geographic Setting

Carlisle soils occupy depressions within lake plains, outwash plains, ground moraines, and floodplains. These soils formed in woody and herbaceous organic materials. Slopes are 0 to 2 percent and elevations are 250 to 3,800 feet.

Drainage and Permeability

Very poorly drained. Depth to the seasonal high water table ranges from 2 foot above the surface to 1 foot below the surface from September to June. Surface runoff is very slow or ponded. Permeability is moderately slow to moderately rapid.

Use and Vegetation

A high proportion of these soils has been drained and is used for truck crops or pasture. Major crops include onions, potatoes, corn, radishes, celery, carrots, and lettuce. Some areas are used for small grains, hay, and sod production. The remaining portion is in woodland or cut-over woodland. Major tree species include American elm, white ash, red maple, willow, tamarack, quaking aspen, and alder.

CHESHIRE

The Cheshire series consists of very deep, well drained loamy soils formed in supraglacial till on uplands.

Geographic Setting

Cheshire soils are nearly level to very steep and are on till plains and upland hills. Slope ranges from 0 to 60 percent. The soils formed in acid glacial till derived mostly from reddish sandstone, shale, and conglomerate with some basalt.

Drainage and Permeability

Well drained. Surface runoff is medium to rapid. Permeability is moderate or moderately rapid throughout.

Use and Vegetation

Many areas are cleared and used for cultivated crops, hay, or pasture. Some areas are used for vegetables, nursery stock, and other specialty crops. Scattered areas are used for community development. Stony areas are mostly wooded. Common trees are red, white, and black oak, hickory, ash, sugar maple, red maple, gray birch, white pine, and hemlock.

ELLINGTON

The Ellington series consists of very deep, moderately well drained soils formed in loamy over sandy and gravelly glacial outwash.

Geographic Setting

Ellington soils are nearly level to strongly sloping soils on glaciofluvial landforms. Slope commonly is 0 to 8 percent, but the range includes 0 to 15 percent. The soils formed in loamy over stratified sandy and gravelly outwash derived from reddish brown sedimentary rocks and basalt.

Drainage and Permeability

Moderately well drained. Surface runoff is slow to medium. Permeability is moderate or moderately rapid in the surface layer and subsoil and rapid or very rapid in the substratum. The soil has a seasonally high water table.

Use and Vegetation

Much of the acreage is used for cultivated crops, hay, or pasture. Common crops are silage corn, vegetables, tobacco, and nursery stock. Some areas are wooded or used for community development. Common trees are red, white, and back oak, hickory, red maple, white ash, gray birch, and white pine.

Table 2. Description of the predominant soil types at Curtis Woodlands and Friendly Acres Farm

HOLYOKE

The Holyoke series consists of shallow, well drained and somewhat excessively drained soils formed in a thin mantle of till derived mainly from basalt and red sandstone, conglomerate, and shale. Depth to hard bedrock ranges from 10 to 20 inches.

Geographic Setting

Holyoke soils are nearly level to very steep and are on bedrock controlled hills, modified by glacial action. Slope ranges from 0 to 50 percent. The soils formed in a thin mantle of glacial till over bedrock. Some pedons have been modified by silty windblown deposits. The underlying bedrock is primarily basalt but includes red sandstone, conglomerate, or shale. Rock outcrops range from few to many.

Drainage and Permeability

Well drained and somewhat excessively drained. Surface runoff is medium to very rapid. Saturated hydraulic conductivity is moderately high to very high.

Use and Vegetation

Mostly forested. Small cleared areas are used for orchards, cultivated crops, hay, or pasture. A few areas are used for community development. Common trees are red, white, black, and chestnut oak, hickory, red maple, red cedar, hemlock, white pine, and gray and black birch.

LUDLOW

The Ludlow series consists of moderately well drained soils formed in loamy lodgment till. They are very deep to bedrock, moderately deep to a densic contact, and have a seasonal high water table.

Geographic Setting

Ludlow soils are nearly level to strongly sloping and are on till plains, hills, and drumlins. Slope ranges from 0 to 15 percent. The soils formed in acid till derived mostly from reddish sandstone, shale, and conglomerate with some basalt.

Drainage and Permeability

Moderately well drained. Surface runoff is negligible to high. Saturated hydraulic conductivity is moderately high or high in the surface layer and subsoil and low to moderately high in the substratum.

Use and Vegetation

cultivated crops, vegetables, or orchards. Scattered areas are used for community development. Some areas are wooded. Common trees are red, white, and black oak, hickory, ash, red maple, sugar maple, red cedar, and white pine.

MANCHESTER

The Manchester series consists of very deep, excessively drained soils formed in sandy and gravelly glacial outwash and stratified drift.

Geographic Setting

Manchester soils are nearly level to steep soils on terraces, outwash plains, kames, deltas and eskers. Slope ranges from 0 to 45 percent. The soils formed in sandy and gravelly glaciofluvial materials and stratified drift derived mainly from a red sedimentary rocks and basalt.

Drainage and Permeability

Excessively drained. Surface runoff is negligible to high. Saturated hydraulic conductivity is high in the surface layer, and high or very high in the subsoil and substratum. The soils are droughty.

Use and Vegetation

Most areas are forested or in brushy vegetation. Cleared areas are used for hay, pasture and silage corn. Small areas, mostly irrigated, are used for tobacco, vegetables and nursery stock. Many areas are in community development. Common trees are white, red and black oak, gray birch, aspen, white pine and pitch pine. Gravel is commonly excavated from areas of these soils.

Table 2. Description of the predominant soil types at Curtis Woodlands and Friendly Acres Farm

MENLO

The Menlo series consists of very poorly drained loamy soils formed in subglacial till. They are very deep to bedrock and moderately deep to a densic contact. Menlo soils have a water table at or above the soil surface most of the year.

Geographic Setting

Menlo soils are nearly level and are in drainageways and low depressional areas of glaciated till plains and hills. Slope ranges from 0 to 3 percent. The soils formed in acid till derived mostly from reddish sandstone, shale, and conglomerate with some basalt. In some pedons there is a thin layer of organically enriched local alluvium on the surface.

Drainage and Permeability

Very poorly drained. Surface runoff is slow and the soil is often ponded. Permeability is moderate in the organic surface layer and solum and slow or very slow in the substratum. Saturated hydraulic conductivity is moderately low to high in the solum and low to moderately high in the substratum.

Use and Vegetation

Nearly all areas are vegetated with water tolerant plants. A few partially drained areas are used for unimproved pasture. Common trees in wooded areas are red maple, elm, ash, and gray birch. Other plants include alder, sweet pepperbush, sedges, rushes, and cattails.

PALM

The Palm series consists of very deep, poorly drained, moderately slowly permeable soils. They formed in residuum and colluvium that weathered from andesitic to basaltic, marine deposited volcanic and volcanoclastic sandstone.

Geographic Setting

Palm soils are on concave benches of mountain sides in uplands. They formed in residuum and colluvium in mountainous uplands. Slopes range from 35 to 85 percent.

Drainage and Permeability

Poorly drained; moderately slow permeability.

Use and Vegetation

Palm soils are used for watershed protection, recreation, research, and wildlife habitat. Forested with native and introduced species.

POOTATUCK

The Pootatuck series consists of very deep, moderately well drained loamy soils formed in alluvial sediments.

Geographic Setting

Pootatuck soils are nearly level soils on floodplains and along rivers and streams. Slope ranges from 0 to 3 percent. The soils formed in recent alluvium derived mostly from granite, gneiss, and schist.

Drainage and Permeability

Moderately well drained. Surface runoff is slow. Permeability is moderate or moderately rapid in the loamy upper layers and rapid or very rapid in the sandy substratum. Most areas of these soils flood for short periods each year. Soils on higher positions flood occasionally.

Use and Vegetation

Cleared areas are used for cultivated crops, hay, or pasture. Common trees in wooded areas are white pine, white, yellow, and gray birch, red maple, elm, alder, and hemlock.

Table 2. Description of the predominant soil types at Curtis Woodlands and Friendly Acres Farm

WETHERSFIELD

The Wethersfield series consists of very deep, well drained loamy soils formed in dense glacial till on uplands. The soils are moderately deep to dense basal till.

Geographic Setting

Wethersfield soils are nearly level to steep and are on till plains, low ridges, and drumlins. Slope ranges from 0 to 35 percent. The soils formed in acid glacial till derived mostly from reddish sandstone, shale, and conglomerate with some basalt.

Drainage and Permeability

Well drained. Surface runoff is negligible to high. Permeability is moderately rapid or moderate in the surface layer and subsoil, and slow or very slow in the dense substratum. Saturated hydraulic conductivity is moderately low to high in the surface layer and subsoil, and low to moderately high in the substratum.

Use and Vegetation

Many areas are cleared and used for cultivated crops, hay, or pasture. Some areas are used for vegetables, orchards, and nursery stock. Scattered areas are used for community development. Some areas are wooded. Common trees are red, white, and black oak, hickory, ash, sugar maple, red maple, beech, gray birch, white pine, and hemlock.

WILBRAHAM

The Wilbraham series consists of poorly drained loamy soils formed in subglacial till. The soils are very deep to bedrock and moderately deep to a densic contact. Wilbraham soils have a water table at or near the surface much of the year.

Geographic Setting

Wilbraham soils are nearly level to gently sloping and are in depressions and drainageways on glaciated hills. Slope commonly is less than 5 percent, but the range includes 0 to 8 percent. The soils formed in acid till derived mainly from reddish sandstone, shale, and conglomerate with some basalt.

Drainage and Permeability

Poorly drained. Surface runoff is slow. Permeability is moderate in the surface layer and subsoil,and slow or very slow in the dense substratum. They have an aquic moisture regime, but do not exhibit the low chroma matrix colors required for Aquepts.

Use and Vegetation

Most areas are wooded. Cleared areas are used for hay or pasture and, if drained, are used for cultivated crops. A few areas are used for community development. Common trees are red maple, elm, white ash, pin oak, gray birch, and red cedar.

Official Soil Series Descriptions available from the NRCS Soil Survey Division online at: **http://ortho.ftw.nrcs.usda.gov/osd/** and in the Soil Survey of Middlesex County (USDA/Soil Conservation Service).

Table 3. Select properties of the predominant soils at Curtis Woodlands and Friendly Acres Farms

Drainage	Map Symbol	Soil Description	Slope (%)	Prime Farmland	Restrictive Layer
Very Poorly	17	Adrian and Palm Soils	0-2		
	18	Carlisle Muck	0-2		
Poorly	6	Wilbraham and Menlo Extremely Stony	0-3		Compact Hardpan (18-36")
Somewhat Poorly	104	Bash Silt Loam	0-3		
Moderately Well	20A	Ellington Silt Loam	0-5	Yes	
	40B	Ludlow Silt Loam[2]	3-8	Yes	Compact Hardpan (20-40")
	41B	Ludlow Silt Loam Very Stony	2-8		
	42C	Ludlow Silt Loam Extremely Stony	2-15		
	102	Pootatuck Fine Sandy Loam	0-3	Yes	
Well	63B	Cheshire Fine Sandy Loam	3-8	Yes	
	69B	Yalesville Fine Sandy Loam[2]	3-8	Yes	Bedrock (20-40")
	87B	Wethersfield Loam[2]	3-8	Yes	Compact Hardpan (20-40")
	87C	Wethersfield Loam[1]	8-15		
	87D	Wethersfield Loam[1]	15-25		
	88B	Wethersfield Loam Very Stony	8-15		
	89C	Wethersfield Loam Extremely Stony	3-15		
Well and Somewhat Excessively	77C	Cheshire-Holyoke Complex Very Rocky	3-15		Bedrock (10-20")
Somewhat Excessively	78E	Holyoke-Rock Outcrop Complex	15-45		Bedrock
Excessively	37C	Manchester Gravelly Sandy Loam[2]	3-15		
	37E	Manchester Gravelly Sandy Loam	15-45		

[1]soil type qualifies as a highly erodible land (USDA/SCS 1980)

[2]soil type qualifies as a potentially highly erodible land (USDA/SCS 1980)

Table 4. Select limitations of the predominant soils at Curtis Woodlands and Friendly Acres Farms

				Limitations				
Drainage	**Map Symbol**	**Slope (%)**	**Soil Description**	**Paths & Trails**	**Camp & Picnic Areas**	**Haul Road & Log Landings**	**Hazard of Soil Rutting**	**Roads Suitability (natural surface)**
Very Poorly	17	0-2	Adrian and Palm Soils	Severe[a]	Severe[a]	Severe[a]	Severe[a]	Poorly[a]
	18	0-2	Carlisle Muck	Severe[a]	Severe[a]	Severe[a]	Severe[a]	Poorly[a]
Poorly	6	0-3	Wilbraham and Menlo Ext. Stony	Severe[a,c]	Severe[a,c]	Moderate to Severe[a,c]	Moderate[c]	Poorly[a,c]
Somewhat Poorly	104	0-3	Bash Silt Loam	Severe[a]	Severe[a]	Severe[a]	Severe[a]	Poorly[a]
Moderately Well	20A	0-5	Ellington Silt Loam	Not Limited	Moderate[a]	Moderate	Severe	Moderate
	40B	3-8	Ludlow Silt Loam	Not Limited	Moderate[a]	Moderate	Severe	Moderate[b]
	41B	2-8	Ludlow Silt Loam Very Stony	Moderate[c]	Moderate[a, c]	Moderate	Severe	Moderate
	42C	2-15	Ludlow Silt Loam Ext. Stony	Severe[c]	Severe[a,b,c]	Moderate[c]	Severe	Moderate[c]
	102	0-3	Pootatuck Fine Sandy Loam	Moderate[a]	Severe[a]	Severe[a]	Moderate	Poorly[a]
Well	63B	3-8	Cheshire Fine Sandy Loam	Not Limited	Not Limited	Slight	Moderate	Moderate[b]
	69B	3-8	Yalesville Fine Sandy Loam	Not Limited	Not Limited	Moderate	Moderate	Moderate[b]
	87B	3-8	Wethersfield Loam	Not Limited	Moderate[a]	Moderate	Severe	Moderate[b]
	87C	8-15	Wethersfield Loam	Not Limited	Moderate[a, b]	Moderate	Severe	Moderate[b,c]
	87D	15-25	Wethersfield Loam	Moderate[b]	Severe[a,b]	Moderate[b]	Severe	Poorly[b]
	88B	8-15	Wethersfield Loam Very Stony	Moderate[c]	Severe[a,c]	Moderate	Severe	Moderate[a,b]
	89C	3-15	Wethersfield Loam Ext. Stony	Severe[c]	Severe[a,b,c]	Moderate[c]	Severe	Moderate[b,c]
Well and Somewhat Excessively	77C	3-15	Cheshire-Holyoke Complex Very Rocky	Moderate[c]	Moderate[b, c] to Severe[a,b,c]	Slight	Moderate	Moderate[b]
Somewhat Excessively	78E	15-45	Holyoke-Rock Outcrop Complex	Severe[b, c]	Severe[a,b,c]	Severe[b]	Severe	n/a
Excessively	37C	3-15	Manchester Gravelly Sandy Loam	Not Limited	Moderate[b]	Slight	Moderate	Moderate[b]
	37E	15-45	Manchester Gravelly Sandy Loam	Severe[b]	Severe[b]	Moderate[b]	Moderate	Poorly[b]

Limiting Feature: [a]wetness, [b]slope, [c]stoniness

Areas of Concern

Sawmill Brook

Sawmill Brook flows north to the Mattabesset River, across both Curtis Woodlands and Friendly Acres Farm. Associated with the brook corridor are floodplain and wetland soils, as well upland soils with restrictive compact hardpan layers that limit subsurface permeability. Ludlow soils in particular can have a seasonally high ground water table, and all of these soils can be seasonally wet. Recreation and forest management uses in soils with compact hardpan can be seasonally limited.

Based on observations during the field walk it appears that especially for Curtis Woodlands Sawmill Brook and its floodplain are receiving heavy, flashy flows. This flow regime could be partially natural, but may be related to development in the contributing drainage to the brook. Depending on the extent of seasonal flooding, recreation and forest management activities may be limited in the brook corridor and associated floodplain.

Recommendations

- The brook is aesthetically pleasing, and trails should be located to provide views of the brook and access into the riparian corridor. Crossing the brook should be accomplished by bridges or other low-impact elevated structures.
- Proposed land use change in the Sawmill Brook watershed should be reviewed to ensure stormwater quality and quantity is adequate controlled and will not cause degradation of the brook and its riparian corridor.

Photo 1. A section of Sawmill Brook on Curtis Woodlands that appeared to be over wide and shallow. There was evidence of recent strong flood flows in the floodplain associated with the brook.

Photo 2. A section of Sawmill Brook on Friendly Acres Farm with ample streamside vegetation providing deep shade.

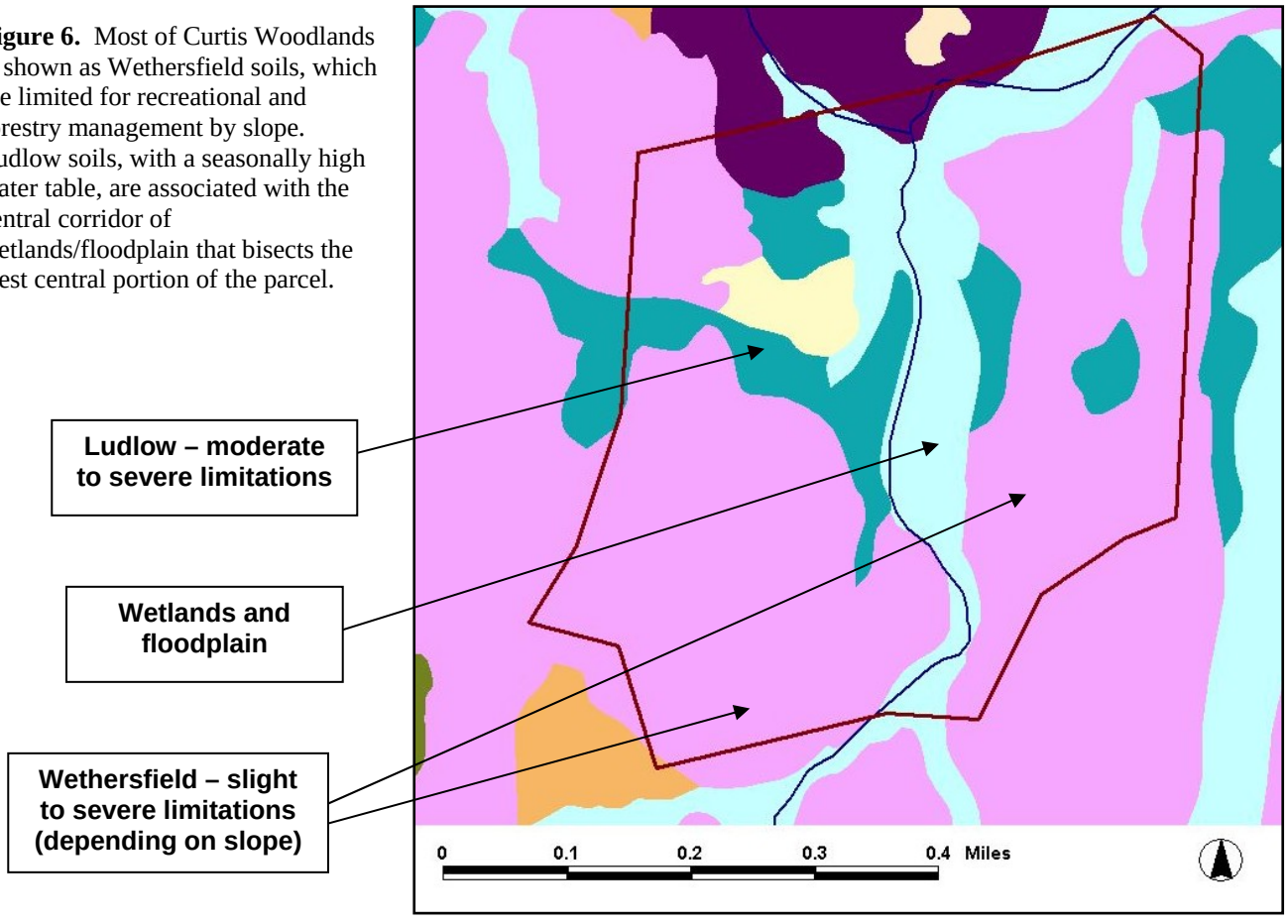
Curtis Woodlands

Soils across the majority of Curtis Woodlands are Wethersfield loam and Ludlow silt loam. Ludlow soils have a seasonally high water table and a compact substratum that limits permeability. These soils are moderately to severely limited for paths, trails, and camping areas. Wethersfield soils are less limited for paths and trails then Ludlow soils where slopes are gentle (e.g., 3-8%). There was evidence observed during the field walk that equestrian use is causing some portions of trail to become muddy and rutted. This was especially observed in the sloping wooded area just west of the entrance from Dunn Hill Road. The observed rutting was not far from the location of a gullied drainageway that carries surface and road drainage to the brook. Through the central portion of the property the floodplain riparian corridor associated with Sawmill Brook was wide, which may limit the development of a trail system to the west side of the parcel. Lastly, there was evidence that flashy flows are causing some bank erosion and scour in sections of brook in the southern portion of the parcel.

Recommendations

- Trail use should be restricted when soils are seasonally saturated. Stabilizing the wet sections of trail and providing cross drainage may help improve the wet and muddy conditions.
- A gullied drainage channel that conveys runoff to Sawmill Brook was observed in the southeastern portion of the parcel. This head of this drainage channel is a 12-15" stormwater outlet that discharges road drainage from the cul-de-sac development just south of the parcel. Evidence of scour at the discharge location as well as the large size of riprap placed below the pipe indicates that flows from this pipe are significant. Retrofit or modification of this stormwater outlet to control discharge velocities should be considered.

Figure 6. Most of Curtis Woodlands is shown as Wethersfield soils, which are limited for recreational and forestry management by slope. Ludlow soils, with a seasonally high water table, are associated with the central corridor of wetlands/floodplain that bisects the west central portion of the parcel.



Friendly Acres Farm

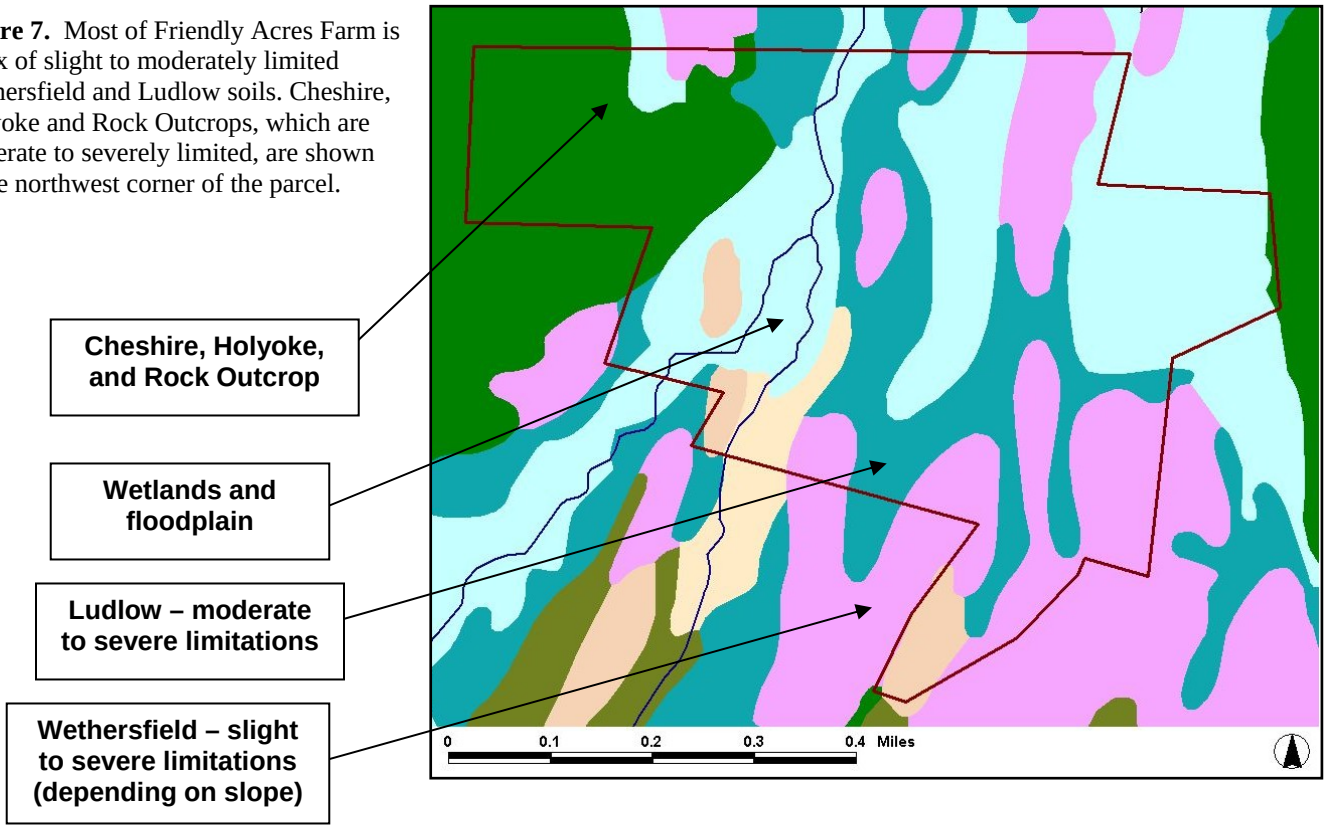
Soils on Friendly Acres Farm vary from Ludlow and Wethersfield in the southeastern portion, to floodplain and wetland soils associated with Sawmill Brook in the central portion, to Cheshire, Holyoke, and rock outcrops in the northwest portion of the parcel. Access to the parcel from Seward Road offers gentle, somewhat improved access to western portion of the parcel. Access to the northern portion of the parcel is more restricted, with steep slopes to the northwest corner of the parcel and a wide wooded wetland in the north central portion of the parcel. Soils on Friendly Acres Farm are most limited by steep slopes and stoniness, although Ludlow soils can be seasonally wet depending on conditions.

Photo 3. A broad wooded wetland spans much of the north central portion of Friendly Acres Farm.

Recommendations

- Development of a recreational area (e.g., picnic ground or brook viewing location) accessed by Seward Road for pedestrians with restricted mobility should be considered.
- Steep trail sections should be adequately stabilized and provided with cross drainage to limit soil erosion. Re-routing trails to be cross slope or switch-back to climb the grade should be considered in some locations.
- Use of the northern wooded wetland for education/outreach should be considered, however the feasibility of stabilized access (e.g., boardwalk) would need to be evaluated.

Figure 7. Most of Friendly Acres Farm is a mix of slight to moderately limited Wethersfield and Ludlow soils. Cheshire, Holyoke and Rock Outcrops, which are moderate to severely limited, are shown in the northwest corner of the parcel.



Wetland Review

The team visited Curtis Woodlands and Friendly Acres Farm on May 24, 2005. Both parcels are town property. The two properties were treated as separate entities albeit with many similar traits. The dominant wetland feature of both parcels is Sawmill Brook and its floodplain.

Both properties sit within the watershed of Sawmill Brook which is approximately 2,150 acres in size. Of this total, these parcels make up a little over 14 per cent. The watershed is dominated by woodland and agriculture.

Curtis Woodlands Property

The Team entered this parcel, which is north of the previous property on the open field in the southeast corner and continued west to the brook. The Team followed the stream north and then went cross-country to the northwest corner. From there the Team paralleled an old road south along the east border heading back to the start. The Team did not visit any of the parcel to the west of Sawmill Brook. The topography varies here from a high of 335 feet in the southwest corner to a low point of 155 feet where the Brook leaves the property in the northeast corner.

Important note: Sawmill Brook flows about 1.33 miles, and nearly doubles the size of its watershed, between Happy Acres Farm to the south and the Curtis Woodlands. In that span, it receives the flow from the ~1.25 mile long Asmun Brook and its watershed (~1.75 square miles). And it has come down slope from 240 feet to about 190 feet in elevation. For these reasons the Brook is very prone to flooding in season and raging when bank full. It is a different stream than when it left Happy Acres Farm.

In its flowpath across the parcel, Sawmill Brook divides the Curtis Woodlands almost in half. The extensive floodplain shows meander scars and flooded oxbows. These flooded oxbows have a vernal or springtime flooding aspect to them. Unidentified frogs made use of at least one of them.

In places the Brook is visually broad, flat, shallow and rocky. And while its flow was tame on the day of our visit, the clues it leaves on the landscape tell of a different characteristic. On this property the stream appears at times to be flashy, or prone to sudden high rates of flow in both speed and volume. These fast flowing waters have the ability to transport much debris, and the ability to erode. At river bends, organic

materials pile up to 3 feet above the base flow. Undercut stream banks depict the work of a highly erosive, vigorously flowing stream.

The floodplain is forested and the stream overflows its banks in the spring. In the flatter areas oxbows and old channelways flood. In passing through this area the Team had to select the high ground to remain dry of foot.

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Sawmill Brook is seen here flowing placidly downstream. However, the evidence on the landscape tells of a stream that in stormy conditions comes rushing bank-full toward this photographer's location. The undercut banks and streamward-leaning trees on the right bank combined with the leaf debris matted to the sticks well above the water line in the right foreground tell the story of stream flow vastly different than what is seen here. (Photo courtesy of Wendy Goodfriend)

The last seventy years have also seen a change on this property. As with Friendly Farms, there is much land in forest currently that in the 1930s was dedicated to open fields and thinned woodlands. Today, post agricultural successional growth has produced healthy woodland cover and function as seen in the upland areas and the forested wetlands as well. Earlier successional vegetation such as cedars and hemlocks can be found shaded out and standing dead under the canopy.

Spring 1934 photo mosaic with approximate boundaries of Curtis Woodland property.

Approximate boundaries of Curtis Woodlands property in the spring of 1990. White flag marks the 3-4 foot gullying due to erosion.

Of Note

- **Vernal Pools** - The floodplain oxbows and old river channels should be investigated for the possibility of being breeding vernal pools before any trail or recreational use planning is begun. The upland habitat is critical to the health of breeding vernal pools, should be considered part of the vernal pool habitat and buffered accordingly.

- **Invasive species** - The open field in the southeast corner of the parcel is filling with the invasive Autumn olive (*Elaeagnus umbellata*). This bush/tree is thriving in the open, sunlit field and will continue its growth to tree size. Elimination of this species from the parcel now will be far easier than any time in the future.

- **Deep gullying erosion** - The Team found deep gullying erosion (three to four feet deep gullies) along Sawmill Brook (located at the white flag on the 1990 aerial photograph). The gullying appears to be the result of the street's storm-drain outflow which passes under the road at the 90 degree bend and empties onto the property. Further investigation will confirm the cause of the erosion which the town will hopefully then rectify. Unchecked, this erosion will continue to downcut vertically and carry it is sediment load to the watercourse.

Friendly Acres Farm

The topography here is mostly broad and flat. West of Gate Road the land is dominated by the floodplain of Sawmill Brook and lies at ~250 feet above sea level. Further west, beyond the floodplain, the land slopes up hill to ~440 feet at the western boundary, 190 feet above the floodplain. The southern part of the parcel also slopes up out of the floodplain so that the intersection of Gate Road and Trimountain Road sits at about 350 feet. East of Gate Road is a broad flat area of wetland ~33 acres in size lying at about 215 feet.

The Team's walking tour crossed the brook and its major tributary along the closed road which runs west through the property just west of the intersection with Gate Road. Two 30 inch concrete pipes carry Sawmill Brook under the road. The stream here is braided, or many-channeled, with clear water flowing. Since the stream does pass over glacial till, the stream bottom shows a composition of various sized sediments and cobbles. This steam crossing area is quite open-to-the-sun. The herb

layer is dominated by Virginia creeper (*Parthenocissus quinquefolia*), touch-me-not (*Impatiens capensis*), Poison ivy *(Toxicodendron radicans)* and the invasive garlic mustard (*Alliaria petiolata*). Japanese barberry (*Berberis thunbergii*) and Multiflora rose *(Rosa multiflora),* two of the state's most invasive plants, have invaded the shrub layer. Sugar and red maples (*Acer* sp.) dominate the tree layer. Not far beyond this crossing the main tributary to Sawmill Brook passes under the east-west road in a 36 inch corrugated metal pipe.

Beyond the stream crossings the Team turned north along the old road. A small pond at the foot of a rock face was encountered shortly after passing the house on the west or left-hand side. The pond appears to be the remnant of a small quarrying operation. This pond was covered with duckweed (*Lemna* sp.) and is home to at least a pair of green frogs (*Rana clamitans)*.

The last leg of this walk took the Team east across the northern boundary of the property. As seen in the photographs below, at this area Sawmill Brook and its tributaries have merged into one stream. The floodplain is lush with growth, especially at the herb and tree level. The ground is tussocky interspersed with standing water. Wild geranium (*Geranium maculatum*), trout lily *(Erythronium americanum)*, Canada mayflower *(Maianthemum canadense),* marsh marigold (*Caltha palustris)*, skunk cabbage *(Symplocarpus foetidus)* and sensitive fern *(Onoclea sensibilis)* were abundant. Red maple trees (*Acer rubrum*) and shad bush trees *(Amelanchier canadensis)* dominated the tree layer.

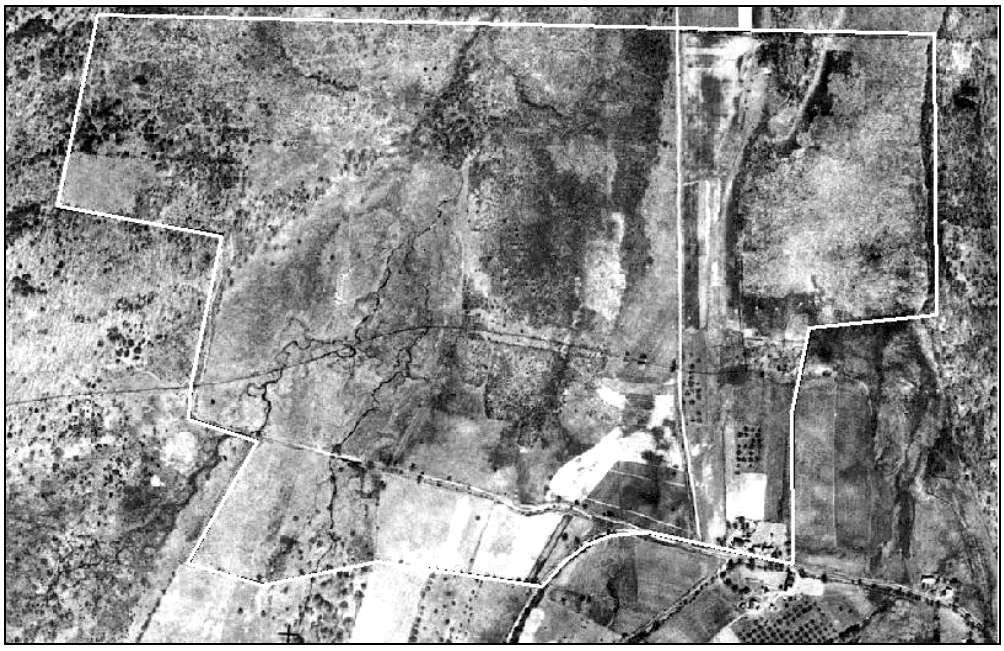
* * * * * * * * * * * *

When assessing the ecological integrity of any review area, one of the factors or considerations in the process is the element of time. Over time much can change on the landscape. The land can heal or it can be impacted. On this property the landscape has undergone dramatic change in the last seven decades.

As seen below in the 1934 aerial photograph, the property 70 years ago was predominantly cleared of trees and likely used as pasture. Other areas appear to have been in hay or crop fields. In this cleared condition, it is easily seen how the flatness of the landscape allows the brook to meander. By the time of the 1990 photograph the land had reforested to what is today.

This now-forested floodplain/upland continuum allows for precipitation to recharge the stream. The forest floor slows runoff to allow groundwater infiltration. Fallen leaves and woody debris in the stream bed provide cover and organic matter for stream's macro invertebrates. Thus, in this rarely seen scenario, the Friendly

Acres Farm property has had the opportunity to revert to an ecologically stable forested stream environment.



In this 1934 aerial photo mosaic the farm fields and pasture land is easily recognized. Note the meander scars of Sawmill Brook and its tributary which indicate flat terrain to the southwest.

This 1990 aerial photograph shows the landscape much as it appears today. While agricultural fields are still present much of the floodplain has returned to its natural forested state.

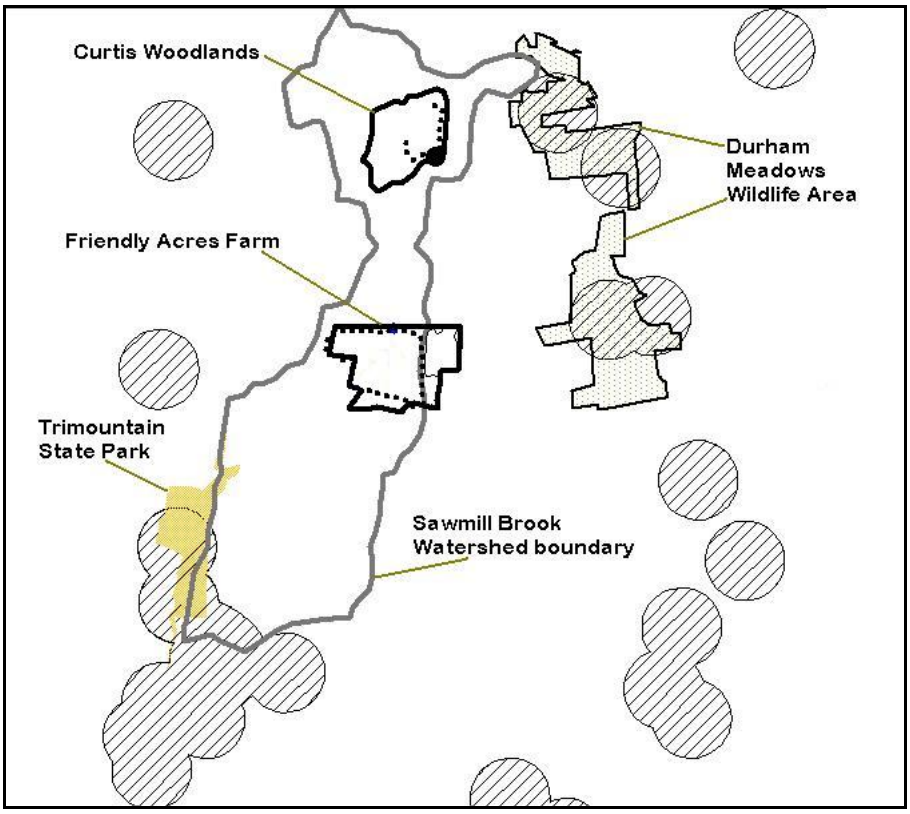
Of Note

- This parcel has far more ecological assets than liabilities. The water quality of Sawmill Brook is rated by the CT DEP as AA. This is the highest/best ranking surface water can receive in the state. (This is on a scale of AA being the best and degradation decreasing the "score" to "A", "B", "C", and "D".)

- **Possible Vernal pool** - As described above, it would be worth investigating the possibility that the small water body (~300-350 square feet) by the old quarry could be a vernal pool. With no inlet or outlet, this self contained pool has the possibility to be a breeding pool. Its low impact location adds to its value.

- **Invasive species** - in the open areas where the old east-west road crosses Sawmill Brook and its main tributary, there is a multitude of invasive species. A management plan making use of volunteers such as scout groups, garden clubs, etc. could help to eliminate or at least control the spread of these invasives. In addition to this location, the invasive Autumn olive (*Elaeagnus umbellata*) can be found growing vigorously along Gate Road especially in the northern section of the property.

- **Resource inventory** - The Natural Diversity Data Base (NDDB) at the Connecticut DEP has compiled and mapped information on rare plant and animal species and significant natural communities in the state. Not all of the state has been mapped. Often state properties and water bodies have been more closely inventoried. Looking at the graphic below, each circle with the diagonal lines represents one species or community record in the data base. Because of the fine ecological condition of the watershed overall and of the two parcels in particular, consideration should he given to inventorying for permanent record. (Additional information about the data base may be obtained at the DEP by calling 860 424-3592 or 424-3378.)



Neighboring properties have been inventoried over time and found to embrace rare plant and animal species and significant natural communities. This NDDB graphic is current through July, 2005.

- **Public Support** - Support of open space from the town population is at its best when the population interacts with the property. This parcel offers potentially wonderful view sheds of the surrounding hills and landscapes for hikers and walkers. The scheduling of a "farm day" / open house, or seasonal activities such as hay rides and sleigh rides would add to the perceived value, and thus the support, from the people of Durham. In addition, signage identifying these open properties as 'town owned' allow the public to see what their taxes have paid for. Quite often, keeping these locations a secret is the worst thing that could happen to them.

The Natural Diversity Data Base

The DEP Environmental and Geographic Information Center, Natural Diversity Database indicated that the state endangered American bittern *(Botaurus lentiginosus),* state threatened least bittern *(Ixobrychus exilis)* and state species of special concern blue-spotted salamander "complex" *(Ambystoma laterals)* occur in this area.

The American bittern and least bittern are secretive birds that nest in marsh complexes. These birds are associated with high water quality wetlands. Activities that degrade the water quality in wetlands, or streams that that feed them, will affect the bitterns. Bitterns are most susceptible to human disturbance during the breeding season (April through July).

The blue-spotted salamander "complex" results in the hybridization of the blue-spotted salamander with the Jefferson salamander. The hybrids can only be reliably distinguished by karyological and biochemical analyses. Blue-spotted salamanders are associated with riparian red maple swamps. They breed in March and April and may be found on the road surface on wet rainy nights. They favor grassy, flood plain wetlands for breeding. If you have additional questions regarding this salamander, contact Julie Victoria (DEP Wildlife Division, Franklin WMA, 391 Route 32, North Franklin, CT 06254).

The activities for these two parcels, as outlined in the information provided, will not impact these listed species. If improvements are slated that may result in sedimentation or erosion into Sawmill Brook or wetlands, best management practices should be followed to reduce these impacts. If silt fencing is utilized, it should be removed as soon as soils are stable so amphibian migration is not impeded.

This section of the Wildlife Division (Sessions Woods) has not made an on-site inspection of the project area. Consultation with this office should not be substituted for site-specific surveys that may be 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 any subsequent environmental permit applications submitted to the DEP for the proposed site. 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 DEP Wildlife Division should be requested and species-specific surveys may be required.

FISHERIES RESOURCES

Curtis Woodlands

Fisheries Resources

The Team's fisheries biologist walked an approximate 250 meter section of Sawmill Brook upstream from the location of the Scout Camping Area. The stream fish community would be similar to what has been documented near the Friendly Acres Farms parcel except that as a general rule of thumb, fish species diversity increases as you move downstream in the watershed. In particular, fish species diversity will increase along the stretch of brook adjacent to the Lyman Golf Course parcel as Sawmill Brook nears its confluence with the Coginchaug River. The section of watercourse adjacent to the Curtis Woodland parcel does not appear to support fish species of recreational value such as trout so its recreational angling value is very limited.

The stream is of moderate gradient alongside the Curtis Woodland parcel, averaging approximately 20 feet in width. Large sized cobbles and large gravels are dominant substrate types. Fish habitats are mainly in the form of alternating riffle and pool habitats; however, pool habitats are fairly shallow thus limiting the availability of deep water cover habitat for fish during low flow periods. Streambed substrates are covered with attached filamentous algae. Attached algae are common within agricultural watersheds and are a sign of nutrient loading and poorer water quality. A common feature in this section of stream are multiple, braided channels. In general, braided channels are typically wide and shallow, have unstable streambanks and are a sign of stream channel instability or a stream channel out of equilibrium. Braided channels are typically formed as a response to excess sediment loading; thus, multiple channels are created to facilitate the movement of streambed substrates during storm events.

Recommendations

A negative artifact of channel braiding relative to fisheries resources is that stream flow is conveyed from one undivided channel into several braided, divided channels diminishing the amount of overall usable habitat for fish communities, especially during the summer. Opportunities do exist in this stretch of brook along the property to enhance instream fish habitats by installing a structure called a channel block. Attached to this report is some specific information relative to the construction of a channel block as described by Seehorn 1992. If the Town of

Durham is interested in exploring the installation of a channel block, the Team's fisheries biologist is willing to provide further technical guidance.

Sawmill Brook and its surrounding wetlands could serve as valuable ecological study areas for students and the general public as well. The Town and local schools should consider installing interpretative signs along the trail system to explain the types and values of various stream, wetland and upland habitats along with identifying local flora and fauna. The existing trail shows areas of damage by horse traffic especially in wet areas or in wetlands. Heavy use of the trail systems by horses should be discouraged; otherwise, the trail system will require more intensive repair and maintenance. Any crossings within wetland habitats on the property should be accomplished with raised boardwalk or timber bridge structures to reduce erosion and sedimentation to sensitive resources.

Friendly Acres Farm

Fisheries Resources

Sawmill Brook was last sampled by the DEP Inland Fisheries Stream survey team on 6/28/89 within a 150 meter stretch below the Trimountain Road crossing which is upstream of the Friendly Acres Farms property. Obligate stream species were found that included common shiner, white sucker and fallfish. Warmwater pond species that included largemouth bass, pumpkinseed, bluegill and bullhead were also found. These pond species most likely originate from Carey Lowe Pond, located just upstream of Trimountain Road crossing. Warmwater pond species can pass through this watercourse as seasonal "blowdowns" during high flow periods. Blowdowns is a fisheries term that refers to fish that are blown or flushed out of pond habitats during high stream flows.

The unnamed tributary to Sawmill Brook, whose headwaters originate at Fowler Mountain, has not been sampled by the DEP Inland Fisheries Division. The day of the field review the stream was observed to support a coldwater fish community comprised of native brook trout and blacknose dace. Brook trout, which are species native to Connecticut, typically spawn during the month of October. Eggs incubate within gravel substrates over the fall and winter periods with eggs hatching in late February or early March. Fry remain in the gravel until their yolk sacs are absorbed at which time the fry emerge from underneath the gravel and move into preferred stream microhabitats. Fry emergence occurs when fish reach about 1.5 inches in length. Blacknose dace, a member of the minnow family reach sexual maturity in 1 year and spawn in shallow riffle areas during the spring. They reach lengths of 2-3 inches.

Recommendations

Three culverts convey the streamflow of Sawmill Brook under the main access road to the Friendly Acres Farm property. Although there is suitable water depth in 2 culverts to allow fish movement to upstream areas, these multiple, undersized culverts inhibit the downstream movement of streambed substrates (bedload) through them, hence the large accumulation of substrates just upstream of the culverts. Notice the presence of large size cobbles (4-6 inches in diameter) upstream of the crossing, yet in areas below the crossing, the dominant substrates are smaller gravels (less than 2 inches in diameter) and sands. Undersized culverts and the aggradation (build-up) of materials upstream of the crossing may create future erosion and scour problems at this road crossing.

Thus, it is recommended that if funds are available, the 3 culverts should be replaced with a single culvert to allow for fish passage and the movement of bedload materials. For future reference, attached to this report are fisheries resource best management guidelines for stream crossings. In addition, vegetation has been cleared on either side of the crossing creating a large opening in the stream canopy increasing solar radiation and stream temperatures in the area. Streamside vegetation (trees and shrubs) should be planted to the extent that site conditions allow to provide streamside shading and cover. Native hardwood vegetation should be considered such as oak/maple species along with fast growing shrub vegetation that grows in wet soils such as willows or dogwoods.

STREAM CROSSING GUIDELINES

The Inland Fisheries Division (the "Division") routinely recommends the installation of span bridges or arch culverts for the crossing of ***perennial watercourses***. These structures best preserve physical aquatic habitat and do not create barriers to fish migration. In certain select situations, the Division has accepted the installation of culverts for stream crossings. However, a certain amount of modification to a culvert is required to assure the efficacy of maintaining aquatic habitat and resource integrity. The modifications recommended are:

- The invert of a box culvert should be set no less than 1 foot below the existing streambed elevation. The invert of a round culvert less than 10 feet in diameter should be set 1 to 2 feet below the existing streambed elevation. For round pipe greater than 10 feet in diameter, the culvert invert should be set one-fifth of the pipe diameter below the streambed elevation.

- For multiple culvert situations, one or more of the culverts should be installed as per the guidelines for single culverts. Deflectors may need to be installed in the stream to concentrate low streamflows into and through the recessed culvert.

- The culvert gradient should be no steeper than the streambed gradient up- or downstream of the culvert.

- The culvert alignment should be similar to that of the stream and the culvert kept at a short a length as possible. Vertical headwalls rather than fill slopes should be installed at the culvert inlet and outlet to reduce the total culvert length.

- Corrugated metal culverts rather than concrete culverts are preferred. The corrugations create a roughness, which aids in the retention of streambed material.

- Streambed material excavated for the culvert placement should be stockpiled and be replaced within the culvert following its installation. The streambed material should be replaced in a manner replicating the original stream cross section with a well-defined low flow channel contiguous with that existing in the stream.

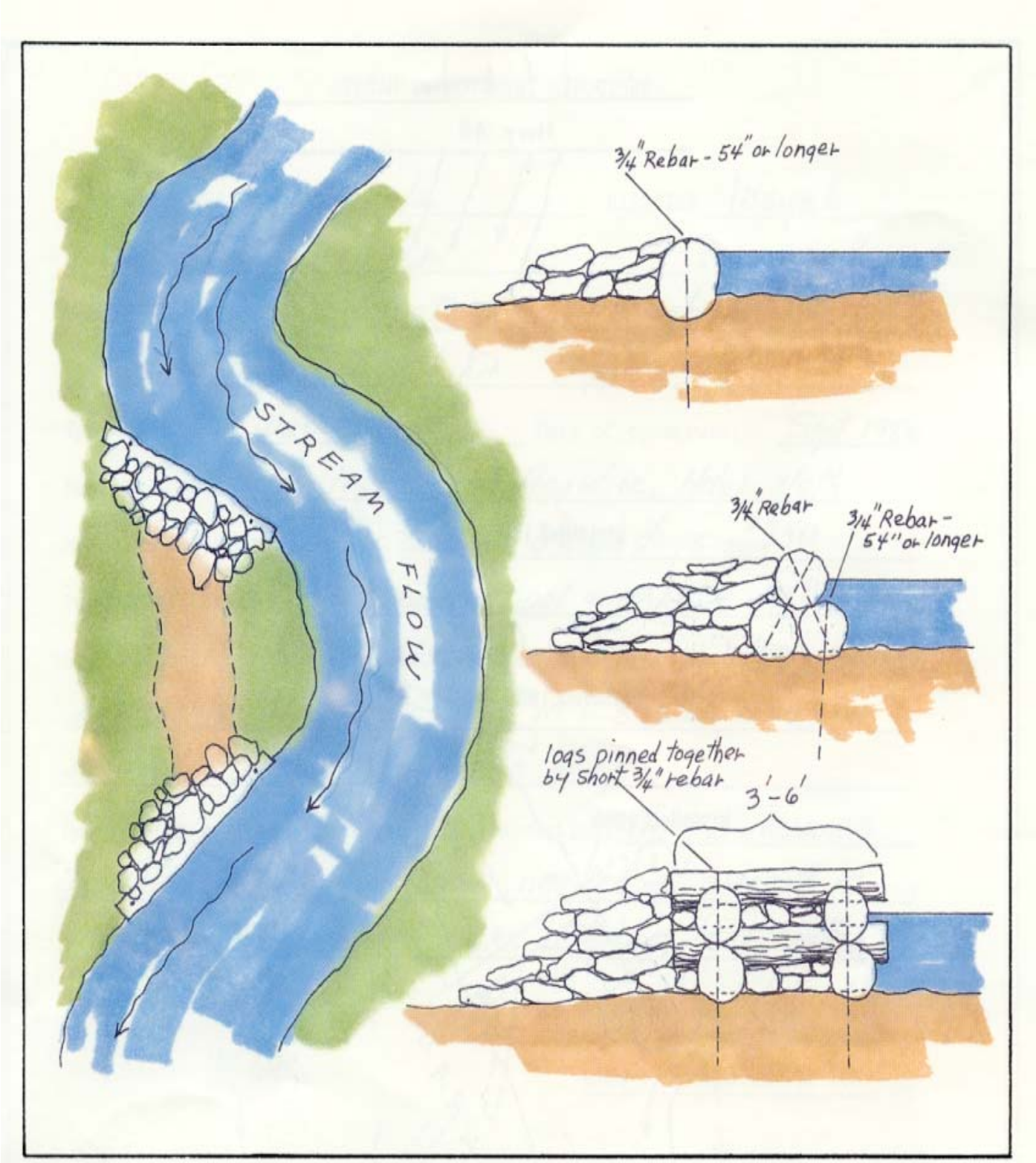
Culverts installed on ***intermittent watercourses*** are evaluated based upon the potential for seasonal utilization of the watercourses by fish.

In addition to offering recommendations for structure design, the Division has developed the following measures to enhance and/or protect aquatic habitats and resources during instream and near-stream construction activities

- The placement of scour protection measures should be minimized to the fullest extent possible. Native stone should be utilized rather than quarried rip-rap.
- Unconfined instream activities should be allowed only during the time period of June 1 through September 30.
- Retaining walls should be utilized in lieu of fill slopes along roadway approaches to stream crossing structures to minimize riparian habitat loss.
- Riparian vegetation disturbed during construction should be re-established in a timely manner upon the project completion. The species of vegetation selected for reestablishment should be native to the immediate watershed and be non-invasive.
- All appropriate erosion and sediment controls should be established prior to and be maintained through all phases of construction

Diagram of Channel Block

From Seehorn, M.E. 1992. Stream Habitat Improvement Handbook, USDA Forest Service.
Technical Publication R8-TP7



WILDLIFE RESOURCES

A site inspection was conducted to evaluate existing wildlife habitat on the property. The Curtis Woodlands property is approximately 138 acres in the northwest corner of Durham bordered by active railroad and the Lyman Orchards Golf Course. The site contains a field area, mixed coniferous-deciduous forest, and a portion of the Sawmill Brook. The Friendly Acres Farm property is approximately 200 acres in the western section of Durham, with a newly constructed dairy barn (leased for dairy operations) and a number of agricultural fields, some of which will be used to grow hay and silage. There are also woodlands and shrublands on the property. These town-owned conservation lands are to have management plans developed.

Curtis Woodlands

Existing Wildlife Habitats

Field-

This site contains a large field (exact size unknown) currently dominated by autumn olive. As previously stated, early-successional habitat that is useful to wildlife is being lost at a worrisome rate, resulting in the decline of a myriad of species dependent on it.

Forested Area-

The forested portion of the property contains both deciduous, coniferous, and mixed deciduous/coniferous areas. Again, forested areas are valuable to wildlife, providing cover, food, nesting and roosting places and denning sites.

A portion of Sawmill Brook runs through the forested portion of the property. Riparian zones (the area where terrestrial and aquatic ecosystems meet) are valuable to wildlife due to the increased plant species and structural diversity. They are used for foraging, as travel corridors, and provide for species that require multiple habitat types. Some species that make use of riparian zones include wood turtles, water shrews, white-tailed deer, dragonflies, otters, mink, common yellowthroats, and yellow warblers.

Habitat Management Recommendations

There is a good opportunity to improve the habitat to benefit wildlife by managing the field currently dominated by autumn olive. This patch of early-successional habitat bordering mature forest has the potential to provide for a variety of species, including cottontails, turkeys, and kingbirds. Management techniques should include mowing to prevent encroachment by the surrounding forest and invasive species control (autumn olive) through cutting and/or herbiciding, with the goal of establishing a native shrubland. Shrublands are habitat patches with woody shrubs typically less than ten feet tall, with scattered open patches of grasses and forbs. The structural and vegetative diversity found in this habitat type allow wildlife species to use it for nesting, brood rearing, feeding, and escape from predators. Many species that prefer shrubland habitat are declining, including golden-winged warblers and prairie warblers. Other species that utilize shrublands include spotted turtles, golden-winged warblers, fox sparrows, cottontail rabbits and white-footed mice. After mowing and invasive species removal, options include either waiting to see what comes in naturally, or seeding to establish certain shrubland plants. These can include highbush blueberry, winterberry, and viburnums. The area should be maintained by reentering the stand at short intervals (every one to five years) and removing regenerating invading trees. Once established, periodic vegetative management will need to be conducted every three to five years to prevent reversion to forest.

Forestry management techniques should also be considered for this site. Creating a variety of age-classes within a forested area is often beneficial to a variety of wildlife species. However, care should be used around the riparian zone so as not to cause disturbance to this area. Refer to the forestry portion of this report for more information. Additionally, care should be taken when placing trails and deciding on public use of these areas. Trails should not run parallel to the riparian zone, as this can lead to degradation, and the effects of horseback riding, biking and other activities over the entire area should be carefully considered.

Friendly Acres Farm

Existing Wildlife Habitats

Fields-

The site contains multiple fields of various acreages, some of which will be used to grow hay and silage to support the dairy operation currently running on the

property. One field (approximately 10 acres) will be utilized for grazing while a total of approximately 75 acres either will be used for hay and silage production or will remain open field. Currently, there are non-native invasive species, including multiflora rose in some of the fields.

Early-successional habitat (grasslands, hayfields, meadows, etc.) is important to a variety of species generally termed "grassland specialists" because of their dependence on open, grassy habitats. These birds, including bobolinks, Savannah sparrows, and grasshopper sparrows require large grassy areas and long seasons (needing until July 15th or later if they have to renest) in order to breed successfully. Other species that make use of this habitat type include hognose snakes, eastern box turtles, black racers, red fox, and white-tailed deer. Many grassland specialists are declining along with the habitats they depend on. Development, intensive agricultural practices, lack of fire, and natural succession has all contributed to the decline in quantity and quality of these habitats. Multiple haying (mowing fields two or three times a year) destroys nesting attempts by those grassland specialists present because of the length of time they require to successfully nest. These species also prefer larger fields; bobolinks require at least five acres, eastern meadowlarks require 15 to 20 acres, Savannah sparrows require 20 to 40 acres, and both grasshopper sparrows and vesper sparrows require 30 acres.

Remaining early-successional areas are often too small to be of value to those species with large breeding acreage requirements, and agricultural haylands that are sufficiently large are usually mowed too frequently to allow birds to complete their nesting cycle, resulting in dramatic declines in species such as Savannah and grasshopper sparrows. Proper management of remaining early-successional areas is critical to the survival of these species.

Forested Area-

This area contains mixed deciduous and coniferous trees. Forested areas are valuable to wildlife, providing cover, food, nesting and roosting places and denning sites. Mast produced by oaks provides excellent forage for a wide variety of mammals and birds including white-tailed deer, gray squirrel, southern flying squirrel, eastern chipmunk, white-footed mouse, eastern wild turkey and blue jay. Trees, both living and dead, also serve as a home for a variety of insects, which, in turn, are eaten by many species of birds, including woodpeckers, warblers and nuthatches. Other wildlife species found in this habitat type include white-breasted nuthatch, American redstart, barred owl, broad-winged hawk, redback salamander and northern ringneck snake.

Habitat Management Recommendations

In order to benefit wildlife species, habitat management in the existing fields should include non-native invasive species control and a delayed mowing schedule. Invasive species such as multiflora rose can become the dominant vegetation, significantly reducing plant diversity. They displace native vegetation that provides high-quality forage, thereby diminishing the value of an area to wildlife. Invasive species control can be accomplished through manual pulling (although very labor intensive) or through the use of herbicides such as *Roundup*. Mowing may also be used for invasive species control, however, in order to be fully effective, it must be conducted three to six times per year, which may interfere with nesting birds and other wildlife. Often, herbicides are utilized in conjunction with mowing.

While actual acreages of the fields were not available, there are many grassland bird species that will utilize fields of various sizes and structures. Field size, species presence/absence in the area, current vegetative species composition and structure, and management resources are some of the factors to consider in managing for grassland specialists. These birds have narrow, specific requirements. For example, species that will breed in smaller fields include bobolinks (5-10 acres), eastern meadowlarks (15-20 acres) and Savannah sparrows (20-40 acres). Bobolinks prefer mixed grass (8-12" height) with relatively sparse ground cover and a mosaic of grasses sedges and forbs. Eastern meadowlarks prefer sparse to dense grass-dominated cover (10-20" height) with scattered shrubs and tall forbs. Savannah sparrows prefer dense ground vegetation with a mix of short and tall grasses (1-25" height).

If possible, expanding field sizes should also be considered. Species such as grasshopper sparrows need a minimum of 30-acre grasslands in order to successfully breed. In general, mowing should be done every one to three years to control incursions of woody plants (except for fields being managed for Savannah sparrows, when mowing should be done yearly). Mowing should be conducted after July 15th or later (ideally, after August 1st), and prior to March 1st in order to prevent nest destruction. Mowing schedules should also be modified based on which species of grass, forbs, and woody plants are present, how fast woody plants resprout or invade after cutting, and other site-specific considerations. Many grassland specialist species will tolerate only light grazing.

Field borders can be removed to control invasive woody plants and expand grassland size. In fields that will be grazed, rotating livestock between fields planted in warm- and cool-season grasses will prevent overgrazing and provide a mosaic of grass heights and structures. Light grazing also removes ground litter, benefits bunch grasses and allows development of wildflowers and scattered shrubs, all of which are beneficial to wildlife. In addition to grassland birds, many other species will benefit from proper management of these fields, including meadow voles, red fox, cottontail rabbits, green snakes, box turtles, bats, and a multitude of insects.

Vegetation Review

Vegetation

The Curtis Woodlands and Friendly Acres Farm parcels are part of the Durham Conservation Lands. Each parcel may be divided into several broad vegetation categories. These include mixed hardwoods, mixed hardwoods/floodplain, hemlock, softwoods/hardwoods, hardwood swamp, old field and open field. Below are brief descriptions of each of the vegetation categories found on each property. The location and acreage of these areas were obtained from both 1995 aerial photographs and 1990 orthophotographs and are only approximate. They are depicted on the appropriate Vegetation Type Maps. The field inventory of vegetation types was conducted in August and December of 2005. A more comprehensive inventory of the herbaceous vegetation that is present in each of these categories should be made at different times throughout the year by a botanist.

The vegetation that has developed on both of these parcels is quite diverse and strongly reflects the soils that are present and the past use of the land. A clear succession from once open pastureland to a dense mixed hardwood forest is apparent. Old stone and barbed wire fences delineate some of these areas. As a result of this succession, the trees are older and generally larger in the areas that were abandoned first. Younger trees, including pioneer species such as gray birch and eastern red cedar, are present in the areas that were abandoned more recently.

Several non-native invasive plant species have become well established throughout much of the review sites especially in the old-field areas and the wetlands. These include Japanese barberry, Asiatic bittersweet, multiflora rose, and autumn olive, several species of bush honeysuckle, Japanese honeysuckle, common buckthorn, winged euonymus and tree-of-heaven. Wineberry and garlic mustard are also present, but only in a few isolated locations. These species are of special concern because they are non-native and have the potential to become major components of the ecosystem by out competing native species. Although some of these species provide wildlife with food and cover, they are aggressive competitors with native plants and should be controlled when possible. At the present time, mechanical removal of some of these plants should be effective especially where limited numbers of individuals are present. In areas where these species are well established, a combination of mechanical, chemical and perhaps biological control methods may be needed. If no effort is made at this time to control the non-native invasive species that are present, they will become more widespread and control will become much more difficult. In this report, non-native invasive plant species will be marked with an "*" for easier identification. The most up-to-date control and management information on the above non-native invasive species may be found at the following web site:
http://tncweeds.ucdavis.edu/esadocs.html

The infestation of Hemlock Woolly Adelgid that has occurred over the last fifteen or so years has caused some eastern hemlock mortality on sections of both of the properties. The Hemlock Woolly Adelgid is a small aphid-like insect that feeds on the sap from young Eastern Hemlock twigs during all seasons of the year with the greatest damage occurring during the spring. The loss of new shoots and needles seriously impairs the hemlock's health and vigor. The Adelgid is dispersed by wind, birds and mammals and is at the present time almost impossible to control in a forested environment. Cultural and chemical control methods have proven to work well in ornamental landscapes.

Biological control agents such as the Asian ladybird coccinellid beetles show promise, but widespread availability and use are probably several years off. Defoliation and the resulting mortality can occur within several years after initial infestation. Infested hemlocks die at different rates and deteriorate quickly after death. Although standing dead hemlock provide excellent foraging and cavity-nesting habitat for many species of birds they also create problems. Dead hemlock trees not only pose a direct threat to people and property; they may also pose a long-term wild fire hazard and are generally not aesthetically pleasing. Many of the hemlocks that have survived appear to be in decline resulting from the Adelgid infestation and other stressors such as drought, poor site conditions and other insect and disease pests. The decline of eastern hemlock will lead to a loss of habitat diversity and aesthetic beauty. Monitoring tree condition will be vital to prescribing future management strategies, which may or may not include cutting to reduce hazardous conditions.

The forested portions of both of these properties are well suited to environmental education, conservation and passive recreation. However, due to the unpredictable risk of falling dead hemlock trees and falling dead branches, use of the trails in the hemlock areas should be restricted until a safe condition exists. This high-risk condition may exist for several years if the dead hemlock are left alone to fall on their own. However, if dead and dying trees that are within striking distance of the trails were felled, the high-risk condition would be eliminated.

Specific forest management recommendations aimed at improving the overall health, stability and diversity of the forested portions of these properties are suggested for vegetation types where implementation is not restricted by access or site limitations. Management practices include crop tree selection and release (focused on removing the unhealthy and poor quality trees that are interfering with the growth of healthy trees), invasive species control and management; vine removal, apple tree release and cull tree removal. Specific recommendations may be found in the individual vegetation type descriptions for each property.

It is important that the property boundaries are located and clearly marked before any management activities are implemented.

Vegetation Type Descriptions

Curtis Woodlands - 138 Acres

A. Mixed Hardwoods

This mixed Hardwood vegetation type totals approximately 55 acres. It is made up of two distinct age classes. The dominant larger trees, which include sugar maple, white ash, tuliptree, red oak, sycamore, and shagbark hickory, are approximately 110 years old. The younger trees that are present in the overstory are approximately 70 years old and include red oak, black oak, white oak, black birch, yellow birch, red maple, sugar maple, white ash, black cherry, shagbark hickory, pignut hickory, and mockernut hickory. Scattered dead and dying eastern hemlock are also present. Occasional dead and declining eastern red cedar may be found in the understory as remnants of when this area was abandoned as pasture. The understory vegetation that is present includes hardwood tree seedlings, hophornbeam, American hornbeam, maple leaved viburnum, spicebush, witch-hazel and highbush blueberry. Several patches of Japanese barberry* and multiflora rose* have become established in the flats at the toe of the slope near Sawmill Brook. These patches should be eradicated before they become more widespread. Vines and ground cover vegetation include grape, poison ivy, Virginia creeper, green briar, rattlesnake plantain, spotted wintergreen, wild sarsaparilla, wood aster, club moss, skunk cabbage, jack-in-the pulpit, evergreen wood fern, New York fern, hayscented fern, Christmas fern and many other species of grasses, sedges and wild flowers.

B. Hemlock

Approximately 29 acres of the Hemlock vegetation type are present within this parcel. Over 60% of this vegetation type is made up of seedling to large sawtimber size eastern hemlock that are declining or have died due to an infestation of Hemlock Woolly Adelgid and Elongate Hemlock Scale. Fortunately sugar maple, white ash, black cherry, tuliptree, American elm, sassafras, black birch, red maple, American beech, shagbark hickory, mockernut hickory, pignut hickory, red oak, black oak, white oak and occasional eastern red cedar are also intermixed. Many of these trees are healthy and will expand their crowns to take up the space made available by the declining hemlock. A high percentage of the black birch that are present are infected with Neo-Nectria canker. This fungal disease causes cankers that destroy the trees future value for lumber. In areas that are accessible, unhealthy cankered black birch could be removed to create more growing space for healthy trees. In some areas the understory vegetation is taking advantage of the increased light levels caused by the dying hemlock. Included are hardwood tree seedlings (especially black birch), hemlock seedlings, winged euonymus*, highbush blueberry, witch-hazel, hophornbeam, American hornbeam and deciduous holly. Poison ivy, grape, raspberry, wineberry*, club moss, Christmas fern, spotted wintergreen, wintergreen, garlic mustard*, grasses and sedges were observed as ground cover where sunlight reaches the forest floor.

Unfortunately as the hemlock die and fall apart they create a hazardous situation. The trail that passes through this area should be monitored and perhaps temporally closed to avoid the potential risk of injury to users. One management option is to let the hemlock die and fall at its own pace. This option is excellent for all the wildlife that utilizes dead and dying trees. However, it leaves this area unsafe for recreational uses for the longest period of time. It also creates the longest period of potential high wildfire danger. Another option is to remove only the hemlock that are within striking distance of the trail. This would effectively eliminate the hazard to users.

C. Old Field

There are several areas that are vegetated with Old Field /Transition Hardwoods present within this property. Area C totals approximately 15 acres and is dominated by crowded pole to small sawtimber size eastern red cedar with sugar maple, white ash, black birch, red maple, black cherry, red oak and American beech intermixed. Vines including Asiatic bittersweet*, grape, poison ivy and Virginia creeper have taken over much of the area and are beginning to damage the trees that are present. Some of the larger trees are in very poor condition as a result of having crowns that have been damaged by these vines. Removal of the vines from trees that still have potential to become healthy would improve the condition of this stand. The cut vine stems should be treated with herbicide to control sprouting and re-growth. Understory vegetation includes hardwood tree seedlings but is dominated by dense patches of Japanese barberry*. Pennsylvania sedge, club moss and Christmas fern make up the ground cover that is present.

D. Hardwood Swamp/Streambelt

There are three Hardwood Swamp areas that total approximately 11 acres located within this tract. Two of these wetlands are located along Sawmill Brook. The vegetation that is present in all of these wetlands is somewhat variable but generally dominated by pole to sawtimber size red maple. Other tree species that are present include yellow birch, eastern hemlock, sugar maple, sycamore, black gum, white ash, American beech, mockernut hickory and American elm depending on which wetland is being considered. All size classes are represented in these wetlands. Shrub species that are present include widespread Japanese barberry* along with spicebush, multiflora rose*, speckled alder, highbush blueberry, swamp azalea, winterberry, hophornbeam, American hornbeam and witch-hazel. Skunk cabbage, tussock sedge, club moss, sphagnum moss, poison ivy, cinnamon fern, sensitive fern, horsetail and false hellebore are present as ground cover. Several of the large red maples that are present have cavities that make excellent den sites for many species of wildlife including wood ducks. There are also many standing dead trees called snags that are being utilized by a variety of birds.

E. Old Field

Three separate stands that total approximately 11 acres are represented in this vegetation type. Each is dominated by a dense growth of sapling to small pole size eastern red cedar. The cedar are declining in health and vigor as a result of fierce competition with black birch, red maple, black cherry, tuliptree, American elm, white

ash, scarlet oak, shagbark hickory, bigtooth aspen and occasional eastern hemlock that are also present. In some areas vines including Asiatic bittersweet*, grape, poison ivy and Virginia creeper are beginning to damage the trees that are present. Removal of the vines from trees that still have potential to become healthy would improve the condition of this stand. The cut vine stems should be treated with herbicide to control sprouting and re-growth. Understory vegetation is dominated by non-native invasive species including Japanese barberry*, multiflora rose*, winged euonymus*, autumn olive*, Japanese honeysuckle* and at least two species of bush honeysuckles*. Ground cover vegetation is sparse but includes Christmas and several species of clubmosses.

Many of the cedar could be brought back to health to provide better habitat for wildlife if they were released from the hardwood competition. This could be accomplished by removing the competing trees from three out of four sides of their crowns thus allowing them to receive more sunlight. Openings that are made may allow sunlight to reach the forest floor and stimulate the growth of herbaceous vegetation, which is usually desirable to wildlife. However, because many non-native invasive plant species are present, consideration must be given to eradicating or controlling the spread of these species before any releasing of crop trees takes place.

F. Old Field/Transition Hardwoods

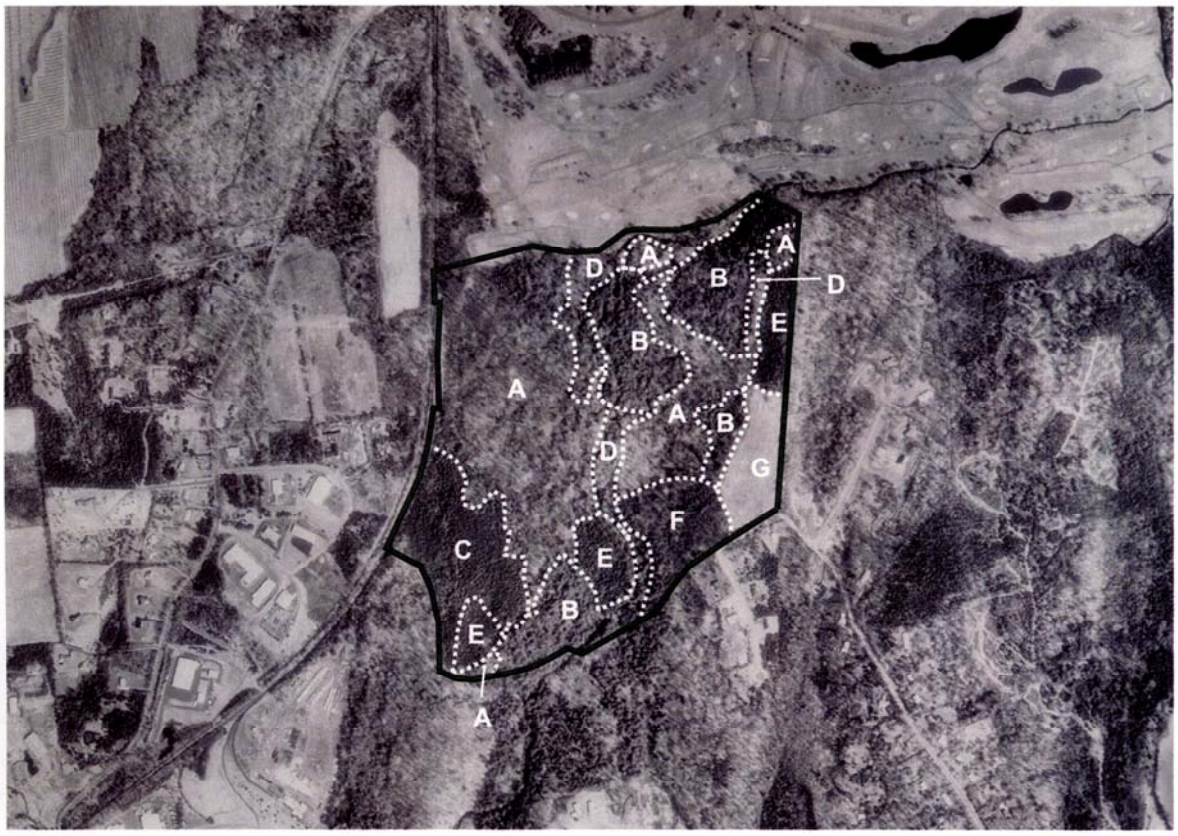
This Old Field /Transition Hardwoods vegetation type totals approximately 9 acres and is dominated by declining pole size eastern red cedar. Yellow birch, black birch, red maple, white ash, black cherry and red oak are beginning to overtop the cedar as they move toward dominance in the stand. Vines including Asiatic bittersweet*, grape and poison ivy are present and should be removed from quality trees. Understory vegetation includes hardwood tree seedlings, American hornbeam, winged euonymus*, and multiflora rose* along with Japanese barberry*, which has become widespread. Pennsylvania sedge, club moss, Christmas fern, sensitive fern and royal fern make up the ground cover that is present.

G. Open Field

The Open Field vegetation type occupies approximately 8 acres of this tract. This area is being mowed periodically to control the encroachment of woody vegetation including non-native invasive species. The woody vegetation that was present before the last mowing that occurred in the fall of 2005 included hardwood tree seedlings (white ash, gray birch, tree-of-heaven*, quaking aspen and bigtooth aspen), speckled alder, smooth sumac, staghorn sumac, raspberry, gray dogwood, multiflora rose*, autumn olive*, common buckthorn*, bush honeysuckle*, Japanese honeysuckle*, Asiatic bittersweet*, grape and poison ivy. Many of these species provide very important early successional habitat for many species of wildlife. However, the non-native species are aggressive competitors with native plants and should be eradicated. The herbaceous vegetation that is present includes assorted grasses, ragweed, milkweed, Queen Anne's lace, lamb's quarters, evening primrose, common mullein, spreading dogbane, intermediate dogbane, black-eyed Susan, ox-eyed daisy, white clover, chicory, field pussytoes, purple vetch and many species of goldenrod, aster and cinquefoil.

Of concern are several large specimens of tree-of-heaven* that are located at the western edge of this area. These trees are non-native invasive species that are extremely prolific seeders and sprouters. Felling these trees and immediately treating the stumps with herbicide to kill the root system should eliminate this seed source. Newly established seedlings will also need to be treated with herbicides if they are to be eradicated.

DURHAM CONSERVATION LANDS
CURTIS WOODLANDS
DURHAM, CT
VEGETATION TYPE MAP



LEGEND

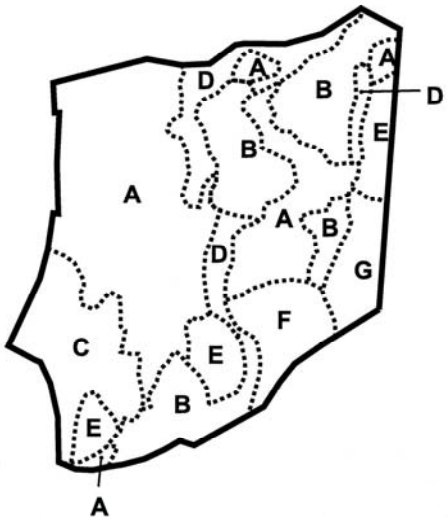
PROPERTY BOUNDARY

VEGETATION TYPE BOUNDARY

VEGETATION TYPES

A. Mixed Hardwoods	55+- Acres
B. Hemlock	29 +- Acres
C. Old Field	15+- Acres
D. Hardwood Swamp/Streambelt	11+- Acres
E. Old Field	11+- Acres
F. Old Field	9+- Acres
G. Open Field	8+- Acres

DURHAM CONSERVATION LANDS
CURTIS WOODLANDS
DURHAM, CT
VEGETATION TYPE MAP



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LEGEND

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Vegetation Type Descriptions

Friendly Acres Farm - 210 Acres

A. Hardwood Swamp

There are two Hardwood Swamp areas that total approximately 52 acres that are described in this vegetation type. Both swamps are similar, however the one to the east of Gate Road is associated with a small tributary to Parmalee Brook and the one to the west of Gate Road drains into Sawmill Brook. Sapling to pole size red maple are dominant in the overstory with occasional American elm, white ash and eastern red cedar intermixed. The vegetation that is present in the understory is quite variable from area to area. Highbush blueberry, speckled alder, arrowwood viburnum, hop-hornbeam, American hornbeam, gray birch, deciduous holly, swamp azalea, swamp rose, nannyberry, witch-hazel, poison sumac, Japanese barberry* and multiflora rose* are present in one area or another. Skunk cabbage, false hellebore, tussock sedge, club moss, sphagnum moss, poison ivy, cinnamon fern, sensitive fern, evergreen wood fern, royal fern, sedges, goldenrod and many wild flower species are present throughout as ground cover. A few of the standing dead trees (snags) that are present have cavities that are being utilized as nesting sites for birds.

B. Open Field

Several Open Fields are present that total approximately 31 acres. These fields are vegetated with grasses and are being utilized as mowing lots.

C. Softwoods/Hardwoods

Approximately 23 acres of the Softwood/Hardwoods vegetation type are present within this parcel. Over 40% of this vegetation type is made up of a mix of declining pole to sawtimber size eastern hemlock and eastern red cedar. Many of the hemlock are infested with Hemlock Woolly Adelgid and Elongate Hemlock Scale while the cedar is declining as a result of being overtopped by other trees. Fortunately, hardwoods tree species including black birch, red maple, tuliptree, sugar maple, white ash, sassafras, American beech, shagbark hickory, mockernut hickory, pignut hickory, red oak, black oak, white oak, black cherry, sassafras and paper birch are also intermixed. These trees will expand their crowns to take up the space made available by the declining hemlock and cedar. The understory vegetation that is present is made up of hardwood tree seedlings, hemlock seedlings, winged euonymus*, highbush blueberry, witch-hazel,

maple-leaved viburnum, hophornbeam, American hornbeam and spice bush. Scattered Asiatic bittersweet*, poison ivy and grape vines are also present in some of the trees. Japanese barberry* has become densely established in some areas, especially near Sawmill Brook. Poison ivy, club moss, Christmas fern, hayscented fern, spotted wintergreen, grasses and sedges were observed as ground cover where sunlight reaches the forest floor.

D. Mixed Hardwoods/Floodplain

This Mixed Hardwood/Floodplain vegetation type totals approximately 18 acres and is generally restricted the moderately well drained areas along Sawmill Brook that periodically become flooded. The vegetation that is present is quite variable but is dominated by pole to sawtimber size red oak, tuliptree, sugar maple, black cherry, red maple, white ash, American elm and sycamore. Some of the larger trees that are present are in very good condition and are very healthy while others appear to be declining. In addition several of the larger trees have cavities that are suitable as nesting sites for wildlife. The understory vegetation that is present includes eastern red cedar, spice bush, arrowwood viburnum, maple leaved viburnum, nannyberry, hop-hornbeam, American hornbeam, highbush blueberry, multiflora rose* and apple. The vine species that are present include Asiatic bittersweet*, grape and poison ivy. Ground cover vegetation includes raspberry, wineberry*, goldenrod, green briar, cinnamon fern, Christmas fern, sensitive fern and many other species of grasses, sedges and wild flowers. Several of the apple trees that are present could be brought back to health if they were pruned and released to full sunlight.

E. Mixed Hardwoods

This Mixed Hardwood vegetation type totals approximately 16 acres and is almost identical to the Softwoods/Mixed hardwoods vegetation **type C** described above. However, the softwood components of eastern hemlock and eastern red cedar are absent.

F. Mixed Hardwoods

All size classes are represented in the three areas that make up this vegetation type. These stands total approximately 15 acres and include red oak, black oak, scarlet oak, white oak, sugar maple, tuliptree, red maple, black birch, black cherry, sassafras, American beech, shagbark hickory, pignut hickory and mockernut hickory. Hardwood tree seedlings, hop-hornbeam, American hornbeam, winged euonymus*, multiflora rose*, Japanese barberry*, deciduous holly, maple-leaved viburnum, and highbush blueberry are present in the understory along with remnant gray birch and scattered eastern red cedar. Ground cover vegetation includes sedges, poison ivy, club moss, raspberry, evergreen wood fern, Christmas fern and Canada mayflower.

The trees in this stand are becoming crowded. A fuelwood thinning following the Crop Tree Selection method of thinning would help to reduce the crowded condition and allow potential crop trees to improve in health and vigor over time. Trees that are

removed to release crop trees, may be harvested and utilized as fuelwood, felled or deadened in place and left standing for wildlife. Up to 40 trees per acre should be chosen as crop trees. These trees should be released to full sunlight by removing the competing trees from three out of four sides of their crowns. Poor quality defective trees that are not providing specific benefits to wildlife such as the production of desirable mast or suitable cavities may also be harvested or deadened in place at this time. Care should be taken not to create openings so large that the growth of the non-native invasive species that are present becomes stimulated.

G. Old Field

Two Old Field areas that total approximately 12 acres are present within this tract. Portions of each appear to be periodically mowed to set back the encroachment of woody vegetation. At present these areas are dominated by grasses, goldenrod, sedges, common burdock, staghorn sumac, scattered multiflora rose* and various wildflower and weed species.

H. Open Swamp

Approximately 11 acres of Open Shrub Swamp are present within this property. The tree species that are present include seedling to sapling size red maple, American elm, white ash, black gum and eastern red cedar. Shrub species that are present include speckled alder, highbush blueberry, swamp azalea, arrowwood viburnum, gray birch, swamp rose, steeplebush, winterberry, alternate leaved dogwood and Japanese barberry*. Skunk cabbage, tussock sedge, club moss, sphagnum moss, poison ivy, goldenrod, raspberry, cinnamon fern, Christmas fern, sensitive fern and sedges are present throughout as ground cover.

I. Mixed Hardwoods

This is a lineal area that totals approximately 10 acres and is located in a narrow strip that runs along the roads that pass through the tract. It also includes a narrow area that passes between several open areas. The vegetation that is present varies considerably from place to place. All size classes are represented. Red oak, white oak, black oak, scarlet oak, sugar maple, tuliptree, red maple, black birch, yellow birch, black cherry, sassafras, American beech, shagbark hickory, pignut hickory, mockernut hickory, eastern hemlock, eastern red cedar and American elm are present. Many of these trees are healthy and in good condition, while others are not. Those that are unhealthy and are at risk of falling in the road should be considered for removal.

J. Hardwood Swamp

There are two Hardwood Swamp areas that total approximately 9 acres that are directly adjacent to Sawmill Brook. Pole size red maple are dominant in the overstory with occasional yellow birch, white ash, black gum, sassafras, tuliptree, black birch, eastern red cedar and eastern hemlock. The vegetation that is present in the understory

is dominated by pole size hophornbeam, American hornbeam and winged euonymus*. Highbush blueberry, witch-hazel, maple-leaved viburnum, and spicebush are also present. Japanese barberry* has become dense throughout most of this area. Skunk cabbage, false hellebore, tussock sedge, club moss, sphagnum moss, poison ivy, cinnamon fern, sensitive fern, evergreen wood fern, royal fern and many species of sedges are present throughout as ground cover. Some of the larger red maples that are present have cavities that make excellent den sites for many species of wildlife. There are also many standing dead trees (snags) that are being utilized by a variety of birds.

K. Old Field

This Old Field area totals approximately 7 acres and is dominated by crowded pole size eastern red cedar with red maple, white ash and black cherry intermixed. Understory vegetation includes hardwood tree seedlings, highbush blueberry, hophornbeam, American hornbeam, spicebush, arrowwood viburnum, deciduous holly, Japanese barberry*, winged euonymus*, multiflora rose* and grape vines. Pennsylvania sedge, club moss, poison ivy, sphagnum moss, royal fern and Christmas fern make up the ground cover that is present. Many of the cedar that are present could be brought back to health to provide better habitat for wildlife if they were released from the hardwood competition. This could be accomplished by removing the competing trees from three out of four sides of their crowns thus allowing them to receive more sunlight. Openings that are made may allow sunlight to reach the forest floor and stimulate the growth of herbaceous vegetation, which is usually desirable to wildlife. However, because many non-native invasive plant species are present, consideration must be given to eradicating or controlling the spread of these species before any releasing of crop trees takes place.

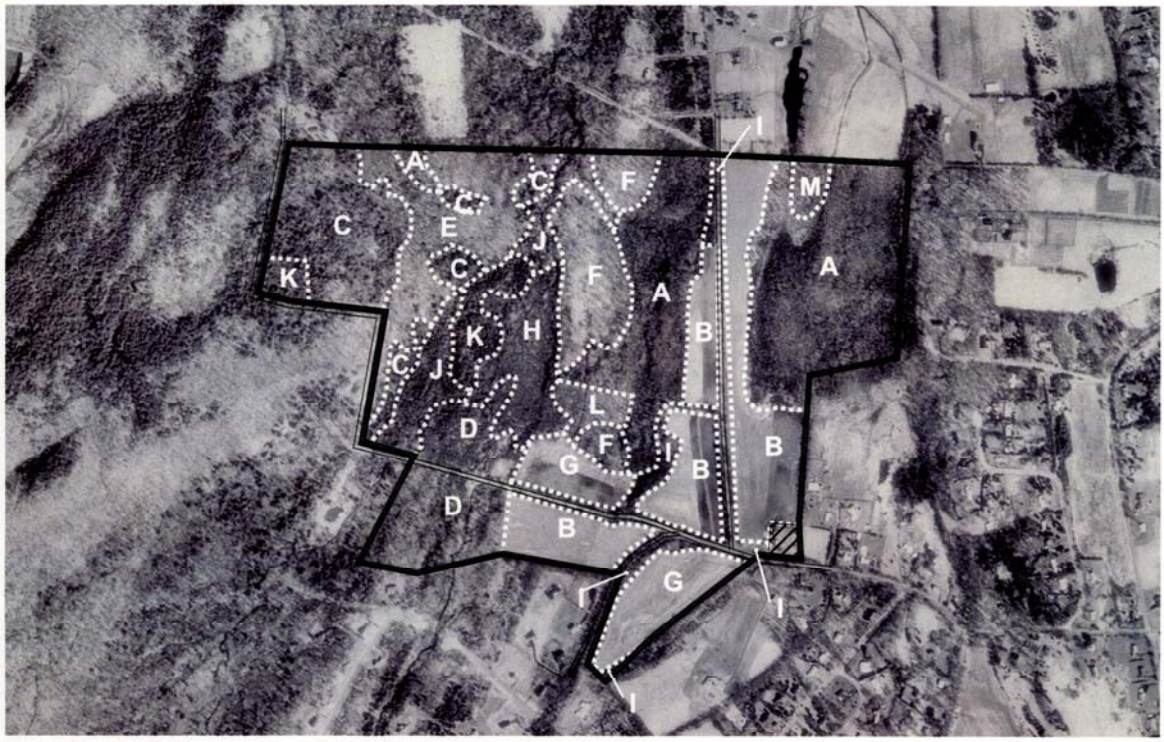
L. Mixed Hardwoods

This Mixed Hardwood vegetation type totals approximately 3 acres. It is made up of sapling to pole size trees that originated from stump sprouts, resulting in predominantly multiple stemmed trees. Red maple is the dominant tree species that is present. Others that are present include red oak, white oak, black birch, black cherry and sassafras. This stand is very crowded and would benefit by being thinned following the Crop Tree Selection method of thinning as described above for vegetation **type F**.

M. Mixed Hardwoods

This Mixed Hardwood vegetation type totals approximately 2 acres and is restricted to an area of well drained soils surrounded by wetlands. Healthy pole and sawtimber size trees that range from 75 to about 100 years of age dominate this area. The overstory in this vegetation type is dominated by red oak, black oak, white oak, sugar maple, black birch, red maple and black cherry. The understory vegetation that is present includes hardwood tree seedlings, maple leaved viburnum, hophornbeam, American hornbeam and witch-hazel. Ground cover vegetation includes poison ivy, Virginia creeper, Canada mayflower, wood aster, club moss, evergreen wood fern, hayscented fern, Christmas fern and many other species of grasses, sedges and wild flowers.

DURHAM CONSERVATION LANDS
FRIENDLY ACRES FARM
DURHAM, CT
VEGETATION TYPE MAP



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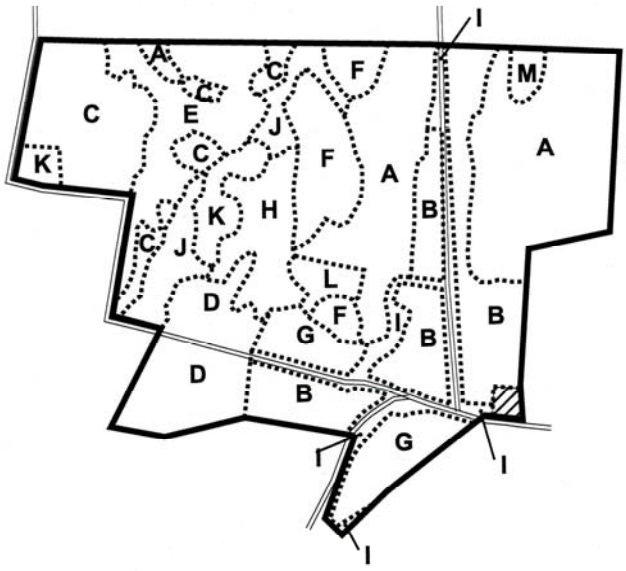
LEGEND

- PROPERTY BOUNDARY
- VEGETATION TYPE BOUNDARY
- ROADWAY
- BARNYARD 1+- ACRE

VEGETATION TYPES

A. Hardwood Swamp	52+- Acres
B. Open Field	31+- Acres
C. Softwoods/Hardwoods	23+- Acres
D. Mixed Hardwoods/Floodplain	18+- Acres
E. Mixed Hardwoods	16+- Acres
F. Mixed Hardwoods	15+- Acres
G. Old Field	12+- Acres
H. Open Swamp	11+- Acres
I. Mixed Hardwoods	10+- Acres
J. Hardwood Swamp	9+- Acres
K. Old Field	7+- Acres
L. Mixed Hardwoods	3+- Acres
M. Mixed Hardwoods	2+- Acres

DURHAM CONSERVATION LANDS
FRIENDLY ACRES FARM
DURHAM, CT
VEGETATION TYPE MAP



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K. Old Field	7+- Acres
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M. Mixed Hardwoods	2+- Acres

Archaeological and Historical Review

A review of the state of Connecticut archaeological site files and maps show no known archaeological resources in either the Curtis Woodlands or Friendly Acres Farm areas, however, topographic and environmental characteristics of the land suggest a high sensitivity for undiscovered cultural resources. These potential sites would be associated with the terraces adjacent to wetland areas and represent the seasonal camps of Native American hunter-gatherers utilizing the natural resources of the area.

Passive trail development may allow for interpretive landscapes of past cultural use including the town's farming history. An archaeological reconnaissance survey for the project areas may identify, evaluate and manage all cultural resources for educational and research purposes. The Office of State Archaeology would recommend a survey if any land use activities proposed for the conservation lands should affect below-ground resources. In lieu of ground disturbances, no action need be taken except to develop possible educational opportunities.

The Connecticut State Museum of Natural History/Archaeology Center would be more than pleased to assist the town of Durham and its school system in developing any educational and research possibilities they wish to explore.

Recreation Review

The ERT consists of a review of two town of Durham properties (138 acre Curtis Woodlands and the 200 acre Friendly Acres Farm) along Sawmill Brook, a major tributary of the Coginchaug River. Both were purchased with grant-in-aid assistance around 1970 as open space preservation as well as to protect Durham's future water supply development potential. Prior to the ERT, the Town recommended the need for a management plan for each tract and already has preliminary management plans available for comment. The remainder of these ERT comments consists of an overview description of each property and commentary on said preliminary management plans as needed.

Curtis Woodlands

Curtis Woodlands is a largely wooded tract containing a handsome stretch of Sawmill Brook, with an old field overgrown with Russian olive as seen at Dunn Hill Road. Currently authorized activities include permit hunting by lottery and Boy Scout camping by permit. In addition informal equestrian use by an abutter to the east occurs, resulting in a frequently muddy trail corridor. Also noted is an eroded gully, presumably caused or aggravated by storm wash of Dunn Hill Road. This reviewer has the following management recommendations:

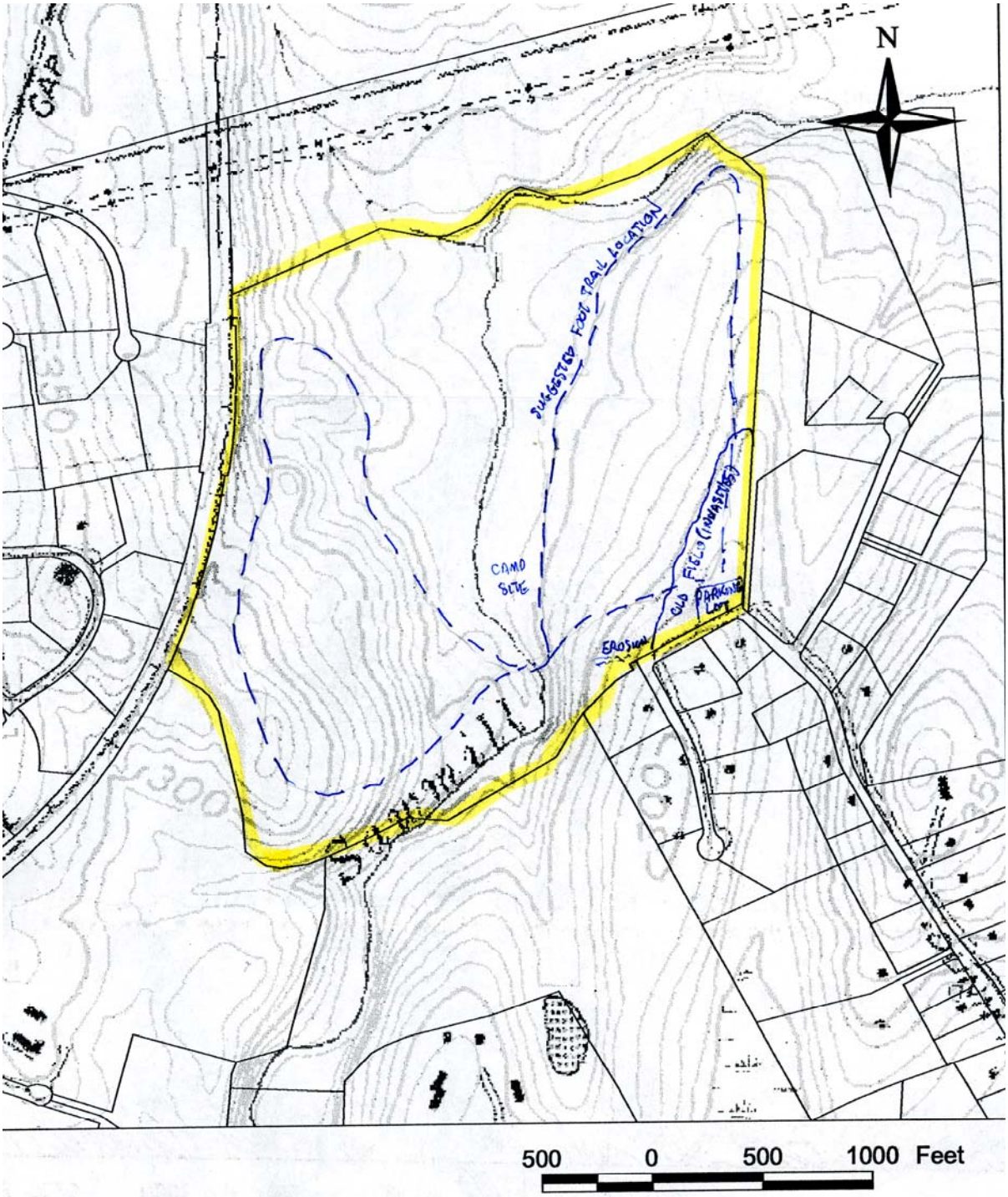
- Develop a small, fenced parking lot (+/- 6 car capacity) off Dunn Hill Road in the old field to provide off-road parking.
- Periodic mowing and clearing to maintain old field
- Develop a foot trail system perhaps as suggested on the following map, located on suitable, dry soils and separate from any equestrian trail to avoid muddy, unpleasant trail conditions.
- Develop a policy on possible equestrian use including a seasonal ban as needed to avoid negative impacts on wet soils.
- Continue permit hunting and Boy Scout camping with proper coordination to avoid conflict and public safety concerns.

- Correct gully erosion problems and siltation impact on Sawmill Brook.
- Consider what if any silvicultural activity would be appropriate as dead hemlock removal. The eastern portion clearly has better access, while accessing the more or less landlocked western portion could impact Sawmill Brook.
- Continue prohibition on motor vehicle access off-road.

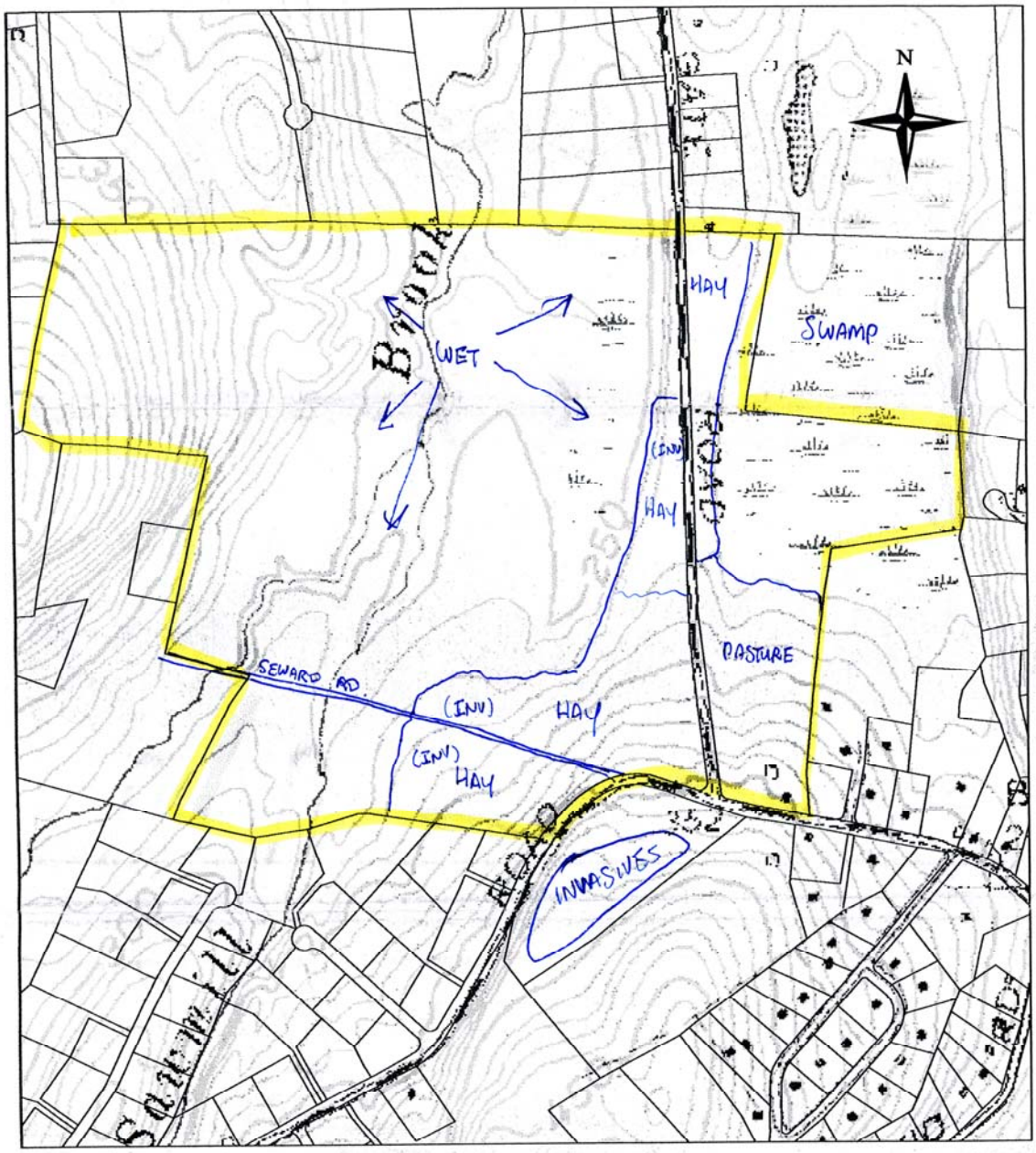
Friendly Acres Farm

Friendly Acres Farm is located at the junction of Gate and Parmalee Roads. The most noteworthy feature of the property is a small operating dairy farm complete with a new barn. Operating under a lease from the town, the lessee proposes to carry out a dairy operation with an education component. Approximately 25 acres of existing hay and pasture land are available for this purpose, although some invasives can be seen as roughly indicated on the attached map. As long as this farming venture continues, clearly the focus of any management plan for the property must be built around it so as not to interfere with it. Much of the rest of the tract consists of damp to swampy woodland along Sawmill Brook plus swamp east of Gate Road. In addition there is some hilly woodland east of Mountain road in the westernmost part of the tract. Management recommendations include:

- Detail farm lease agreement to include periodic liming, seeding as needed to maintain the hayfields, including sufficient length of lease to justify such investment.
- Encourage lessee to control the invasives encroaching into some hayfields by mowing as needed.
- Continue permit hunting.
- Consider feasibility of active silviculture program on dry upland east of Mountain Road
- Development of a trail system may not be feasible because of the large extent of damp to poorly drained soils which do not provide a desirable base for locating trails.



Curtis Woodland
Town of Durham, CT



Tri-Mountain Road/Pent Road
Friendly Acres
Town of Durham, CT

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Appendix

WHIP (Wildlife Habitat Incentive Program

EQUIP (Environmental Quality Incentives Program

Contact ERT Office for WHIP and EQUIP Program Sheets