Ridgebury School, Peterson Gorge and Ridgebury Slope

Ridgefield, Connecticut

King's Mark Environmental Review Team Report

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

Ridgebury School, Peterson Gorge and Ridgebury Slope
Ridgefield, Connecticut

Environmental Review Team Report

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

For the
Ridgefield Conservation Commission,
Ridgebury School and the Ridgebury School Garden Club
Ridgefield, Connecticut

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No. 356

Acknowledgements

This report is an outgrowth of a request from the Ridgefield Conservation Commission, the Ridgebury School and the Ridgebury School Garden Club to the Southwest Conservation District (SWCD) and the King's Mark Resource Conservation and Development Area (RC&D) Council and ERT Subcommittee for their consideration and approval. The request was approved and the measure reviewed by the King's Mark Environmental Review Team (ERT).

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

The field review took place on Tuesday, May 10, 2011.

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**Participated on the field review but no report submitted.*

I would also like to thank Laura Stabell from the Ridgebury School Garden Club and Ben Oko from the Ridgefield 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 maps. During the field review Team members were given additional information. Some Team members made separate or additional trip 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 King's Mark RC&D Executive Council hopes you will find this report of value and assistance in habitat management and restoration and educational opportunities using the Ridgebury Elementary School property and adjacent open space parcels.

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Introduction

Introduction

The Ridgefield Conservation Commission, the Ridgebury School and the Ridgebury School Garden Club have requested Environmental Review Team (ERT) assistance in reviewing the Ridgebury School and adjacent town owned open space Peterson Gorge and Ridgebury Slopes.

Ridgebury School is a K-5 elementary school located in the northern end of town on Bennetts Farm Road. It was built in 1962 with an expansion completed in 2003. The school property is approximately 20 acres in size and contains the school building, parking, mowed grass areas, playing fields, a school garden and a large pond created from a brook/wetland area. There are two adjacent town owned open space parcels that connect with trails to the school. Peterson Gorge Open Space is 16 acres in size and Ridgebury Slopes Open Space is 14 acres in size. The parcels are in the Saugatuck River watershed which is a drinking water supply watershed for other communities. The open space parcels feature streams, wetlands, forest, and steep slopes.

Objectives of the ERT Study

The town and school seek to understand the current environment, the opportunities for education and what can be done to manage the resources in a coordinated way. The ERT has been asked to provide a basic natural resource inventory, information on habitat management and restoration and information on educational opportunities using outdoor classrooms and schoolyard habitats.

The ERT Process

Through the efforts of the Ridgefield Conservation Commission, the school and garden club this environmental review and report was prepared for the Town of Ridgefield

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

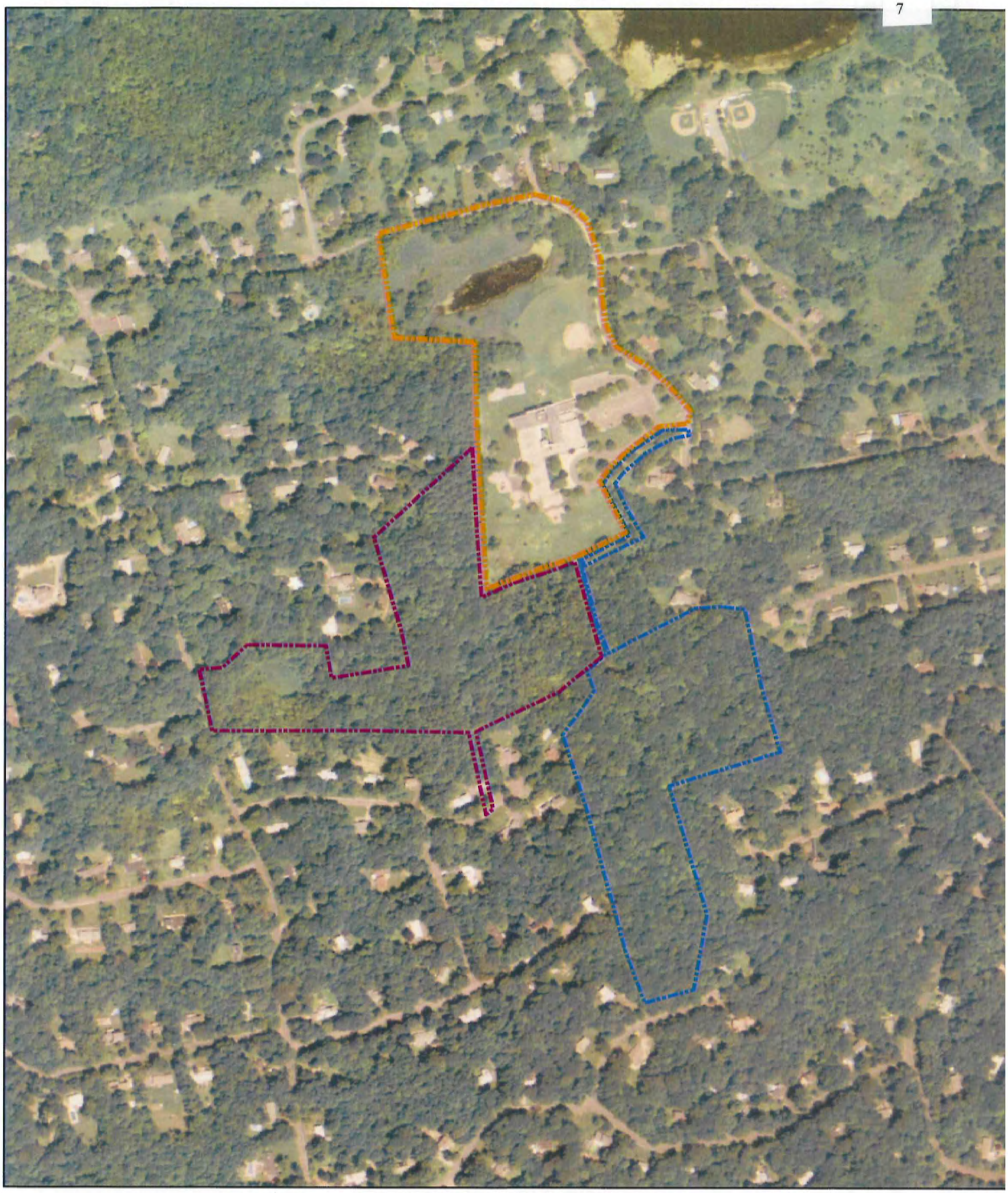
The review process consisted of four phases:

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 10, 2011, with additional field visits occurring in June, July and December 2011. 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. Some Team members made separate or additional trip while others conducted a map review only.

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.

Ridgebury School Outdoor Classroom/NRI Color Aerial Map



The Connecticut Environmental Review Team

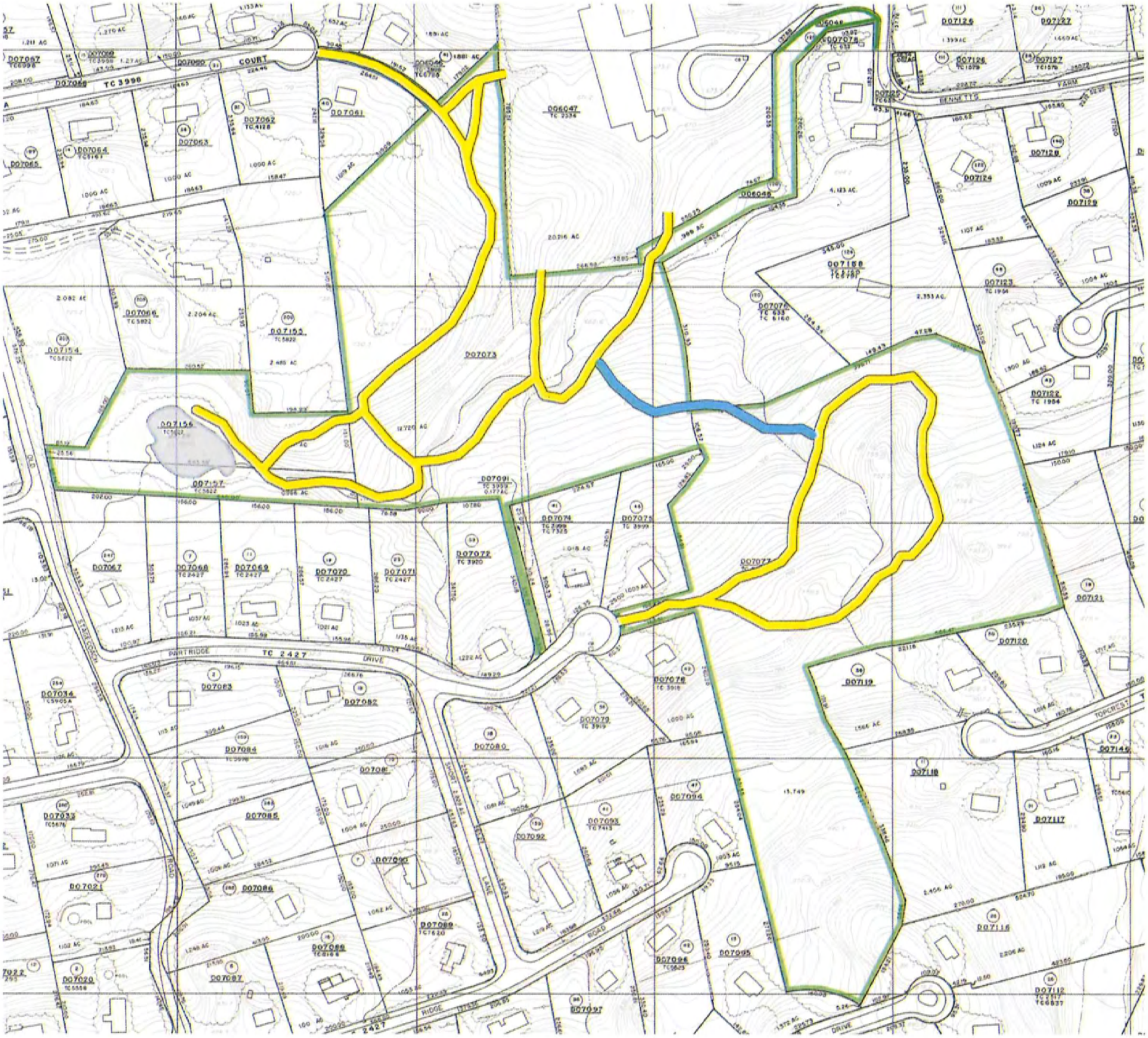
This map was prepared by Amanda Fargo-Johnson for the Connecticut Environmental Review Team. This map is for educational use only. It contains no authoritative data. April 2011.

0 0.05 0.1 0.2 Miles

ERT Site Review Areas

Ridgefield, CT

Ridgebury Slopes/ Peterson Gorge



Ridgebury School Outdoor Classroom/NRI Site Map

The Connecticut Environmental Review Team

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April 2011.

0 0.05 0.1 0.2 Miles

Ridgefield, CT

Ridgebury School Outdoor Classroom/NRI Aerial Map

The Connecticut Environmental Review Team

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April 2011.

Miles
0 0.025 0.05 0.1

Ridgefield, CT

Topography and Geology

Topography

This area in western Connecticut is very hilly. Hilltop elevations surrounding the school are between 900-950 feet (above sea level) and valley bottoms around 600 feet. (Hill tops nearby reach just over 1000 ft and the deeper valleys, for instance along US-7, between 450-500 ft.) Most of the valley slopes are moderate, but some are fairly steep. Total relief in the area is around 400 ft.

Relief on the open space parcel is slightly less, around 185 ft. The lowest elevation is Bennetts Pond at around 615’ (Lake Windwing is 600’). The highest elevation on the trail system is about 750’ (the elevation in the undeveloped portion of the southern parcel reaches almost 800 ft.). Slopes on the parcel are gentle to moderate and appear stable. Bedrock outcrops are abundant in the woods and several are found on the immediate school grounds.

Two distinctive features of the regional topography are apparent. First is the valley in which the school is located. There is almost 400 of total relief surrounding the valley. It is a marble valley typical of other marble valleys in western Connecticut. Hill slopes on either side of the valley are locally steep. The second is a topographic grain in the area. Steep slopes are

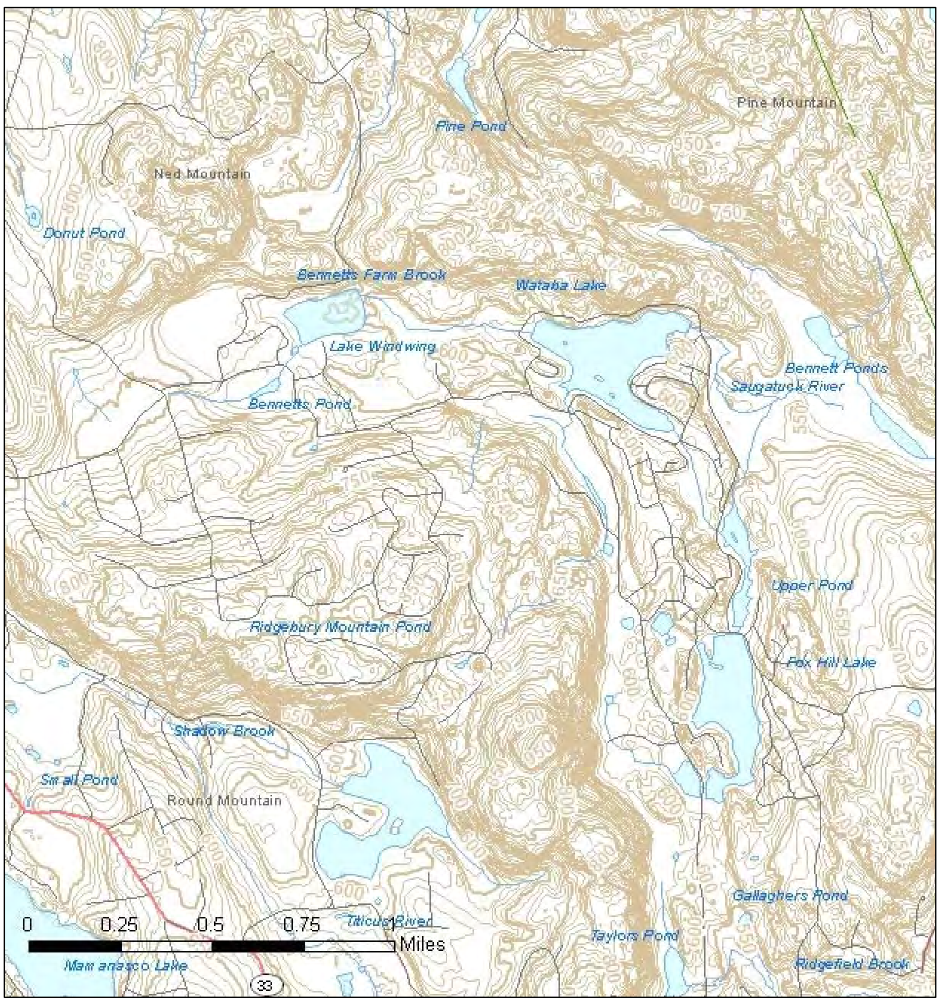


Figure 1. Topographic map generated from LIDAR data. Contour interval 10’. Note relatively deep marble valley occupied by several lakes filling what may have originally been sink holes. The second feature is the distinct topographic grain that shows up particularly in the highlands. The grain is oriented west-northwest in the northeast corner of the map. It gradually swings more north-northwesterly to the south and west.

west-northwest in the northeastern quadrant of Figure 1. Topographic lineations, formed by aligned hill slopes, are more north-northwesterly over most of the rest of Figure 1. These topographic features are controlled by properties of the underlying bedrock.

An interesting topographic feature of rather small scale is the hollow area at the western end of what is called Ridgebury Slope Trail (Figure 2). This feature is about 275 feet across at the bottom and is filled with a wetland, possibly a vernal pool. This hollow appears unrelated to the bedrock and probably owes its origin to erosion by a glacial melt-water stream that fell through a hole in the ice as it was melting.

Figure 2. Hollow at west end of Ridgebury Slope Trail. Topographic map enlargement (right) and mosaic of two photographs showing hollow and its outlet (left).

Bedrock Geology

A variety of different rocks are found in the area. Granitic rock, gneiss and pegmatite, schist, amphibolite, marble and impure marble are found in and around the open space. They formed around 400-500 million years ago at the edge of the ancestral North American continent. Rodgers (1985) subdivides the rocks into two basic categories: Ordovician marble in the valley and an older (Cambrian) group of schist and gneiss that form the highlands (Figure 3).

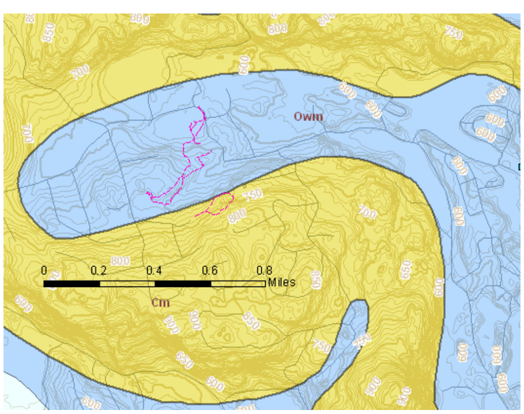


Figure 3. Geologic map of Rodgers, 1985 showing distribution of geologic formations in the area around the Ridgebury School outdoor classroom. Area colored blue underlain by Ordovician carbonate rocks belonging to the Walloomsac Formation (Owm). Area colored yellowish underlain by Cambrian Manhattan Schist (Cm). Contact between older Manhattan and younger Walloomsac Formation is interpreted to be an overthrust that pushed older rocks over younger rocks. Magenta colored lines indicate path covered by this reviewer that roughly correspond to trails in the open space areas. (Geology after Rodgers, 1985)

Basal Walloomsac Marble. The marble found in the valley is composed light grey crystalline carbonate rock around the school but is rusty weathering dolomitic marble in the adjacent woods along the western portions of the Ridgebury Slope Trail. Several outcrops of marble are found on the grounds immediately surrounding the school (Figure 4). The rock is

a.

b.

Figure 4. Outcrop pictures of Walloomsac Marble on immediate school grounds. A. Bedded marble north of school building consists of coarsely crystalline calcite/dolomite crystals that mimic what was probably a coarse-grained sedimentary precursor. Although a scale is missing from this image, the bed is about 12' thick. b. Conglomeratic bed in the marble on the play-ground west of the school building. Note that bedding coincides with the primary foliation at this location. The bed with clasts is about 6" thick and extends across the field of view just below the middle of the image. Clasts that may have been fossils are surrounded by a coarsely crystalline matrix that may have been calcarenite (sand composed of $CaCO_3$ [lime] grains made up of broken and disarticulated fossil material). The large clast in the left is lighter than the surrounding rock and may have been a fossil. Right next to it is a clast that is granular (almost in the center with a "tail" pointed down) and may have been a fragment eroded from a previously deposited calcarenite and deposited with the fossil (inferred) fragments. Pen is 5.3".

a.

b.

Figure 5. a. Karst features in marble west of school building. Karst is formed by dissolution of the carbonate rock forming solution holes and solution enlargements of cracks and fractures. Pen is 5.3"
b. Karst features in rusty weathering marble. Note rounded nature of outcrop. Bedding is faint but extends across the image and dips steeply into the outcrop. Plants for scale are several inches across.

c. Granular nature of rusty weathering marble. Wedding ring on finger is ¾" in diameter.

bedded marble whose composition (calcite vs. dolomite) was not determined in the field. It is composed of both coarse and fine-grained crystals of carbonate mineral that suggests a precursor sedimentary rock that was coarse grained, probably a carbonate sand (calcarenite). The rock layers dip steeply northward. Rocks on the west side of the school (Fig. 4b) are stratigraphically lower (older) and are composed of metamorphosed bedded conglomerate and calcarenite. The bedding coincides with the foliation in this location. This bed has scattered karst features (Figure 5a).

Rusty weathering dolomitic marble forms rounded outcrops in the woods along the western portion of the Ridgebury Slope Trail. In addition to being rounded, the outcrops contain scattered karst features (Figure 5b). Bedding is faint but can be seen in Figure 5b. The rock is composed of granular rusty weathering marble (Figure 5c) and likely is composed of ferroan dolomite or calcite, possibly with fine-grained impurities.

Outcrops of what appear to be bedded schist and gneiss (metamorphosed sandstone) are exposed on the school grounds near the building's main entrance and adjacent to the driveway (Figure 6). The schist contains garnet, dark grey mica, and quartz and feldspar (Figure 6a, b). It probably was a siltstone prior to metamorphism. Bedding in the meta-sandstone is distinct

a. **b.**

c. **d.**

Figure 6. Walloomsac Schist interbeds. a. Two foot high outcrop in courtyard near main entrance to Ridgebury School. This is mostly grey schist but has several gneissic layers. Foliation dips away from viewer at near the same angle as interbedded marble layers. b. Gneissic layer at east end of outcrop shown in 6a contains garnet, quartz, white feldspar and grey mica. c., d. Layered medium-grained sandy marble adjacent to driveway. d. Relict clastic texture in sandy marble. Pen = 5.3"; key-chain disc = 2".

enough to give the rock a gneissic appearance (Figure 6c, d). These rocks appear more like the Walloomsac Schist but likely are interbedded layers of the schist with the marble.

Cambrian Manhattan Schist. The southern half of the open-space parcel is underlain by rocks Rodgers assigns to the Manhattan Schist. Here they are intruded by a younger weakly foliated granite. They can be accessed along a trail-loop through the Peterson Gorge open space area as well as the trail from Ridgebury Slope to Peterson Gorge.

The older rocks are characteristic of the Manhattan Schist. At this site they consist of amphibolite gneiss and garnet-bearing schist. Amphibolite gneiss is poorly exposed: the only outcrop I found that was unequivocally in place (i.e. not disturbed or moved by glacial ice during the last Ice Age) is found in the stream valley at the east end of the rock exposure in Peterson Gorge (down-hill from the sign post). It consists of northward dipping dark gray gneiss with thin light colored folia that are feldspar rich (see figure 7a). Several blocks of dark gray amphibolite lacking the lighter layers were found on the hill-slope and in the stream bed. The amphibolite is clearly intruded by granite (Figure 7b): it contains veins of granite extending into the amphibolite, and xenoliths of amphibolite (?) are found within the granite.

Garnet bearing schist outcrops are most easily found in the middle of the loop-trail near its western entrance off Partridge Road. The schist is dark gray and contains large porphyroblasts of garnet (Figure 7c, d). Porphyroblasts of 1-2 centimeter in diameter are common. Sillimanite is reported from rocks of this formation at other areas, but it was not noticed during the field reconnaissance. Broken pieces of this rock are scattered down-slope along much of the stream course of Peterson Gorge.

Granite gneiss is found underlying much of the southern part of the Peterson Gorge parcel (Figure 8). It is weakly foliated light colored granite gneiss. Foliation dips toward the north. It is composed of muscovite, quartz and white-microcline feldspar (although local areas contain pink feldspars). The weak foliation is caused by parallel alignment of muscovite and in some places by changes in granularity. In places the granite contains xenoliths of dark grey layered rock that is similar to the amphibolite that the granite demonstrably intrudes.

A prominent outcrop of granite gneiss intrudes into the rusty Walloomsac dolomite at the west end of the Ridgebury Slope trail along the north side of the wetland. There it contains appreciable pegmatite, a course grained equivalent of the granite. The pegmatite does not have a noticeable foliation, suggesting it was intruded after the foliation was produced in the granite gneiss.

At near-by locations, similar granite has been dated using radioactive elements in some of the minerals. The dates obtained are Ordovician in age (~450 m.y.).

Structure

The easily observed structural feature is the dip of the layers toward the north. Where foliation and/or bedding is prominent the rock layers are all tilted north (they strike nearly east-west). This is found all over the parcels. This is of interest because of the interpretation that has been made from the state geological map by Rodgers (1985).

Rodgers opinion, based on compiling information from numerous publications by other geologists, is that the upper portion of the hills are underlain by rocks that were thrust over the rocks exposed in the valleys (see Figure 9). The overthrust fault is a major feature that developed during the Taconic mountain building event. A large overthrust is difficult to imagine. Essentially, a large horizontal slice of ocean bottom sedimentary layers became detached during convergent plate

a.

b.

c.

d.

Figure 7. Manhattan Schist. a. Amphibolite gneiss in a large glacial boulder that has nearly the same orientation as nearby outcrops. Dark amphibole rich layers alternate this thin feldspar-rich layers. b. Granite on right side of image intrudes into and cuts across layers of amphibolite gneiss. Unfortunately

lichen obscure some of rock. Notice that the feldspars in the granite here are pink. c. Typical exposure of Manhattan Schist. d. Garnet porphyroblasts in biotite mica schist. Pen for scale in b., c., and d. is 5.3" long.

a. **b.**

Figure 8. a. Typical outcrop habit of granite gneiss. Rock is light grey in color and normally has rounded outcrop forms. It typically forms the high ground where exposed because it is resistant to weathering and erosion. b. Inclusion (xenolith/enclave) of amphibolite(?) in granite gneiss. Weak foliation is not expressed in this image, but it dips toward the left.

tectonic movement. It was thrust on top of layers to one side or the other, in this case toward the west. The overthrust rocks were the Manhattan Schist. They were thrust on top of the Walloomsac Schist and other older (underlying) rocks that are not exposed in the Ridgebury open space parcels.

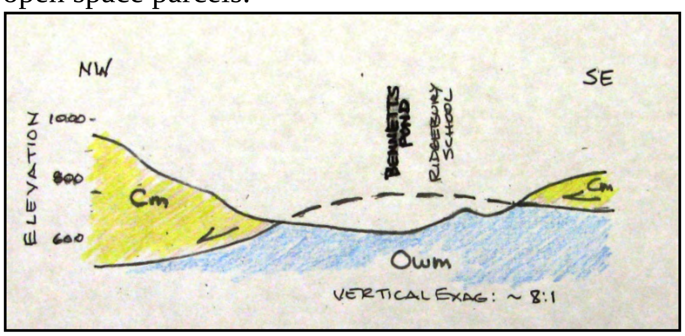


Figure 9. Cross section sketch (after Rodgers, 1985) showing overthrust that crosses Ridgebury marble valley. Cross section runs diagonally through Bennett's Pond in a NW-SE direction. The cross section is about a mile wide. The vertical and horizontal scales are not the same and that exaggerates the vertical dimension of the topographic sketch (the hill slopes are over steep in the sketch).

Although such overthrusting is well ingrained in the geological literature, it is this reviewers impression that the local geology can be explained without resorting to such large scale features. This reviewer is impressed that the orientation of the layers is the same in the alleged overthrust sheet as it is in the underlying rocks. Also the granite was intruded into both the overthrust as well as the underlying rocks. At least some of the layering in the underlying rocks is original bedding. These suggest to this reviewer that the rocks have been sequentially deposited one on top of the other and then intruded by granite and metamorphosed. This is not to say that over thrust sheets do not exist, even close near-by. Ample evidence exists for them elsewhere. This reviewer neither saw the field evidence nor read any the reasoning to apply the overthrust interpretation here.

The topographic grain noted above is likely caused by enhanced glacial erosion along zones of fractured rock caused by local fracturing and faulting of the rock. Displacement of rock layers cannot be demonstrated along most of the lineaments. Interpretation of our local area does show appropriate displacement along one of the lineaments.

Pleistocene Geology

Glacial till covers the ledge over most of the school grounds and open space. Till is the soil deposited by the melting glacier. It is the residue of sand, mud and larger particles (even boulder size) that was imbedded in the ice and left behind on the ground when the ice melted. Except where water has washed away some of the mud, a continuous spectrum of grain-size, from mud to boulders, make up the soil. In some places the till is compact and clay-rich; in other places it is less compact and more sandy.

The large hollow at the west end of the Ridgebury slope trail system (see Figure 2) warrants additional discussion. It likely was produced by a glacial melt-water stream during the melting of the last Ice Age glacier. The valley that leads down stream from the hollow to Bennett's Farm Brook was also eroded by a melt-water stream. The interesting thing is how abruptly the upstream end of that valley occurs: it is a large steep-sided bowl-shaped hollow with a relatively flat bottom. Down stream the valley is lined by thin, narrow terraces composed of angular to rounded stream-deposited sand and gravel (contrast the bed-load of the Ridgebury slope stream bed with that of the Peterson Gorge stream bed: Peterson Gorge contains no sand and no rounded pebble and gravel sized grains where as Ridgebury Slope stream does; see Figure 10). These observations are consistent with an interpretation that a melt-water stream

a. b.

Figure 10. a. Sediment in Peterson Gorge stream is angular and contains little sand. Gradient here is steep and that may account for the paucity of sand: i.e. sand is washed past this point by high velocity stream flow. b. Sediment in Ridgebury Slope stream contains abundant sand. It is hypothesized that the greater abundance of sand relative to the sand load in Peterson Gorge stream is due to sand derived from a glacial melt-water stream. It could be, however, that the gradient is more gentle at this location and that less sand has been washed through the system here. This hypothesis was considered after the field observation. A test of that hypothesis could be made by looking for abundant sand in the Peterson Gorge stream down-stream from the gorge where the gradient is less steep.

plunged through a crevice or hole in the stagnant melting glacial ice forming a plunge-pool where it hit the underlying ground surface. The hollow is that plunge-pool. Considerable water along with sediment it carried washed through the system and helped erode the valley. It deposited excess sand and gravel in its stream bed during high flow. The modern stream does not carry as much sediment and has eroded through some of the former stream bed, leaving narrow terraces of the former bed along the edges of the modern valley. The stream in Peterson Gorge is of more modern vintage and did not have the necessary discharge (volume of flow) to erode a deep valley. It is also a very short stream and has not rounded the grains of gravel that it carries. Only some of the gravel of Ridgebury Slope stream is rounded and the rest is angular like that of Peterson Gorge. The rounded grains were derived from glacial abrasion and abrasion in the older melt-water stream while it flowed along the surface of the glacier upstream from the plunge hole (called a “Moulin” by glacial geologists).

References

Rodgers, John, 1985, *Bedrock Geological Map of Connecticut*. State Geological and Natural History Survey of Connecticut, Nat’l. Resource Atlas Series, 1:125,000, 2 sheets.

Team Geologist field review path map

Soils Resources

This soils report applies to the 20 acre Ridgebury Elementary School property located at 112 Bennetts Farm Road, as well as the two adjacent town owned open space parcels, Peterson Gorge and Ridgebury Slopes, 16 and 14 acres respectively. The information in this report is based on the historical soils series descriptions, the USDA Web Soil Survey, and field observations.

The historical reference for soils regarding this region can be found on sheet number 27 of the 1979 Fairfield County Survey. Exhibit #1 - CT soils mapping generated by the USDA Web Soil Survey.

Mapping Units

Wetland Soils

USDA Soil #3 - Map Unit Rn - Ridgebury, Leicester and Whitman extremely stony fine sandy loams
Consists of nearly level to gently sloping, poorly drained soils in drainageways and depressions on glacial uplands. Ridgebury soils are very deep and derived mainly from gneiss and schist. Typically, they have a friable loam or fine sandy loam surface layer and subsoil over a firm, fine sandy loam or sandy loam dense till substratum. Stones and boulders cover 5 to 35 percent of the surface. Ridgebury soils have a perched water table within 1.5 feet of the surface much of the year.

This mapping unit is approximately 7 acres in size and runs from east to west, along the stream that runs through the Ridgebury Slopes property.

Concern
A section of the yellow and blue trail at Ridgebury Slopes travels over this wetland soil. Trails should be kept narrow and sides stabilized with ground cover to minimize disturbances. A nontoxic, elevated walkway may be needed for consistently wet or ponded sections of this trail.

USDA Soil #108 – Sb - Saco silt loam
This nearly level, very poorly drained soil has a surface layer of black silt loam and is typically found on low flood plains of major streams and their tributaries. The permeability of the soil is moderate in the surface layer and subsoil, and rapid or very rapid in the substratum. Runoff is very slow and water is ponded on the surface in some areas. The water table is at or near the surface most of the year and many areas of this soil are wooded or covered by marsh grasses and sedges.

This mapping unit is approximately 8 acres in size and is north of the school where the pond is located.

Non-wetland Soils

USDA Soil # 60B - CfB - Canton-Charlton fine sandy loam, 3 to 8 percent slopes
USDA Soil # 60C - CfC - Canton-Charlton fine sandy loam, 8 to 15 percent slopes
This sloping, well drained soil can be found on the sides of hills and ridges. Typically the surface layer is very dark brown, fine sandy loam. The permeability is moderate or moderately rapid, runoff is rapid, and available water capacity is moderate. The soil dries out and warms up in the spring. The erosion hazard is moderate to severe, depending on the steepness of the slope.

This mapping unit is less than 1 acre of the three properties and is mainly located to the west of the school's pond.

USDA Soil #73C - CrC - Charlton-Chatfield very rocky soil, 3 to 15 percent slopes
USDA Soil #73E - CrE - Charlton-Chatfield very rocky soil, 15 to 45 percent slopes
This complex consists of sloping to very steep well-drained soils located on uplands where the relief is affected by underlying bedrock. They have an undulating topography marked with bedrock outcrops, a few drainageways, and a few small wet depressions. Most areas are wooded. Stone and boulders cover 1 to 5 percent of the surface. The Charlton component has moderate or moderately rapid permeability. Runoff is medium to rapid. The Chatfield component has moderate to moderately rapid permeability above the bedrock.

This mapping unit is 16 acres in size and is located north of the stream at Ridgebury Slopes, uphill where the blue trail crosses over to Peterson Gorge, and at the eastern and southern extents of that property.

USDA Soil #75E - HrE - Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes
This complex consists of moderately steep to very steep soils on hills and ridges. The areas have an undulating topography marked with exposed bedrock, a few narrow drainageways, and few small, wet depressions. Permeability is moderately rapid to rapid, and runoff is rapid or very rapid. Stones and boulders cover 1 to 5 percent of the surface. Most areas of this complex are located in woodlands. The slope, shallow depth to bedrock, exposed bedrock, and stones on the surface limit its use.

This mapping unit is approximately 14 acres in size and covers most of the Peterson Gorge property.

<u>Concern</u>
Soil erosion from runoff flowing down trail sides was observed at several points. Enhanced conservation measures are needed with the increase in steepness of slope, as in the CrC, CrE and HrE soil types. Blazing of new trails atop of steeper sections should be discouraged.

To reduce runoff volume and velocities, provide a runoff diversion at the top of slope and install water bars across trails at intervals dictated by slope angle at length shown (2002 CT E&S Guidelines).

Water bar Spacing Along Steeper Trails:

1% slope @ 440’	2% slope @ 245’	5% slope @ 125’
10% slope @ 78’	15% slope @ 58’	

USDA Soil #306 - UD - Udorthents, 3-8 percent slopes.
This soil is comprised of cut and borrow areas where the surface layer and subsoil has been modified or removed. In many places, the landscape has been smoothed, and the cut and fill areas occur in a complex pattern. The soil in this unit has a wide range of characteristics. Texture ranges mainly from sandy loam to silt loam or the gravelly analogs. Consistence ranges from loose to very firm. Permeability ranges from very rapid to slow.

This mapping unit is approximately 9 acres in size and is located in the southern half of the school’s property where the building was constructed.

Environmental Education

Pond Science

The two distinct ponds located on these properties present an excellent opportunity for hands-on science and learning about freshwater ecology. This could be anything from collecting samples for simple water chemistry tests and viewing microorganisms through a microscope, observing aquatic and terrestrial wildlife up close in their natural habitat, to learning about native and invasive plant species associated with ponds. An observation deck that extends out into either pond is something to consider, as it will give groups of students or classes easier access to view the habitat up close.

The dammed pond at the western extent of Ridgebury Slopes can be shown as an example of what happens to a pond at the end of its life cycle, or the natural process of eutrophication. It has become shallow and overgrown with emergent plant life as sediment and forest detritus have slowly filled it in. With an excess of nutrients present in the system, this has created the ideal living conditions for various emergent plants. Over time, the forest will reclaim the pond as it continues to shallow and more terrestrial plants take hold.

Education Trails / Natural Resource History

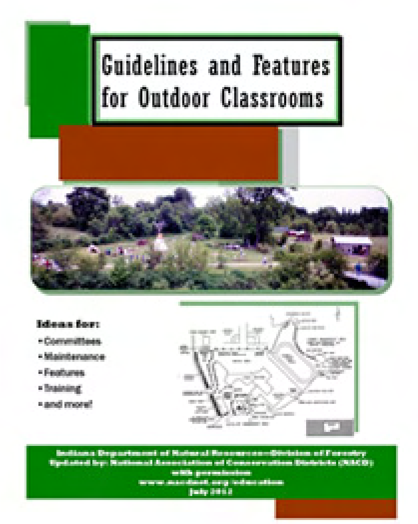
A system of trails has already been established at Ridgebury Slopes and Peterson Gorge that is pleasant to walk through, passes many interesting features, and is easily accessible.

Trails are a great way to bring people face to face with nature, and one way to enhance the current system is to include informational signs at key points of interest that will allow students / visitors to appreciate a particular landform, plant, animal, habitat, or site of historical significance. This information will provide insight into the local environment in context, and more importantly, help build a sense of awareness and stewardship for our natural resources.

A strategically placed seating/pavilion along the trail could serve as a staging area for outdoor living classrooms and laboratories, though the overall sloping and stony nature of these properties may make placing one difficult.

These kinds of improvements would help expand and enhance all grade level science based curriculums in the school system, as well as benefit the citizenry and other environmental groups associated with the Town.

The National Association of Conservation Districts has an on-line guide and additional resources that may be useful. They can be found at:
http://www.nacdnet.org/education/resources/outdoorclassrooms



Guidelines and Features for Outdoor Classrooms | PDF |
Interested in developing an outdoor classroom at a local school or area in your community? This guide was developed by the Indiana Department of Natural Resources - Division of Forestry and updated with permission by the National Association of Conservation Districts (NACD). It is only available in a PDF format that you can print as needed. This guide will give ideas for features in an outdoor classroom as well as setting up a community, funding ideas, curriculum resources and more.

Additional Outdoor Classroom Resources
NACD Outdoor Classroom Survey Results from May 2012 | PDF |
NACD Summer Resource Outdoor Classroom Section | PDF |
NACD Educators Guides (activities, literature connections and please see resource section for additional resources)

- Soil to Spoon
- Forests for People - More Than you can Imagine!
- Conservation Habits = Healthy Habitats
- DIG IT! The Secrets of Soil
- Water Is Life

Examples of simple seating and more elaborate structures.

Chidsey Brook Nature Trail, Avon CT

CT Forest & Park Association Outdoor Classroom, Middlefield, CT

Common Ground High School, Urban Farm & Environmental Education Center, New Haven, CT

Belding Wildlife Management Area, Vernon, CT

Map Unit Name—State of Connecticut
(Ridgebury Elementary School, 112 Bennetts Farm Road, Ridgefield, CT)

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Soil Ratings

- Canton and Charlton soils, 3 to 8 percent slopes
- Canton and Charlton soils, 8 to 15 percent slopes
- Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky
- Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky
- Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes
- Ridgebury, Leicester, and Whitman soils, extremely stony
- Saco silt loam
- Udorthents-Urban land complex
- Water
- Not rated or not available

Political Features

Cities

Water Features

Oceans

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:5,290 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 18N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Connecticut
Survey Area Data: Version 10, Mar 31, 2011

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Name

Map Unit Name— Summary by Map Unit — State of Connecticut				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
3	Ridgebury, Leicester, and Whitman soils, extremely stony	Ridgebury, Leicester, and Whitman soils, extremely stony	6.6	12.2%
60B	Canton and Charlton soils, 3 to 8 percent slopes	Canton and Charlton soils, 3 to 8 percent slopes	0.4	0.7%
60C	Canton and Charlton soils, 8 to 15 percent slopes	Canton and Charlton soils, 8 to 15 percent slopes	0.3	0.5%
73C	Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	9.3	17.1%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	5.8	10.7%
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	13.6	24.9%
108	Saco silt loam	Saco silt loam	8.3	15.2%
306	Udorthents-Urban land complex	Udorthents-Urban land complex	9.2	16.8%
W	Water	Water	1.1	1.9%
Totals for Area of Interest			**54.6**	**100.0%**

Description

A soil map unit is a collection of soil areas or nonsoil areas (miscellaneous areas) delineated in a soil survey. Each map unit is given a name that uniquely identifies the unit in a particular soil survey area.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Aquatic Habitats and Resources

Aquatic Habitats

The most significant surface water feature on the $20^{\pm}$ acre Ridgebury Elementary School property is an unnamed pond that is located within the Saugatuck River drainage basin (CT Department of Energy and Environmental Protection Basin #: 7200). Based upon both aerial photo and topographic map measurements, the pond is estimated to be approximately $2^{\pm}$ acres in surface area. A field investigation indicates that the pond is artificial in nature, having been created by excavation along the course of an unnamed stream. Given the extensive growth of phragmites around the pond perimeter, it is presumed that the pond is shallow (likely less than 10 feet in depth) and that there are significant areas of extremely shallow water (less than 5 feet over approximately 50-75% of the total pond area). A significant sediment delta has formed at the stream inlet to the pond.

Unnamed pond on the Ridgebury School property, Ridgefield.
May 6, 2011.

The Department of Energy and Environmental Protection classifies the unnamed pond and the unnamed stream as *Class AA* surface waters. Designated uses for surface water of this classification are existing or potential drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply and other purposes.

Aquatic Resources

The unnamed pond can be classified as a warmwater aquatic resource as it has shallow water depths and abundant aquatic plant growth. The Inland Fisheries Division (the "Division") has never conducted surveys to evaluate the resident fish population. The pond is anticipated to support bluegill, largemouth bass, golden shiner and brown bullhead. These fish species are common to warmwater lakes and ponds in Connecticut.

Water supply to the pond is primarily from an unnamed watercourse that receives drainage from a large watershed. As common to small ponds created on streams with large watersheds, the unnamed pond is susceptible to eutrophication, that is the process of nutrient enrichment leading to the over production of aquatic plants (e.g. phragmites). The eutrophication process in the pond is anticipated to have occurred at an accelerated rate since it's creation given land use changes within its contributing watershed. As the eutrophication process advances (such as a further increase in aquatic plant growth), the ability of a pond to support a diverse aquatic community becomes lessened. In general, and specifically from a fisheries management/ standpoint, a species-variant aquatic plant growth of up to 25-40% coverage is considered beneficial. Plant growths in excess of that percentage are likely to cause adverse impacts. Therefore it is well advised to maintain aquatic plant growth within controllable limits.

Recommendations

The Department of Energy and Environmental Protection-Wildlife Division W*etland Habitat and Mosquito Management Program (WHAMM)* utilizes a combination of mechanical removal (cutting) and herbicide application to control phragmites within State-owned marshes and other waterbodies. Attached is information briefly summarizing the WHAMM protocol for phragmites control. It would be prudent for either the Ridgebury Conservation Commission, the Ridgebury School or the Ridgebury School Garden Club to contact the DEEP WHAMM Program at 860.842.7239 for phragmites control recommendations specific to the Ridgebury Elementary School site.

Controlling *Phragmites australis* in Connecticut's Fresh and Salt-water Marshes

By Paul Capotosto and Roger Wolfe

Introduction

Phragmites australis (Phragmites) is an aggressive invasive plant species that has taken over thousands of acres of marsh in Connecticut. The State of Connecticut, Department of Environmental Protection's Wildlife Division, Wetlands Habitat and Mosquito Management (WHAMM) Program has been doing Phragmites control since 1997. Over sixty-six sites have been under the WHAMM Program's control.

Phragmites will grow up to twenty feet tall.

Ecology of Phragmites

Phragmites is a tall, perennial grass that grows in brackish, tidal fresh water and non-tidal freshwater wetlands. Native Phragmites may have been present as a minor component of Connecticut tidal marshes as early as 3000 years ago, in the last 30-50 years Mono-typical Phragmites has begun spreading at rates as high as 1-3% per year in areas like the lower Connecticut River. It is estimated that approximately 10% of Connecticut's tidal wetlands are dominated by Phragmites. It is now confirmed that the new, pestiferous type that has been introduced, possibly on ballast stone from ships is genetically different from the native plant stock and most commonly found in Europe. Scientists, environmental managers, and conservationists are increasingly concerned about the potential threat that the spread of Phragmites poses to tidal wetlands throughout Connecticut. Phragmites is intolerant of soil salinities greater than 18 parts per thousand, and is not typically found in salt marshes, unless the salinity regime has been altered through impounding, diking, or some other means of restricting tidal flow. Phragmites is most abundant in brackish and tidal fresh marshes. Other factors that may contribute to the spread of Phragmites include disturbances such as excavation, sedimentation, and increasing nutrient concentrations.

Phragmites forms dense colonies or clones, mainly spreading through thick underground rhizomes. New shoots form at the nodes along the rhizomes. In nutrient rich areas such as tidal marshes, this simple and rapid method of spread allows Phragmites to out compete the native plant species for both nutrients and light. In addition to the threat imposed on native plant and animal species, the density of the Phragmites stems, and the slow rate of decomposition in the winter after the stems die provide an ample supply of combustible material that creates a serious fire hazard, particularly in suburban areas.

Thick stands of Phragmites form nearly impenetrable barriers to the movement of animals and large birds such as ducks, shorebirds, and wading birds. These thick monotypic stands result in a degradation of habitat by raising the marsh elevation and by filling in the open water areas. This habitat loss starts the decline in the diversity of bird species utilizing a marsh. The Seaside sparrow, Salt marsh Sharp-tailed sparrow (both Connecticut species of special concern), as well as the Willet and Marsh wren are less abundant in Phragmites marshes. In part, this is because they are highly adapted to nesting in native plant-dominated salt and brackish marshes. Although a few bird and animal species such as rail, American bittern, Red-winged blackbird, deer and muskrat may inhabit Phragmites marshes, most other animals and birds avoid these areas because they cannot penetrate the thick stands.

The shade from these large stands also hinders the growth of native plants. Studies have shown that plant diversity is greatly reduced after forming dense monocultures of Phragmites, and that it appears to be detrimental to the overall ecological functioning of tidal wetlands.

Control Methods

The objective of Phragmites control is not to completely eradicate the species, because in certain circumstances it may contribute to overall habitat diversity of tidal wetlands, but rather to reduce the extent of monotypic stands that have invaded brackish and tidal-fresh water wetlands. There are two methods commonly used to control the spread of Phragmites:

1) **Restoring Salt Water Tidal Flows**: The Connecticut Department of Environmental Protection's Office of Long Island Sound Programs, Tidal Wetland Restoration Program uses this method for restoring degraded tidal wetlands. Since Phragmites is intolerant of salinities greater than 18 ppt, reintroduction of salt water results in a gradual replacement of Phragmites by native vegetation. However, this generally takes between ten to twenty years. Planting of native vegetation is usually not necessary because of abundant natural seed sources. Since 1980, this restoration technique has been applied to approximately 1500 acres in Connecticut.
2) **Three-year Herbicide Application and Mowing**: Glyphosate, Habitat and Renovate are aquatic herbicides used to control dense stands of Phragmites in brackish tidal marshes of Connecticut. An aquatic surfactant (sticking agent) is typically mixed with the herbicide prior to its application. Spraying occurs during the mid summer months until the first frost. A month after the spraying, mowing can begin and is done with low ground pressure equipment. This ground spraying and mowing is done for three successive years. About eighty percent of the Phragmites will be eliminated after the first year. Since 1997, the WHAMM Program has controlled 1,497 acres.

DEP WHAMM Program's lgp ARGO with tower and tank with high-pressure sprayer.

DEP WHAMM Program's Posi-Track ASV MD2810 Low Ground Pressure Mower.

Wildlife Resources

Background

The Ridgebury School and adjacent town-owned parcels total about 50 acres and contain the school grounds (building, parking lot, and athletic fields), a large pond, streams, wetlands and forest.

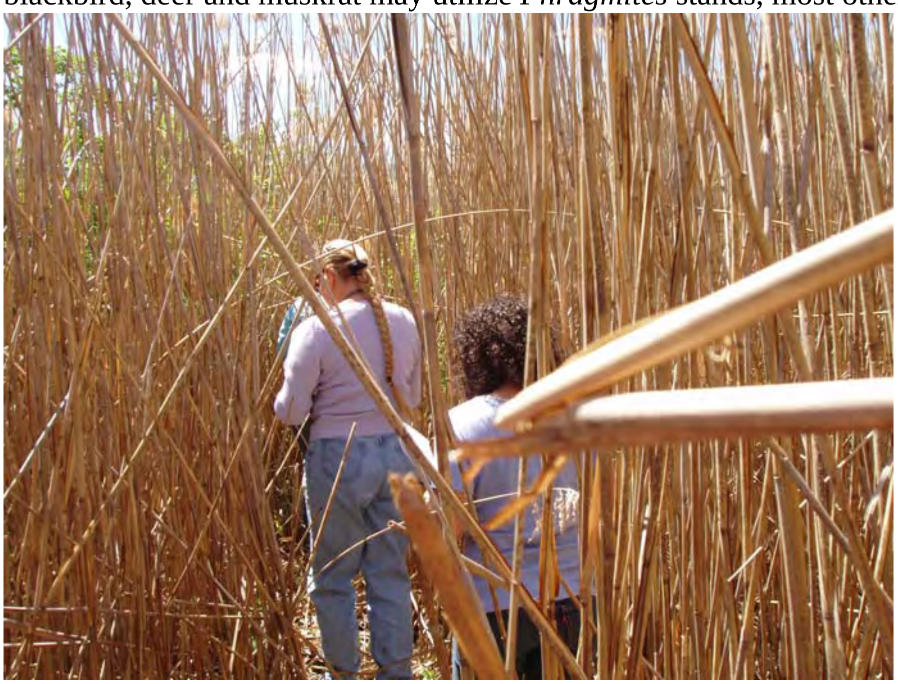
The request for an environmental review came from the Ridgefield Conservation Commission, the Ridgebury School and the Ridgebury School Garden Club to provide information on what species may be found in these habitats, habitat management, and opportunities for an outdoor classroom/education.

A site walk was conducted on May 10, 2011. The bulk of the 20-acre school grounds are comprised of the school building, athletic fields and parking areas, however there are areas of herbaceous growth around the schoolyard, as well as a 2-acre pond, which is surrounded by *Phragmites australis* and other invasive vegetation. The town-owned parcels (16-acre Peterson Gorge and 14-acre Ridgebury Slopes) contain streams, wetlands and forest.

School Grounds

Large Pond

The large pond is approximately 2 acres in size, and situated in the northern portion of the school's grounds. Currently, the vegetation is dominated by *Phragmites australis*, an invasive plant that can grow to 20 feet tall and forms a dense monoculture. *Phragmites* outcompetes native plant species for both nutrients and light, and forms an impenetrable barrier to movement. Although a few bird and animal species including red-winged blackbird, deer and muskrat may utilize *Phragmites* stands, most other species avoid these areas because they cannot penetrate the thick stands. The shade from these large stands also hinders the growth of native plants. Studies have shown that plant diversity is greatly reduced once dense monocultures of *Phragmites* have formed.



Treating the *Phragmites,* a process that typically includes an herbicide spraying and mowing regimen repeated at least three times can result in a significant reduction of *Phragmites* stands, allowing the regeneration of native species. This, in turn, will provide more diverse vegetation used for feeding, cover and nesting, resulting in increased wildlife use of the pond and providing an opportunity for the students to monitor the change in vegetation over time and document any increase in wildlife diversity around the pond.

In addition to treating the *Phragmites,* placing logs, root wads, or other similar structures in the pond would provide basking spots for species such as painted turtles, also increasing wildlife use of the pond. Interpretive signs could be installed at the southeastern portion of the pond, where it is currently mowed up to the pond edge, in order to educate students and staff as to the *Phragmites* treatment regimen and any structural additions to the pond, as well as the type of wildlife expected to benefit from these treatments.

Schoolyard Herbaceous Areas

The western portions of the school grounds contain herbaceous areas that are suitable for a butterfly garden, providing an opportunity for students to gain species identification skills and to learn about plant/animal interactions and butterfly life history. Please see the attached Wildlife Habitat Series document on butterfly gardens for information on site location and plant selection (see Appendix).

Treating the invasive species (multiflora rose and autumn olive) found around the school grounds can provide an opportunity to teach students about invasive species and management, and what species may replace the invasives, post-treatment. Small changes to the maintenance mowing regimen, such as leaving un-mowed a portion of the steep-sloped area by the front (leading down towards the parking lot and ball field) and the area on the southern side of the school would also provide an opportunity to show students what species will grow in an area that is not mowed, again giving the opportunity to gain identification skills and learn about both invasive and native plant species, with the additional benefit of decreasing maintenance work and emissions from lawn mowing equipment.

While this may not provide significant wildlife habitat because of its small size, it is an educational opportunity; students can learn about native plant species and wildlife/plant interactions, and, on a small scale, compare and contrast managed (mowed) versus unmanaged (un-mowed) areas and their use as foraging areas for birds and habitat for insects and butterflies. For more information, the US Fish and Wildlife Service has published a very useful guide on schoolyard habitat projects, available for download in pdf format at http://www.fws.gov/cno/pdf/HabitatGuideColor.pdf.

Peterson Gorge and Ridgebury Slopes

Forested Area and Wetlands

The forested areas located south and southwest of the school are steep-sloped and dominated by black birch, with several small stands of tulip trees and American beech in areas of rocky ledges and outcrops. Throughout this area, the understory is sparse, with invasive barberry as the most common species. Forested areas are valuable to wildlife, providing food (berries, buds, acorns, seeds, catkins), cover, nesting and roosting places, and denning sites. Trees, both living and dead, 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 barred owl, grey squirrel, eastern chipmunk, white-footed mouse, redback salamander and eastern garter snakes.

There is an unnamed stream running through the area, as well as a small, swampy wetland at the western boundary of the property. Many species of reptiles and amphibians, such as the gray tree frog and the spotted salamander use wetlands for breeding and spend the balance of their time in the adjacent forested uplands. Many bird species use forested wetlands at varying times of the year for breeding, feeding and shelter. Examples include northern water thrush, common yellowthroat and eastern phoebe. Other wildlife likely utilizing this habitat for food and cover are raccoons, wood frogs, spring peepers and northern water snakes.

Riparian habitat, or riparian zone, is the area of trees, shrubs and herbaceous plants that follow the edge of streams, rivers, lakes and ponds. It provides habitat for many aquatic-based species including frogs, salamanders, toads, ducks, beaver, muskrats, and mink. Generally, greater vegetative diversity along watercourse edges provides greater value for wildlife. This zone of vegetation provides valuable cover, nesting sites, roosting sites and, in many cases, abundant food for wildlife. The vegetation found in this habitat is tolerant to periodic flooding and its presence causes floodwater to slow down and allows the soil to absorb the excess water.
Streams can also provide important travel corridors for mammals, as this zone of vegetation along a stream or river is often the only remaining contiguous vegetation within a developed area.

While not documented on the site walk, there is a reported vernal pool on the property. Vernal pools are small, temporary bodies of standing fresh water that are typically filled in spring and dry out most years. There is no inlet or outlet, and therefore fish are not found in these pools. Vernal pools are important to the survival of many species of reptiles and amphibians that utilize wetlands for reproduction. For some species, such as the wood frog and the spotted salamander, vernal pools are critical because it is the only type of wetland in which they will breed. These species are also dependent on the presence of healthy forested uplands surrounding the vernal pool, because, when not breeding, this is where they spend the balance of their life cycle. Calhoun and Klemens (2002) recommend that the upland areas around breeding pools up to a distance of 750 feet be considered critical upland habitat, that at least 75% of that zone be kept undisturbed and that a partially closed-canopy stand be maintained. It would be beneficial to conduct a spring survey at the pool to document all breeding species.

Wood frog found on site.

Although there may not be suitable habitat management projects in the forest and wetland areas, there are opportunities for education and outreach. Tree identification signs could be installed along the trail, indicating diagnostic characteristics of each species, and spotting scopes could be utilized to observe birds and other wildlife in the wetland areas. Students could compare which species are seen only in the wetland areas and only in the forested areas, and which species are found in both, as well as differences seen during each season. Lessons on the effects of nearby development on wildlife species could be incorporated into lessons, particularly the impacts of crossing roadways to get to suitable habitat, and the replacement of woodlands with lawn.

Summary

While the Ridgebury School and surrounding town-owned parcels may not provide significant wildlife habitat, there is certainly potential to create educational opportunities through projects around the school grounds, including treating the *Phragmites* surrounding the pond and establishing a butterfly garden, and through educational walks and species documentation in the forested wetlands south of the school.

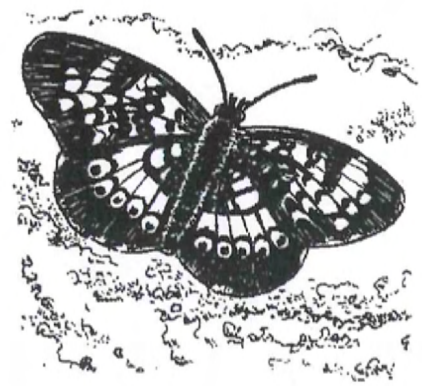
References

Calhoun, A.J.K. and M.W. Klemens. 2002. MCA Technical Paper No. 5. Best Development Practices (BDPs): Conserving Pool-Breeding Amphibians in Residential and Commercial Developments in the Northeastern United States. Metropolitan Conservation Alliance, Wildlife Conservation Society. Bronx, New York.

WILDLIFE IN CONNECTICUT

WILDLIFE HABITAT SERIES

Butterfly Gardens



General Information

Gardens designed to attract butterflies are most successful when careful thought is given to site and plant selection. Consideration of the needs of butterflies and their life histories is also important. By following a few simple tips, a garden can easily become alive with fluttering visitors.

Most butterflies are sun-loving insects, so be sure to plant the garden in a sunny location. Butterflies use the sun's heat to warm the muscles in their thorax (the middle part of an insect's body), which enables them to fly. Many butterfly gardeners place flat surfaces, such as rocks, among the plants for butterflies to bask on. As long as the site chosen has sun for a good part of the day, it will be used by butterflies.

When choosing plants for your butterfly garden, be sure to provide both larval (caterpillar) "host" plants and adult nectar sources. For example, many caterpillars of fritillary butterflies eat the leaves of violets, their host plants; later, the adults visit the blooms of a different plant, such as purple coneflower, for nectar. Sometimes, one plant can serve the needs of both butterfly and caterpillar, as is the case with butterfly weed. Trees and shrubs also serve as host plants for many caterpillars. It is important to remember that gardeners who provide host plants for larvae must tolerate the sometimes "unsightly" look to their plants as the foliage is being consumed by the caterpillars. Remember, do not use insecticides because this will defeat the purpose of the garden.

Two other important considerations when gardening for butterflies are to provide a series of blooms throughout the season and to emphasize the planting of native species. Suggestions for spring-blooming native plants include wild columbine and violets. Columbine will grow in a sunny, rocky area in addition to its usual woodland habitat. Both of these examples are host plants for caterpillars. Mid-season blooming plants include mountain mint, dogbane, coreopsis, milkweed, butterfly weed, thistle (only field or pasture should be used) and wild bergamot. Black-eyed Susan and purple coneflower are also mid-season bloomers and, although not native to New England, are native to the midwestern United States. Late-season blooming plants for attracting butterflies include New England aster and goldenrod. Both of these plants can reach heights above three feet, but cultivars are available for growing shorter plants. Cultivars are propagated from cuttings not from seed. Some native plant gardeners prefer not to use cultivars because they do not grow exactly as the parent plant in the wild. It is best to refer to a field guide to determine the color of the flowers and the soil in which the plants grow best.

Finding a source for the plants is the final step in planning a butterfly garden. Plants **should not** be collected from the wild because many will not transplant well and they have an ecological role to perform in the natural landscape. With some plants, such as goldenrod and milkweed, seed can be collected (only a small quantity of seed should be collected from a large stand of the plant) and later sowed in the garden. Success will be dependent, in part, on the maturity of the seed being collected. There are a few nurseries in Connecticut and in other states where nursery-propagated native wildflowers can be obtained.

Recommended Guides for Butterfly Identification

Glassberg, Jeffrey. 1993. *Butterflies through Binoculars*. (New York: Oxford University Press), 160 pp.

Pyle, Robert Michael. 1985. *The Audubon Society Field Guide to North American Butterflies*. (New York: Alfred A. Knopf, Inc.), 924 pp.

Stokes, Donald and Lillian and Ernest Williams. 1991. *The Butterfly Book*. (Boston: Little, Brown and Company), 95 pp.

Wright, Amy Bartlett. 1993. *Peterson's First Guide to Caterpillars*. (Boston: Houghton Mifflin Company), 128 pp.

Plant List

Wildflowers

Achillea (Yarrow) (A)
Apocynum (Dogbane) (A)
Asclepias (Milkweeds) (A, L)
Aster (A, L)
Cirsium (Thistle, use field or pasture only) (A, L)
Coreopsis (A)
Echinacea (Coneflower) (A)
Eupatorium (Joe-pye-weed) (A)
Geranium (A)
Monarda (Beebalm) (A)
Pycnanthemum (Mountain mint) (A)
Rudbeckia (Black-eyed Susan) (A)
Solidago (Goldenrod) (A)
Verononia (Ironweed) (A)
Viola (Violets) (A, L)

Shrubs

Clethra (Pepperbush) (A)
Lindera (Spicebush) (L)
Rhododendron (A)
Vaccinium (Blueberry) (A, L)
Viburnum (A)

Trees

Cornus (Dogwood) (A, L)
Juniperus (Red cedar) (L)
Prunus (Wild cherry) (L)
Sassafras (L)

A=*Adult nectar source*
L=*Larval food plant*

Forest Resources

Ridgebury School Grounds

The school property is approximately 20 acres in size and contains the school building, parking lot, mowed grass area, playing fields and a large pond with an associated wetland. Tree growth on the property is limited to the property boundaries in the west and south, landscape trees around the building and parking lot and wetland trees north of the pond. The western boundary of the school grounds has several rows of sawtimber* sized European larch. The southern boundary contains a row of sawtimber sized black walnut trees.** There are scattered red cedar trees in the southwest corner of the property. The trees associated with the wetland near the pond are red maple, slippery elm and white ash. The landscape trees around the building and parking lot have numbered metal tags. This indicates that these trees were inventoried at some time and records of that inventory should be in the town or school records.

**Sawtimber* *means a hardwood tree 12-inch dbh (diameter at breast height or 4.5 feet off the ground) and larger, and softwood trees 10-inch dbh and larger, that contain at least one 8 foot sawlog.*
*** (Additional Information on Black Walnut from the UCONN Home & Garden Education Center website)*
- *http://uconnladybug.wordpress.com/2010/09/09/something-about-black-walnut/*

Peterson Gorge

The 16 acre parcel of town owned open space abuts the school property in the west and south. The parcel is predominately forested except for a shallow pond in the west near Old Stagecoach Road. The forest cover type on the property in mixed hardwood sawtimber. The tree species that make up the main canopy are sugar maple, red oak, basswood, yellow poplar, white ash, hickory, black oak, beech, black birch, black cherry, American elm and sycamore. There are widely scattered individuals of white pine, red cedar and hemlock in the canopy. Vine species present in the canopy are grape, oriental bittersweet and poison ivy. The mid-canopy is occupied by poletimber*** and saplings of white ash, black birch, hickory, red oak, sugar maple and beech. Shrub species in the understory are witch hazel, flowering dogwood, ironwood, hornbeam, sweet pepperbush, winged euonymus, Japanese barberry, European buckthorn, multiflora rose. The forest floor is open in area with dense shade. In areas with more sunlight, the forest floor is occupied by Japanese stilt grass, garlic mustard and oriental bittersweet. The invasive plant species present are oriental bittersweet, garlic mustard, Japanese stilt grass, Japanese barberry, winged euonymus, multiflora rose, phragmites, European buckthorn. The density of shade from the main canopy influences the variety and number of invasive species present. Areas of the property with higher percentages of sugar maple and beech in the canopy have fewer invasive species growing there.

****Poletimber** means hardwood trees between 5 and 11 inches dbh, and softwood trees 5 to 9 inches dbh. These trees are too small for sawlogs, but could be sold as pulpwood, fuelwood, or other small products where such markets exist.*

Ridgebury Slopes

The 14 acre parcel of town owned open space abuts Peterson Gorge in the northwest and is southerly of the school grounds. The parcel is entirely forested by a canopy of mixed hardwood sawtimber. The tree species that comprise the main canopy are hickory, black birch, red oak, sugar maple, beech, yellow poplar, white oak, chestnut oak, and red maple. The understory contains witch hazel, sugar maple, beech and striped maple. The forest floor is generally open due to the shade from the beech and sugar maple understory.

Forest Health Issues

The two major issues that the Team forester observed were the dying and dead white ash in the Peterson Gorge parcel and the amount of invasive species in the openings of all parcels. The white ash mortality is due to the ash decline disease complex. The ash trees are first stressed by environmental factors such as drought or flooding and become stressed and weakened. A secondary organism invades the trees and affects the trees' water and nutrient transport system and the trees start to die from the top down. There is no treatment for white ash growing in the forest. Dead and dying ash trees along the trail system or near recreation areas become hazard trees and should be removed. The second forest health issue is the abundance of invasive plants that occupy any opening in the forest. These plants should be controlled before they spread into the areas of the forest where dense shade are keeping the invasives at bay.

Management Recommendations

The property boundary lines on all three parcels are not evident. The boundaries should be marked with either paint or signage. Interested parties who wish to discuss more specific management options for the properties should contact Larry Rousseau at (860) 485-0226 or email at Lawrence.rousseau@ct.gov.

Landscape Ecologist Review

Plants Overview

- No formal survey was undertaken.
- Below are names of species mentioned in the discussion of potential classroom sites and work parties.
- Many more species than those noted below are found on the site.

Native Plants (defined as species indigenous in Connecticut)

Herbaceous

Common Milkweed (*Asclepias syriaca*)
Hog Peanut (*Amphicarpa bracteata*)
Jewelweed (*Impatiens* sp.)
Tufted Loosestrife (*Lysimachia thyrsiflora*) – in wooded pool

Vines

Poison Ivy (*Toxicodendron radicans* – ssp. *radicans* in CT)
Virginia Creeper (*Parthenocissus quinquefolia*)

Trees and Shrubs

Ash tree (*Fraxinus* sp.)
Bayberry (*Morella* [*Myrica*] *pensylvanica*)
Dogwood (*Cornus* sp.)
Eastern Red-cedar (*Juniperus virginiana*)
White Oak (*Quercus alba*)

Native to Eastern USA, but not to Connecticut

Fringetree (*Chionanthus virginicus*) – native as far north as NJ and eastern PA (planted)

Non-native but not on Connecticut List of Invasive & Potentially Invasive

Mugwort (*Artemisia vulgaris* ssp. *vulgaris*) – unruly, non-native, considered invasive elsewhere; aka Wormwood (genus) or White Sage (not the same as the native White Sage of Western USA)
Orchard Grass (*Dactylis glomerata*) –widely planted and widely escaped

Invasive Plants (Identification information available at **http://www.ct.nrcs.usda.gov/invas-factsheets-spanish.html** and **http://www.ct.nrcs.usda.gov/invas-factsheets.html)**

The state of Connecticut maintains an official list of Invasive and Potentially Invasive Plants. To be classified as invasive or potentially invasive, a plant must be both non-native and troublesome.

The following species from the state list of invasive and potentially invasive plants were noted on the property. (Others likely are present.)

Autumn-Olive (*Elaeagnus umbellata*)
Garlic Mustard (*Alliaria petiolata*)
Honeysuckle, non-native shrubby (hollow-stemmed, shrubby *Lonicera* sp.)
Japanese Barberry (*Berberis thunbergii*)
Japanese Stilt Grass (*Microstegium vimineum*)
Multiflora Rose (*Rosa multiflora*)
Narrow-leaf Bittercress (*Cardamine impatiens*)
Oriental (Asiatic) Bittersweet (*Celastrus orbiculatus*)
Phragmites (*Phragmites australis* ssp. *australis*)
Ragged Robin (*Lychnis flos-cuculi*)
Reed Canary Grass (*Phalaris arundinacea*)

In addition:

Thistles {possibly the potentially invasive Canada Thistle (*Cirsium arvense*)} were seen in rosette (non-flowering) form.

Basswood (*Tilia* sp.) was noted casually, but not examined. In addition to the native American Basswood (*Tilia americana* var. *americana*), the non-native Largeleaf Linden (*Tilia platyphyllos*), littleleaf Linden (*Tilia cordata*), and Common Linden (*Tilia* X*europaea*) have been reported growing in the wild in Connecticut. (The *Tilia* observed was not Littleleaf Linden.)

Potential Outdoor Classroom Sites

Sunny Phragmites Pond Area

The sunny area by the pond is dominated by Phragmites which thickly rings the pond and has jumped to other locales as well. Included within the Phragmites stand or the adjacent fence row were the following invasives: Garlic Mustard, Narrow-leaf Bittercress, Asiatic Bittersweet, shrubby Honeysuckle, and Multiflora Rose. Other unwanted plant species in this area include the non-native and very unruly Mugwort and native Poison Ivy. The native Virginia Creeper and a Dogwood (*Cornus* sp.) also were present.

The Phragmites protects the pond bank from erosion that would occur if free access were available. To provide controlled access, a small section might be cleared and maintained clear by repeated mowing. Note that soils are wet immediately adjacent to the pond (precluding the use of heavy mowing equipment in certain seasons). Phragmites spreads enthusiastically by creeping underground stems. Both resprouting within the mowed area and spread from adjacent remaining Phragmites would be expected.

Possible construction projects include a wildlife blind and small dock. Some potentially useful characteristics of a wildlife blind include: wooden floor raised off the ground, wide viewing opening on the pondside, built-in table below opening, bench(es), roof that shades opening so that birds, etc., do not detect movement within the blind, open to the back (away from the pond) for better supervision of blind users.

Examples of Wildlife Viewing Blinds and Dock

Morris County Great Swamp Education Center, NJ

Occoquan Bay, U.S. Fish & Wildlife Service

Wooded Pond Area

The wooded pool area appeared to have the greatest diversity of understory plants (not keyed out). Some things that could be done to enhance the educational experience in this area:

- drop a few trees so that pond is more visible from rocks.

-- Note that dropping trees into the pool provides access for both children with dipnets and animal predators seeking to pull something out of the pond
-- It is generally not recommended to muck about in a pond pulling a tree out should it fall into the pond

- invite local experts to start ongoing species lists of plants, pond animal life, and birds observed at the pool in different months
- zealously monitor the entire pool area for Garlic Mustard, Narrowleaf Bittercress, and Japanese Stilt Grass and pull all individuals that are found. (For plants in flowering or fruting stages, place in plastic garbage bags for removal from the site.)
  -- Fact sheets for these species are available as follows: ftp://ftp-fc.sc.egov.usda.gov/CT/invasives/GarlicMustardInvasora-10-14-10.pdf (Garlic Mustard) , ftp://ftp-fc.sc.egov.usda.gov/CT/invasives/narrowleaf-bittercress.pdf (Narrowleaf Bittercress), and ftp://ftp-fc.sc.egov.usda.gov/CT/invasives/JapStiltGrassInvasora-09-2010.pdf (Japanese Stilt Grass). (Note that these fact sheets are slow to load.)
- construct a small deer exclosure (a fenced area to keep deer out) in a place that includes both a section of moist soil near the pond and some of the adjacent drier slope, re-routing the poolside trail uphill as needed to accommodate the fence.
  -- the purpose of a deer exclosure is to see what would be growing on the site in the absence of deer browsing

- elsewhere, such fences have shown remarkable differences in just a few years. Photo to the left is Bluff Point State Park, Groton, CT deer exclosure in 1995, photos from 2001 may be found at http://toomanydeer.blogspot.com/

  -- continued removal of any invasives associated with the exclosure (e.g., Bittersweet climbing up the fence or Garlic Mustard, Japanese Barberry, etc., appearing within) is recommended to allow the native plants freedom to grow

-- Rigid plastic deer fencing with well anchored posts is adequate to keep deer out.
-- A gate should be included in the fence to allow entry for controlling invasive plants.

Potential Invasive Plant Work Party Areas

Trail Entry From Schoolyard to PetersonGorge

Garlic Mustard and Narrowleaf Bittercress were observed in this area. Both these species are tolerant of shade and will crowd out forest understory wildflowers and seedlings of woody plants. They are easily identified and easily pulled up. (Fact sheet links under Wooded Pool Area.)

Pulling parties could be used to control these plants at the trail head and along the trail. Pulled plants should be bagged if they have produced the second year flower stalk. Because both people and animals use trails, trails are the most important place to control invasives such as these that have easily-spread seeds.

Ridgebury Slope Moist Area (upslope, south of main stream, west of small feeder gorge):

- in early June, this area was a verdant green as a result of a thick cover of invasive Japanese Stilt Grass.
  -- In this early stage of growth (and perhaps because of the shady conditions), the diagnostic white reflecting stripe along the main vein on the top side of the leaf was not clearly evident
  -- the plant may be identified by its offset main vein and its stilted, very easy to pull up roots (in addition to the occasionally evident reflective stripe) ftp://ftp-fc.sc.egov.usda.gov/CT/invasives/JapStiltGrassInvasora-09-2010.pdf

- Japanese Stilt Grass also was seen along with Narrowleaf Bittercress along the trail that parallels the stream and the trail that leads up to the moist green area

- Japanese Stilt Grass is an annual that flowers late in the summer. When mature, it makes a thick cover up to 18” tall that shades out other plants. It seeds prolifically. Sites where it has been controlled will subsequently need to be monitored and controlled for many years as seeds in the seed bank sprout.
- Stilt Grass may be controlled by handpulling, battery powered string-trimmer (weedwhacker), or backpack flameweeder.

Flameweeders should be operated by people who have had training to understand the

appropriate use of the equipment, appropriate site conditions, and appropriate ancillary fire prevention tools.
- Japanese Stilt Grass seeds spread readily along flood plains. In the absence of control, it is expected that seeds from the Moist Area will continue to spread down hill towards the main stream.

Priorities

The Wooded Pool Area appears to have the greatest remaining diversity of plant species and it has multiple avenues for environmental education (plant diversity, pond, geology, deer exclosure). Because there is much to be seen here and much to lose with continued deer pressure and spread of invasive plants, the team landscape ecologist recommends a focus on the pool area first.

Local experts should be encouraged to share their knowledge and become involved. The ERT completed a report for the Town of Darien on the Selleck's Woods and Dunlap Woods nature preserve properties (www.ctert.org/ERTWebsite/pdfs/Darien_SelleckѕDunlap_351.pdf)that may be of interest, as well as the website for the Friends of Selleck's Woods, a private 501(c)3 non-profit organization that cares for the properties on behalf of the Darien Parks and Recreation Commission (www.sellеckswoods.com).

NRCS U.S. Department of Agriculture
Natural Resources Conservation Service

344 Merrow Road, Suite A * Tolland, Connecticut 06084-3917 * (860) 871-4011 * www.ct.nrcs.usda.gov

INVASIVE SPECIES IDENTIFICATION SHEET

Garlic Mustard

Alliaria petiolata (Bieb.) Cavara & Grande

Alternate Latin names: *Erysimum alliaria* L.; *Sisymbrium alliaria* Scop.; *Alliaria officinalis* Andrz.; *Alliaria alliaria* of various authors; **Alternate common names** include Hedge-mustard
- **biennial**, herbaceous plant; grows **1'-3 1/2' tall**
- **flowers white**; mustard-like with four 1/4" long evenly-spaced petals; blooms Spring/Summer
- **leaves wide** with heart-shaped leaf bases that never clasp around the flower stalk
- **long-stemmed basal leaves are rounded** or kidney-shaped with scalloped margins
- **flowering stalk has alternate,** increasingly **triangular, leaves** with large, **pointed teeth**
- **young**, crushed **leaves** and the slender, white taproot have unusual, **rank, garlic odor**
- **seed pods** 1"-2 1/2" long; **slender** relative to length; 4 angled,

Even without its **white, mustard-type flowers and long, slender seed pods**, Garlic Mustard is readily distinguished by its **leaves that are wide, strongly-veined and (when young) garlic scented.** There are typically 3 or 4 basal leaves each 2" (up to 7") wide that grow on long stems out of the top of the root. Leaves on the tall flowering stalk are short-stemmed and smaller than the basal leaves (but may be up to 2 1/2" wide). First-year plants have only a few long-stemmed, scallop-margined basal leaves (they do not send up a flowering stalk). After setting seed the second year, the plant dies, but the flower stalks and seed pods may dry and remain standing.

Garlic Mustard **fruits grow upward and outward** on short, thickened stalks. Early fruits attached lower on the main stalk extend higher than the small flowers still blooming at the top of the stalk.

Garlic Mustard grows tall before other plants in early Spring. Once a few plants get established, Garlic Mustard multiplies into a dense stand that may easily shade out native wildflowers on trailsides, wetland borders, floodplains, and in open woods. Seeds remain viable 2-5 years.

Text and photos by: Charlotte Pyle, October 2002
Helpful review provided by: Lillian Willis

11/2002

Environmental Education

There is implanted in the heart of every normal boy and girl a desire to live close to nature, to roam over field and forest, to gather the wild flowers, listen to the sweet songs of birds and lie with bare head looking up into the depths of the ethereal blue and drink to the fill of God's fresh air. Woe be to the teacher or parent who would suppress this desire. *–Public School Methods, The Methods Company, Chicago, 1917*

While the above quote, taken from a teacher's method instruction book for public school education, is a bit dated, the main sentiment still rings true. Ridgebury Elementary School is fortunate to be located in an environment where nature is close at hand. A wide variety of habitats are located immediately adjacent to the school or within a short walk. Meadow, pond, stream, hardwood forest, emergent wetland and garden are a few such habitats available.

This request for an environmental review of the school and surrounding areas asked that the ERT Team address environmental education opportunities. Based on this reviewer's assessment of what information was available to team members and her own on-line research into the school curriculum, this reviewer believes the questions that first need to be answered are "Does Ridgebury Elementary School support environmental education and should it have a larger role in the school curriculum?"

Environmental education, at its best, is a multi-discipline, cross-curriculum approach to education. It provides opportunities to engage in academic studies and social and developmental skills. It often engages students that may have difficulty with more traditional classroom approaches. It allows students to become fully immersed in their outdoor classroom and engage in multiple learning styles. In an article entitled *The Benefits of Environmental Education,* the National Environmental Education Foundation (please see the Appendix for the article) explores the many benefits of environmental education, including links to improvements in other subjects in both application and testing.

The 2004 Connecticut Science Standards and inclusion of science on Connecticut Mastery Tests have put more emphasis on science as a core subject. Several of the key science teaching strands in the elementary framework are strongly correlated to what most think of as an environmental component of science education. Simply put, even with the most restrictive viewpoint on the role of environmental education, it is part of the elementary education curriculum. A broader view confirms that environmental education has a role in all subject areas. You can view *Connecticut's Environmental Literacy Plan 2012 (*www.ctwoodlands.org*)* that has as its ultimate goal "for all Connecticut citizens to use environmental literacy for individual and social purposes to create and maintain sustainable communities."

While taking an "environmental" approach to education can be a very effective, it also takes effort, time and support. Concerns about teaching outdoors in natural settings are often expressed. These may include; lack of appropriate knowledge, concern about safety, difficulty in providing enough chaperones, limited teaching supplies, doesn't fit well into required curriculum and limitations on time, among others. If environmental education is to be a priority, it is essential that these concerns be addressed and that teachers have the necessary support from administration and parents.

The following is a brief outline of action items to follow when considering environmental education at the school:

1. Decide if environmental education is a priority at the school. It is not really necessary to define the full extent as it will likely change over time as resources permit. Visit other schools where outdoor classrooms have been successfully incorporated (Spaulding Elementary School, Suffield, CT; Brewster Elementary School, Durham, CT; Northeast Academy, Groton, CT are a few schools with new outdoor classrooms).
2. Put together a team that is able to focus on how it will work, what is needed and what may be available. Suggested representatives include teachers, administration, PTO, local environmental organizations such as Conservation Commission or Land Trust, regional organizations such as a watershed group or Audubon, local colleges and/or high schools and local businesses. Other representatives might include "local experts" with a passion for sharing their knowledge.
3. Review curriculum and decide which areas to target, where the use of natural settings could enhance lessons.
4. Identify some key curriculum guides and strategies. There seems to be an almost endless supply of materials, making it overwhelming to hone in on those which may be most effective. The website below offers a collection of materials and ideas from a Massachusetts school system involved in the process of creating and using outdoor classrooms.

   http://www.miltonoutdoorclassrooms.com

5. Identify the barriers to incorporating outdoor teaching and what would be needed to address those issues.
6. Address what is realistically available in the community for support. In terms of supplies, small local businesses are often a great resource for smaller fund amounts which could be combined. "Teaching boxes" may be available for borrowing from the Department of Environmental Protection, Trout Unlimited or other local environmental organizations.
7. It is entirely plausible to start small; a seasonal hike in during gym class, collecting seeds for an art class or figuring out how to measure the height of a tree using your shadow. Inviting local "experts" to share their knowledge is another way to provide environmental education opportunities. Be prepared to give invited guests some idea of what topics fit in with the lesson plan. Starting small and building incrementally on what works, increases the positive experience for everyone involved.

8. It is not required to be an expert to engage in environmental education. Some of the most effective teaching comes when the "leaders" are learning right alongside the students.
9. Finally, enthusiasm is contagious!

Included in the Appendix is a listing of program ideas developed for the City of New London a few years back as a way to introduce the various elementary schools to learning, using a local park as the classroom. The topics were correlated to grade and science standards to demonstrate how it could address curriculum requirements. The purpose of including it is to simply offer ideas to spark a further discussion.

Benefits of Environmental Education

National Environmental Education Week, a project of the National Environmental Education Foundation (www.neefusa.org), is the nation's largest event devoted to environmental learning among K-12 students. Environmental education (EE) is often lauded by educators as an ideal way to integrate classroom curricula, stimulate the academic and social growth of young people, and promote the conservation of the natural environment. Just a few of EE's many benefits are listed below. For ideas on how to bring environmental education and its benefits into your classroom during National Environmental Education Week, log on to www.EEWeek.org.

Studying EE Creates Enthusiastic Students, Innovative Teacher-Leaders

In a world where it is increasingly challenging to get students interested in classroom lessons, EE offers an enriching way for both students and teachers to connect their appreciation of the natural world to academics.

Educators at Pine Jog Environmental Education Center in Palm Beach County have helped 11 Florida schools restructure their curriculum so that they can meet state standards while organizing activities and multidisciplinary teaching units around environmental themes. Why environmental themes? Because children have a natural interest in the environment around them. Interested students are motivated students, and motivation is a key ingredient for academic achievement.

Though the 11 schools have diverse student populations, the results of this restructuring were remarkably similar. Students at these schools are more enthusiastic about learning and perform better academically. Teachers are also more enthusiastic about teaching—they bring more innovative instructional strategies into the classroom and take more leadership in school change.

According to former Palm Beach principal Connie Gregory, "Our students [made] significant improvement in their writing and language arts skills because they were choosing to write about what interested them, which was the environment. … Likewise, our teachers are turned on by the new instructional strategies they are using and the improvements they are seeing in their students. And we all know a turned-on teacher is a better teacher."

Excerpted from:

Archie, M. (2003). *Advancing Education through Environmental Literacy*. Alexandria, VA: Association for Supervision and Curriculum Development.
The National Environmental Education and Training Foundation. (2000, September). *Environment-Based Education: Creating High Performance Schools and Students*. Washington, DC: National Environmental Education and Training Foundation.

EE Helps Build Critical Thinking, and Relationship Skills

Environment-based education emphasizes specific critical thinking skills central to "good science"—questioning, investigating, forming hypotheses, interpreting data, analyzing, developing conclusions, and solving problems. These are the same skills fifth-grade students in Texas teacher Jane Weaver's class are learning as they use the local and regional prairie environment to learn about science, mathematics, history, social studies, and language arts.

The subject matter is standards-based, but students are learning it by tackling real-world projects instead of by doing workbook exercises. For example, Weaver's students have restored a prairie, and designed and built a bridge. As a result, students learned more than just the immediate project skills: they've developed their thinking and problem-solving abilities. They've learned important life skills, such as cooperation and communication. And, as often happens in project-based learning, they've found unique opportunities to build relationships.

Excerpted from: Archie, M. (2003). *Advancing Education through Environmental Literacy*. Alexandria, VA: Association for Supervision and Curriculum Development.

EE Instructional Strategies Help Foster Leadership Qualities

Environmental education emphasizes cooperative learning (i.e., working in teams or with partners), critical thinking and discussion, hands-on activities, and a focus on action strategies with real-world applications. As a result, students who study EE develop and practice the following leadership skills:

- Working in teams
- Listening to and accepting diverse opinions
- Solving real-world problems
- Taking the long-term view
- Promoting actions that serve the larger good
- Connecting with the community
- Making a difference in the world

The Catalina Leadership program in Catalina, California, and the Adopt-a-Watershed Project in Hayfork, California, are two examples of environment-based education programs that develop leadership skills. In Catalina, fourth- to 12th-grade students gain leadership skills in a natural setting by exploring the complexity of the natural world. In Hayfork, students study watershed conservation to develop skills such as investigation and problem-solving.

Excerpted from: The North American Association for Environmental Education (NAAEE) and The National Environmental Education and Training Foundation (NEETF). (2001). Using Environment-Based Education to Advance Learning Skills and Character Development. Washington, DC: NAAEE and NEETF.

EE Makes Other School Subjects Rich and Relevant

Using outdoor settings like wetlands, schoolyard habitats, or even national parks can infuse a sense of richness and relevance into a traditional school curriculum. California's Heritage Project—a partnership between three school districts and Sequoia and Kings Canyon National Parks—is one example.

Once a week, K–12 students meet with a park ranger to learn about park-related topics, such as forest fire cycles. Frequent park visits to gain hands-on experience are encouraged, creating stronger connections than the more typical once-yearly field trip provides.

The Heritage Project also offers EE classes that combine learning with recreation and exercise. For example, students study river ecology while kayaking, or equine caretaking while horseback riding.

These hands-on experiences motivate students to learn, and they pay off in better test scores, better social skills, and increased parental involvement. The program's growth testifies to its success: nearly 75% of local students have become involved in the Heritage Project since it was founded, and teachers welcome the educational support from expert staff at participating parks, forests, refuges, museums, zoos, and nature centers.

Excerpted from: The National Education and Environment Partnership. (2002). Environmental Education and Educational Achievement: Promising Programs and Resources. Washington, DC: National Environmental Education and Training Foundation.

EE Teaches Students to be Real-World Problem-Solvers

Students at the School of Environmental Studies in Apple Valley, Minnesota, attend high school on the Minnesota Zoo's grounds, and have daily opportunities to hone their problem-solving skills. The "Zoo School" functions as an interdisciplinary learning laboratory that, in the words of Principal Dan Bodette, "… allows kids to do the kind of thinking that problem solving in the real world requires."

The Zoo School's environment-based approach to education lays the foundation for building students' problem-solving skills. Environment-based education employs these key strategies for teaching creative and successful problem solving:

- introducing inquiry-based instructional activities with real-world applications,
- encouraging critical thinking about these activities,
- allowing individual choice about and engagement in the particular problem to be solved,
- helping students make connections between disciplines, and
- fostering independent and cooperative group learning.

For example, students at the Zoo School spend ten days each trimester investigating an independent study topic of their choice. Projects include anything from designing a Web page for the Jane Goodall Institute's Roots and Shoots program to teaching local fourth graders about ecosystems.

Recently, two students profiled a local pond for a themed unit that explored the human/water relationship. They tested the pond water for phosphates, nitrates, and dissolved oxygen so that they could determine the pond's ecological health and recommend improvements to city officials. The students were so involved in the project that they stayed at Kinko's until 2 A.M. preparing the presentations they were delivering to city officials the next day—a not unfamiliar scenario in today's 24/7 workaday world.

Excerpted from: The National Education and Environment Partnership. (2002). Environmental Education and Educational Achievement: Promising Programs and Resources. Washington, DC: National Environmental Education and Training Foundation.
The National Environmental Education and Training Foundation. (2000, September). *Environment-Based Education: Creating High Performance Schools and Students.* Washington, DC: National Environmental Education and Training Foundation.

EE Helps Students Become Self-Directed Learners

Sometimes traditional instruction, such as lecturing, is the most practical approach to covering broad content. But when students learn through a problem- or project-based approach—a key strategy in environment-based education—they gain a better understanding of what they learn, they retain it longer, and they take charge of their own learning—key skills for success in our data-driven, rapidly changing world.

A case in point: the experience of a student who moved from a traditional school to one focused on EE. "I've learned a lot more [here] than I ever did at my old school," he said. "There, they spoon-fed you. Here, they leave [learning] up to you, and that makes it easier to learn, and to want to learn more."

An observation by Kathleen McLean, a teacher at Great Falls Public School in Great Falls, Montana, underscores the point: "I take students to places where they can see evidence of [environmental] problems…I am inspired by their creativity and persistence in finding solutions."

Excerpted from:
The National Environmental Education and Training Foundation. (2000, September). *Environment-Based Education: Creating High Performance Schools and Students*. Washington, DC: National Environmental Education and Training Foundation.
The North American Association for Environmental Education (NAAEE) and The National Environmental Education and Training Foundation (NEETF). (2001). Using Environment-Based Education to Advance Learning Skills and Character Development. Washington, DC: NAAEE and NEETF.

EE Gets Apathetic Students Excited About Learning

Even bright students can be uninterested in learning—especially if they think that what they're learning is not relevant to their everyday lives. But tap into their interests—for example, as environmental education does, with its emphasis on the living world and hands-on activities—and students suddenly get excited.

Take Daniel, for instance. Daniel was bright, but never turned in his work. His consistent response to any assignment was, "Why do we have to do that?"

One day Daniel's teacher began a unit on cycles. She started with the cycle that was least familiar—soil minerals—and brought in a bare-bones terrarium that held only soil and earthworms. Students were to add various materials to the terrarium and observe what changed.

Daniel suddenly got interested. He completed assignments, raised his hand to answer questions, and worked with classmates. Every morning before school started, even before the teacher arrived at the classroom door, Daniel was there waiting for her.

He wanted to check on the terrarium and see what was happening, he told his teacher. When she asked why he was so excited about the terrarium, but never got that excited about his other work, Daniel said, "Nobody's ever asked me to study something like this before!"

Excerpted from: The National Environmental Education and Training Foundation. (2000, September). *Environment-Based Education: Creating High Performance Schools and Students.* Washington, DC: National Environmental Education and Training Foundation.

EE Schools Demonstrate Better Academic Performance across the Curriculum

Schools that adopt environmental education as the central focus of their academic programs frequently demonstrate the following results:

- Reading, science, social studies, and mathematics scores improve.
- Students develop the ability to transfer their knowledge from familiar to unfamiliar contexts.
- Students "learn to do science" rather than "just learn about science."
- Classroom discipline problems decline.
- All students have the opportunity to learn at a higher level.

Hawley Environmental Elementary school in Milwaukee, Wisconsin, is just one example of how an environment-based curriculum can improve students' academic performance. Reading scores at Hawley exceeded all other schools in Wisconsin that were located in similar income-level areas, and the following year student achievement at Hawley exceeded the state average on state tests and on nationally normed assessments.

Because of these and other achievements, Hawley has since been recognized by the U.S. Department of Education and other organizations as a high-performing school that offers "hope for urban education."

Excerpted from:
Archie, M. (2003). *Advancing Education through Environmental Literacy*. Alexandria, VA: Association for Supervision and Curriculum Development.
The National Environmental Education and Training Foundation. (2000, September). *Environment-Based Education: Creating High Performance Schools and Students.* Washington, DC: National Environmental Education and Training Foundation.

EE Is a Perfect Match for Community Service Learning Requirements

Many schools require students, especially middle and high school students, to participate in service learning. Environmental projects are a leading choice for service learning nationwide.

At Pennsylvania's Huntingdon Area Middle School, for example, sixth-grade students study a hands-on, 60-hour, environmentally-based core curriculum. After completing the core course, many students participate in an after-school EE club (Science Teams in Rural Environments for Aquatic Management Studies [STREAMS]) that performs environmental activities to benefit the community.

Students fund all activities by writing and obtaining their own grants. They've become local experts in community stewardship, even educating local citizens, government authorities, and the press about environmental planning and protection. As a result of their service activities, students displayed fewer discipline problems and met with unprecedented academic success. They also formed community partnerships with Pennsylvania organizations such as the League of Women Voters, Juniata College, and the Huntingdon County Conservation District. And parents are now enthusiastic supporters of students' after-school activities.

Similar projects exist at other schools, with similarly positive results. For instance, students at Florida's Dowdell Middle Magnet School built houses for 300 native Floridian toads and created brochures to educate the community about the toads' preferred habitat. This project has increased respect between students and teachers, teachers and parents, and among the students themselves. And students at Four Corners School of Outdoor Education on the Colorado plateau repaired hundreds of miles of trails and roads on public lands. These restoration projects allowed students aged 16–23, 90% of whom are Navajo, to learn job skills, life skills, and environmental stewardship, not to mention a school-district-approved science curriculum.

Excerpted from: The National Education and Environment Partnership. (2002). Environmental Education and Educational Achievement: Promising Programs and Resources. Washington, DC: National Environmental Education and Training Foundation.

EE Offers All Students Equal Chances for Academic Success

Environmental educators often find that students who fail in traditional school settings can succeed when the natural outdoor environment becomes the students' classroom. For example, students who learn best by doing can be as successful as students who learn best through lectures and books.

Jeremy, for example, is a high school senior whose writing skills were weak and who admitted that he often had trouble "tying facts together." After Jeremy got involved in the environmental education program at his school, things changed. He had to write a 2400-word paper, complete an action project, and present his conclusions to a community panel. Not only was his paper "awesome," according to this English teacher, but Jeremy went further. On his own initiative, he submitted an editorial based on his research to his state capital's newspaper, and it was published.

Excerpted from:

The National Environmental Education and Training Foundation. (2000, September). *Environment-Based Education: Creating High Performance Schools and Students.* Washington, DC: National Environmental Education and Training Foundation.

The North American Association for Environmental Education (NAAEE) and The National Environmental Education and Training Foundation (NEETF). (2001). Using Environment-Based Education to Advance Learning Skills and Character Development. Washington, DC: NAAEE and NEETF.

Bates Woods Program Ideas
by
The Children's Museum of Southeastern Connecticut

PreK

- Colors in the Park (fall or spring season)
- Exploring Bates Woods Using Our Five Senses
- I Spy Scavenger Hunt

Kindergarten

- Park Artifacts-Sorting and Classifying (K.1)
- What Lives at Bates Woods? (K.2)
- Changing Weather (K.3)
- Building Teddy Bear Shelters (K.4)

First Grade

- Shadows and Sundials-The Power of the Sun (1.1)
- Special Creature Features and Other Survival Techniques (1.2)
- Babies in the Park-Exploring New Beginnings (1.3)
- Outdoor Explorers-Using Tools to Gather Information (1.4)

Second Grade

- Solids, Liquids and Gas (2.1)
- Traveling Seeds Scavenger Hunt (2.2)
- The Dirt Under Our Feet or Soils and the Plants That Love Them (2.3)
- Did the Native Americans Have to Eat Their Vegetables? (2.4)

Third Grade

- Simple Tests to Answer Questions About Nature (3.1)
- Wet or Dry We Call it Home-Comparing water and land habitats. (3.2)

- Rock Hounds of Bates Woods (3.3)
- Race to Recycle or Trash in the Park (3.4)

Fourth Grade

- Forces and Motion or Bridge the Gap (4.1)*
- What do Chains and Webs Have to do With Food? (4.2)
- The Water Cycle Starts With One Drop (4.3)
- Lighthouses in the Park (4.4)*

Fifth Grade

- Survivor…The Game That Depends on Using Your Senses (5.2)
- Planetarium in the Park (5.3)
- Exploring the Park With Optical Instruments (5.4)

*Starred items represent programs already developed by the museum that could be conducted at the park.

Programs:

What Lives at Bates Woods? (K.2)

Take a walk through the park with a naturalist and discover what lives at Bates Woods. How can you tell living from nonliving things? What is the difference between plants and animals?

Teddy Bear Shelters (K.4)

Bring your favorite bear or any other stuffed friend and build a shelter for it using just what you find in the park.

Special Creature Features (1.2)

Are all living things the same? What special features help them survive?

Babies in the Park (1.3)

Explore the park looking for new beginnings. From tadpoles and insect larvae to new sprouts and buds, how do animals and plants grow and change?

Did the Native Americans Have to Eat their Vegetable? (2.4)

What are some of the plants that Native Americans would have eaten?

Soils and the Plants That Love Them (2.3)

Why do different plants grow in different areas? Is all soil the same? Perform some simple tests to determine what is in the soil, its texture and how water moves through it.

Rock Hounds of Bates Woods (3.3)

Take a hike to explore the impressive rock formations of Bates Woods. Learn how to tell igneous, metamorphic and sedimentary rocks apart. Try some simple tests to determine color, hardness and magnetic properties of rocks.

Wet or Dry, We Call it Home (3.2)

Explore two different habitats, one wet, one dry. How are the animals living there adapted to their habitat? How does their habitat meet their needs?

What do Webs and Chains Have to do With Food? (4.2)

We'll pick an animal and construct a food chain. Then we'll expand it and create a food web. What happens when one part of the web is changed or removed? Finally we'll compete in a game of survival.

The Water Cycle Starts with One Drop (4.4)

Become a drop of water and move through the water cycle. We'll search for water in Bates Woods.

Exploring Bates Woods Using Optical Instruments (5.2)

After a short review on how the eye works, we'll explore the park using optical instruments; from magnifying lens and microscopes to binoculars and telescopes and even a periscope.

Shadows and Sundials: The Power of the Sun (5.3)

What do shadows tell us about the position of the sun and earth? Predict what happens as the earth moves. Does the sun also move? Build a sundial to tell time.

Archaeological and Historical Review

The Office of State Archaeology (OSA) conducted a field review of the above-named Environmental Review on Monday, 12 December 2011. Areas of sensitivity include well-drained soils, generally level topography adjacent to the wetland basin for pre-Contact Native American camps. The project area has a high sensitivity for Native American sites in the far western/southern portions of the property (highlighted in yellow on the Color Aerial Map). Topographically and environmentally, this area has low terraces of well-drained soils with little slope. In addition, the confluence of two brook systems flowing into each other is another highly sensitive area for prehistoric encampments. The area possesses similar topographic and environmental features as those in Richardson Park in Ridgefield, where Native American artifacts have been recovered that date to 10,000 years ago. Similar potential occurs at the Peterson Gorge portion of the property.

Educational opportunities highlighting Native American lifeways and adaptation to local resources may exist for this area. An archaeological survey could test the area for such sites and provide a field workshop for students and the public to learn about the cultural past and the science of archaeology.

(Dig It! mock archaeological dig, Monroe, CT sponsored by UCONN Alumni Association)

While the French Revolutionary War armies under General Rochambeau camped in Ridgebury, there is no historic indication that they stopped or camped on the Ridgebury School project area. In addition, other portions of the property consist of high ledge and landscape that appears to have been modified through time. As a result, these areas possess a low to moderate sensitivity for archaeological sites.

In summary, the western/southern area of the Peterson Gorge, namely the terraces above the confluence of the brook systems, possesses the highest sensitivity for undiscovered archaeological sites, and has the potential for an outdoor classroom activity.

The Office of State Archaeology is available to provide technical assistance to the Ridgefield School system to assist in the educational development of the property for local students..

Ridgebury School Outdoor Classroom/NRI Color Aerial Map

The Connecticut Environmental Review Team

This map was prepared by Amanda Fargo-Johnson for the Connecticut Environmental Review Team.
This map is for educational use only.
It contains no authoritative data.
June 2013.

ERT Site Review Areas

Areas of sensitivity

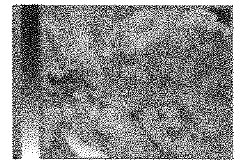
0 0.05 0.1 0.2 Miles

Ridgefield, CT

N W E S

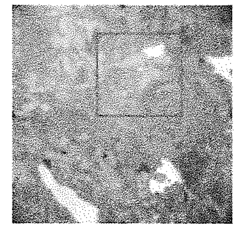
Appendix

Aerial survey of Connecticut 1934 photograph 02747



Title	Aerial survey of Connecticut 1934 photograph 02747
Subject - TGM	Aerial photographs; Connecticut; Ridgefield
Coverage - Spatial	1:12000
Creator	Fairchild Aerial Survey Co.; Connecticut Air National Guard
Contributors	Connecticut State Planning Board
Date - Created	1934 Apr.
Date - Digital	2004-2006
Collection	Aerial photographs
Type	Image
Format	jp2
Source - Location	9 x 7 in., b&w photograph; Connecticut State Library, State Archives, RG 089: 11a
Relation	Research Guide to Aerial Photographs at the Connecticut State Library: http://www.cslib.org/aerials/
Town(s) Covered	Ridgefield
X Coord	-73.5155
Y Coord	41.3306
Publisher	Connecticut State Library
Rights	Digital image © Connecticut State Library. All rights reserved. Images may be used for personal

Aerial survey of Connecticut 1965 photograph 00308



Title	Aerial survey of Connecticut 1965 photograph 00308
Subject - TGM	Aerial photographs; Connecticut; Ridgefield
Description	Vertical aerial view of Connecticut. Flight lines were flown on an east-west axis. Flight line: 14
Coverage - Spatial	1:18000
Creator	Keystone Aerial Surveys, Inc
Date - Created	1965 Mar.
Date - Digital	2004
Collection	Aerial photographs
Type	Image
Format	jp2
Language	eng
Source - Original	Photograph, negative, b&w, 9 x 9 in.
Source - Location	Connecticut State Library, State Archives, RG 079: 4
Relation	Research Guide to Aerial Photographs at the Connecticut State Library: http://www.cslib.org/aerials/
Town(s) Covered	Ridgefield
X Coord	-73.5145
Y Coord	41.3326

About the Team

The King's Mark Environmental Review Team (ERT) is a group of environmental professionals drawn together from a variety of federal, state and regional agencies. Specialists on the Team include geologists, biologists, soil scientists, foresters, climatologists and landscape architects, recreational specialists, engineers and planners. The ERT operates with state funding under the aegis of the King's Mark Resource Conservation and Development (RC&D) Area - an 83 town area serving western Connecticut. (www.kingsmark.org)

As a public service activity, the Team is available to serve towns within the King's Mark RC&D Area - *free of charge.*

Purpose of the Environmental Review Team

The Environmental Review Team is available to assist towns in the review of sites proposed for major land use activities or natural resource inventories for critical areas. For example, the ERT has been involved in the review of a wide range of significant land use activities including subdivisions, sanitary landfills, commercial and industrial developments and recreation/open space projects.

Reviews are conducted in the interest of providing information and analysis that will assist towns and developers in environmentally sound decision making. This is done through identifying the natural resource base of the site and highlighting opportunities and limitations for the proposed land use.

Requesting an Environmental Review

Environmental reviews may be requested by the chief elected official of a municipality or the chairman of an administrative agency such as planning and zoning, conservation or inland wetlands. Environmental Review Request Forms are available at your local Conservation District and through the CTERT Coordinator. This request form must include a summary of the proposed project, a location map of the project site, written permission from the landowner / developer allowing the Team to enter the property for the purposes of a review and a statement identifying the specific areas of concern the Team members should investigate. When this request is reviewed by the local Conservation District and approved by the CTERT Subcommittee, the Team will undertake the review. At present, the ERT can undertake approximately two reviews per month depending on scheduling and Team member availability.

For additional information regarding the Environmental Review Team, please contact the CT ERT Coordinator, Connecticut Environmental Review Team, P.O. Box 70, Haddam, CT 06438. The telephone number is 860-345-3977, connecticutert@aol.com, www.cterg.org.