LANGHAMMER PROPERTY

ASHFORD, CONNECTICUT

Eastern Connecticut Environmental Review Team Report

Eastern Connecticut Resource Conservation and Development Area, Inc.

Langhammer Property

Ashford, Connecticut

Environmental Review Team Report

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

For the

Conservation Commission

Ashford, Connecticut

June 2014

Report #634

ACKNOWLEDGEMENTS

This report is an outgrowth of a request from the Ashford Conservation Commission to the Eastern Connecticut Conservation District (ECCD) and the Connecticut Environmental Review Team Subcommittee for their consideration and approval. The request was approved and the measure reviewed by the Eastern Connecticut Environmental Review Team (ERT).

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

The field review took place on Thursday, April 11, 2013.

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**Participated on field review, no report submitted yet.*

I would also like to thank Loretta Wrobel, Gwen Haaland, Ray Fenn and Steve Morytko, Ashford Conservation Commission, Pete Anderson, Willington Conservation Commission, Dan Donahue, natural resource consultant and Phil Renn, town resident, for their cooperation and assistance during this environmental review.

Prior to the review days, each Team member received a summary of the proposed project with various maps. During the field review and after Team members received additional information. Some Team members made separate or additional field visits to the sites. Following the reviews, reports from each Team member were submitted to the ERT coordinator for compilation and editing into this final report.

This report represents the Team's findings. It is not meant to compete with private consultants by providing site plans or detailed solutions to development problems. The Team does not recommend what final action should be taken on a proposed project - all final decisions rest with the town. This report identifies the existing resource base and evaluates its significance to the proposed use, and also suggests considerations that should be of concern to the town. The results of this Team action are oriented toward the development of better environmental quality and the long term economics of land use.

The Eastern Connecticut RC&D Executive Council hopes you will find this report of value and assistance in providing information for plans to develop a public access trail and linkage to other preserved land.

If you require additional information please contact:

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Executive Summary

The town owned 73 acre Langhammer Property is located north of Howey Road near the Willington Town line. The forested parcel was obtained by the town in 1959 and has had some forestry management measures conducted in the late 1990's such as boundary marking and improvement thinnings. The Ashford Conservation Commission wants to develop a management plan for recreation use and conservation of the property and to raise public awareness for public use and preservation as open space. It is a wooded property that can be easily be connected for walking and hiking to the permanently protected open space of the +300 acre Fenton Ruby Park and Wildlife Preserve and Drobney Sanctuary in Willington. The Langhammer Property and the Willington open space creates a large (almost 400 acre) unfragmented forested area.

Bedrock Geology

The site is nearly bisected by a thrust fault and looking at the topographic map it is easy to imagine the stream following the trace of the thrust fault. The bedrock formations are estimated to be from the Paleozoic Era aged about 542 million years ago to 251 million years ago. Thick glacial till (Glacial till was laid down directly by glacial ice and is characterized by unsorted sand, silt and clay with variable amounts of stones and large boulders mixed in) covers most of the property's surface. The site has interesting ridges that allow visitors to see the bedrock and there are inclusions of garnets. Garnets are often of interest and they are the CT state mineral. This information can be with visitors if an educational kiosk or trail guide is planned.

Eastern Connecticut Conservation District

A soils map has been prepared using the USDA-NRCS Web Soil Survey with brief descriptions of each soil series mapped for this site. Erosion hazards for each soil unit have also been identified with 66.5 acres having moderate hazard for roads/trails and 14.6 acres having a severe erosion hazard rating. This table should be reviewed prior to construction or maintenance of trails to ensure that trails are proposed in suitable locations and proper erosion and sedimentation control measures are used. The Conservation Commission asked about the suitability of the property for future cemetery use. The ECCD reviewed the soils for cemetery use potential using soil evaluation for large animal disposal. While the internment process is different at cemeteries, consideration of underlying conditions, including depth to bedrock, slope, seepage, ponding, et cetera would be similar. The soils appear to be "very limited" for cemetery use.

A determination should be made about legal public access via Howey Road from the Ashford side and whether the portion of Howey Road adjacent to the Langhammer Property should be restricted to protect the integrity of the historic Old Connecticut Path. Parking is currently limited to an area filled by the town off of Lustig Road. This area could be expanded and graded

to provide additional parking for visitors and would be an ideal location for an informational kiosk and trailhead. A walking trail that incorporates existing trails that connects points of interest and a connector trail to the Fenton Ruby Park is proposed.

Water resources on the property consist of an intermittent stream with a waterfall that drains a vernal pool that contained wood frog eggs and a salamander egg mass, and a forested wetland in the center of the parcel that that gives rise to Eno Brook. There are also several seeps along the easterly side of the property. The parcel should be further evaluated to see if there are additional vernal pools that should be documented and preserved. The proposed walking trail runs alongside the water fall and around the vernal pool so care should be taken that visitors do not disturb amphibian egg masses or larva. Property managers may need to weigh the benefits of showcasing these features and providing educational opportunities with the need to protect this fragile resource from disturbance. Boardwalks or bog bridges should be constructed to cross Eno Brook and the intermittent watercourse and all proper erosion and sediment control measure should be utilized to protect the wetlands and watercourses.

Fisheries Resources

The watercourse on the property is of the headwater reaches of Eno Brook which is a tributary to the Fenton River. This stretch of the watercourse on the property does not support a fish community. An important function of this watercourse is to provide clean and unpolluted waters to downstream areas of the watershed which contain an increased diversity of aquatic organisms. Based upon field and watershed characteristics the stretch of Eno Brook below Lustig Road and upstream from Taylor Pond likely supports a coldwater fish population such as native brook trout. The riparian corridors serve several important functions in keeping biologically healthy and diverse stream and riparian ecosystems. It is the policy of the DEEP Inland Fisheries Division that riparian corridors be protected with a 100 foot wide undisturbed riparian buffer zone. Trails should be carefully designed to minimize damage to the landscape and erosion and sedimentation problems. Boardwalk systems should be used to cross wetlands and interpretive signs can explain the types and values of various brook, wetland and upland habitats along the trail.

Wildlife Resources

The property consists mainly of forested uplands with some moderate slopes with a few ledges. The overstory is mostly oak and maple trees, with areas of mountain laurel and an understory that has been heavily deer browsed. The shrub and herbaceous are sparse and invasive plants do not appear to be a major issue at this time but early detection and action can prevent a bigger problem. Forest management techniques can be used to benefit wildlife on the more level areas of the property and should be managed by a certified professional forester. The invasive non-native Japanese barberry was found on the property and it should be monitored and hand pulling considered before it becomes widespread and difficult to remove. (A Japanese Barberry Control

Methods Reference Guide is available on line at:
http://www.ct.gov/caes/lib/caes/documents/publications/special_bulletins/special_bulletin_feb_2013_ward.pdf)

The vernal pool at the time of the field review contained wood frog and spotted salamander egg masses. During the field review while examining the vernal pool four dead wood frogs were discovered. Any future observations of amphibian die-off events should be reported to Dr. Tracy Rittenhouse at UCONN and Jenny Dickson of the CTDEEP Wildlife Division who are conducting research on *Ranavirus.* Many other wildlife are likely using this habitat for food and cover. It would be beneficial to conduct a spring survey at the pool to document all breeding species.

General guidelines for protecting wildlife resources when developing trails have been included in the report. The property has great potential for wildlife outreach and education through the use of interpretive signs and trail development.

Landscape Ecologist Review

Overall the property offers many opportunities for hiking, birdwatching and other wildlife observations with its varied habitats of woodland, stream, wetlands, laurel thickets and bedrock ridges, along with historical significance. The fact that the property is adjacent to the +300 acre Willington Fenton Ruby Park and Wildlife Preserve adds to its attraction because it can connect users to a more extensive trail system and adds habitat for wildlife that requires larger acreage.

Some of the wet spots/potential vernal pools near Lustig Road and bordering Howey Road should be investigated during the spring season to determine if they are functioning vernal pools by finding such obligate species as wood frogs, spotted salamanders or fairy shrimp.

Invasive species are not currently a major problem but immediate action should be given to Garlic Mustard and Narrow-leaved Bittercress near the parking area on Howey Road. Both species are shade tolerant and can spread quickly by seed so it is important to control them when they are found near trails and parking areas where their seed can easily be spread by hikers and pets when attached to clothing, shoes or fur. Other invasive species noted include: Japanese Barberry, Asian Bittersweet, Winged Euonymous, Dame's Rocket and Multiflora Rose. An invasive species not found on the property, but that should be on a property "watch list," is Japanese Stilt Grass. It is an annual grass that is shade tolerant, a prolific seed producer and will quickly dominate moist floodplains.

Erosion is a concern where trails are steep over shallow soils. Switchbacks or re-routing may be necessary if using the existing trail system. It is recommended that the trail that goes to the vernal pool be re-routed to avoid the waterfall because of its susceptibility to damage and erosion. A preliminary list of understory plants has been prepared with approximate locations.

Archaeological and Historic Sensitivity

The property has no known archaeological sites but a field review did document a couple of important cultural resources. The southern border of the property along Howey Road has been identified as a segment of the "Old Connecticut Path" a highway used in the Colonial Period by settlers moving between Boston and Hartford. Consideration should be given to nominating this segment for inclusion on the National register of Historic Places. There are also a series of finely built high stonewalls that may have been pasture enclosures for sheep. These features offer the opportunity to be used as educational tools to teach about local 18th and 19th century farming activities in Ashford. In addition there are a number of stone mounds on the property probably associated with agrarian activities of the historic farms but similar features have been identified as Native American in origin. The Office of State Archaeology strongly recommends that they be preserved and mapped to determine if spatial patterns are associated. The lack of significant wetlands suggests a low-to-moderate sensitivity for Pre-Contact Indian campsites on the property. These historic resources provide a great educational opportunity for outdoor laboratories to teach about the town's history and the preservation of cultural resources.

Trails and Greenways

Considerations for trail construction and linkages should include discussions about what uses will be permitted on the Langhammer Property (hiking, biking, equestrian, etc.) and what is allowed on the Fenton Ruby parcels (foot traffic only).The unpaved parking area on Howey Road would make a good trailhead and should have room for amenities such as composting toilets, benches, kiosk and horse trailer parking. Building and maintaining trails should include developing a trail plan, and a maintenance plan that could include neighbors and volunteers.

Northeastern CT Council of Governments

The development of the Langhammer Property as a natural habitat and nature preserve is consistent with the town's Plan of Conservation & Development goals of protecting large undeveloped parcels, historic stonewalls, providing recreational opportunities that include wildlife observation and hiking, conserving inland wetlands and watercourses for their essential roles and protecting and conserving forests for wildlife, water quality and productivity and creating natural resource management plans for the utilization of municipal open space parcels.

The boundaries of the property should be re-identified with plaques or posts to keep hikers from accidentally trespassing on adjacent property and to keep unrelated or prohibited activities off the property. A decision should be made about permitting hunting, if it is not allowed, then existing deer stands should be removed. As setback distance from property lines should be established for trails using the Ashford Planning and Zoning regulations setbacks for the Residential Agricultural zone as guidance.

Public access points should be limited, well defined and convenient so limiting access to one trailhead at the parking area with a link to the Fenton Ruby Park will accomplish those goals. The existing parking area should be formalized, expanded and cleaned up to accommodate more vehicles. The legal status of Howey Road needs to be studied for additional access or protection.

TABLE OF CONTENTS

INTRODUCTION

The Town of Ashford Conservation Commission has requested an environmental review and natural resource inventory of the Langhammer Property. The 73 acre forested site is located north of Howey Road near the town's border with Willington. The property has an intermittent watercourse and wetlands, some of which may be vernal pools. The 305 acre Fenton Ruby Park and Wildlife Preserve and Drobney Sanctuary in Willington is adjacent. A section of the Old Connecticut Path, a Native American/Colonial "highway," runs along the southernmost portion of the property.

The town took title to the property in 1959. A consulting forester prepared an inventory for two main stands of trees in 1981with recommendations for a forestry management program and again in 1987 a written proposal for a Multiple Use management Plan was presented to the Ashford Board of Selectmen but not acted upon. In 1997 a Forest Stewardship Plan was completed for the property ("Westford Hill Woodlands") and following Board of Selectmen approval an improvement thinning was conducted in 1998, as well as property boundaries located and marked.

Objectives

The Ashford Conservation Commission is requesting a comprehensive environmental review/natural resource inventory for development of a plans for public access that will highlight major property features while preserving the natural habitat. The property is the largest town owned open space in Ashford, but is relatively unknown and underutilized.

The Conservation Commission is interested in designing a trail to link to the Ruby Fenton Park property and other issues that have been identified include adequate parking for recreational users, development of trails within the property, protection of wetlands and vernal pools, wildlife and forestry management and protection of historical and cultural resources.

The ERT Process

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

This report provides a natural resource inventory and a series of recommendations and guidelines which cover the topics requested by the town. Team members were able to review maps, plans and supporting documentation provided by the town.

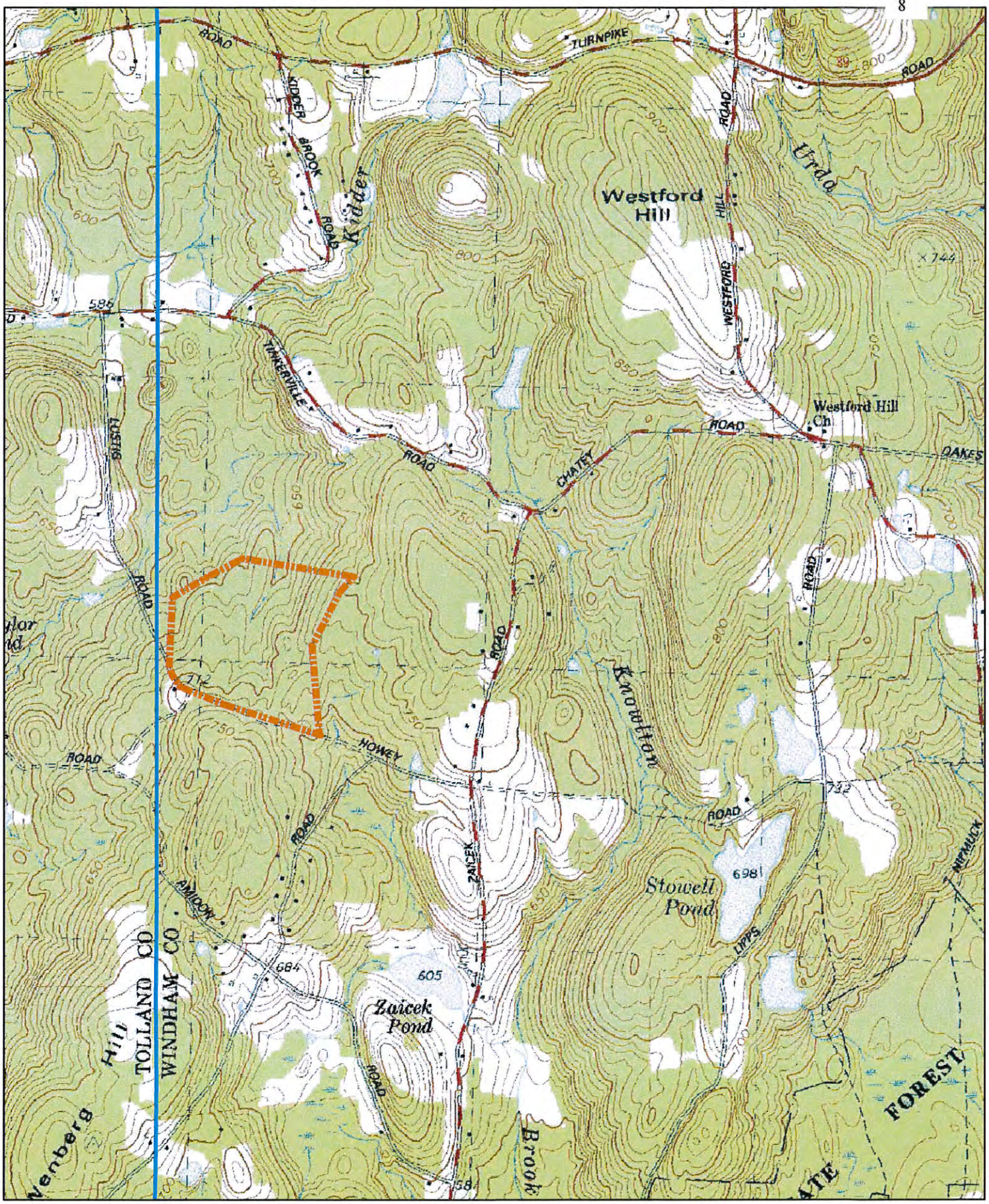
The review process consisted of four phases:

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

The data collection phase involved both literature and field research. The field review was conducted on April 11, 2013. Some Team members made separate and additional field visits on their own. The field review allowed Team members to verify information and to identify other resources.

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

Langhammer Property Site 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 2014

Approx. Property Boundary

0 700 1,400 2,800 Feet

Ashford, CT

Langhammer Property 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 2014

Approx. Property Boundary

0 355 710 1,420 Feet

Ashford, CT

Langhammer Property Aerial Map

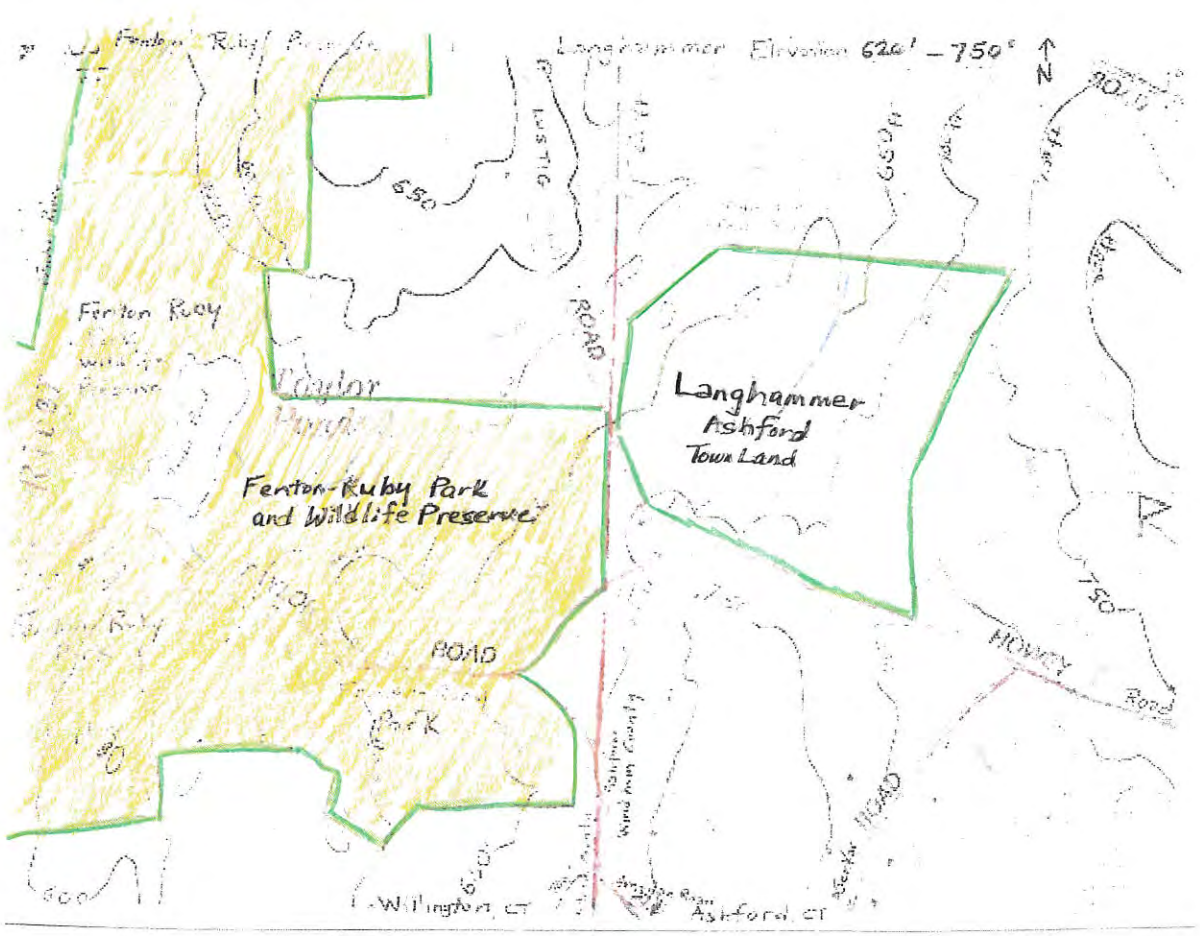
The Connecticut Environmental Review Team

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 2014

Approx. Property Boundary

0 335 670 1,340 Feet

Ashford, CT


Fenton Ruby
Wildlife
Preserve
Taylor
Parcel
Fenton-Ruby Park
and Wildlife Preserve
ROAD
Park
Langhammer
Ashford
Town Land
Howey
Road
Willington CT
Ashford CT
650
750
N


Tolland County
Windham County
County Line
Meadow Road
Ludlig Rd
Chaley Rd
LANGHAMMER
ASHFORD
TOWN LAND
FENTON RUBY
WILDLIFE RESERVE
Howey Rd
E Howey Rd
Zalcek Rd
Stekel Rd
N

BEDROCK AND SURFICIAL GEOLOGY

Bedrock Geology

The site (Figure 1, outlined in red) is nearly bisected by a thrust fault shown as a thick black line. A thrust fault (Figure 2) is described as "a fault in which the rocks on the upper side of an inclined fault plane have been displaced upwards, usually by compression." Looking at the topography of the site in Figure 3, it is easy to imagine the stream following the trace of the thrust fault.

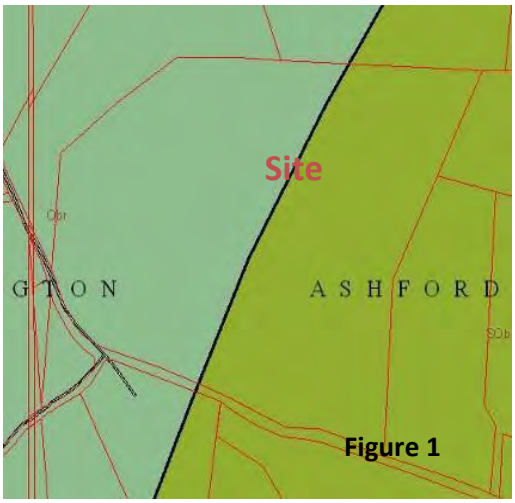


Figure 1

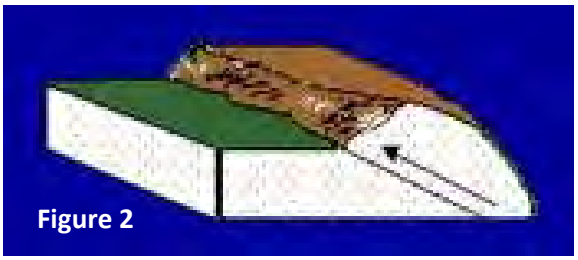


Figure 2

Figure 3

The geologic unit shown in Figure 1 as shaded pea green (on the right) has been identified as the lower member of Bigelow Brook Formation (SOBL) described as gray medium grained granofels (poorly layered, metamorphic rock composed primarily of quartz and feldspar, Photo 1). The geologic unit shown as shaded gray green (on the left) has been identified as Brimfield Schist (Obr) which is characterized as gray, rusty-weathering, medium to coarse grained, interlayered schist and gneiss (Photo 2). Both formations are part of the Iapatos (Oceanic) Terrane / Merrimac Synclinorium (a series of synclines) and estimated to be from the Paleozoic Era aged from about 542 million years ago to 251 million years ago.

Quaternary and Surficial Geology

The Quaternary period in geologic time began about 1.8 million years ago and continues today. During the last million years the northern hemisphere has experienced numerous ice ages of varying intensity. At least two have been intense and spread ice as far south as Long Island. The last ice age ended about 15,000 years ago; during its height, ice more than a mile thick covered Ashford.

Glacial till covers most of the property's surface. Flowing glacial ice is a powerful agent of erosion. The ice freezes soil and rocks into its base and uses those particles like sand paper to scrape and abrade the underlying bedrock. The result is to round off the hill tops and in the process, create a huge amount of sand, mud and gravel; essentially ground up bedrock. This ground-up debris is referred to as glacial till (or till).

The Surficial Materials map for Connecticut compliments the Quaternary process information reviewed above. The map indicates that subject property area is covered by thick till, composed of gravel, sand and clay.


Photo 1


Photo 2

Comments

The site has interesting ridges that allow visitors to see the bedrock. There are many inclusions of garnet (Photo 1) which are often of interest and are the CT State Mineral (visit http://www.ct.gov/ctportal/cwp/view.asp?a=885&q=246506). Some of the material shared here might be interesting on an educational kiosk.

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.

Stone, J.R., Schafer, J.P., London, E.H., DiGiacomo-Cohen, M.L., Lewis, R.S.,Thompson, W.B., 2005, Quaternary Geologic Map of Connecticut and Long Island Sound Basin (1:125,000). U.S. Geol. Surv. Sci. Invest. Map # 2784.

EASTERN CONNECTICUT

CONSERVATION DISTRICT REVIEW

Introduction

The Town of Ashford has requested an environmental review of the town owned Langhammer Property. Specific concerns identified by the Town of Ashford include the creation of baseline of land features and conditions via a natural resource inventory; assessment of the potential and/or limitations for public access using an established walking trail that will highlight major property features while preserving natural habitat; recommendations for a public access trail to connect to Fenton-Ruby Park in Willington; recommendations for a public access point and parking, and potential for cemetery development on the west side of the parcel. The review conducted by the Eastern Connecticut Conservation District (ECCD) focuses on property access, trail development, and conservation of soil and water resources.

Site Description

The Langhammer parcel is approximately 73 acres, and is located between Howey Road and Tinkerville Road, near the Ashford/Willington town boundary, in Ashford, Connecticut. The parcel is forested, dominated by hardwoods such as oaks and maples, and understory species including ash, hickory, and black birch. The topography is varied, with the north-sloping topography bisected by several distinct northeast-southwest trending ridges. Several small pockets of wetlands are located on the site. A perennial stream locally known as Eno Brook flows northerly from the center of the parcel to the Fenton River system. The parcel is accessed from the west (through Willington) via Lustig Road. Access from Howey Road, which follows a section of the Old Connecticut Path, a Native American and Colonial trail that led from Massachusetts Bay to the Connecticut River valley, is restricted. There is very limited parking on the site. The existing parking area, located in the southwest corner of the parcel off Lustig Road, was created by the placement of fill by the town of Ashford. The parcel borders the 130-acre Fenton-Ruby Park and Wildlife preserve, owned by the Town of Willington.

Property Access, Parking and Trail Development

The Town of Ashford has expressed interest in improving the Langhammer property to make it more available to Ashford residents for recreational purposes. Currently, the property is accessed from the west. Howey Road in Ashford, which appears to be the most direct access, may have sections that are privately owned and therefore access is restricted. The Town should

establish whether the road has been discontinued or abandoned, and consult the town attorney to determine whether either condition would preclude public passage. The Town may want to consider that the portion of Howey Road adjacent to the Langhammer parcel may be part of the Old Connecticut Path. If that is the case, restricting access to the Langhammer parcel from the east along Howey Road may serve to protect this important historic resource (see figure 1).

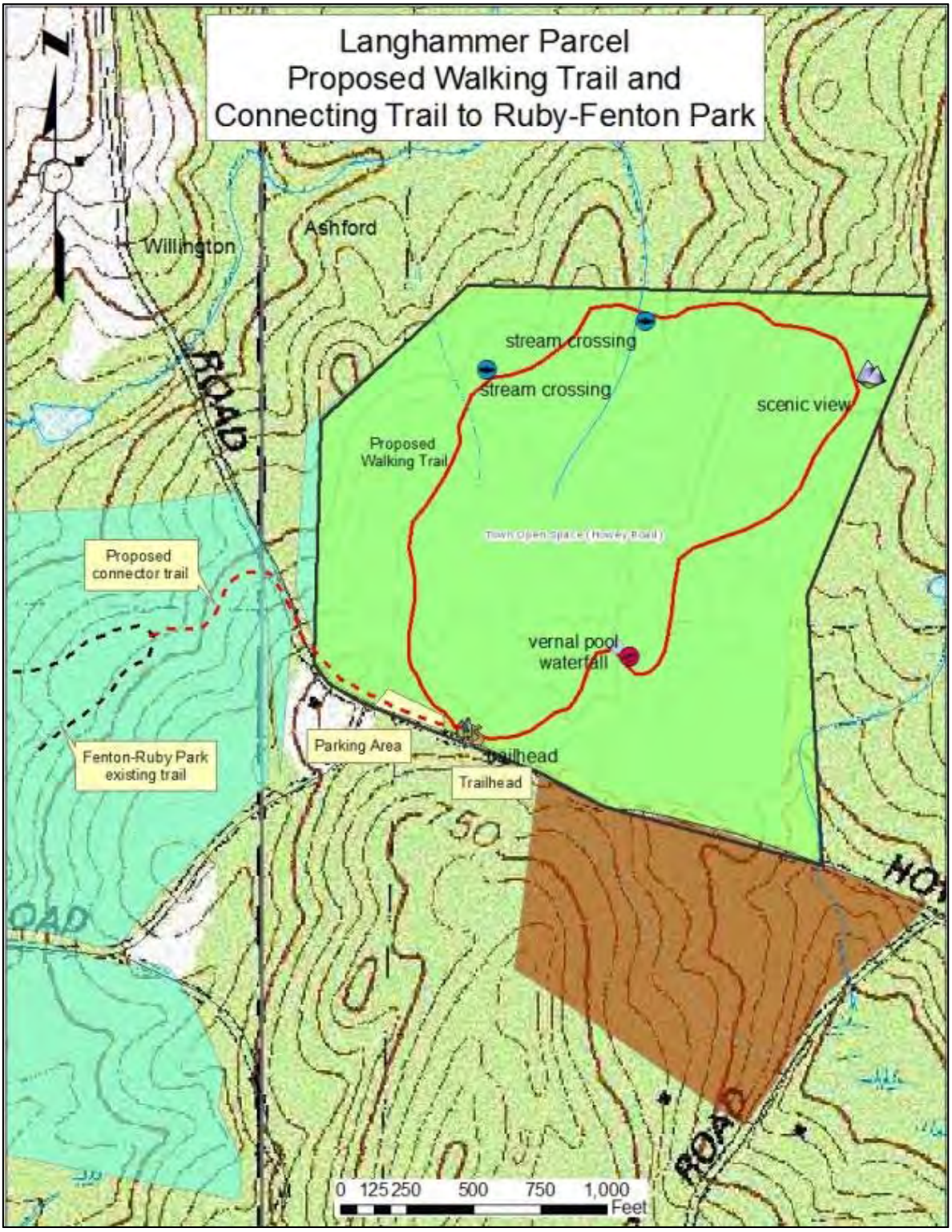
Figure 1

Old Connecticut Path adjacent to the Langhammer Property, looking east.

Parking at the site is limited. An informal parking area has been created at the southwest corner of the parcel, off Lustig Road, by the placement of fill by the Town of Ashford (see Figure 2). This filled area could be expanded and graded to provide additional parking for visitors. An improved parking area would be ideal for the establishment of a trailhead and a kiosk with trail maps and other information for hikers.

Figure 2

A proposed walking trail that incorporates existing trails and connects cairns where no established trails exist on the site is shown below. This figure identifies some points of interest on the property, including an intermittent stream/waterfall draining a vernal pool, a perennial stream crossing (Eno Brook), an intermittent stream crossing, and a scenic view. This figure also depicts a segment of trail at the Fenton -Ruby Park, and proposes a short length of trail to connect the two properties.



Water Resources

There are limited water resources on the Langhammer parcel. A vernal pool located in the southeast portion of the property is approximately identified on the attached proposed trail map, as is an intermittent stream with a waterfall that drains the vernal pool. There is a forested wetland in the center of the parcel that gives rise to a perennial stream (Eno Brook) that extends northerly, and an intermittent stream that extends northwesterly from this wetland. Several seeps are located along the easterly side of the property, located at the base of a hill that extends easterly from the parcel. Numerous wood frog eggs were noted in the vernal pool, as well as at least one salamander egg mass, indicating that this is a viable vernal pool that supports the local breeding population of vernal pool-obligate amphibians. The parcel should be evaluated by a qualified biologist to determine if other vernal pools exist on the property, and the locations should be documented for future preservation.

The proposed walking trail runs alongside the waterfall and circles around the vernal pool. Care should be taken that visitors do not disturb egg masses or amphibian larva. Property managers may want to weigh the benefit of showcasing these features and providing educational opportunities with the need to protect this fragile resource from disturbance and potential degradation. The proposed walking trail also proposes to cross Eno Brook and an intermittent stream. Care should be taken to prevent trail establishment and subsequent foot traffic from degrading stream habitat. Property managers may want to consider installing boardwalks or bog bridges over the streams if substantial foot traffic is anticipated, or trail instability or erosion is observed. Any construction activity proposed in or near a potential wetland should not be conducted until a wetland delineation conducted by a qualified soil scientist has been completed.

Erosion & sediment control measures should be utilized to protect wetlands or watercourses adjacent to construction activities.

Intermittent stream with waterfall flowing from the vernal pool in the southeast portion of the Langhammer Property.

Perennial stream flowing north from a wetland at the center of the Langhammer parcel.

Intermittent stream flowing toward the northwest boundary of the Langhammer parcel from the central wetland.

Seep emerging from the bottom of the slope of a hill in the northeast portion of parcel. This seeps flows intermittently toward the wetland in the center of the parcel.

Wood Frog egg masses in the vernal pool in the southeast portion of the Langhammer parcel.

Soil Resources

As part of the review, ECCD prepared a soil map of the site using the USDA-NRCS Web Soil Survey. It is attached at the end of this section. Following is a brief description of each of the soil series mapped for this site.

Ridgebury Series: The Ridgebury series consists of very deep, somewhat poorly and poorly drained soils formed in till derived mainly from granite, gneiss and schist. They are commonly shallow to a densic contact. They are nearly level to gently sloping soils in low areas in uplands. Slope ranges from 0 to 15 percent. Saturated hydraulic conductivity ranges from moderately low to high in the solum and very low to moderately low in the substratum. Mean annual temperature is about 49 degrees F. and the mean annual precipitation is about 45 inches.

Leicester Series: The Leicester series consists of very deep, poorly drained loamy soils formed in friable till. They are nearly level or gently sloping soils in drainageways and low-lying positions on hills. Slope ranges from 0 to 8 percent. Permeability is moderate or moderately rapid in the surface layer and subsoil and moderate to rapid in the substratum. Mean annual temperature is about 50 degrees F., and mean annual precipitation is about 47 inches.

Whitman Series: The Whitman series consists of very deep, very poorly drained soils formed in glacial till derived mainly from granite, gneiss, and schist. They are shallow to a densic contact. These soils are nearly level or gently sloping soils in depressions and drainageways on uplands. Permeability is moderate or moderately rapid in the solum and slow or very slow in the substratum. Mean annual precipitation is about 45 inches and mean annual temperature is about 49 degrees.

Woodbridge Series: The Woodbridge series consists of moderately well drained loamy soils formed in subglacial till. They are very deep to bedrock and moderately deep to a densic contact. They are nearly level to moderately steep soils on till plains, hills, and drumlins. Slope ranges from 0 to 25 percent. Saturated hydraulic conductivity ranges from moderately low or moderately high in the surface layer and subsoil and low or moderately low in the dense substratum. Mean annual temperature is about 48 degrees F., and mean annual precipitation is about 46 inches.

Canton Series: The Canton series consists of very deep, well drained soils formed in a loamy mantle underlain by sandy till. They are on nearly level to very steep glaciated plains, hills, and ridges. Slope ranges from 0 to 35 percent. Saturated hydraulic conductivity is high in the solum and high or very high in the substratum. The mean annual temperature is about 46 degrees F. and the annual precipitation is about 44 inches.

Charlton Series: The Charlton series consists of very deep, well drained loamy soils formed in till. They are nearly level to very steep soils on till plains and hills. Slope ranges from 0 to 50 percent. Saturated hydraulic conductivity is moderately high or high. Mean annual temperature is about 50 degrees F., and mean annual precipitation is about 47 inches.

Chatfield Series: The Chatfield series consists of moderately deep, well drained, and somewhat excessively drained soils formed in till. They are nearly level to very steep soils on glaciated plains, hills, and ridges. Slope ranges from 0 to 70 percent. Crystalline bedrock is at depths of 20 to 40 inches. Saturated hydraulic conductivity is moderately high to high in the mineral soil. Mean annual temperature is 51 degrees F. and mean annual precipitation is 38 inches.

Selected Soil Interpretations

Erosion Hazards: In addition to the mapping of site soils, ECCD has provided information identifying erosion hazards for each soil unit relative to the construction and maintenance of trails. Soil erosion hazard tables should be reviewed prior to the construction of new trails to ensure the proposed trails are in suitable locations. Appropriate erosion & sediment control measures should be taken based on the erosion hazard rating, following recommendations in the 2002 Connecticut Erosion & Sediment Guidelines Manual. The erosion hazard chart and associated ratings can be found at the end of this section.

Wetland Soils: ECCD reviewed site soils to identify wetland soils on the parcel. These soil maps can also be found at the end of this section. Be advised that soils are mapped to 2 acre units, and any soil units smaller than 2 acres will not be depicted on this map. While general soil information can be helpful in identifying concerns with use or development, on-site investigations should be conducted to address specific concerns, such as activities adjacent to or within wetland soils.

Interment Potential: ECCD reviewed site soils for potential future cemetery use, particularly on the west side of the parcel where terrain is relatively level. The soil evaluation conducted reviewed soils for large animal disposal. While the interment process differs, consideration of underlying conditions, including depth to bedrock, slope, seepage, ponding, et cetera, would be similar. The large animal disposal chart and associated ratings can be found at the end of this section.

References

Connecticut Council on Soil and Water Conservation and Connecticut Department of Environmental Protection, 2002 Connecticut Guidelines for Soil Erosion and Sediment Control, May, 2002.

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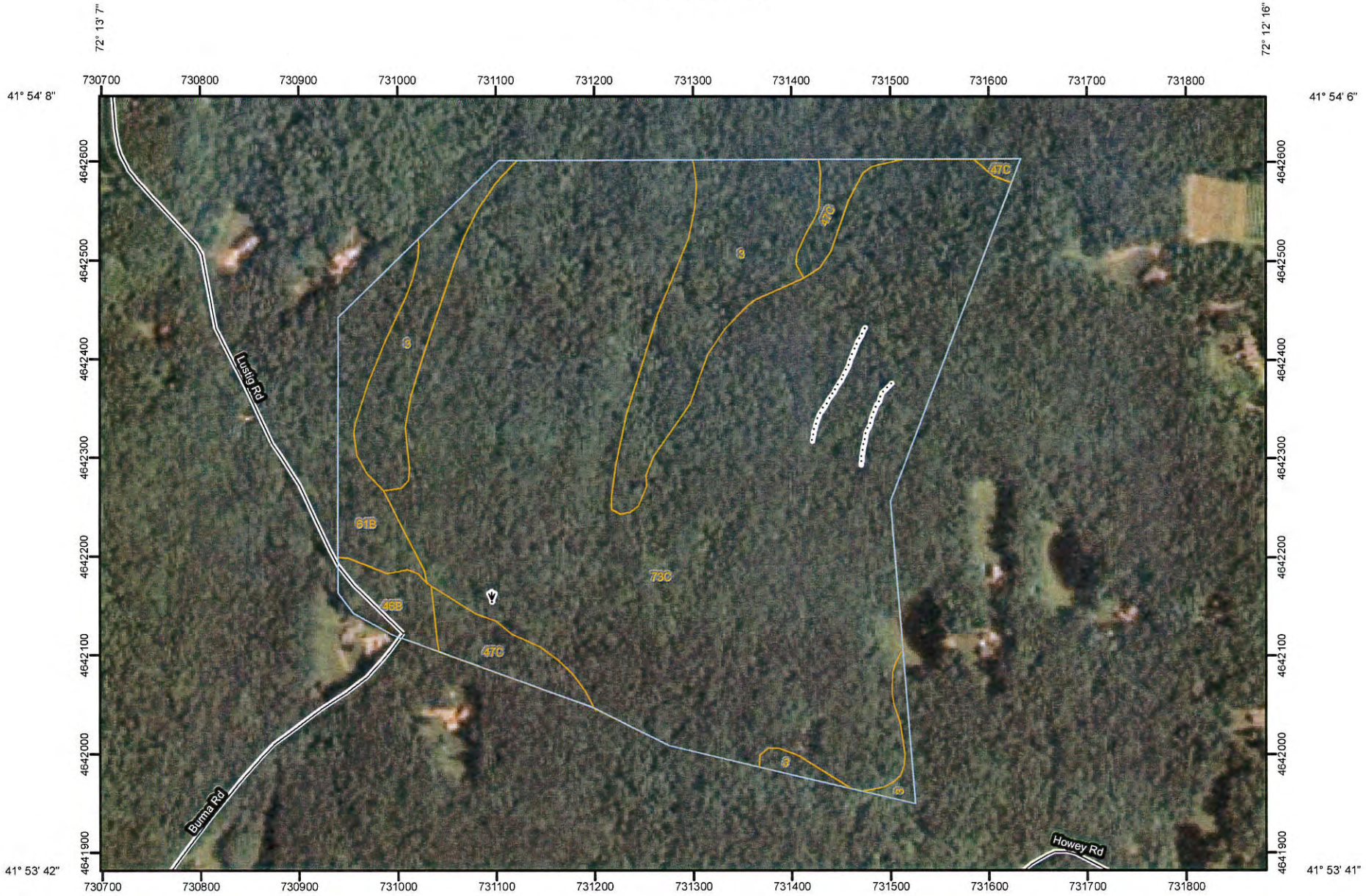
Available online at https://sites.google.com/a/oldconnecticutpath.com/oldconnecticutpath/ .

(Langhammer Parcel)



USDA Natural Resources Conservation Service

5/14/2013
Page 1 of 3

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:5,610 if printed on A size (8.5" × 11") sheet.

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

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

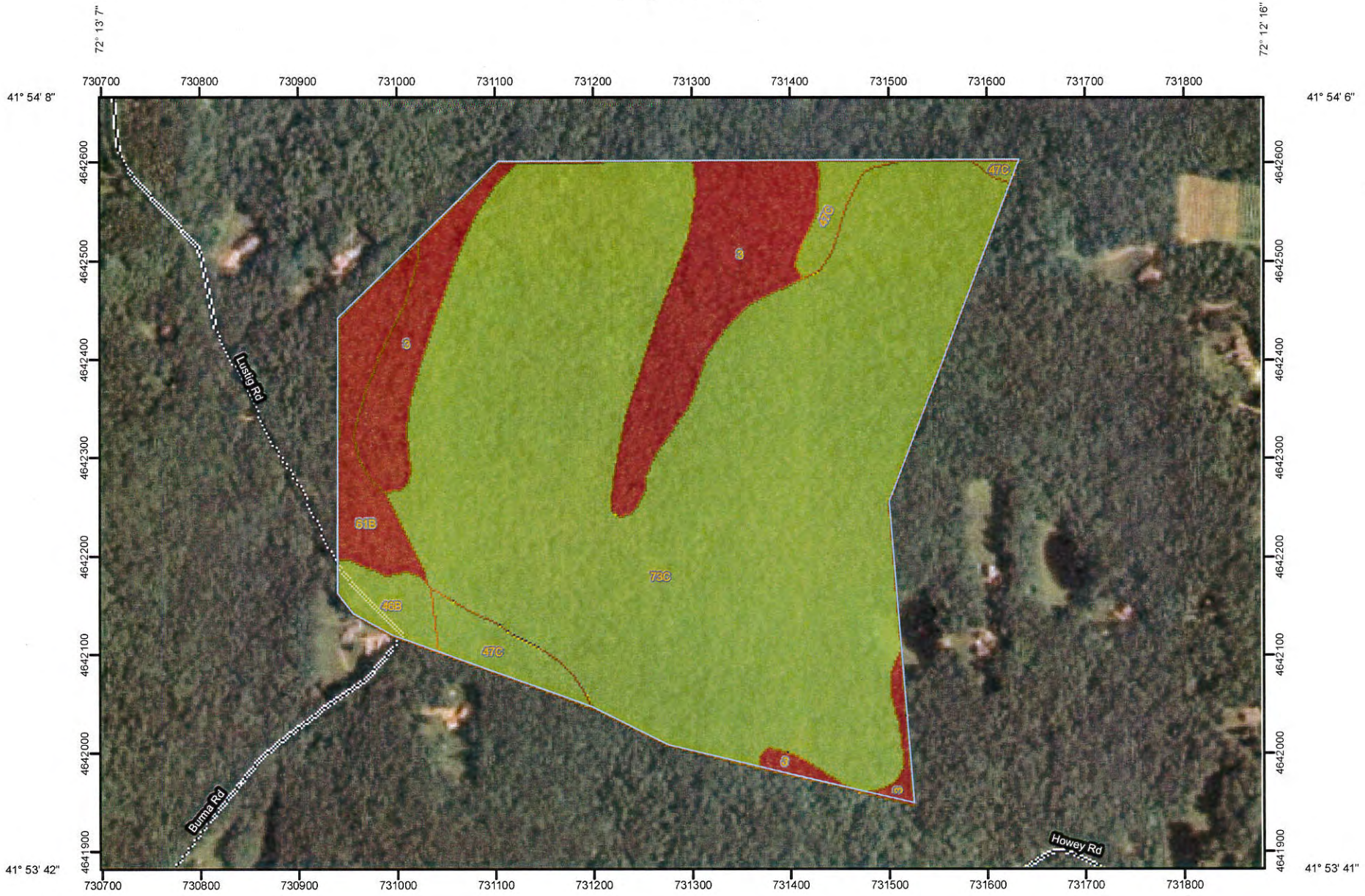
Date(s) aerial images were photographed: 7/17/2006

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 Legend

State of Connecticut (CT600)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
3	Ridgebury, Leicester, and Whitman soils, extremely stony	11.3	13.9%
46B	Woodbridge fine sandy loam, 2 to 8 percent slopes, very stony	1.5	1.8%
47C	Woodbridge fine sandy loam, 2 to 15 percent slopes, extremely stony	2.9	3.6%
61B	Canton and Charlton soils, 3 to 8 percent slopes, very stony	3.3	4.1%
73C	Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	62.2	76.6%
Totals for Area of Interest		**81.1**	**100.0%**

Erosion Hazard (Road, Trail)—State of Connecticut
(Langhammer Parcel)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- Very severe
- Severe
- Moderate
- Slight
- Not rated or not available

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:5,610 if printed on A size (8.5" × 11") sheet.

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

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Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

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Survey Area Data: Version 10, Mar 31, 2011

Date(s) aerial images were photographed: 7/17/2006

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Erosion Hazard (Road, Trail)

Erosion Hazard (Road, Trail)— Summary by Map Unit — State of Connecticut (CT600)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
3	Ridgebury, Leicester, and Whitman soils, extremely stony	Very Severe	Leicester (35%)	Horizon data present (1.00)	11.3	13.9%
			Whitman (15%)	Horizon data present (1.00)		
46B	Woodbridge fine sandy loam, 2 to 8 percent slopes, very stony	Moderate	Woodbridge (80%)	Slope/erodibility (0.50)	1.5	1.8%
			Paxton (5%)	Slope/erodibility (0.50)		
			Montauk (3%)	Slope/erodibility (0.50)		
			Sutton (2%)	Slope/erodibility (0.50)		
			Georgia (1%)	Slope/erodibility (0.50)		
			Stockbridge (1%)	Slope/erodibility (0.50)		
47C	Woodbridge fine sandy loam, 2 to 15 percent slopes, extremely stony	Moderate	Woodbridge (80%)	Slope/erodibility (0.50)	2.9	3.6%
			Paxton (5%)	Slope/erodibility (0.50)		
			Montauk (3%)	Slope/erodibility (0.50)		
			Sutton (2%)	Slope/erodibility (0.50)		
			Stockbridge (1%)	Slope/erodibility (0.50)		
			Georgia (1%)	Slope/erodibility (0.50)		
61B	Canton and Charlton soils, 3 to 8 percent slopes, very stony	Very Severe	Canton (45%)	Horizon data present (1.00)	3.3	4.1%
				Slope/erodibility (0.50)		
			Leicester (5%)	Horizon data present (1.00)		
			Chatfield (5%)	Horizon data present (1.00)		
				Slope/erodibility (0.50)		
			Hollis (5%)	Horizon data present (1.00)		
				Slope/erodibility (0.50)		
73C	Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	Moderate	Charlton (45%)	Slope/erodibility (0.50)	62.2	76.6%
			Sutton (5%)	Slope/erodibility (0.50)		
Totals for Area of Interest					**81.1**	**100.0%**

Erosion Hazard (Road, Trail)— Summary by Rating Value		
Rating	**Acres in AOI**	**Percent of AOI**
Moderate	66.5	82.0%
Very Severe	14.6	18.0%
Totals for Area of Interest	**81.1**	**100.0%**

Description

The ratings in this interpretation indicate the hazard of soil loss from unsurfaced roads and trails. The ratings are based on soil erosion factor K, slope, and content of rock fragments.

The ratings are both verbal and numerical. The hazard is described as "slight," "moderate," or "severe." A rating of "slight" indicates that little or no erosion is likely; "moderate" indicates that some erosion is likely, that the roads or trails may require occasional maintenance, and that simple erosion-control measures are needed; and "severe" indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion-control measures are needed.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the specified aspect of forestland management (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

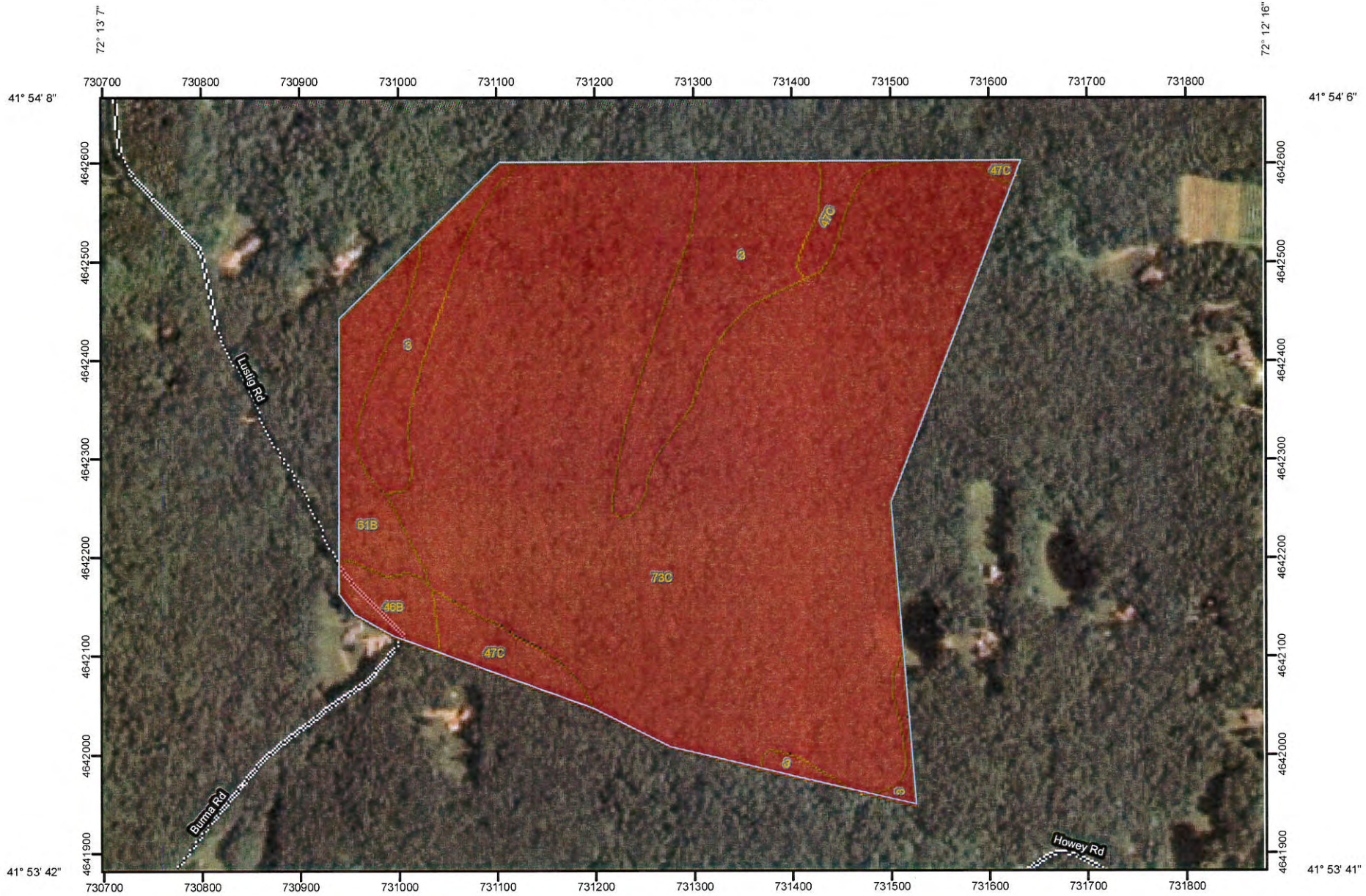
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Catastrophic Mortality, Large Animal Disposal, Pit—State of Connecticut
(Langhammer Parcel)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Soil Ratings

Very limited

Somewhat limited

Not limited

not rated or not available

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:5,610 if printed on A size (8.5" × 11") sheet.

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Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
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Date(s) aerial images were photographed: 7/17/2006

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.

Catastrophic Mortality, Large Animal Disposal, Pit

Catastrophic Mortality, Large Animal Disposal, Pit— Summary by Map Unit — State of Connecticut (CT600)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
3	Ridgebury, Leicester, and Whitman soils, extremely stony	Very limited	Ridgebury (40%)	Wetness (1.00)	11.3	13.9%
				Water gathering surface (0.50)		
			Leicester (35%)	Wetness (1.00)		
				Seepage (1.00)		
				Water gathering surface (0.33)		
			Whitman (15%)	Ponding (1.00)		
				Wetness (1.00)		
				Water gathering surface (0.50)		
			Sutton (2%)	Wetness (1.00)		
				Seepage (0.50)		
				Water gathering surface (0.27)		
			Woodbridge (2%)	Wetness (1.00)		
				Water gathering surface (0.27)		

Catastrophic Mortality, Large Animal Disposal, Pit— Summary by Map Unit — State of Connecticut (CT600)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
46B	Woodbridge fine sandy loam, 2 to 8 percent slopes, very stony	Very limited	Woodbridge (80%)	Wetness (1.00)	1.5	1.8%
				Water gathering surface (0.27)		
			Paxton (5%)	Wetness (1.00)		
				Slope (0.04)		
			Ridgebury (3%)	Wetness (1.00)		
				Water gathering surface (0.50)		
			Sutton (2%)	Wetness (1.00)		
				Seepage (0.50)		
				Slope (0.04)		
				Water gathering surface (0.27)		
			Leicester (2%)	Wetness (1.00)		
				Seepage (1.00)		
				Water gathering surface (0.33)		
			Georgia (1%)	Wetness (1.00)		
				Water gathering surface (0.13)		
			Whitman (1%)	Ponding (1.00)		
				Wetness (1.00)		
				Water gathering surface (0.50)		

Catastrophic Mortality, Large Animal Disposal, Pit— Summary by Map Unit — State of Connecticut (CT600)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
47C	Woodbridge fine sandy loam, 2 to 15 percent slopes, extremely stony	Very limited	Woodbridge (80%)	Wetness (1.00)	2.9	3.6%
				Slope (0.63)		
				Water gathering surface (0.27)		
			Paxton (5%)	Wetness (1.00)		
				Slope (1.00)		
			Montauk (3%)	Slope (1.00)		
				Wetness (0.99)		
				Water gathering surface (0.13)		
			Ridgebury (3%)	Wetness (1.00)		
				Water gathering surface (0.50)		
			Sutton (2%)	Wetness (1.00)		
				Seepage (0.50)		
				Slope (0.04)		
				Water gathering surface (0.27)		
			Leicester (2%)	Wetness (1.00)		
				Seepage (1.00)		
				Water gathering surface (0.33)		
			Georgia (1%)	Wetness (1.00)		
				Water gathering surface (0.13)		
			Whitman (1%)	Ponding (1.00)		
				Wetness (1.00)		
				Water gathering surface (0.50)		

Catastrophic Mortality, Large Animal Disposal, Pit— Summary by Map Unit — State of Connecticut (CT600)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
61B	Canton and Charlton soils, 3 to 8 percent slopes, very stony	Very limited	Canton (45%)	Seepage (1.00)	3.3	4.1%
				Sand content (0.78)		
				Slope (0.04)		
			Sutton (5%)	Wetness (1.00)		
				Seepage (0.50)		
				Water gathering surface (0.27)		
			Leicester (5%)	Wetness (1.00)		
				Seepage (1.00)		
				Water gathering surface (0.33)		
			Chatfield (5%)	Depth to bedrock (1.00)		
				Slope (0.63)		
				Seepage (0.21)		
				Water gathering surface (0.13)		
			Hollis (5%)	Depth to bedrock (1.00)		
				Slope (0.63)		
				Seepage (0.21)		

Catastrophic Mortality, Large Animal Disposal, Pit— Summary by Map Unit — State of Connecticut (CT600)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
73C	Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	Very limited	Chatfield (30%)	Depth to bedrock (1.00)	62.2	76.6%
				Slope (0.63)		
				Seepage (0.21)		
				Rock outcrop (0.70)		
				Water gathering surface (0.13)		
			Sutton (5%)	Wetness (1.00)		
				Seepage (0.50)		
				Rock outcrop (0.70)		
				Water gathering surface (0.27)		
			Leicester (5%)	Wetness (1.00)		
				Seepage (1.00)		
				Rock outcrop (0.70)		
				Water gathering surface (0.33)		
			Hollis (5%)	Depth to bedrock (1.00)		
				Slope (0.63)		
				Seepage (0.21)		
				Rock outcrop (0.70)		
Totals for Area of Interest					**81.1**	**100.0%**

Catastrophic Mortality, Large Animal Disposal, Pit— Summary by Rating Value		
Rating	**Acres in AOI**	**Percent of AOI**
Very limited	81.1	100.0%
Totals for Area of Interest	**81.1**	**100.0%**

Description

"Catastrophic mortality, large animal disposal, pit," is a method of disposing of dead animals by placing the carcasses in successive layers in an excavated pit. The carcasses are spread, compacted, and covered daily with a thin layer of soil that is excavated from the pit. When the pit is full, a final cover of soil material at least 2 feet thick is placed over the burial pit.

The interpretation is applicable to both heavily populated and sparsely populated areas. While some general observations may be made, onsite evaluation is required before the final site is selected. Improper site selection, design, or installation may cause contamination of ground water, seepage, and contamination of stream systems from surface drainage or floodwater. The risk of contamination can be reduced or eliminated by installing systems designed to eliminate or reduce the adverse effects of limiting soil properties. Ratings are for soils in their present condition. The present land use is not considered in the ratings.

Ratings are based on properties and qualities to the depth normally observed during soil mapping (approximately 6 or 7 feet). However, because pits may be as deep as 15 feet or more, geologic investigations are needed to determine the potential for pollution of ground water and to determine the design needed. These investigations, which are generally arranged by the pit developer, include examination of stratification, rock formations, and geologic conditions that might lead to the conducting of leachates to aquifers, wells, watercourses, and other water sources. The presence of hard, nonrippable bedrock, bedrock crevices, or highly permeable strata at or directly below the proposed pit bottom is undesirable because of the difficulty in excavation and the potential pollution of underground water.

Properties that influence the risk of pollution, ease of excavation, trafficability, and revegetation are major considerations. Soils that are flooded or have a water table within the depth of excavation present a potential pollution hazard and are difficult to excavate. Slope is an important consideration because it affects the work involved in road construction, the performance of the roads, and the control of surface water around the pit. It may also cause difficulty in constructing pits in which the pit bottom must be kept level and oriented to follow the contour of the land.

The ease with which the pit is dug and with which a soil can be used as daily and final cover is based largely on soil texture and consistence, which determine workability when the soil is dry and when it is wet. Soils that are plastic and sticky when wet are difficult to excavate, grade, or compact and difficult to place as a uniformly thick cover over a layer of carcasses. The uppermost part of the final cover should be soil material that favors the growth of plants. It should not contain excess sodium or salts and should not be too acid. In comparison with other horizons, the surface layer in most soils has the best workability and the highest content of organic matter. Thus, it may be desirable to stockpile the surface layer for use in the final blanketing of the filled pit area.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected of a properly

designed and installed system. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of the individual limitations. The ratings are shown in decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

FISHERIES RESOURCES

Based upon DEEP mapping, the watercourse located on the Langhammer Property is part of the headwater reaches of Eno Brook, which is tributary to the Fenton River. The lower section of Eno Brook has been impounded, creating Taylor Pond. Based upon a field inspection, the headwater stretch of this watercourse on the Langhammer Property does not support a fish community. The watercourse appears to be seasonal and intermittent based upon field conditions, albeit mapping indicates perennial flows. One of the more important functions of this section of watercourse is to provide clean and unpolluted waters to downstream areas of a watershed, which contain an increased diversity of aquatic organisms.

Surface water quality of Eno Brook is classified by the Connecticut Department of Energy and Environmental Protection (DEEP) as Class AA. Designated uses of Class AA waters are as follows: existing or proposed drinking water supply, fish and wildlife habitat, recreational use (may be restricted,) agricultural and industrial supply.

The fish community of Eno Brook has not been sampled by Inland Fisheries Division (IFD). Based upon an examination of field and watershed characteristics, the stretch of Eno Brook below Lustig Road and upstream from Taylor Pond more than likely supports a coldwater fish population such as native brook trout. Brook trout, which are species native to Connecticut, typically spawn during the month of October. Eggs incubate within gravel substrates over the fall and winter periods with eggs hatching in late February or early March. Fry remain in the gravel until their yolk sacs are absorbed at which time the fry emerge from underneath the gravel and move into preferred stream microhabitats. Fry emergence occurs when fish reach about 1.5 inches in length.

Brook Trout Photo: USFWS

Realizing the importance of brook trout and their habitats, a unique partnership is now underway between state, federal, and local agencies, academia, as well as non-profit government organizations and private citizens called the Eastern Brook Trout Joint Venture (EBJTV). As part of the National Fish Habitat Initiative, this venture is a geographically focused, locally driven scientifically based effort with goals to protect, restore, and enhance aquatic habitat throughout the eastern range of brook trout. More can be learned about these efforts at http://www.easternbrooktrout.org/.

Comments/Recommendations

1. Lands adjacent to streams, often referred to as the riparian corridor, serve several vital functions in the maintenance of biologically healthy and diverse stream and riparian ecosystems. Vegetated riparian corridors: (1) naturally filter sediments, nutrients, fertilizers, and other non-point source pollutants from overland runoff, (2) maintain stream water temperatures suitable for spawning, egg and fry incubation, and rearing of resident finfish, (3) stabilize streambanks and

stream channels thereby reducing instream erosion and aquatic habitat degradation, (4) supply large woody debris to streams providing critical instream habitat features for aquatic organisms, (5) provide a substantial food source for aquatic insects, which represent a significant proportion of food for resident finfish, and (6) serve as a reservoir, storing surplus runoff for gradual release into streams during summer and early fall base flow periods.

It is the policy of the Inland Fisheries Division (IFD) that riparian corridors be protected with a 100 ft. wide undisturbed riparian buffer zone. A riparian wetland buffer is one of the most natural mitigation measures to protect the water quality and fisheries resources of watercourses. This policy and supportive documentation can be viewed on the DEEP website at:
http://www.ct.gov/deep/lib/deep/fishing/restoration/riparianpolicy.pdf
http://www.ct.gov/deep/lib/deep/fishing/restoration/riparianpositionstatement.pdf

2. Trails on the property should be designed to enhance the learning and aesthetic aspects of outdoor recreation while minimizing damage to the landscape. Traversing wetlands and steep slopes should be avoided whenever possible to minimize erosion and sedimentation problems; where wetlands must be crossed, a boardwalk system should be used. Interpretative signs can be installed along any newly created trail system to explain the types and values of various brook, wetland and upland habitats along with identifying local flora and fauna. For more specific guidance on trail design and construction, contact the Connecticut Forest & Park Association (860-346-2372) or www.ctwoodlands.org.

WILDLIFE RESOURCES

Background

The town of Ashford has requested ERT assistance in an environmental review/natural resource inventory for developing a long term property management plan on the town-owned Langhammer Property. The 72-acre parcel is located north of Howey Road in western Ashford. It is adjacent to Willington's Fenton-Ruby Park and Wildlife Preserve.

The Langhammer property was purchased 52 years ago and is the largest town-owned open space in Ashford. The property has been managed in the past with the most recent tree harvest occurring in 1998. Primarily the public uses the property for hiking and hunting. ATV use has been an ongoing problem as the town does not intend for them to utilize the site. The town is considering the construction of an educational trail that would connect with a 4.5-mile trail system on the adjacent 305-acre Ruby-Fenton Park in Willington.

A site walk was conducted on April 11, 2013. The bulk of the parcel consists of deciduous forest with a heavily deer browsed understory. There is a central watercourse running north-south, a small vernal pool, and a small stream containing a waterfall.

Existing Wildlife Habitat

Forested Uplands

The property consists mainly of forested uplands. There are areas with moderate slopes with a few ledges. The overstory is mostly comprised of oak and maple trees, while the understory is heavily deer browsed and contains sections of mountain laurel. The shrub and herbaceous layer is sparse with a few scattered barberry plants present, but there is no major infestation, and no herbiciding control would need to be implemented.

Forested areas such as these are valuable to wildlife, providing cover, food, nest sites. Mast or acorns produced by oaks provides excellent forage for a wide variety of mammals and birds including white-tailed deer, gray squirrel, southern flying squirrel, eastern chipmunk, white-footed mouse, eastern wild turkey and blue jay. Trees, both living and dead, also serve as a home for a variety of insects, which, in turn, are eaten by many species of birds, including woodpeckers, warblers and nuthatches. During the site walk there was a large amount of evidence of deer use and a garter snake was found. Sections of the property contain steep slopes, limiting the opportunity to implement forest management

practices. However, forestry management techniques specifically to benefit wildlife can be considered for the level portions of this site. Creating a variety of age-classes within a forested area is often beneficial to a wide variety of wildlife species by providing a mix of food resources, and cover types. The location of the wetland and vernal pool should be carefully considered when planning any cutting. Forestry management should only be undertaken under the advisement of a certified professional forester. The existing forest management plan was written in 1997 by Certified Forester Dan Donahue. An improvement thinning on approximately 51 acres took place in 1998 which was designed and administered by Mr. Donahue.

While no invasive species control is currently planned, the existing Japanese barberry should be monitored. These invasive species can become the dominant vegetation in the understory, significantly reducing plant diversity. They displace native vegetation that provides high-quality forage, thereby diminishing the value of an area to wildlife. Although very time-intensive and laborious, hand pulling as a management technique can be considered as an alternative to herbicide use. The amount of labor involved can be reduced if control techniques are implemented before the invasive species become widespread.

Vernal Pools/Wetlands

During the site visit, there was one area on the property that contained standing water where wood frog and spotted salamander egg masses were visible. Many species of reptiles and amphibians, such as the gray tree frog and the spotted salamander, use wetlands such as these for breeding and spend the balance of their time in the adjacent forested uplands. Other wildlife likely utilizing this habitat for food and cover are raccoons, star-nosed moles, pickerel frogs, spring peepers, northern water snakes and many bird species such as Louisiana waterthrush, wood thrush, northern water thrush, and eastern phoebe.

The standing water may be considered a vernal pool. 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.

During our examination of the standing water, four dead wood frogs were discovered. Any future observations of amphibian die-off events should be reported to Dr. Tracy Rittenhouse, University of Connecticut, who is conducting research on *Ranavirus*, and Jenny Dickson, of the CT DEEP Wildlife Division.

Dr. Rittenhouse may be reached at (860)-486-5042 or tracy.rittenhouse(@)uconn.edu; and her web page is found at http://wfcc.uconn.edu/Tracy_Rittenhouse-WildlifeandFisheriesConservationCenter-UniversityofConnecticut.php. Jenny Dickson may be reached at (860) 675-8130, or at jenny.dickson@ct.gov. Information reported should include number of carcasses, date, and location information (so that samples may be obtained). Additional information on *Ranavirus* may be found in the Appendix.

When considering management activities, 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.

The 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 can provide habitat for many aquatic-based species including frogs, salamanders, beaver, ducks, beaver, muskrats, and mink. Generally, the greater the vegetative diversity along the edges of watercourses, the greater the value 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. The zone of vegetation along a stream or river is often the only remaining contiguous vegetation within a developed area, especially in a densely populated state like Connecticut. It may continue for miles, providing an important travel corridor for wildlife and connecting one habitat to another.

Education and Trails

Currently, a small rudimentary trail designated by rock cairns exists on the property. The town wishes to construct a trail on the property with an educational component including placement of interpretive signs that can be placed at appropriate locations. If a recreational trail is to be developed, care must be taken in order to prevent disturbance to wildlife. Please see Attachment A regarding recommended guidelines for trail establishment.

Summary

Large, unfragmented parcels of mature forest containing multiple habitat types, including wetlands are increasingly rare in Connecticut, as development creates small, isolated patches of habitat in the landscape. For wildlife, large blocks of habitat are always better, as they can provide a greater variety of food, more nesting and roosting sites, and areas for cover. Protecting the 72-acre Langhammer property would be beneficial to wildlife as it would link with over 300 acres of existing open space. The property also offers the potential for outreach and education regarding wildlife, through the use of properly developed trails and use of interpretive signs. Given proper management and outreach/education, the stewardship of the Langhammer property could be beneficial to both wildlife and public users of the area.

ATTACHMENT A

General Guidelines For Protecting Wildlife Resources When Developing Trails

Some properties may lend themselves to providing a variety of recreational opportunities (e.g., hiking, hunting, fishing, nature study and photography, horseback riding, mountain biking.) Properly designed trails can provide excellent opportunities to increase public appreciation for wildlife and the ecological values of various habitats. Trails should be designed to enhance the learning and aesthetic aspects of outdoor recreation while minimizing damage to the landscape. They should be laid out to pass by or through the various cover types and other special features represented on the property while avoiding those areas prone to erosion or that contain plants or animals that may be impacted by human disturbance. Uses that are generally considered "compatible" could impact sensitive resources depending on the location, timing and frequency of their occurrence. For example, while regulated fishing is considered an accepted form of outdoor recreation, there could be impacts associated with it, such as streambank erosion at heavily used sites. The overall level of disturbance to vegetation/habitat and wildlife can be significantly reduced by establishing one or two (will depend on property size and degree of importance to natural resources) multiple-use trails rather than several single/exclusive-use trails.

Some guidelines to follow when developing a trail system include:

- Narrow, passive-use recreation trails with natural substrate that would require minimal vegetation removal, maintain forest canopy closure, prohibit the use of motorized vehicles, and require dog owners to keep their dogs under control, are preferred to reduce environmental impacts and disturbance to wildlife. Abandoned roadways (e.g., farm/logging roads) should be incorporated into the trail system whenever possible and appropriate to minimize cutting activity/vegetation removal;
- If a paved, multi-purpose trail is established, avoid the use of curbing. If it is necessary, Cape Cod style curbing (curbing at 45 degree angle) is recommended;
- Know the characteristics of the property and plan the layout so that the trail passes by or through a variety of habitat types;
- Make the trail as exciting and safe as possible and follow a closed loop design. Avoid long straight stretches of >100'; trails with curves and bends add an element of surprise and anticipation and appear more "natural";
- Traversing wetlands and steep slopes should be avoided whenever possible to minimize erosion and sedimentation problems; where wetlands must be crossed, a boardwalk system should be used;
- The property boundaries and trail should be well marked. It is best to provide a map/informational leaflet describing the wildlife values associated with the property (e.g., value of wetlands, various habitat types/stages of succession, habitat management practices) and guidelines for responsible trail use;
- Potential impacts of trails on private property owners should be identified. Where trails bisect private property, the access should be of adequate width and the trail well-marked to help avoid potential conflicts (e.g., trespass by trail users);

- For more specific guidance on trail design and construction contact the Connecticut Forest & Park Association (860-346-2372 or www.ctwoodlands.org) or Appalachian Mountain Club (www.outdoors.org);
- For an extensive literature review about the effects of different types of recreation activities on wildlife, visit web site www.Montanatws.org – 307 page document published in 1999 entitled, "Effects of recreation on Rocky Mountain wildlife: A review for Montana."

Prepared by the CT DEP Wildlife Division for the Partners In Stewardship Program (June 2002)
Questions? Contact CT DEP Wildlife Division at 860-295-9523 (Eastern CT) or 860-675-8130 (Western CT)

LANDSCAPE ECOLOGIST REVIEW

Overall Comments

The Langhammer Property is a wonderful asset to the Town of Ashford. It offers opportunities for hiking, birdwatching and other wildlife observation. Forest, laurel thickets, a stream, wetland habitats, and an area of "micro-canyonlands" (composed of small, forested, north/south-running bedrock ridges and valleys) offer visual diversity for hikers and habitat diversity for wildlife. In addition, the property has enough topographic variation and evidence of previous human history to make for interesting walking.

Habitat Connectivity

The Langhammer Property's adjacency to Willington's Fenton-Ruby Park and Wildlife Preserve is important because it connects Ashford trail users to a much larger area. Further, the large acreage of the Fenton-Ruby Park and Wildlife Preserve (305 acres) augments the Langhammer Property's ± 73 acres adding to the habitat potential of the Langhammer Property for forest birds and mammals that need large acreages.

Vernal Pools

There are some wet spots on the property, one of which is a functioning vernal pool (in which vernal pool obligate species are found). Spotted Salamander larvae and Wood frogs (both considered obligate species) were observed in the vernal pool above the intermittent waterfall. One small pool in the vicinity of Lustig Road had Fingernail Clams, but no evidence of vernal pool obligate species was seen. The tiny pool that borders Howey Road had no evidence of vernal pool obligate species. (In regard to pools other than the above-noted vernal pool, it should be noted that the date [June 24] of observation was too late for determining the presence/absence of Fairy Shrimp, another obligate species).

Invasive Plants

While invasive plants currently are not a major problem, some *immediate* attention should be given to the vicinity of the parking area on Howey Road where Garlic Mustard (*Alliaria petiolata*) and Narrow-leaved Bittercress (*Cardamine impatiens*) have been seen. Both species are tolerant of forest shade and spread rapidly by seed. It is particularly important to control them when they are found in the vicinity of trails and parking because of the risk of seed spread.

Garlic Mustard (and possibly Narrow-leaved Bittercress) can develop viable seeds after the plants have been pulled. Therefore, any plants that have shot up their flowering stalk should be bagged when they are pulled, then disposed of as trash. The month of May is a good time to make a concerted effort at control of Garlic Mustard and Narrow-leaved Bittercress, though these

plants can be pulled earlier and somewhat later in the year as well. Both species are biennials that die after producing seed in their second year, so it is pointless to pull them after their seed pods have burst open.


Japanese Barberry

Other invasive species noted on the property were Japanese Barberry (*Berberis thunbergii*), Asian (Oriental) Bittersweet (*Celastrus orbiculatus*), Winged Euonymus (*Euonymus alatus*), Dame's Rocket (*Hesperis matronalis*), and Multiflora Rose (*Rosa multiflora*). These species were notable within (but not restricted to) the portion of the property between the parking area and Lustig Road. Note that in forest shade, Winged Euonymus (also known as Burning Bush) does not exhibit the bright red autumn foliage of plants grown in full sunlight.

The forest appears younger in the section where there are stone walls near Lustig Road. Perhaps a more recent date of human-mediated disturbances coupled with access by bicycles, and proximity to the road where invasive plants flourish at the sunny edge contribute to the presence of invasive plants in this area.

Note that most invasive shrubs and vines have fruits that are spread by birds whereas many herbaceous plants (e.g., Garlic Mustard, Narrow-leaved Bittercress, Dame's Rocket) have seeds that spread by being carried by hikers, bicyclers, and mammals that walk through the area. It is important to steer pathways around these species because just a few seeds can quickly start a new population.

Where invasive species have been established long enough to set seed, there is likely a seed bank (seeds buried in the soil). Not all seeds come up the first year after the fruits are dropped to the ground, so when undertaking control, it is important to repeatedly revisit places where control appears to have been successful.

Because seeds are constantly being spread by birds, deer, etc., a pro-active approach to invasive plant control is warranted. This can be a simple as walking the trails and keeping an eye out for invasive plants. Priority species (including those which will spread quickly if not controlled) should be controlled immediately.

A species which was not observed in the Langhammer Property that should be on people's "watch list" is Japanese Stilt Grass (*Microstegium vimineum*). This is an annual grass that is shade-tolerant and a prolific seed producer. Seeds can be spread by hikers, walking animals, water, vehicles, and equipment. It can quickly come to dominate moist floodplains.

Should any equipment be brought onto the site, its undercarriage and wheels should be cleaned before coming onto the property and cleaned before leaving the property. Uncleaned equipment, fill dirt, and mulch often are sources of invasive plant seeds.

Trail Concerns

There are existing informal trails that could be used as the basis of a trail system. Starting at the Howey Road parking area, existing trails may be accessed both to the east and to the west. If a connecting route were defined between east and west a large loop could be made. In addition, the southeast portion of the property has potential for trails. As the trail system is developed, some existing trail sections may be abandoned.

Erosion is a concern where trails are steep over shallow soil.

- Switchbacks (or perhaps a complete re-routing) are advised where the existing trail comes down a steep eroding, slope from the northeast to the brook.
- The trail which currently goes to the vernal pool should be re-routed to avoid both the intermittent waterfall which drains the pool and the ledge north of the pool. The shallow soil around the waterfall and ledge is extremely prone to denuding of plant cover and erosion. If established trail access to the vernal pool is deemed desirable, it should be done via a spur trail in a less steep area.

In the corner of the property where Howey Road meets Lustig Road, bicycles have caused some trail damage. It would be worth thinking about how to isolate this area from the remainder of the trail system or to discourage the use of bicycles altogether. In addition to causing trail erosion and damage to vegetation, bicycles are another way that invasive plants are spread in from the roadside; and (as previously noted), this portion of the property has invasive plants. The most important invasives to control are those whose seeds are spread by human and animal travel along trails (Garlic Mustard and Narrow-leaved Bittercress).

Trails should be re-routed to avoid traffic through known areas of Garlic Mustard and Narrow-leaved Bittercress. Note that even when it appears that these species have all been removed, there is likely to be a seed bank.

Preliminary Understory Plant List

A separate list of understory plants noted while walking the trail on June 24, 2013, is provided. Species listed as invasive or potentially invasive in Connecticut are indicated in red and their names are preceded by two asterisks. A single asterisk indicates non-native species that are not considered invasive. This list does not represent a full understory species list for the property.

Information on Invasive Plant Identification is provided separately for (please see following pages):

- Garlic Mustard
- Narrow-leaved Bittercress
- Japanese Stilt Grass (species to watch for)

Understory plants noted while walking at Langhammer Property 06-24-2013												
	-- alphabetized by Scientific Name		of note: Scarlet Oak by little wetland									
Scientific names follow Arthur Haines Flora Novae Angliae (2011)												
	* indicates not native											
	** indicates invasive in CT											
	x indicates garden escape											
	N indicates CT native plant											
*	**Common Name**	**Scientific Name**	**Comments**	Howey Parking	Lustig Rd	Trail from Lustig	Wet Spot	Sheep Pen	Fern City	Creek	Canyonland e. of Cr.	Main N/S trail
**	Garlic Mustard	Alliaria petiolata		x	x							
N	Wood Windflower	Anemone quinquefolia					x					
N	Hemp Dogbane	Apocynum cannabinum	aka Indian Hemp		x							
N	Jack-in-the-Pulpit	Arisaema triphyllum					x					
**	Japanese Barberry	Berberis thunbergii				x						
**	Narrow-leaved Bitter-	Cardamine impatiens		x	x							
N	Pennsylvania Sedge	Carex pensylvanica				x						
N	American Hornbeam	Carpinus caroliniana ssp	aka Muscle-wood, Blue			x						
**	Asian Bittersweet	Celastrus orbiculatus	aka Oriental Bitte		x							
N	Spotted Wintergreen	Chimaphila maculata	aka Spotted Prince's-pine								x	
*	Queen Anne's Lace	Daucus carota	aka Wild Carrot		x							
*	Foxglove	Digitalis sp.			x							
N	Marginal Wood Fern	Dryopteris marginalis					x					
**	Winged Euonymus	Euonymus alatus	aka Burning	x								
N	Eastern Teaberry	Gaultheria procumbens	aka Eastern Spicy-wintergreen								x	
N	Downy Rattlesnake-pl	Goodyera pubescens									x	
N	Witch-hazel	Hamamelis virginiana				x					x	
**	Dame's Rocket	Hesperis matronalis			x							
N	Water Pennywort	Hydrocotyle americana	aka American Marsh-pennywort							x		
N	Yellow-eyed Grass	Hypoxis hirsuta	aka Common Star-grass									x
N	Common Winterberry	Ilex verticillata					x					
N	Jewelweed; Touch-me	Impatiens sp.	(not the invasive *I. glandulifera*)							x		
N	Mountain-laurel	Kalmia latifolia	aka Mountain American-laurel					x			x	
N	Skunk Cabbage	Symplocarpus foetidus								x		
N	Canada Mayflower	Maianthemum canadense				x						
N	Indian Cucumber Roo	Medeola virginiana				x						
N	Cow-wheat	Melampyrum lineare	aka American Cow-wheat					x				
N	Partridgeberry	Mitchella repens				x						
N	Indian-pipe	Monotropa uniflora	aka One-flowered Indian-pipe									x
x	Evening Primrose spe	Oenothera sp.	appears to be san		x							
N	Cinnamon Fern	Osmundastrum cinnamomeum					x					
N	New York Fern	Parathelypteris noveboracensis				x						

	Virginia creeper	Parthenocissus quinquefolia			x							
N	Halberd-leaf Tear-thu	Persicaria arifolia								x		
N	Solomon's-seal	Polygonatum biflorum	King Solomon's-seal			x						
N	Christmas Fern	Polystichum acrostichoides				x						
N	Old-field Cinquefoil	Potentilla simplex	aka Common Cinquefoil									x
N	American Shinleaf	Pyrola americana					x					
**	Multiflora Rose	Rosa multiflora			x	x						
N	Swamp Dewberry	Rubus hispidus	aka Bristly Blackberry								x	
	Sphagnum Moss	Sphagnum sp.	presumed native							x		
N	Starflower	Lysimachia borealis	formerly *Trientalis bor*			x						
N	Lowbush Blueberry	Vaccinium spp.	most common lowbush blu			x	x				x	
N	Maple-leaved Viburnu	Viburnum acerifolium				x						

United States Department of Agriculture
Natural Resources Conservation Service

CONNECTICUT

Planta Invasora — Invasive Plant

***Alliaria petiolata* (Bieb.) Cavara & Grande**

ALIARIA

- Florecitas blancas de cuatro pétalos, cado uno 3 a 6 milímetros de largo
  - florece en la primavera
- Planta llega a 1 metro de altura
- En el verano con muchas vainas pardas, cada una 2.5 a 6 centímetros de largo
- Hojas no en pares
  - a lo largo del tallo, de forma arriñonada cerca de la base, pero triangulares mas arriba
- Nuevas hojas cuando machacadas **huelen como ajo**
- Raíz enroscada

GARLIC MUSTARD

- Small white petals with four white petals, each 1/8 to 1/4 inches long
  - blooms in Spring
- Plant grows 1 foot to 3½ feet tall
- In summer, has many brown seed pods, each 1" to 2 ½" long
- Leaves alternate (not in pairs)
  - kidney-shaped near ground
  - triangular at top of stem
- New leaves have a strong **garlic odor** when crushed
- Taproot is kinked

EASTERN CONNECTICUT STATE UNIVERSITY

Written by/Escrito por Charlotte Pyle, USDA-NRCS
Traducido por/Translation by Carmen R. Cid, ECSU

NRCS Natural Resources Conservation Service

octubre del 2010

October 2010

Planta Invasora — Invasive Plant

Microstegium vimineum (Trin.) A. Camus

HIERBA ZANCUDA JAPONESA

- Hojas usualmente tienen una ancha vena central, de blanco brillante
- Hojas puntiagudas y afiladas a la base
  - De 7.5 cm de largo
- El borde de las hojas tiende a redoblarse
  - Un lado de la hoja se redobla más que el otro
- Hojas de verde claro y fina textura
- Fáciles de arrancar de la tierra
  - Sin raíces grandes o tallos rastreros
  - Raíces como zancos conectadas a la base de tallo principal
  - Puede brotar raíces de otras partes del tallo
- Semillas colectadas en espigas
  - 1 o 2 espigas (hasta 5) por tallo
  - Espigas con "pelos" rígidos
- Se encuentra al sol on en la sombra
  - Puede llegar a 45 cm de altura

JAPANESE STILT GRASS

- Leaves usually have a wide, shiny-white midvein
- Leaves with a pointed tip and a tapered base;
  - Up to 3" long
- Leaf margins bow out
  - One side curves slightly more
- Leaves light green and thin-textured
- Very easy to pull up
  - Lacks heavy roots or runners
  - Roots stilted at base of plant
  - May also send roots out of its stem
- Seedheads are in spikes
  - 1 or 2 (up to 5) on a stem
  - Stiff "hairs" present
- Grows in both sun and shade
  - Can grow to 18" tall

EASTERN CONNECTICUT STATE UNIVERSITY

Written by/Escrito por Charlotte Pyle, USDA-NRCS
Traducido por/Translation by Carmen R. Cid, ECSU

NRCS Natural Resources Conservation Service

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

Narrow-leaf Bittercress

Cardamine impatiens L.

Alternate Common Name: Bushy Rock-cress

- **biennial herbaceous plant**; with erect form; **6"-31" tall; shiny green** in color
- **stem leaves alternate; numerous (6-20);** thin and pliable; up to 4" long, or longer
- **lower and middle stem leaves have 6-9 pairs of long-pointed, somewhat lobed leaflets**
- **small ears of the leaf bases remain on the mainstem when the principal leaves are removed**
- **flower petals may be absent; if present, 4, white, tiny** (1/10" long or less); in June
- **fruit** is a **slender, upward-growing, string bean-like** silique **6/10" to 3/4" long;**

Narrow-leaf Bittercress is similar to the native Pennsylvania Bitter-cress (*Cardamine pensylvanica* Muhl.) in that it has lobed or toothed leaflets on a tall, erect mainstem; tiny, white flowers; and the basal leaves may be few or absent by the time it flowers. **Narrow-leaf Bittercress is differentiated by the downward-pointing "ears" at the base of the leafstalks. When a leaf is removed, the ears remain on the mainstalk.** As is typical of other species of Bittercress, the fruits open from the base with two deciduous strips coiling up to reveal the seeds attached to a central membrane. The young seedling leaves do not resemble mature leaves (see photo of seedlings in pot). The first year, the plant lacks the tall, flowering stalks.

Narrow-leaf Bittercress grows vigorously in disturbed areas, covering the ground in dense (but easy-to-pull up) patches. The plant is currently uncommon, but increasing, in New England.

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

11/2002

ARCHAEOLOGICAL AND HISTORIC SENSITIVITY

The Office of State Archaeology (OSA) had the opportunity to conduct a field review of the Langhammer Property for its archaeological and historic sensitivity. A review of the Office of State Archaeology's Site Files and Maps shows no known archaeological sites, however, the field review has documented a couple of important cultural resources.

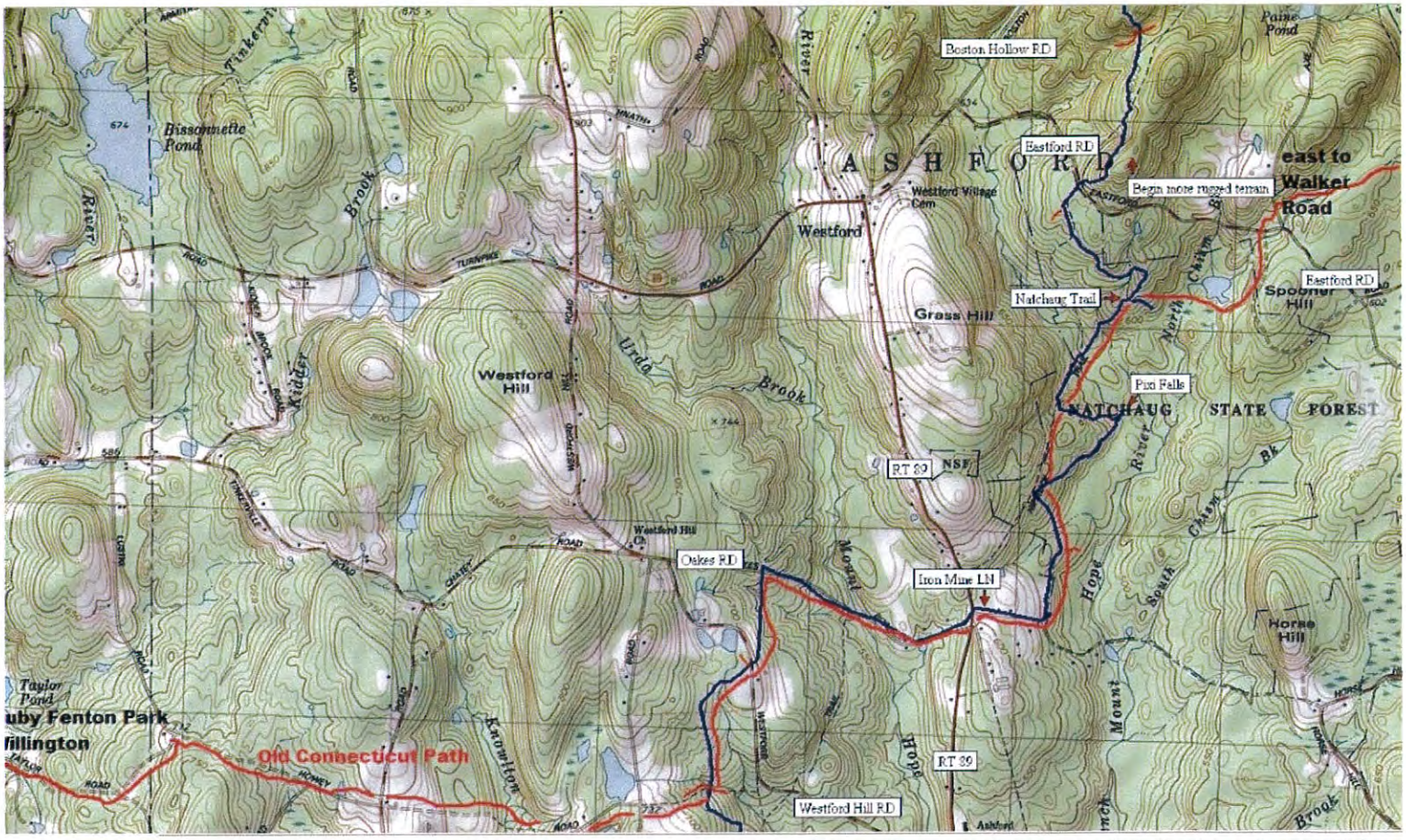
Most significantly, the southern border of the property along Howey Road has been identified as a segment of the Connecticut Path. This was the "highway" used early in the Colonial Period by settlers moving between Boston and Hartford. Previously identified segments of the CT Path have been placed on the National Register of Historic Places. The segment along Howey Road at the Langhammer property appears to have a similar integrity with portions of the CT Path receiving historic designation. This dirt roadway should be preserved and offers an excellent opportunity to teach local, state and national history. For additional information please visit: https://sites.google.com/a/oldconnecticutpath.com/oldconnecticutpath/6-0-tours-walks-along-the-old-connecticut-path/ocp-walks-ashford-connecticut

In addition, there are a series of finely built stonewalls, some of which are unusually high. These most likely were used as pasture enclosures for sheep. Sheep tended to "jump" stonewalls, so higher walling prevented them from leaving the pasture area. Gaps between stones also deterred the sheep from attempting to "jump" the wall. These features are very prominently displayed at many of the stonewalls on the Langhammer property and could be used as an educational tool to teach about local 18th and 19th century farming activities in Ashford. For additional photos please see: https://picasaweb.google.com/101708255161428891722/LanghammerAshfordTownForestLandCT?noredirect=1

Finally, a number of stone mounds are situated on the property. These most likely are associated with the agrarian activities of the historic farms; however, similar features have been identified as Native American in origin. The OSA would recommend that they be preserved and mapped to determine if spatial patterns are associated. The lack of significant wetlands suggests a low-to-moderate sensitivity for Pre-Contact Indian camp sites on the property.

The Office of State Archaeology strongly recommends the preservation of these historic resources. Use of the property for passive recreation, including hiking trails would be proper. In addition, these historic resources would provide a tremendous educational opportunity as outdoor laboratories to teach school students and the general public the town's history, and to promote the preservation of cultural resources.

In this regard, the OSA would be pleased to work with the Town of Ashford to promote an educational awareness of their cultural resources. They would be pleased to offer field tours for the town's citizens to promote these parcels and encourage the community to understand how special these lands are, and why they need to be preserved.



The Old CT Path shown in red, is historian Jason Newton's best estimate of original route, based on old maps, literature and information collected by State archaeologist Nick Bellantoni. The original Old CT Path extends from Boston, MA to Hartford, CT. This is one small section in Ashford, CT believed to be part of the main route taken by early settlers beginning in the 1630s. Note that the path directly follows the southern edge of the Langhammer parcel near Fenton-Ruby Park.

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Gwen Haaland photos
Mar 9, 2013 8:01 PM

The Old CT Path shown in red, is historian Jason Newton's best estimate of original route, based on old maps, literature and information collected by State archaeologist Nick Bellantoni. The original Old CT Path extends from Boston, MA to Hartford, CT. This is one small section in Ashford, CT believed to be part of the main route taken by early settlers beginning in the 1630s. Note that the path directly follows the southern edge of the Langhammer parcel near Fenton-Ruby Park.

TRAILS AND GREENWAYS

Site Visit and Observations


Figure 1

The Town is considering utilizing the property for passive recreation and educational opportunities. The Town has not yet considered what types of use will be allowed. One loop trail is being considered. The property has access from one road only. Neighbors are reportedly the current users and potential stewards. Some hunting and ATV use was reported however, not much evidence was observed on the day of our visit.

Providing a link to the Fenton Ruby Wildlife Preserve was mentioned as being a goal for any trail system on the subject property. The Fenton Ruby Wildlife Preserve allows foot-travel only; no bicycles, horses or motorized vehicles. Should the Town desire to establish multi-use trails on this subject site they would need to provide signage upon entrance from link trail(s) noting the changing permitted trail uses. The transition will likely not be a problem because folks would have to cross a road to get to the Preserve making an obvious transition.


Figure 2

Existing trails are very wide and often appear to have been roads (Figure 1). It is evident that neighbors and others are informally using the property and have subtly marked trails with cairns (Figure 2) to help users navigate the property.

There were many areas of observed erosion on existing trails which could use some re-surfacing or abandonment and re-location. Stone dust surfacing offers a low cost and low maintenance alternative. A good source of literature on alternative surfacing options can be found at American Trails website: http://www.americantrails.org/resources/trailbuilding/index.html .


Figure 3

Property access from Howey Road is a large un-paved area which can provide an excellent trail-head for the property. There appears to be plenty of room to provide parking and other amenities such as composting toilets, benches, kiosks. Should equestrian use be included, demarking spaces for horse trailers can be considered.

The Old CT Path runs directly along the southernmost portion of the property (Figure 3). Providing access and historical information on this feature to users of the property would be desirable as it has been called an important corridor through New England used as one of

America's earliest "highways".

The development of a trail plan is encouraged that might consider the needs of intended users as well as some of the beautiful vistas and interesting flora, fauna and geology on site. The development of a trail plan would also allow for well thought out connections to neighboring properties and avoidance of inherent potential conflicts such as leading a mountain bike to a property that may allow only foot travel. American Trails also has good trail planning resources and model trail plans. Visit: http://www.americantrails.org/nttp/skills/planning.html

The Recreational Trails & Greenways Program encourages Ashford to:

- Improve the existing trails which might include:
- Improvements to trail surfaces and drainage;
- Addition of amenities such as signage (might include allowed uses, safety, directional, interpretive) benches, rest areas, etc.
- Remove/manage invasive plants that can encroach on trail corridors.
- Develop a trail plan for the property;
- Develop a property website that would include information on parking availability and allowed uses such as hiking, mountain bikes and equestrian, etc.
- Establish a trail maintenance plan and associated program that could include volunteers from all user groups and neighbors. Neighbors are reportedly the highest current user group and can become fantastic stewards.

The Recreational Trails & Greenways Program is available upon request to further assist the town.

NORTHEASTERN CONNECTICUT COUNCIL OF GOVERNMENTS REVIEW

The Northeastern Connecticut Council of Governments has the following comments and concerns regarding the development of plans for public access, the trail system and associated parking for the Langhammer Property located north of Howey Rd.

1. Ashford Plan of Conservation and Development (POCD)Review

The development of the Langhammer Property as a Natural Habitat and Land Preserve is consistent with the town of Ashford's Plan of Conservation and Development (Adopted 2005 Effective Date, April 4) Goal A: Maintain Ashford's Rural Character, Goal C: Conserve Ashford's Resources, Goal D:Provide for Municipal Needs.

GOAL A: MAINTAIN ASHFORD'S RURAL CHARACTER

Maintain Ashford's rural landscape for its economic benefits, recreational opportunities, scenic beauty, and unique sense of place. It is important to protect and enhance these characteristics now before they are lost or degraded by uncontrolled growth.

Open Space

Objective 3: Protect large undeveloped properties.

Stonewalls

Objective 5: Protect historic stonewalls and old stone foundations that define past land use, boundaries and rights of way.

Recreation

Objective 10: Provide and protect recreational opportunities such as observation of wildlife, fishing, boating, hiking, riding, hunting, and other activities.

Action a. Emphasize linkage of parcels to provide for walking and other forms of passive recreation.

Action f. Pursue a policy to maintain the right of passage for passive recreation and non-motorized vehicles on decommissioned town roads and trails. (Ashford POCD 2002 p. 18)

GOAL C: CONSERVE ASHFORD'S RESOURCES

Create a community where growth and economic development are compatible with and promote environmental protection and stewardship of resources for the benefit of generations to come.

Inland Wetlands and Watercourses

Objective 2: Conserve inland wetlands and watercourses for their essential roles, such as storm water retention, water quality, and wildlife habitat. Protect their ability to function with sound decisions based upon knowledge. (Ashford POCD 2002 p. 35)

Forests

Objective 3: Protect and Conserve Forests for wildlife habitat, water quality and productivity. (Ashford POCD 2002 p. 36)

GOAL D: PROVIDE FOR MUNICIPAL NEEDS

Any changes within the municipal venue should consider the impact on the rural character of the town since that is what the townspeople have voiced as their major concern. With the additions of the new town office building and fire house, major community needs have already been addressed.

Recreation

Objective 2: Provide diverse and accessible recreational opportunities for townspeople. (Ashford POCD 2002 p. 39)

Municipal Land and Facilities

Objective 10: Maintain clear plans for the utilization of municipal lands and facilities.

Action a. Create natural resource management plans for all municipal open space parcels. (Ashford POCD 2002 p. 41)

2. Trail Development

The boundaries of the property should be identified with plaques or posts to keep hikers from accidentally trespassing on adjacent property and keep unrelated activities such as hunting off the property if it is not allowed. Existing deer stands should be removed (The town has in the past given permission for hunting.).

Trails should be kept a safe distance from property lines to avoid conflicts with neighboring properties and uses. The Ashford Planning and Zoning regulations require a minimum setback of 30 ft. in the side and rear of a lot and 50 ft. in the front within the Residential-Agricultural zone. Even though the development of a trail is not the same as an accessory structure or building so setback requirements may not apply, some setback should be established.

Any trail routes developed should be marked on trees visible and directly adjacent to the path. Stone cairns may also be helpful.

If one of the primary purposes of the property is preservation of wildlife habitat and plant species a more extensive inventory of the property should be developed. Identification of specific species of plants may be helpful in planning the trail route and providing points of interest or areas to avoid.

Map 3 Cultural & Historic Resources of the town of Ashford's POCD does not identify any Archaeological Sites or Areas of High Probability of Archeological Findings on the property. The property does contain stone walls within the eastern section and unusual stone piles identified by John S. Barclay in his Reconnaissance Report dated August 20, 2010. The stone walls may be part of an original structure located on the parcel. The Connecticut 1859 Tackabary Layer shows a structure north of the present Lutwig Rd and just east of the Willington/Ashford line. Confirmation of this would require further research. (State Archaeologist Nicholas Bellantoni after his field review did document a couple of important cultural resources.)

The relationship of the Old Connecticut Path to the Langhammer property as well as the status of the unimproved section of Howey Rd that abuts the Langhammer Property should be researched further. The route of the Old Connecticut Path along Howey, Lustig and Burma roads could be a natural connection between the Langhammer Property and the Fenton Ruby Park as well as a point of interest to hikers and visitors.

3. Public Access Points

Public Access Points should be limited, well defined and convenient for any of the possible users of the trail. Access should be limited to a trail head that leads from the parking area and possible a link to the Fenton-Ruby Park in Willington. A trail connection between the two parks would provide another access point to both facilities as well as an opportunity for joint marketing and events promoting their use. Discussions with the Willington Conservation Commission and Parks/Recreation Departments may provide insight into the feasibility of linking the two properties.

The properties to the east and west are residential and should be protected from any encroachment or disturbance due to trail development or access.

4. Parking

A more formal public parking area should be developed off of Lustig Rd. or Howey Rd. The existing location of the gravel parking area may be sufficient but should be expanded and cleaned up to accommodate more vehicles. It is unclear if the stumps on site are due to the clearing for the parking area or dumped from another site. Overflow parking could be allowed along Howey RD and may require the creation of a suitable shoulder that still allows through traffic, if it is allowed.

Stumps, logs and other debris near existing parking area.

Existing parking area.

Questions as to the current condition of the unimproved section of Howey Rd from Seckar Rd. should also be explored as another way to access the property without going into the town of Willington. Has this portion of the road been officially abandoned or does the town still retain the right to pass?

APPENDIX

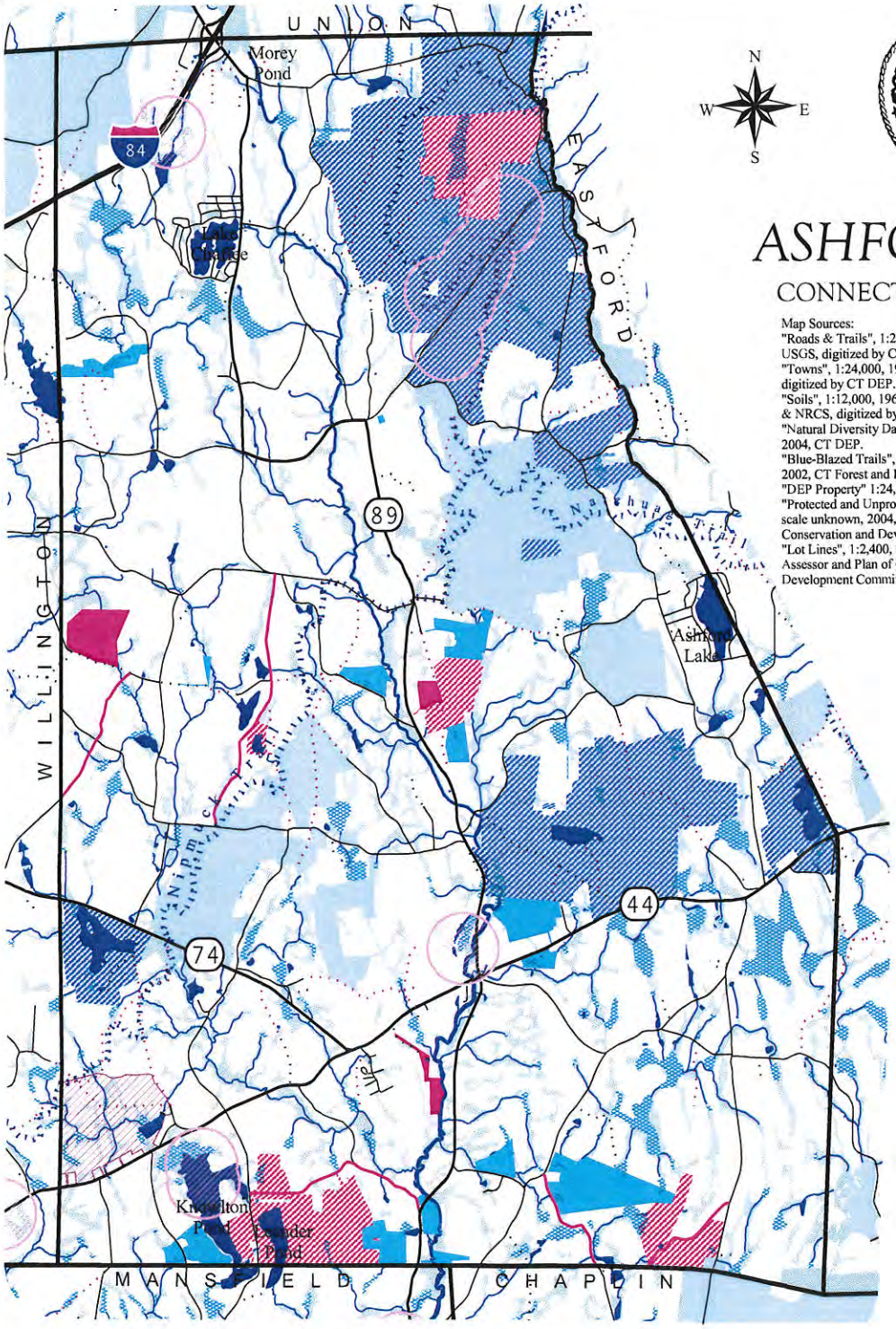
Ashfiord Conservation Areas Map

Old Connecticut Path Information

Langhammer History – Gwen Haaland

Conservation Commission Proposal – 2011

Ranavirus Information



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TOWN OF ASHFORD CONNECTICUT SEAL

ASHFORD

CONNECTICUT

Map Sources:
"Roads & Trails", 1:24,000, 1969-1984, USGS, digitized by CT DEP.
"Towns", 1:24,000, 1969-1984, USGS, digitized by CT DEP.
"Soils", 1:12,000, 1962-1995, USDA & NRCS, digitized by CT DEP.
"Natural Diversity Database", 1:24,000, 2004, CT DEP.
"Blue-Blazed Trails", scale unknown, 2002, CT Forest and Parks Association.
"DEP Property" 1:24,000, 2002, CT DEP.
"Protected and Unprotected Open Space", scale unknown, 2004, Ashford Plan of Conservation and Development Committee.
"Lot Lines", 1:2,400, 2003, Ashford Tax Assessor and Plan of Conservation & Development Committee.

Conservation Criteria
- State Forest & DEP Owned Waterbodies
- Protected Open Space
- Municipal Open Space
- Conservation Easement on Private Land
- Large Unprotected Blocks
- Wagonshed Property

Natural Diversity Database
- Lake/Pond/River
- Marsh/Wetland
- Stream (Perennial or Intermittent)
- Wetland Soils
- CFPA Blue Blaze Trail/ CT State Greenway
- Municipal Scenic Roads

Roads and Trails
- State Route
- Local Road
- Dirt Road
- Trail

Lot Lines

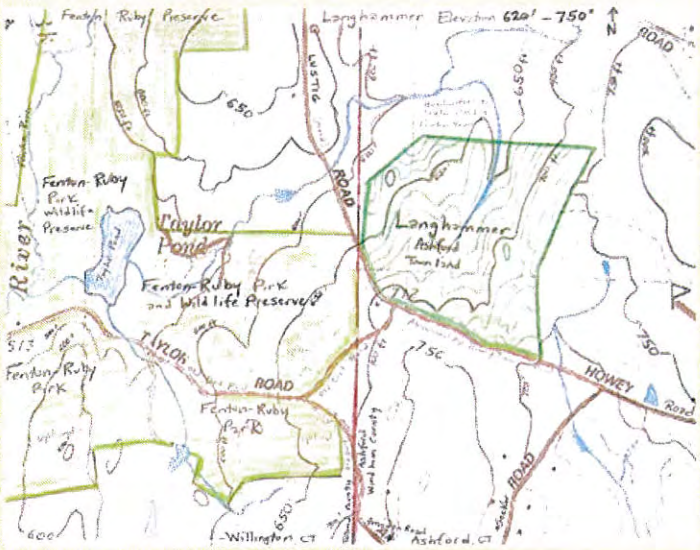
Map 5

Conservation Areas

Prepared by WINCOG 2004. Map is for planning purposes only and is not intended for site specific review.

7: Langhammer Conservation Area: Lustig Road, Ashford, CT

- Town of Ashford Conservation Commission
- Trails under development
- Howey Road likely route of Old Connecticut Path
- Woodland
- Streams
- Waterfalls
- Connection with Fenton-Ruby Park, Willington
- Distance: To be determined
- Difficulty: To be determined



Langhammer Woods – Ashford Conservation Commission

7. Langhammer Conservation Area

7: Langhammer Conservation Area: Lustig Road, Ashford, CT

- Town of Ashford Conservation Commission
- Trails under development
- Howey Road likely route of Old Connecticut Path
- Woodland
- Streams
- Waterfalls
- Connection with Fenton-Ruby Park, Willington
- Distance: To be determined
- Difficulty: To be determined

Langhammer Woods is preserved by the Ashford (CT) Conservation Commission. The property is bordered by the old Howey Road that formed part of the Old Connecticut Path route. A portion was included within the video "Finding the Way to Moose Meadow". More information on the video and the route of the Path through Langhammer Woods can be found at 2.75 Finding the Way to Moose Meadow – Ashford & Willington, CT

Langhammer Woods can be accessed from Lustig Road in Ashford. Parking is limited at the end of Lustig Road (dead end). Trails are being developed to access the preserve. These will be added as soon as they are developed.

Langhammer Woods follows includes a portion of the Old Connecticut Path. Click on the map (above left) to enlarge. A sample of views along the walk is shown above right (click to enlarge). Check back for updates as this walk will be recorded with GPS and posted on EveryTrail.com by September 2013.

A collection of photos displaying the variety of plants and flowers found at Langhammer Woods is provided by Ashford resident Gwen Haaland, Ph.D. (paleobotany). Dr. Haaland shares her botanical expertise through the well labeled photos found in her collection that can be viewed at Langhammer Woods photos.

Langhammer History
Gwen Haaland

Summary: When I was researching Langhammer in the Ashford land records, I found some interesting information. Our present 73 acre parcel was originally 185 acres in size and included an Ashford Tract and a Willington Tract. The Willington land included a section with the Fenton River, probably very close to or part of what is now the Fenton-Ruby Wildlife Preserve! From at least as far back as 1879-sometime well into the 1900s, our Ashford Town Forest land was originally attached to the "Bradley Farm" in Willington. To learn the history of this land prior to 1879 and find the location of the house site (not on the present day parcel, one must start by checking Willington's land records under "Bradley Farm."

The Lamb family owned parcel in 1879, then George Adams, then Jesse Eno, then Langhammer family for 54 years. Note that the brook on our Ashford town parcel is called "Eno Brook."

There were two Joseph Langhammers: Father Joseph Langhammer, who purchased land in 1904 and son Joseph Langhammer, who inherited the parcel (probate, no will) in 1947 with tremendous tax liens at the time he took possession (The poor son did not have much chance to pay it all back.) His Father took a $900.00 mortgage in 1914 and later had to sell off parts of the land. The original 185 acres dwindled down to 153 acres and eventually only 73 acres was left (after parts were sold to his nearby neighbors.) Every year in the land records, it mentions Joseph Langhammer, the Father, owing more money to the town. The town of Ashford took title in 1959 and still owns 73 acres remaining from the original parcel.

Ashford and Willington will come together again once we are able to rejoin the Fenton Ruby Preserve with Ashford's Langhammer Town Forest via a future trail system that will be open to the hiking public. We should then celebrate this land history coming full circle to be reunited (after being split apart during the past century.)

To: Ashford Board of Selectmen
From: Ashford Conservation Commission
Subject: A Conservation Commission proposal for use and preservation of Town land known as the "Langhammer Property"
October 26, 2011
Gentlemen,

The Conservation Commission recognizes that this property, acquired by the Town many years ago, has remained relatively obscure to the Public. Recent developments, however, have created more awareness of the property and, in turn, prompted our Commission to propose a course of preservation and recreational use of the property. In this letter we make a proposal for conservative use by the Public and attempt to address the issues that such use creates.

1. **Assessment:**
   Prior to any proposed use of the property, we feel a professional assessment is essential. We would want to establish a baseline of land features and conditions, as well as, use potential and limitations. This may require the services of one or more professionals. Initially, we would seek the advice of the Willington Conservation Commission in determining the type of assessment due to their experience with the Fenton-Ruby Park and Wildlife Preserve.

2. **Property development and modifications:**
   Assuming a supportive assessment, we recommend the development of a single walking trail that would incorporate the major features of the land. This trail would utilize as much of the current walking paths as possible. It has been proposed that this trail be named the Arthur D. Pinkham Jr. Trail.

   Appropriate signage would highlight the trail for convenience, and all prohibitions would be clearly posted to mitigate improper use and promote safety.

   A public access point is an issue that will need to be negotiated with abutters. This effort would take place at the same time as the assessment process referred to above.

3. **Restrictions:**

All motorized vehicles (ATV and Dirt Bikes) would be prohibited. Use after dark would be prohibited unless for educational observance of wildlife. There would be posted restrictions on camping, burning, and trash. Parking is an issue to be addressed, but would limited to the confines of the property's major point of access.

4. **Public Uses and programs:**
   We envision the primary use to be a quiet, reflective walk through a representation of Ashford woodland. As the land will be maintained in its natural state and has considerable diversity, we would expect it would lend itself to educational efforts of our Ashford School.

   A limited number of hunting permits are issued currently and we see this as a continuing use, although there may be the need for some restrictions for public safety.

5. **Funding:**
   To fund the initial "assessments" the Commission intends to utilize available grants and private resources. We intend to investigate this potential as soon as this letter is released.

6. **Annual reporting and ongoing stewardship:**
   The Conservation Commission will commit to producing an Annual Report stating the current condition of the property, the effects of use by the Public, and schedule of any proposed maintenance. From this report the Commission will request the amount to be added to the Commission's budget for such maintenance.

   The Conservation Commission will create alliances with various organizations and resident volunteers to act as stewards for the Forest. This will include but not limited to, church groups, local clubs, and scouts.

   We will also attempt to promote this property as an extension of the Fenton-Ruby Park and Wildlife Preserve, thus creating a larger protected area for public use.

Loretta Wrobel, chair
Ashford Conservation Commission

Ranavirus Prevalence in Connecticut Wood Frog Populations

Kelly O'Connor and Tracy A. G. Rittenhouse
Department of Natural Resources and the Environment

Research Question: Is ranavirus present in vernal pools throughout Connecticut?

Ranaviruses are attributed to 40-60 percent of amphibian mortality events in the United States. Despite the potential impact of mass mortality events on local population dynamics, spatial distribution and frequency of mass mortality events are not known. The first documented ranavirus-associated mass mortality event in Connecticut was in summer of 2010 at pool LEBR. Prevalence of the virus within pools is generally low (<30%), making the virus difficult to detect without extensive sampling (Hoverman et al, 2012). However, high prevalence rates in CT have allowed us to expand the spatial extent of our surveillance effort to the entire state.

Adult Wood Frog (*Lithobates sylvaticus*) and field crew.

Methods

Year 1 – We sampled wood frog tadpoles from vernal pools in the watershed with a confirmed ranavirus morality event and in a watershed where mass mortality events had been documented but the cause was unknown (blue dots in Figure 1).

Year 2 – We resample pools from Year 1 and added 27 pools. We randomly selected state owned properties given that properties were > 15 km apart and stratified by four Level II Ecoregions (58e, 59a, 59c west of CT river, 59c east of CT river. We then collected tadpoles from up to three pools per property (red dots in Figure 1).

Quantitative real-time polymerase chain reaction (qPCR) was used to amplify and quantify viral DNA within liver tissue. All lab work was completed by Amphibian Disease Diagnostic Laboratory at Washington State University.

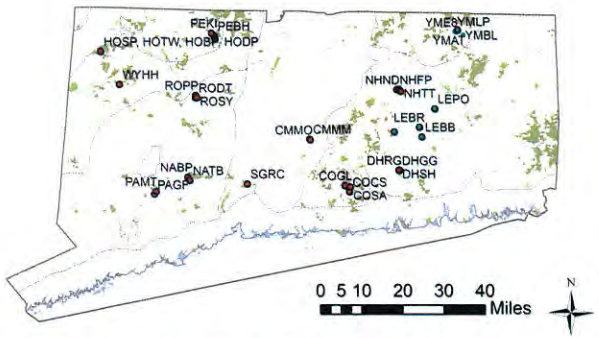


Figure 1. Vernal pools where wood frog tadpoles were collected. Eight pools were sampled in both years (blue dots) and 27 additional pools were sampled in year 2 (red dots). Green represents state owned properties, with dark green = state forest, medium green = state parks, light green = wildlife management areas.

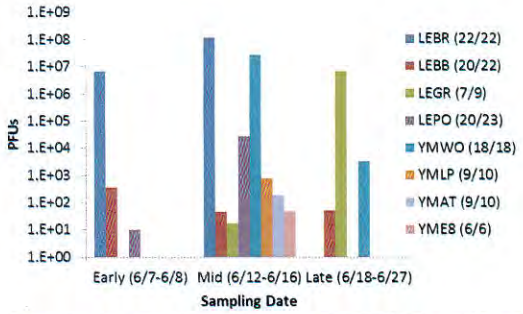


Figure 2. Average plaque forming units (PFUs) by pool and the proportion of tadpoles that tested positive for ranavirus.

Acknowledgements

We thank Jessie Brunner for helpful advice. Jason O'Connor and D. Cristina Macklem collected tadpoles. Funding provided by Connecticut Department of Energy and Environmental Protection.

Main Result: Ranavirus detected in all eight pools sampled in year 1

Prevalence of ranavirus within a pool was very high (Figure 2). All tadpoles collected from three pools (LEBR, YMWO, YME8) tested positive for ranavirus.

Only one mass mortality event was observed during weekly visits to eight pools in Year 1, although all pools contained ranavirus.

PFU levels were particularly high in LEBR, the vernal pool where a mass mortality events were observed in 2010 and 2012.

Results from year 2 are pending.

Symptomatic tadpoles were rarely observed.

Discussion

Prevalence of ranavirus seems to be high in local wood frog populations in Connecticut's vernal pools. We were unable to test hypotheses regarding environmental and landscape predictors of ranavirus presence due to the presence of ranavirus in all vernal pools sampled. The assumption that the presence of ranavirus in a wetland will results in an amphibian mass mortality event cannot be made. Alternatively, observed mass mortality events alone are not an accurate predictor of ranavirus presence across a landscape. The PFU levels in LEGR and LEWO pools were similar to those observed in LEBR, and thus suggests that mass mortality events may have occurred in these pools after our last visit. Our results emphasizes the rapid nature of these mortality events, and supports a need for very frequent and consistent monitoring of vernal pools, especially as tadpoles near metamorphosis.

PURDUE EXTENSION

FNR-485-W

EXPERT REVIEWED

Authors

Megan Winzeler, undergraduate student; Seth LaGrange, undergraduate student; and Jason Hoverman, Assistant Professor in Vertebrate Ecology, Department of Forestry and Natural Resources

PURDUE UNIVERSITY

1913-2013

FORESTRY AND NATURAL RESOURCES

www.fnr.purdue.edu

Ranaviruses:

Emerging Threat to Amphibians

Amphibians are integral to our ecosystem as predators, as a food resource, and as ecological indicators for water pollution and habitat quality. And currently, amphibians face increasing disease challenges.

Like any free-living species, amphibians are host to a variety of pathogens including bacteria, fungi, viruses, and parasitic worms. While the majority of pathogens are relatively benign, viral pathogens in the genus *Ranavirus* are responsible for catastrophic die-offs across the globe. In the United States, ranaviruses have been linked to die-offs in 29 different amphibian species across 25 states.

Researchers haven't tracked ranaviruses closely, so they don't know how common or widespread they are in Indiana's amphibian populations. However, because they are spreading, this publication gives an overview of ranaviruses and their effects on amphibians. We are asking biologists and recreationists to take an active role in helping track these diseases to preserve Indiana amphibians.

What are ranaviruses?

Ranaviruses infect cold-blooded vertebrates, including bony fish, reptiles, and amphibians. They are double-stranded DNA viruses that multiply in host cells. Two species of ranviruses are known to infect amphibians in North America: frog virus 3 (FV3) and *Ambystoma tigrinum* virus (ATV). While FV3 is widespread across North America, ATV has only been detected in regions west of the Mississippi River. Both FV3 and ATV can infect many different species of amphibians, but the outcome of infection varies by species.

What are the signs of infection?

Ranaviruses can infect the liver, kidneys, and spleen. In these organs, the viruses rapidly multiply, kill cells, then spread to infect neighboring cells. Common signs of infection include lethargy, emaciation, hemorrhaging, and edema (swelling) of the legs or body (Fig. 1). The virus spreads rapidly within infected hosts. Signs of disease can be seen within days of infection, and death can occur as early as seven days after infection. Ranavirus infections appear to be more lethal in larval than adult amphibians. This may be due to the fact that in the larval stage the amphibian immune system is underdeveloped, as well as that larvae must put a great deal of their energy into metamorphosis. Although infection rates vary dramatically from species to species, research shows that, once infected with ranavirus, a large percentage of individuals die. This raises significant concern.

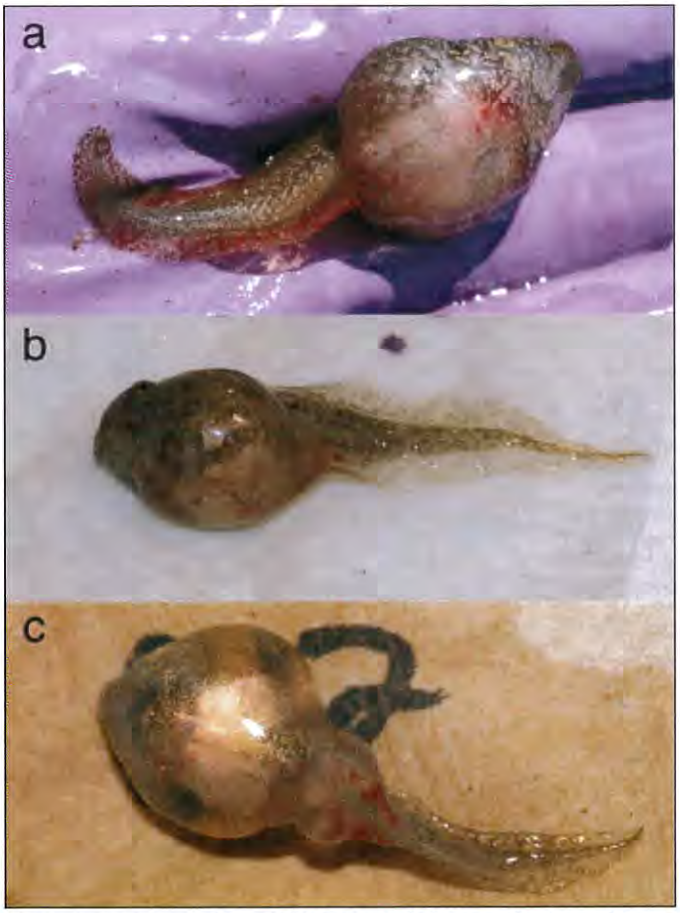


Figure 1. Gross signs of ranaviral infection include hemorrhaging and edema of the legs or body. Shown are green frog (a) and gray tree frog (b, c) tadpoles exhibiting multiple signs of ranaviral infection.

How does it spread?

Most amphibian eggs and larvae develop in water, while juveniles and adults live on land. Ranaviruses can spread in both environments and by direct and indirect routes (Fig. 2).

Direct transmission occurs when an uninfected individual contacts an infected individual. Terrestrial juveniles and adults may be exposed during migration or breeding. Infected, breeding adults may introduce the virus to a breeding pond; however, researchers have not seen transmission from mother to offspring in amphibians. Larval amphibians can contact and infect each other while swimming. Amphibians may also become infected when feeding on the bodies of other live or dead infected individuals.

Indirect transmission can occur through contact with soil or water contaminated by infected individuals. Depending on conditions, ranaviruses can survive outside the host for days or weeks (especially in water), which increases their chance of spreading. However, when breeding sites dry out, the virus is no longer infectious.

We still don't understand how ranavirus spreads to new habitats and persists in populations after ponds dry out. Amphibians, especially larvae, have been known to carry low-level infections in the wild. There is evidence that these infected larvae can metamorphose and carry the pathogen into the next breeding season.

Additionally, fish and reptiles, particularly turtles, may harbor ranaviruses. Fish and reptiles are susceptible to infection; in fact, recent studies show that highly virulent strains of FV3 can cause dramatic die-offs in fish and reptiles. This suggests that ranavirus outbreaks may result from interactions among amphibian, reptilian, and fish hosts. So far, however, few studies have looked at how these different host species affect disease transmission in amphibian populations. This will take more research.

What species are most susceptible?

The growing number of studies focused on ranavirus infection of amphibians shows substantial variation across species, but some general trends. For instance, species that are relatively rare, breed in semi-permanent wetlands, and develop quickly as larvae are more susceptible to infection. However, in laboratory experiments, certain amphibians (e.g., African clawed frog, *Xenopus laevis*) have developed immune responses to ranaviruses, which gives them increased protection against future infection.

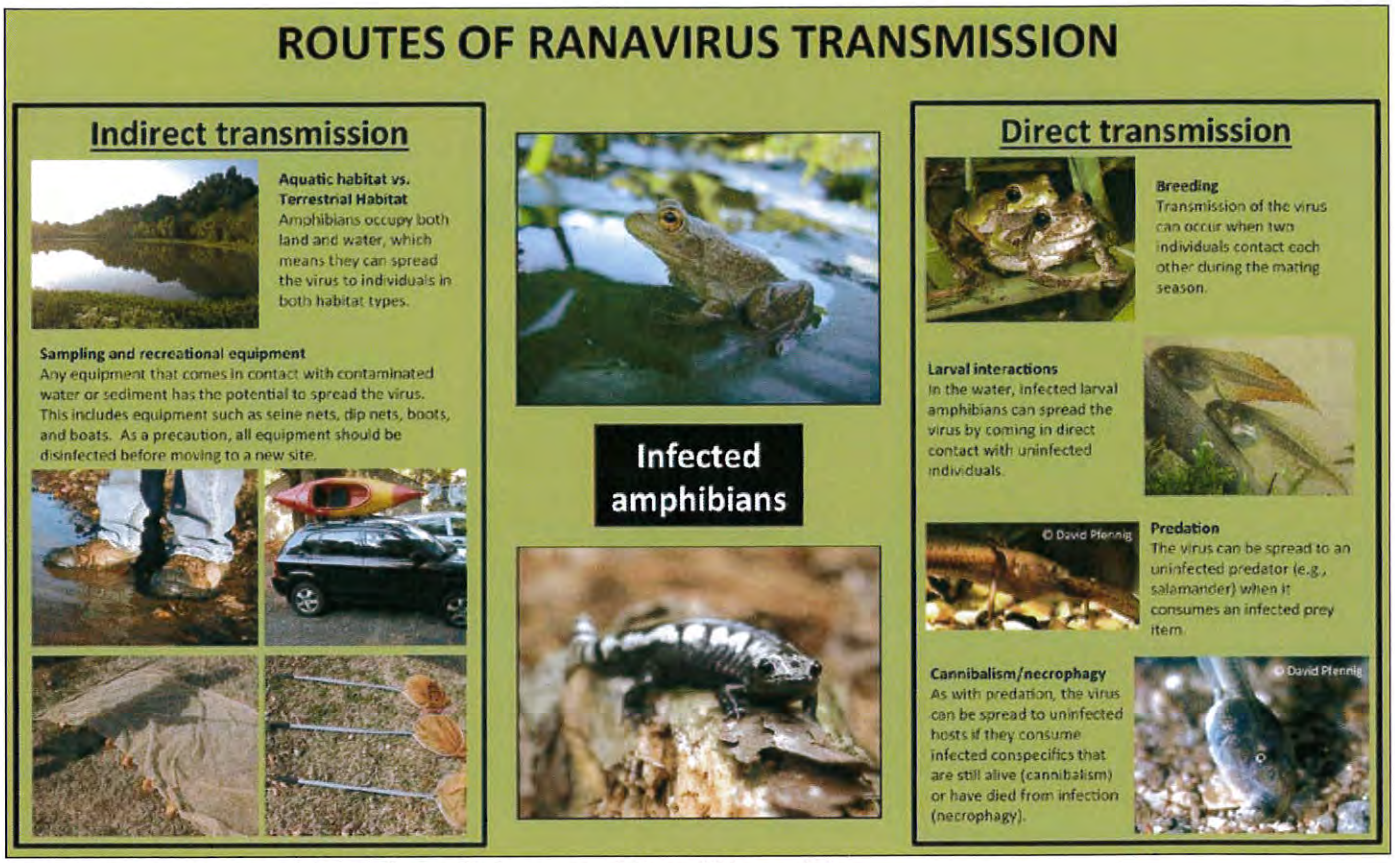


Figure 2. Ranaviruses can spread through direct and indirect routes within amphibian populations.

Species within the family Ranidae (the true frogs) appear to be more susceptible than species from other families (e.g., Hylidae: tree frogs, Ambystomatidae: mole salamanders) (Fig. 3). Because Indiana has a diverse group of true frogs (eight species; Table 1), we must monitor these species for ranavirus infection. Wood frogs—highly susceptible to infection and broadly distributed in Indiana—are a particular concern. There are numerous accounts of wood frog die-offs throughout North America.

In laboratory tests, species in other amphibian families (e.g., Bufonidae: true toads, Hylidae, Ambystomatidae) appear less susceptible to ranavirus infection. However, there have been die-offs in some of these families in North America. This suggests that factors such as environmental stress could contribute to disease development. Collectively, the research demonstrates that ranaviruses can infect and cause disease in a broad range of host species. This is a significant concern, because when there are multiple host species in a community, transmission rates are higher. Higher transmissions rates mean that managers and naturalists need to watch for die-off events in all species in Indiana.

How widespread is the disease?

To date, over 50 salamander, frog, and toad species around the world have reportedly suffered die-offs or have been found to be infected in the wild. In the United States, there are nearly 300 species of amphibians, but fewer than 10% have been examined to assess their susceptibility to ranavirus infection and disease. Moreover, the majority of the research has focused on pond-breeding amphibians; there is limited information on stream-breeding and terrestrial families (e.g., Plethodontidae: lungless salamanders). While research efforts have increased across the country, the risk that ranaviruses pose to amphibian species remains unclear.

Table 1. List of all native amphibians in Indiana, including their susceptibility to ranavirus infection in the lab and whether the species has been reported in mortality events or infected in the field across its range in the United States.

Species	Susceptibility in the lab[1]	Field data[2]
Cope's gray treefrog, *Hyla chyrsoscelis*	High	M, I
Wood frog, *Lithobates sylvaticus*	High	M, I
Southern leopard frog, *Lithobates sphenocephalus*	High	M, I
Green frog, *Lithobates clamitans*	High	M, I
Pickerel frog, *Lithobates palustris*	High	M, I
Eastern tiger salamander, *Ambystoma tigrinum*	High	M, I
American toad, *Anaxyrus americanus*	Low	I
American bullfrog, *Lithobates catesbeianus*	Low	M, I
Spotted salamander, *Ambystoma maculatum*	Low	M, I
Mole salamander, *Ambystoma talpoideum*	Low	ND
Marbled salamander, *Ambystoma opacum*	Medium	M
Northern leopard frog, *Lithobates pipiens*	Medium	M, I
Eastern spadefoot, *Scaphiopus holbrookii*	Medium	M, I
Western chorus frog, *Pseudacris triseriata*	Medium	ND
Northern cricket frog, *Acris crepitans*	ND	I
Eastern hellbender, *Cryptobranchus alleganiensis alleganiensis*	ND	I
Northern dusky salamander, *Desmognathus fuscus*	ND	I
Long-tailed salamander, *Eurycea longicauda longicauda*	ND	I
Southern two-lined salamander, *Eurycea cirrigera*	ND	I
Cave salamander, *Eurycea lucifuga*	ND	I
Northern slimy salamander, *Plethodon glutinosus*	ND	I
Green treefrog, *Hyla cinerea*	ND	M
Spring peeper, *Pseudacris crucifer*	ND	M
Plains leopard frog, *Lithobates blairi*	ND	M
Jefferson's salamander, *Ambystoma jeffersonianum*	ND	M
Eastern newt, *Notophthalmus viridescens*	ND	M, I
Fowler's toad, *Anaxyrus fowleri*	ND	ND
Gray treefrog, *Hyla versicolor*	ND	ND
Crawfish frog, *Lithobates areolatus*	ND	ND
Blue-spotted salamander, *Ambystoma laterale*	ND	ND
Small-mouthed salamander, *Ambystoma texanum*	ND	ND
Streamside salamander, *Ambystoma barbouri*	ND	ND
Four-toed salamander, *Hemidactylium scutatum*	ND	ND
Green salamander, *Aneides aeneus*	ND	ND
Northern zigzag salamander, *Plethodon dorsalis*	ND	ND
Eastern red-backed salamander, *Plethodon cinereus*	ND	ND
Northern ravine salamander, *Plethodon electromorphus*	ND	ND
Common mudpuppy, *Necturus maculosus maculosus*	ND	ND
Western lesser siren, *Siren intermedia nettingi*	ND	ND

[1] Species are categorized into high, medium, and low susceptibility based on the laboratory infection results of Hoverman et al., 2011. "ND" refers to a species with no data.

[2] The *Field data* column was determined from Miller et al., 2011. "M" refers to mortality due to ranaviruses (die-off event) and "I" refers to infection present in an individual. "ND" refers to a species with no data.

What environmental stresses increase disease?

The emergence of ranaviruses in amphibian populations may be linked to environmental stressors that are natural (e.g., competition, breeding) or human-related (e.g., habitat destruction, poor water quality, climate change). These stressors may directly or indirectly make amphibians more susceptible to infection and lead to outbreaks of viral diseases in amphibian populations. For instance, experiments show that pesticide exposure can increase the susceptibility of larval tiger salamanders to ATV infection and increase larval death. Additionally, poor water quality caused by cattle activity around wetlands was linked to increased ranavirus prevalence in pond-breeding amphibians. Thus, cattle ponds and run-off retention ponds could be hotspots of ranavirus disease due to enhanced environmental stress.

Human activity is a significant cause of ranavirus spread across the landscape. For example, ATV moved long distances in the western United States when fishermen used infected tiger salamanders (*Ambystoma tigrinum*) as fishing bait. The infected bait introduced ranavirus to many formerly uninfected areas. Additionally, amphibian culture facilities and fish hatcheries can become sources of more virulent strains of the virus. These facilities house large populations of frogs (usually American bullfrogs) that can evolve resistance to infection. To counter this resistance, more virulent strains of the virus can develop. For instance, an FV3-like isolate from an American bullfrog culture facility caused 50% more mortality in several amphibian species when compared to standard FV3 in laboratory trials (Fig. 3). Thus, the movement of contaminated water and infected animals by humans could be an underlying cause of the increasing reports of ranavirus-associated die-off events.

Few studies have been done to assess long-term effects of ranaviruses on populations. A single study in North Carolina has shown recurrent ranavirus outbreaks reduced population size of several amphibian species (e.g., wood frogs, spotted salamanders) in a wetland. This suggests that recurrent outbreaks can have long-term effects on amphibian populations, especially for highly susceptible species like wood frogs. Unfortuately, Indiana currently lacks long-term surveillance projects focused on ranavirus.

What you can do?

Biologists and recreationists can take an active role in preventing the spread of ranaviruses by disinfecting all equipment after use around bodies of water. Boots, waders, boats, buckets, and any items that come into contact with water or soil in bodies of water where amphibians breed are potential carriers of the virus.

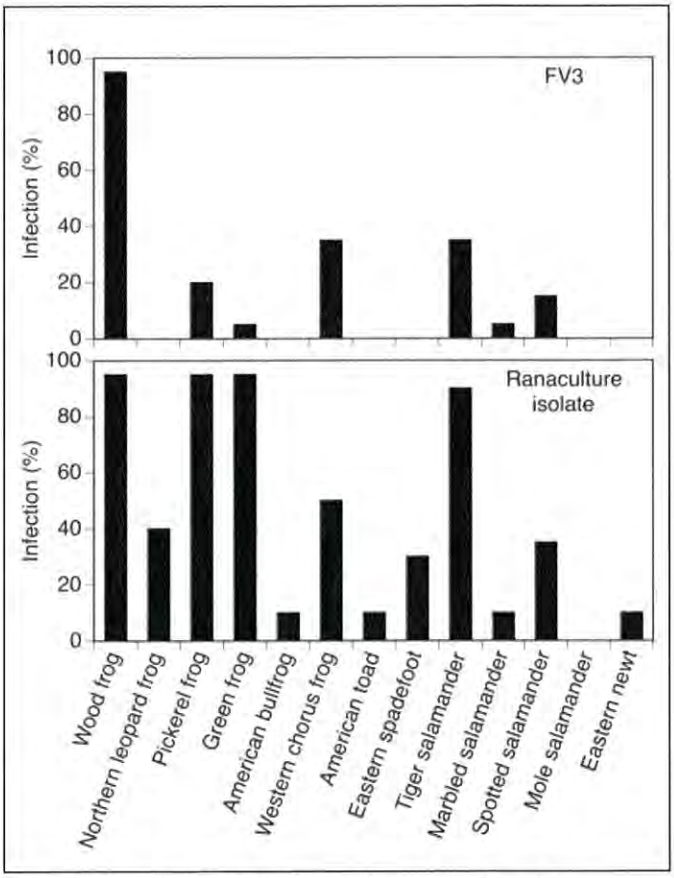


Figure 3. Ranavirus infection varies greatly across species and virus isolates. Shown are the results from laboratory experiments examining the susceptibility of different amphibian species to infection by frog virus 3 (FV3) and an FV3-like virus isolate from an American bullfrog culture facility (Ranaculture isolate). Only species found in Indiana have been included. Modified from Hoverman et al. (2011).

To reduce the spread of ranaviruses:

- Use bleach (10%) or nolvasan (2%) to disinfect all gear (including vehicles in contact with water). Nolvasan is non-corrosive and safe to use on metal equipment such as boats and boat trailers.
- Do not transport soil from one site to another.
- Do not move amphibians, fish, or reptiles from one site to another.

Researchers are working to determine the distribution and presence of ranaviruses in Indiana, but until we know more, do everything you can to prevent its spread.

What if you find dead amphibians?

There have been no reported ranavirus-associated die-off events of amphibians in Indiana. However, the virus recently was found in amphibian and reptiles populations in the state, so a die-off is possible in the future.

If ranaviruses cause a die-off in an amphibian population, you will see numerous individuals (>10) dead at a single location at a time—most likely during a breeding event or larval development. If you discover a die-off:

- Contact the Indiana Department of Natural Resources (dfw@dnr.in.gov, 317-234-5191) for additional guidance.
- Leave dead and moribund individuals where you find them. Moving them increases the risk of pathogen spread. You must have a permit and state approval prior to the collection of a live or dead amphibian.

If you have approval from the Indiana Department of Natural Resources to collect amphibians, we recommend one of the following approaches.

- Because clinical signs of infection vary greatly among species, take tissue samples (preferably liver or kidneys) and oral or cloacal swabs and store them in 95% ethanol for future diagnostic tests.
- Alternatively, you can preserve entire bodies of individuals separately in 95% ethanol or freeze them for testing.

Importantly, increased surveillance and testing will help researchers and managers better estimate ranaviruses' distribution in Indiana and the threat it poses to our amphibians.

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About the Team

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

The services of the Team are available as a public service at no cost to Connecticut towns.

Purpose of the Team
The Environmental Review Team is available to help towns and developers in the review of sites proposed for major land use activities. To date, the ERT has been involved in reviewing a wide range of projects including subdivisions, landfills, commercial and industrial developments, sand and gravel excavations, active adult, recreation/open space projects, watershed studies and resource inventories.

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

Requesting a Review
Environmental reviews may be requested by the chief elected official of a municipality and/or the chairman of town commissions such as planning and zoning, conservation, inland wetlands, parks and recreation or economic development. Requests should be directed to the chairman of your local Conservation District and the ERT Coordinator. A request form should be completely filled out and should include the required materials. When this request is reviewed by the local Conservation District and approved by the ERT Subcommittee, the Team will undertake the review on a priority basis.

For additional information and request forms regarding the Environmental Review Team please contact the ERT Coordinator: 860-345-3977, Eastern Connecticut RC&D Area, P.O. Box 70, Haddam, Connecticut 06438, e-mail: connecticutert@aol.com.

About the Eastern Connecticut RC&D Area

Resource Conservation and Development (RC&D) is a program of the United States Department of Agriculture (USDA). The Secretary of Agriculture gave the Natural Resources Conservation Service (NRCS) [formerly the Soil Conservation Service] responsibility for administering the program. RC&D is unique because it is led by local volunteer councils that help people care for and protect their natural resources in a way that improves the local economy, environment, and living standards. RC&D is a way for people to work together to plan and carry out activities that will make their area a better place in which to live.

Interest in creating the Eastern Connecticut RC&D Area first started in 1965. An application for assistance was prepared and submitted in June 1967 to the Secretary of Agriculture for planning authorization. This authorization was received in August 1968. In 1983, an application by the Eastern Connecticut RC&D's Executive Council was approved by USDA and NRCS to enlarge the area to an 86 town region.

The focus of the Eastern Connecticut RC&D Program is to help people care for and protect their natural resources, improve local economies, and sustain a high quality of life. The program derives its success from its ability to connect individuals, communities, government entities, and grassroots organizations. These connections and partnerships enable the development of shared visions and resource networks that work toward a healthy future for Connecticut. Current members on the RC&D Council represent the Working Lands Alliance, The Last Green Valley, CT Farmland Trust, Town of Mansfield, NECCOG, RiverCOG, NorthCentral Conservation District, Eastern Conservation District and the CT River and Estuary Conservation District.

For more information please visit their website at: www.easternrcd-ct.org.