AIR LINE STATE PARK
TRAIL REGION MASTER PLAN

Appendix C
Environmental Review Team Conservation Reports/Findings

AIR LINE STATE PARK TRAIL REGION

APPENDIX C

ENVIROMENTAL REVIEW TEAM

AIR LINE STATE PARK TRAIL REGION MASTER PLAN
NATURAL RESOURCE DETAIL SURVEYS AND RECOMMENDATIONS

The Environmental Review Team provided analysis of two major focus areas in Hebron and Pomfret and a small agriculture section in Lebanon. The reports in this appendix represent the full text of reports submitted by team members. The Hebron ERT report prepared for the Hebron Conservation Commission can be found at https://ctert.org/wp-content/uploads/2023/02/Hebron-Bernstein-_Hibbert-ERT-Report-1_10_23_WEB.pdf

This appendix is segmented into

- Overall recommendations for the Air Line State Park Trail
- The Pomfret Conservation Area Evaluation
- The Hebron Conservation Area Evaluation

AIR LINE STATE PARK TRAIL

FORESTRY

Nathan Piché
Forester 1, State Lands Management Program CTDEEP

The landscape that the Air Line State Park Trail resides within was once almost entirely forested, with significant areas of upland forest, swamps, river bottoms, and marshes. During the colonial period, much of the forest was cleared for agricultural purposes. Throughout the nineteenth and twentieth centuries, many of the early settlements were abandoned as these early farmers sought out more fertile land to the west. Second growth forests regenerated and have developed into the forests that now define the Air Line State Park Trail experience. Every mile of trail travels through forest preserves, state forests, state parks, wildlife management areas, land trust or town owned forests. Forest management planning, conservation, and preservation are vital to the economic sustainability of the trail as an eco-tourism destination, preserving its unique character in the state's tourism destinations.

Today, the diversity of forest and habitat types/elements of the remaining forests are important to protect, conserve, and enhance through a combination of both passive and active management. Of particular interest is the continuation of oak species in the landscape. Due to the white-tailed deer's preference to browse oak species over others, a plethora of non-native invasive shrub species that outcompete and displace native vegetation, as well as the absence of frequent low-intensity fires, many oak species are being outcompeted by invasive shrubs, black birch, red maple, and American beech.

GEOLOGY

Randolph Steinen, PhD
Geologist - Connecticut Geological Survey, CTDEEP

The state has three major geologic regions---the eastern and western highlands, each composed of older metamorphic rock (Paleozoic and Pre-Cambrian in age), and a central lowland, largely composed of younger (Mesozoic in age), unmetamorphosed sandstone and shale with interbedded basalt flows.

The ALTSP region resides largely in the Eastern Highlands, although the western end of the Air Line Trail proper extends into the central lowland. That part of the trail, however, is not part of the state Park. Elevations are higher in the Eastern Highlands than the neighboring central valley, but it has less topographic relief and lower elevations than western Connecticut and New England as a whole. The underlying geology of most of the eastern highlands consists of diverse roughly north-south belts of metamorphic rock that range in age from Ordovician to Devonian (roughly 500-350 million years ago). A small window of pre-Cambrian rocks (0.9 billion years old) is found in the Willimantic area. None of the metamorphic rocks of the eastern Highlands were originally part of the North American continent, which is called Laurentia by geologists. Instead they formed as volcanic micro-continents and ocean bottom sediment to the east and north of Laurentia and through plate tectonic processes, became welded onto Laurentia around 270 million years ago.

The soils lying atop the metamorphic rocks have their origin, not from direct weathering of the bedrock, but rather from incipient pedogenesis (soil formation) of glacial till, the broken and ground up rock debris left by the ice-age glaciers that once scraped across the region. Glacial erosion and deposition have modified the landscape in all of Connecticut, but in two regions have created areas of truly rolling hills. Thick piles of glacial till were deposited under moving glacial ice resulting in elongate hills composed of till. The elongate hills are called drumlins (an anglicized version of druim, a Gaelic word for rounded hill). One drumlin field is found in the Litchfield area in northwestern Connecticut and the other in Woodstock, just north of the Air Line Trail in Pomfret. A southern drumlin from the Woodstock drumlin field is found on the Pomfret Recreational field, described later in this report.

Connecticut's wildlife is remarkably diverse. The state has 84 species of mammals, 335 species of birds, 50 species of reptiles and amphibians, 169 species of fish, and an estimated 20,000 species of invertebrates. The distribution and abundance of Connecticut's wildlife are directly related to the condition and location of wildlife habitats. The state's varied climate, geology, soil types, topography, and watersheds support a wide range of vegetative communities that provide diverse habitats for its wildlife. The landscape and waterscape diversity provide a complex ecological framework, resulting in unequal distribution of wildlife species in the state, especially those at the northern and southern edges of their habitat range (Dowhan and Craig 1976, Metzler and Tiner 1992, Klemens 1993). Metzler and Wagner (1993) have described 13 imperiled communities, including flora and fauna, that are most in need of conservation in Connecticut.

WILDLIFE

Brian Hess
Supervising Wildlife Biologist
Wildlife Division – Wildlife Diversity Program
Bureau Of Natural Resources
Connecticut DEEP
Brian.Hess@ct.gov
https://portal.ct.gov/DEEP

Ann Kilpatrick
District Wildlife Biologist
Wildlife Division- State Lands/Habitat Management Program
Bureau Of Natural Resources
Connecticut DEEP
Ann.Kilpatrick@ct.gov

Hiking, mountain biking, birdwatching and horseback riding are just some of the ways we get outside to enjoy nature and unwind from our day-to-day activities. However, even these seemingly innocuous activities can have impacts on wildlife including reduced abundance, reproduction, and survival. Thoughtful trail location allows us to enjoy nature while minimizing disturbance to wildlife.

Otter in Winter – Air Line State Park Trail - Photo Credit Stan Malcolm

The Air Line State Park Trail (ALSPT) and adjacent acreage have no borders when it comes to wildlife migration. These boundaries are invisible to a varied and valued population of birds, mammals, reptiles, fish, amphibians and invertebrates crisscrossing the trail, finding habitat near the trail. The importance of wildlife to the full health of the ecosystem that provides the eco-tourism opportunities and experience of the ALSPT Region and the trail cannot be overstated. This section looks at the ecological landscape on which the trail is situated and provides recommendations to ensure ongoing sustainable habitat protection and ecological integrity during infrastructure construction, maintenance, and management.

Connecticut's wildlife is remarkably diverse. The state has 84 species of mammals, 335 species of birds, 50 species of reptiles and amphibians, 169 species of fish, and an estimated 20,000 species of invertebrates. The distribution and abundance of Connecticut's wildlife is directly related to the condition and location of wildlife habitats. The state's varied climate, geology, soil types, topography, and watersheds support a wide range of vegetative communities that provide diverse habitats for wildlife. The landscape and waterscape diversity provide a complex ecological framework, resulting in unequal distribution of wildlife species in the state, especially those at the northern and southern edges of their habitat range (Dowhan and Craig 1976, Metzler and Tiner 1992, Klemens 1993). Metzler and Wagner (1993) have described 13 imperiled communities, including flora and fauna, that are most in need of conservation in Connecticut.

The mission of the DEEP Wildlife Division is to advance the conservation, use, and appreciation of Connecticut's wildlife resources. Connecticut's wildlife, including endangered and threatened species, are inventoried, monitored and managed to maintain stable, healthy populations, in numbers compatible with both habitat carrying capacity and existing land use practices. Annually, hundreds of volunteers help inventory and monitor wildlife in partnership with the Wildlife Division. Educational programs and technical assistance are provided to enhance privately-owned habitats, manage nuisance wildlife, and promote an appreciation for the value of Connecticut's wildlife. Environmental Reviews ensure that projects on state lands, using state funds, or requiring state permits do not impact species that are listed as endangered, threatened, or special concern under Connecticut's Endangered Species Act. To support a diversity of wildlife, the Division manages a wide array of habitat types on Wildlife Management Areas (WMAs), State Forests, Natural Area Preserves, and some State Parks. WMAs are areas of land and water having unique or outstanding wildlife qualities that are managed for the conservation and enhancement of fish and wildlife habitat and to provide opportunities for fish and wildlife-based recreation for the public (i.e., hunting, fishing, trapping and wildlife observation). Public hunting and trapping opportunities are offered on state-owned, state-leased, and permit-required areas, with the Division regulating hunting and trapping seasons and bag

Section 22a-1 of the Connecticut General Statutes, Policy of the state, establishes the mission of the Connecticut DEEP. It states: "The General Assembly finds that the growing population and expanding economy of the state have had a profound impact on the life-sustaining natural environment. The air, water, land, and other natural resources, taken for granted since the settlement of the state, are now recognized as finite and precious. It is now understood that human activity must be guided by and in harmony with the system of relationships among the elements of nature. Therefore, the General Assembly hereby declares that the policy of the state of Connecticut is to conserve, improve and protect its natural resources and environment and to control air, land, and water pollution in order to enhance the health, safety and welfare of the people of the state. It shall further be the policy of the state to improve and coordinate the environmental plans, functions, powers, and programs of the state, in cooperation with the federal government, regions, local governments, other public and private organizations and concerned individuals, and to manage the basic resources of air, land and water to the end that the state may fulfill its responsibility as trustee of the environment for the present and future generations."

limits for harvestable wildlife species statewide. With volunteer assistance, conservation education and safety programs are provided to promote safe and ethical hunting and trapping practices.

In addition to managing Connecticut's system of 112 WMAs that total approximately 34,000 acres, the Division conducts habitat management projects on numerous State Park properties and supports the Forestry Division in planning and conducting management within 170,000 acres of State Forest through the forest management planning process. State-owned conservation land provides large tracts of undeveloped space that contain a diversity of habitats, and habitat management can further create and enhance these spaces. A variety of techniques are employed by resource managers, including silviculture, the science and practice of controlling the establishment, composition, structure and growth of forests. Silviculture plays an important role in the conservation of biological diversity in forested ecosystems. Silvicultural treatments help maintain healthy forests for wildlife and can be used to provide specific conditions that certain wildlife of conservation concern require, such as young forest or pitch pine-oak woodland. *Managing Forests for Trees and Birds in Connecticut - A Guide to Habitat Assessments and Silvicultural Practices,* published by Audubon Connecticut in 2020 (https://ct.audubon.org/sites/default/files/guide_to_managing_forests_for_trees_birds_in_ct.pdf), presents basic principles to evaluate forests with bird habitat in mind and ways to use silviculture to manage for bird habitat.

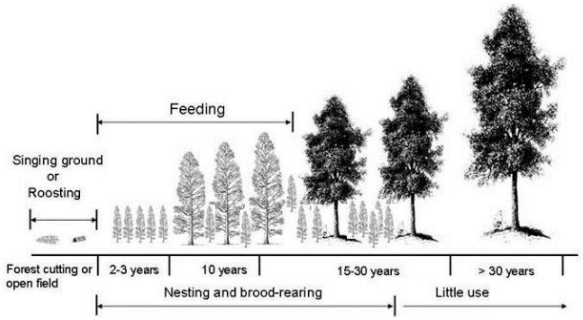
Between 1985 and 2015, Connecticut lost approximately 115,181 acres of forestland (University of Connecticut Center for Land Use Education and Research, 2016). With the landscape of southern New England becoming increasingly fragmented, landscape-level conservation of wildlife requires land managers to consider actions in a regional context. Sustaining large (>1,000 acres) tracts of healthy and resilient forests is critically important for maintaining sustainable wildlife populations in the face of ongoing land use conversion. Large, unfragmented forest blocks are important for many forest-nesting birds such as cerulean warbler, wood thrush and worm eating warbler, and also support an array of forest generalists such as white-tailed deer, bobcat, wild turkey and black bear. At the same time, early successional habitats such as grasslands, old fields, shrublands and young forests have become less common in Connecticut over the past 100 years due to land use conversion, forest maturation, loss of farmlands and the absence of fire within the Connecticut landscape. Associated with the reduction of such habitats is a decline in species such as bobolink, meadowlark, savannah sparrow, blue-winged warbler, rufous-sided towhee, chestnut-sided warbler, ruffed grouse and American woodcock.

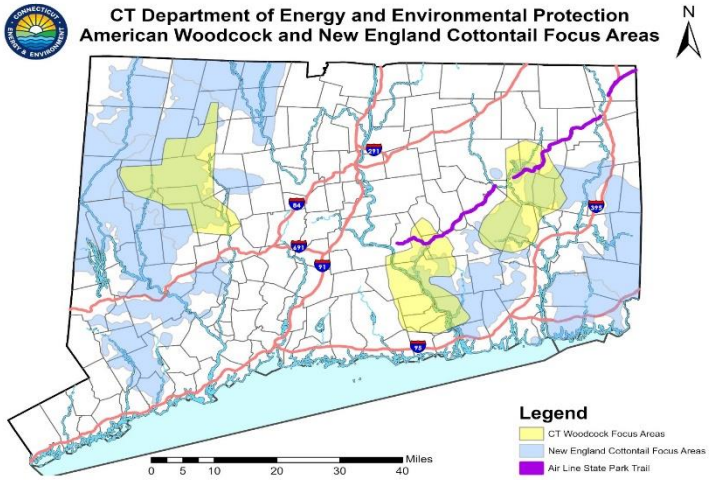
Following historical land clearing practices, the forest has grown since the 1920s with limited disturbance, resulting in a somewhat homogenous forest that lacks structural complexity. Many wildlife species require or benefit from forests that are diverse in age and structure that is mostly lacking in Connecticut. A 2021 mapping effort by the DEEP to assess the statewide extent of young forest and shrubland habitat estimates Connecticut is composed of approximately 3% young forest/shrubland habitat. In general, a goal of maintaining at least 10-15% of a landscape in young forest habitat is considered beneficial to wildlife and is within the historical range of what was present on the landscape and to which wildlife have become adapted (DeGraaf 2003, Dettmers 2003). Mowing, prescribed fire, selective cutting, and selective herbicide applications are used to sustain early successional habitats. Invasive plant control aims to reduce the abundance of invasive plants through mechanical and chemical methods to allow native plants to grow and proliferate to benefit native wildlife and support healthy ecosystems. The publication, *Managing Grasslands, Shrublands and Young Forest Habitats for Wildlife – A Guide for the Northeast*, provides information on how to restore and maintain these habitats (https://portal.ct.gov/DEEP/Wildlife/Habitat/Managing-Grasslands-Shrublands-and-Young-Forest-Habitats-for-Wildlife-A-Guide-for-the-Northeast). While the management of habitats and public use on state-administered lands is essential to ensure the long-term stability of Connecticut's wildlife populations, given that more than 70% of the forestland in Connecticut is privately owned, the conservation and management of forests and early successional habitats on private land is critical to maintaining Connecticut's biodiversity. Before undertaking any land management activity, it is essential to seek advice from a natural resource professional (e.g., certified forester or wildlife biologist)

and have a plan in place. A fact sheet developed by the Clemson Cooperative Extension's Home and Garden Information Center describes in detail, the process of developing and implementing a wildlife habitat management plan (https://hgic.clemson.edu/factsheet/developing-a-wildlife-management-plan/).

American Woodcock Photo: Tom Barnes
New England Cottontail Photo: Paul Fusco

Some sections of the ALSPT are located within or in close proximity to conservation Focus Areas established for both American Woodcock and New England cottontail (NEC). The American woodcock is an important migratory game bird that has experienced population declines throughout the Northeast due in part to habitat loss and forest maturation. A Greatest Conservation Need (GCN) species, it is associated with young forest and other early successional habitats. The NEC is Connecticut's only native cottontail and has declined by more than 85% throughout its range in the Northeast. The loss of habitat has been identified as the primary cause of this decline. NECs require large patches (25 acres or more) of young forest or dense shrubland to maintain viable local populations. While woodcock and NECs are focal species for young forest habitat creation, over 50 other GCN wildlife species rely on young forest or shrubland. On that list are many songbirds such as eastern towhee, indigo bunting, prairie, chestnut-sided, and blue-winged warbler; reptiles such as box turtle, wood turtle, and smooth green snake; a number of small mammals; and many insects including pollinators (Connecticut State Wildlife Action Plan, Chapter 4, 2015; https://portal.ct.gov/DEEP/Wildlife/CT-Wildlife-Action-Plan/Connecticut-Wildlife-Action-Plan). The establishment of these focus areas help direct conservation efforts such as habitat creation and enhancement where existing environmental conditions are suitable. The DEEP Wildlife Division is a partner with the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) and the Wildlife Management Institute in the Young Forest Initiative for At-Risk Species. The goal of this Regional Conservation Partnership Program (RCPP) that includes Connecticut, Maine, New Hampshire, New York, Rhode Island, and Vermont, is to increase the quantity and quality of young forest habitat essential to American woodcock, NECs and other GCN species. The RCPP, created by the 2014 Farm Bill, is a partner-driven, locally-led approach to conservation. It is not a grant program but promotes coordination between NRCS and partners to deliver assistance to agricultural producers and private landowners. The Young Forest RCPP enhances NRCS's capacity to provide technical and financial assistance to private landowners wishing to conduct practices outlined in the USDA Environmental Quality Incentives Program (https://www.nrcs.usda.gov/programs-initiatives/eqip-environmental-quality-incentives).





Connecticut's State Wildlife Action Plan (SWAP) was updated in 2015, establishing a conservation blueprint for proactively conserving GCN species and their habitats. The 2015 GCN species list includes 26 mammals, 95 birds, 31 reptiles and amphibians, 73 fish, 242 invertebrates, and 100 plants. In addition to updating Connecticut's GCN species list, the SWAP describes key habitats and communities. To guide conservation, the Plan details threats and stressors that impact GCN species and key habitats and prescribes conservation actions to address those threats. In addition to these elements, originally established in the 2005 plan, the 2015 revision includes information on climate change, energy development, and emerging diseases. While the permanent loss and degradation of habitat is at the top of the list of threats to wildlife in Connecticut, the SWAP also discusses threats posed by outdoor recreation including the encroachment of humans into natural areas, the degradation of habitat by motorized vehicles, the degradation of habitat by the blazing of unauthorized trails, and adverse impacts like disturbance, litter, and injury. Actions to deal with these threats include developing best management practices for sensitive species, increasing public awareness and stewardship, and creating outreach materials promoting responsible recreation. Participation by conservation partners, academic institutions, and the public was key to making the revised Wildlife Action Plan an effective tool for conserving Connecticut's diversity of wildlife resources for future generations. DEEP has initiated a revision to the SWAP, due in 2025. As part of that effort, DEEP plans to conduct user surveys with existing and new stakeholders to better understand how to make the 2025 SWAP relevant and accessible to a wider audience. Connecticut's fish and wildlife diversity serves as a significant recreational attraction for residents and tourists alike and the SWAP provides a blueprint to recover declining species and keep common species common.

Rare Bobcat travels the Air Line State Park Trail - Photo Credit Stan Malcolm 2023

Maximizing the amount of undisturbed habitat on lands managed for the conservation of wildlife is a critical objective, especially during the spring/summer breeding period. Developed, multi-use trails can conflict with this objective as trails have been shown to fragment and degrade habitat, cause erosion and sedimentation of streams, disturb or disrupt the movements of wildlife, and create avenues for non-native invasive plant infestations. Multi-use trails can also negatively impact those engaged in wildlife-based recreation, especially those seeking a more solitary outdoor experience in which to observe wildlife, such as birders and hunters. At the same time, a properly designed trail system 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. Trails through State Parks and Forests facilitate a variety of recreational opportunities and are approved by the

Department only after formal consideration for forest, water, and wildlife resources, as well as impacts to wildlife-based recreation. Conducting a thorough inventory of plants and animals (to include on-site surveys and a review off Connecticut's Natural Diversity Data Base and other sources of wildlife distribution data; see Chapter 3) and assessing the potential impacts are key elements in developing a sustainable trail/recreational use plan. With any new trail comes the concern that the trail installation will lead to the proliferation of unauthorized trails and prohibited activity (e.g., motorized vehicles, night riding and obstacle construction). This pattern of activity has been well documented at many state properties across Connecticut. Equally important in the development of a sustainable trail is having a plan and funding in place to provide for enforcement and maintenance. Without it, disturbance to wildlife, habitat and wildlife-based recreation will likely increase over time.

Uses that are generally considered compatible could impact sensitive resources depending on the timing and frequency of their occurrence and/or the location. For example, while fishing is considered a passive form of outdoor recreation, there could be impacts associated with it, such as streambank erosion at heavily used sites. Trails can cause negative impacts to wildlife by the ongoing disturbance of human activity. New Hampshire Fish and Game has developed a trail planning guide and mapping tool, *"Trails For People and Wildlife – A Guide to Planning Trails that allow People to Enjoy Nature and Wildlife to Thrive"* (available for downloading at www.wildlife.state.nh.us/trails/), that can be applied by land managers to assess existing trails and site new trails to improve the recreational experience of trail users while sustainably protecting the ecological and management values of a property. The guide describes how wildlife detect human presence and experience disturbance as people use trails, referring to the distance from a trail wherein wildlife can detect people as the 'corridor of influence'. By applying a 'corridor of influence' across an entire trail network, a trail network's total 'impact area' can be assessed. Disturbance from trail activity within the 'impact area' excludes certain species and provides others with less opportunity to survive, forage, reproduce, and raise young. A trail network of significantly lower density that avoids sensitive areas will better sustain and protect wildlife populations, wildlife habitat, and wildlife-based recreation opportunities. Specific guidelines for maintaining and developing trails in various recreational settings can be found in a publication develop and updated in 2019 by the Massachusetts Department of Conservation and Recreation, entitled, *Trails Guidelines and Best Practices Manual* (https://www.americantrails.org/resources/dcr-trails-guidelines-and-best-practices-manual). This document establishes a set of trail guidelines and standards that can be applied across properties with varying management objectives and types of public use.

Some general considerations when developing a trail system include:

- Narrow, passive-use recreation trails with natural substrate that would require minimal vegetation removal, maintain forest canopy closure and prohibit the use of motorized vehicles are recommended to reduce environmental impacts and disturbance to wildlife. Incorporate abandoned roadways, e.g., farm/logging roads, into the trail system whenever possible, but only after determining their use will not negatively affect natural resources.
- Ideally, one trail that allows for multiple uses should be encouraged rather than single/exclusive use trails to reduce the overall level of disturbance.
- To further reduce disturbance to wildlife, dog owners should be required to keep to their dog on a leash. Uncontrolled dogs can be detrimental to wildlife, particularly during the spring/summer breeding period. Despite domestication, dogs do maintain the instinct to hunt and/or chase wildlife. Even if this natural instinct is not triggered, the mere presence of a dog running through an area can cause wildlife to become stressed. Where multiple uses are allowed, requiring dogs to be leashed also will minimize conflicts between trail users.
- To enhance visitor experience, know the characteristics of the property and plan the layout so that the trail passes by various cover types, terrains and other special features represented on a property; however, trail segments should avoid special habitat types; be routed away from wet areas; avoid

steep slopes; avoid known locations of rare species; and be routed along habitat edges (Stevens and Oehler 2019). When possible, follow a closed loop design.

- Trails should be well marked and accompanied by an informational leaflet and/or small interpretive trail signs with URLs that describe the natural resources values associated with the property, such as the value of wetlands, various habitat types and special features, and forest and wildlife habitat management practices;
- The potential impacts of trails on neighboring 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; lack of privacy).

Literature Cited

DeGraaf, R. M., and M. Yamasaki. 2003. Options for managing earlysuccessional forest and shrubland bird habitats in the northeastern United States. Forest Ecology and Management 185:179–191.

Dettmers, R. 2003. Status and conservation of shrubland birds in the northeastern US. Forest Ecology and Management 185:81–93.

Dowhan, J. J. and R. J. Craig. 1976. Rare and endangered species of Connecticut and their habitats. Report of Investigations No. 6: 1-137. Connecticut Department of Environmental Protection, Natural Resources Center and the State Geological and Natural History Survey of Connecticut, Hartford, Connecticut.

Klemens, M.W. 1993. Amphibians and Reptiles of Connecticut and Adjacent Regions. State Geological and Natural History Survey of Connecticut. Bulletin No.112: 1-318. Hartford, Connecticut

Metzler, K.J. and R.W. Tiner. 1992. Wetlands of Connecticut. Connecticut Geological and Natural Historical Survey, Report of Investigations No. 13: 1-115.

Metzler, K. J. and D. L. Wagner. 1998. Thirteen of Connecticut's most imperiled ecosystems. Internal report (draft) of the State Geological and Natural History Survey of Connecticut Department of Environmental Protection,79 Elm Street, Hartford, Connecticut.

Stevens R. and Oehler J. 2019. Trails for People and Wildlife: A Guide to Planning Trails that allow People to Enjoy Nature and Wildlife to Thrive". 44 pp.

University of Connecticut Center for Land Use Education and Research. 2016. Changing Landscape. (U. o. Research, Producer) Retrieved February 7, 2020, from https://clear.uconn.edu/projects/landscape/index.htm.

HERPETOLOGY

Hank Gruner

Conservation Biologist/Herpetologist
60 Townsend Road, Andover, CT 06232

Dennis Quinn

Conservation Biologist/Herpetologist
Quinn Ecological, LLC
40 Pine Street, Plantsville, CT 06479
https://www.quinnecological.com/

With the exception of a few relatively abundant species (e.g., green frog, garter snake, painted turtle, etc.), amphibians and reptiles are among the least encountered representatives of the region's wildlife. However, this does not mean that they are not present. In fact, in the case of some amphibians, such as the red-backed salamander, they may be the most abundant vertebrates.

Although not often seen and often misunderstood, these frequently colorful creatures play important roles in the ecosystem. Because many species utilize both terrestrial and wetland habitats, amphibians and reptiles contribute to nutrient transfer and energy cycling within and between these ecosystems. This is especially true for amphibians having aquatic egg and larval stages, such as the wood frog.

There are fifteen native amphibians: eight frogs and toads, and seven salamanders, and seventeen species of reptiles: eleven snakes and six turtles, that may be encountered along the trail corridor. One non-native turtle, the red-eared slider, may also be encountered in permanent wetlands. Populations of red-eared sliders originated from the release of unwanted pets, and over the past three decades, they have greatly expanded their range in the state. A check list of common and scientific names of the amphibian and reptile species is included in the appendix.

Although some amphibians and reptiles primarily associate with a particular habitat type, many rely on multiple habitats across seasons to meet their life cycle requirements. Among the best examples of this are amphibians such as the wood frog, spotted salamander, marbled salamander and eastern newt. They depend upon vernal pools and wetlands for egg deposition and tadpole/larval development, but reside as juveniles and adults in surrounding forests. Greater than half (56%) of the species occurring within the corridor are dependent upon a mosaic of habitats, a testament to the importance of protecting relatively large, intact and inter-connected landscapes within the corridor.

Reforestation and development have limited the availability of early successional habitats such as old fields, reverting sand and gravel pits, sparsely vegetated rock outcrops, and open canopied wetlands. These habitats are especially important for many amphibians and reptiles. Because early successional habitats are often maintained by activities that involve clearing and mowing, the implementation of best management practices are important to prevent unintended impacts on populations (refer to: Massachusetts guidelines for mowing in rare turtle habitat).

Sections of the trail that traverse wetlands provide basking and nesting habitat for turtles, and foraging and basking habitat for snakes such as the ribbon snake and northern water snake. In some areas, original construction of the rail line has resulted in the creation of ponded areas that function as vernal pools, providing breeding habitat for a diversity of amphibians. The adjacent "shoulder" of the abandoned rail line above these pools can serve as upland habitat for the amphibians, especially if there is an abundance of logs or old railroad ties that provide shelter.

Microhabitat structure is a critical habitat component for many species of amphibians and reptiles. Maintaining natural features such as shrub and herbaceous growth, rotting logs, and rock slabs helps preserve habitat quality. Maintaining habitat quality increases the suitability of the rail trail to serve as a dispersal corridor for some species.

Recreational use and implementing various trail improvements (e.g., paving, creation of parking areas, etc.) can have negative impacts on populations of amphibians and reptiles if not carefully planned, with consideration given to the location and design of proposed activities. The northeast corridor traverses' several habitats that support wood turtles, a species highly vulnerable to these impacts. Within these areas, special conservation considerations should be enacted within zones that range from 300-1,000 feet from the edge of the watercourse(s) (refer to: Northeast Wood Turtle Working Group guidelines). The management considerations within these conservation zones depend upon the suitability of the in-stream and surrounding habitat to support wood turtles, and the type and intensity of land use activities planned (e.g., forestry, recreation, agriculture, etc.). For projects within these conservation zones it is recommended that a qualified biologist assess the suitability of the habitat for wood turtles and provide recommendations.

A comprehensive review of amphibian and reptile conservation in Connecticut and additional guidance regarding habitat management for amphibians and reptiles can be found in Klemens et al 2021, and Mitchell et al 2006.

Ecotourism: Learning and Recreational Opportunities

Self-guided explorations ("Biking or Hiking for Biodiversity") to explore some of the biological diversity and habitats along the northeast trail. Activities are divided into (1) **"habitat call-outs"**, designed to provide information related to various upland and wetland habitats, and land

uses along the trial, and (2) **"wildlife observations"**, designed to engage people in active explorations employing various senses and technologies, especially smart phones.

The location of potential habitat call-out and wildlife observation "stations" along the trail are included on Map X. Stations are repeated on different stretches of the trail along its entire length to ensure local access for all experiences. Repeated stations along the length of the trail also provide those who wish to expand their engagement and investigate variability in the region an opportunity to do so. Options could include signage posted along the trail at representative locations, and/or online or trail head maps that indicate the location of the stations and provide basic information and instructions.

Habitat and Land Use Call-outs: standard habitat descriptions with indicator features (e.g., representative plants, wildlife)

- Forest – could be further subdivided by deciduous, coniferous or age class
- Pitch pine plain
- Agricultural field
- Utility ROW – early successional
- Vernal pool
- Wetland – could be further subdivided by type (e.g., shrub swamp, forested swamp, marsh, vernal pool, pond, etc.)
- Watercourse – river, stream

Wildlife Observations

- Basking Turtle Survey: Using binoculars to observe, count and identify turtles basking in wetlands located immediately adjacent to the trail. Link to a species ID site (ex. ctherpetology.com)

- Frog and Toad Call Survey: Options include signage station at sites and/or an app or website with instructions, link to frog call ID site (ex. Field Herpetology Frog Call MP3 Files | Jockusch Lab (uconn.edu), and seasonal guide to species calling periods.

- Bird Song Survey: Options include signage station at sites and/or an app or website with instructions, link to frog call ID site (ex. Merlin Bird ID by Cornell Lab on the App Store (apple.com), and seasonal guide to species calling periods. This could be located at habitat stations along the trail or a trail-length activity.

SPECIES NOTES OF HERPETOLOGICAL INTEREST

Two similar toads may be encountered along the trail. The American toad which is common and found throughout the corridor in a variety of habitats, and the Fowler's toad which is uncommon and associated with sandy habitats. You can tell the difference by looking at the belly. American toads have white bellies mottled with gray/black markings, while the Fowler's toad has a plain white belly.

- Two striped snakes may be encountered long the trail. The eastern garter snake which is common and found throughout the corridor in a variety of habitats, and the ribbon snake which is uncommon and typically associated with open canopy wetlands and vernal pools. It is very difficult to distinguish them.

- There are no venomous snakes found along the trail corridor. The timber rattlesnake was historically found along several sections of the corridor; however, these populations were extirpated by the early 1900's.

- Although currently not widespread along the corridor, a non-native turtle, the red-eared slider, has been expanding its range in lakes, ponds and rivers across the state. These introductions are due to the illegal release of pet turtles.

- In addition to habitat type, elevation influences the distribution of some amphibians and reptiles. Although rarely seen because they tend to remain under cover, there are two small "brown snakes" that might be observed along the corridor. The Dekay's snake, which is widespread across elevations and habitats, even occurring in urban areas, and the red-bellied snake, which is typically associated with forest habitats and edges at elevations over 500 feet.
- The most widespread and abundant salamander found along the corridor, the red-backed salamander, is often confused for two separate species as individuals occur in two different color phases. A "striped phase", with a distinct red stripe running down the back, and "unstriped phase", which is solid gray/black with no stripe.
- The aquatic red-spotted newt has a terrestrial stage in its life cycle called an eft. Small bright orange/red efts may be encountered moving about the forest and possibly the trail, especially after periods of rain.

POLLINATOR PATHWAYS AND HABITAT

Charlotte Pyle, PhD
Ecologist (Retired)

Introduction

On the broad landscape scale, the Air Line State Park Trail (ALSPT) can be a focus area for a pollinator pathway. The concept of a pollinator pathway is that many people providing small areas of pollinator habitat can create a pattern of habitat that enables pollinators to move over large areas finding food plants as well as habitat suitable for shelter and reproduction. This involves people working together within Towns and across Town boundaries. People often think of pollinator pathways in relation to the long-distance migration of Monarch butterflies, but they can serve as habitat and safe passage for other pollinators as well.

Opportunities to become involved in a pollinator pathway can range in size from backyards (or even a container garden on a deck) to town parks and state forests. In addition to providing pollinator habitat, pollinator pathways are an ideal way to educate the public about the importance of pollinators.

Most people are familiar with the idea that birds and bees pollinate flowers (for example Hummingbirds and Honeybees, not to mention Butterflies). Fewer people know that various types of native bees and certain "flower flies" in the Hover Fly family (Syrphidae) are important pollinators. Figures 1 and 2 highlight some basics of pollination, pollinator pathways and pollinator habitat need. Links to additional information are provided in Figure 2.

After the figures, three tables outline: (**1)** ways to support pollinator habitat, **(2)** things to do or consider before you start planting pollinator plants, and **(3)** things to consider when choosing plants.

A discussion of how pollinator pathways make connections in the larger landscape is followed by a summary focus on the Air Line State Park Trail as a pollinator pathway.

POLLINATOR BASICS : Pollination = getting male pollen to the female part of a plant

How Pollination Works

Plants need pollination to make fruits and seeds
-- Seeds are needed for new plants
-- People and wildlife eat fruits and seeds

Plant flowers attract pollinators with nectar and pollen
-- Pollinators drop pollen grains when moving to new flowers
-- best results with pollen brought from another plant

Note orange pollen sac on bee's back leg

Bumblebee on New England Aster

Tiger Swallowtail on Bee-balm

Habitat for Pollinators

- Food from plants
- Adult insects eat (and some feed their young) nectar and pollen
- Butterfly larvae eat leaves of Caterpillar host plants

- Freedom from pesticides
- Insecticides kill insects.
- Fungicides and herbicides may cause non-lethal, but long-run, harm.

- Insects need nectar and pollen through Spring, Summer and Fall.
- Trees like Maples, Willows and Black Cherry are important sources of early-season nectar.
- Because insects can fly, a site doesn't have to have food in all seasons. (Better for a pathway to include large masses of one color (butterflies) or one species (honey bees) than planting one of each.)

Milbert's Tortoise-shell Butterfly *Caterpillar host plant is Nettles*

Native insects will take nectar and pollen from non-natives like Queen Anne's Lace, but host plants typically are natives.

Figure 1. Pollinator Basics (C. Pyle 2023)

POLLINATOR PATHWAYS-pollinator habitat connected or within safe and easy flight distance

- Air Line State Park Trail – obvious path, many vegetation types, water sources, good access

WHY ARE POLLINATOR PATHWAYS IMPORTANT?

- help educate about pollinators
- provide habitat for pollinators
- facilitate safe movement (long & short distance)

FINDING & CREATING POLLINATOR HABITAT

- don't overlook trees – important caterpillar host plants are Oaks, *Prunus* (Cherries, etc.), Willows, Birches, Poplars/Aspens
- look for existing patches of nectar sources
- look for easy access for watering plantings in their 1st year
- involve students and public groups to grow seedlings
- use signage to educate

Common Milkweed is an excellent nectar plant. Milkweeds also are the Monarch host plant. Each Spring it takes multiple generations of Monarchs to get back north to CT.

Good nectar source in un-mown field with native Goldenrod & Joe-Pye Weed

Shrubs can be good habitat, offering not only nectar, pollen, and caterpillar food but also acting as a windbreak.

⇐ Summersweet is an excellent nectar source.

Additional Information

https://www.pollinator-pathway.org/

http://xerces.org/ **(publications, etc.)**

Figure 2. Pollinator Pathways and Habitat

C. Pyle 2023

Table 1. WAYS TO SUPPORT POLLINATOR HABITAT (C.Pyle 2023**)**
1. Build on existing pollinator plant species and habitat
2. Recognize caterpillar host plants
3. Delay roadside mowing until plants are done flowering
4. Avoid harmful chemicals - "Pesticides" is an umbrella category for products designed to kill unwanted living organisms: -- insectides kill insects, herbicides kill plants, fungicides kill fungus -- certain fungicides and herbicides can cause immune system weaknesses, disorientation, and other non-lethal effects that ultimately affect insect populations' survival and reproduction -- a good reference on pesticides is www.xerces.org/pesticides - do not use insecticides in pollinator planting area or where spray can drift in on air currents - as a general precaution, limit the use of herbicides in the area - never spray herbicides in an area where plants are in flower - if herbicides on woody plants are deemed necessary, use cut and paint stem method, not foliar spray - NOTE: strict interpretation of Pollinator Pathway rules say no use of pesticides
5. Plant native species
6. Do not plant non-native, invasive species - Regardless of any lack of prohibition, do NOT plant any species legally-recognized as Invasive or Potentially Invasive in Connecticut https://cipwg.uconn.edu/wp-content/uploads/sites/244/2022/11/CT-Invasive-Plant-List-2018_Common-Name-1.pdf -- Notes: - Most species on the Connecticut list of invasive species are prohibited by statute (ban on buying, selling, and transport [except for disposal]). - For those that are not prohibited, note that **the lack of prohibition relates to socio-political factors and is not meant to indicate a lesser degree of harmfulness**. - Be better safe than sorry -- Avoid plant species on the Connecticut Research List https://cipwg.uconn.edu/wp-content/uploads/sites/244/2015/08/CT-Invasive-Plant-Research-List-Aug-2015.pdf

7. Spread the word about the importance of pollinator habitat by planting and maintaining demonstration plantings (including signs) in highly visible places
8. Encourage farmers to protect and to create pollinator habitat in uncultivated areas and roadsides. In some situations, technical and financial assistance may be available from the USDA-Natural Resources Conservation Service. (The main NRCS office for Connecticut (860-871-4011) can tell you whom to contact if local USDA service centers cannot be found on the internet.)
9. Keep records - plantings (species, plant size, number, planting date, care given) - photographs of insects on flowers (include plant species, date, time of day, weather) - time spent establishing/managing habitat
Table 2. BEFORE YOU START PLANTING (C. Pyle 2023)
1. Before enhancing or creating pollinator habitat, consider what site preparation will be needed
2. Evaluate and look for on-site availability of habitat elements - existing caterpillar host plants and good nectar and/or pollen plants - water - shelter from wind (for butterflies) - flat rocks that will receive morning sun (to help butterflies warm up enough to fly) - mud puddles for male butterflies to extract and concentrate nutrients from water - overwintering habitat (*e.g.*, stone walls; ask if it is acceptable to leave dead stalks standing on this site?) - nesting habitat for native bees (*e.g.*, do not cover all patches of bare, sandy soil) - potential bumblebee nesting sites (e.g., rock walls, hollow logs, and bunch grasses) Note: Bumblebees have small colonies and are rarely aggressive
3. Types of areas you may wish to avoid - areas with extensive invasive plant problems (or, control the invasives before planting) - although Poison Ivy is a native species, you may wish to avoid areas where it has a heavy presence
4. When planning to remove invasives, first consider whether they are serving a valuable purpose,

for example, Multiflora Rose on an eroded stream bank might be better left in place. Where shrubby habitat is in short supply and shrub-loving birds and mammals are present, invasive shrubs are better than no shrubs at all. (Controlling the additional spread of the shrubs and/or a staged removal and planting with natives may be appropriate rather than immediate, total site clearing).
5. Consider what maintenance may be needed - monitor at least once a year for new invasive plants (and be prepared to act as needed) - for plants planted in Spring, be prepared to water as needed for the first Summer - your site can be made more showy and have a longer flowering period if you deadhead blooms
6. Recognize the level of maintenance needed is different at different kinds of sites - it is important to make the appearance of demonstration plantings attractive and/or to include signage that explains the purpose of untidy vegetation (*e.g.,* dead stalks left as overwintering habitat) - it is easy to take care of individual plants in small, residential plantings - for areas away from "civilization" (especially larger areas), recognize that intensive, backyard style maintenance is not practical.
7. Consider the potential for excessive deer browsing **-** if needed in your area, design with plants that are more resistant to deer. (Nothing is deer-proof!) - deer protection may be needed for young plants
8. Plants vs. seeds -- consider: likely survival at your site, labor / site prep, and materials cost
9. If you are going to want a large number of plants, pre-ordering/pre-planning is strongly advised
10. Consider engaging students and other community members in growing pollinator plants from seed. (This will require someone to re-pot seedlings and water them over the summer until they get large enough to survive when planted in the fall.)
11. You may wish to start with small projects

Table 3. PLANT CHOICE CONSIDERATIONS (C. Pyle 2023)

1. Native vs. non-native

- **Natives are preferred** for pollinator plantings because native insects have roles in the ecosystem; and to survive, the insects require the plant species with which they have evolved relationships; *e.g.*, nesting bird success depends on the food source provided by the larva of insects who in turn require particular plants or groups of native plant species to feed upon.
- **visit GoBotany.NativePlantTrust.org** to find out if a suggested plant species is native to Connecticut
- when describing your plants as "native," make sure to say native **to** _____ (e.g., CT, Eastern US, etc.)

2. "Nativars" (= cultivated varieties of native species) **vs. "Straight" Species of Native Plants**

- **using "straight" species** bypasses the *potential risk* that the cultivar selection process has resulted in the loss of characteristics valued by pollinators and other wildlife (e.g., a flower form with less accessibility to pollen and nectar; lowered plant height that benefits predators of birds; etc.) or the loss of characteristics that made the straight species more genetically-fit to grow in the wild (issue of potential "swamping" of the natural native gene pool with unfit genes)
- **cultivated varieties of native species** may offer characteristics that make the plants more suited to gardens

3. Attractiveness of Different Flower Colors to Different Pollinators

- **Butterflies:** are attracted to bright shades of red, yellow, orange, pink, purple, and even bright white blossoms that are flat-topped or clustered and have short flower tubes.
- **Bees:** many species prefer purple, violet or blue hues, especially those with color patterns (sometimes not visible to humans) that guide the bees to the nectar; Also yellow flowers with ultra-violet markings that people cannot see; Bees see red as black so it does not attract them
- **Flies:** those that do pollination tend to come out early in the year and like clusters of small white (or sometimes yellow) flowers, especially with scents not pleasant to humans -- these flower flies also require water availability

4. Attract Pollinators with Masses of Flowers close together

- **flying butterflies** respond to large patches of one color (as opposed to intricately mixed colors)
- **honeybees** like masses of one species at a time (**bumblebees** are not so picky)

5. To promote cross-pollination (which results in better fruit production and seed set), multiple individuals of the same species should be planted at a site; and it can be good to have some of the same plant species in nearby pollinator plantings

6. Plant sun-loving species in sunny locales for best flower production

7. To help shade soil to deter weeds and to enhance massed color, plant densely, including species that tolerate some crowding and/or some layering of plants overhead
8. Choose plants from a diversity of families to promote pollinator diversity
9. Include plants with long-lasting dead stalks for butterflies over-wintering in chrysalis form
10. In certain locales, choosing low-growing plants may contribute to human's sense of safety
11. When purchasing plants and seeds, check to make sure that they (or the soil they grow in) have not been pre-treated with with systemic insecticides or fungicides.

Pollinator Pathways Make Connections in the Larger Landscape




Pollinator pathways are rather abstractly defined and represent areas where people intend to work together for the benefit of pollinator species and their movement across the landscape. Pollinator gardens may be components of the pathway. In general, pollinator gardens can be concretely defined as to their location and boundaries, and they tend to be small. Despite the word *pathway*, the habitat areas under management for pollinators on a pollinator pathway typically come in bits and spurts rather than in an unbroken chain of pollinator habitat. (And that is OK because pollinator insects can fly.)

While both backyard pollinator gardens and pollinator pathways serve the goal of providing habitat for pollinators, the backyard manager may be more focused on visual enjoyment of butterflies in the garden than thinking about how pollinators move across the landscape. Yet, the presence of many small pollinator gardens sustains pollinators and helps them navigate the larger landscape.

Advice to people establishing pollinator habitat is to provide early, mid-, and late-season sources of nectar and pollen. At the backyard scale, providing nectar over all three seasons certainly will help ensure seeing butterflies throughout the year, but opportunities for massing flowers (which attracts pollinators to the area) may be lost if the garden is small.

In the often-natural landscape setting of the ALSPT, large masses of flowers of a single color can draw passing butterflies out of the sky. Honeybees, who like to work in areas where there are many plants of a single species in bloom, will seek out massed flowers of one species.

It is important to realize that just because a pollinator is feeding on nectar, it does not mean that pollination is occurring. The pollen carried from one flower must be deposited on another flower of the same species. When multiple individuals of the same species are present, it increases the chance that the pollen that falls off the pollinator will land on the right species.

In the big picture, the goal of a pollinator pathway is to benefit pollinators and in doing so support pollinators' ecological relationships with other living things. Making sure to promote caterpillar host plants and bee nesting habitat helps ensure the long run presence of the pollinators. As so beautifully detailed in Doug Tallamy's research results, providing habitat for caterpillars not only supports a new generation of butterflies, it supports a crucial food source for the young of countless bird species.

Most butterflies eat nectar as adults. Therefore, when planting or identifying good caterpillar host habitat, it is a good idea to make sure there is a close-by, or on-site, nectar source for the egg-laying adult. (Note that although butterflies have fairly specific caterpillar host plants, they are not fussy about the species of the nectar sources.)

The question of how close together should patches of pollinator habitat be on a pollinator pathway is very hard to answer for a variety of reasons. Different species of insects will fly different distances; when insects are foraging for food, they tend not to fly the maximum distance recorded for their species; measurements of how far insects fly in search of food are confounded by weather conditions, time of day, and what food sources were present in the landscape. The good news is that insects can and will fly, so food sources do not have to be contiguous.

An unwanted connection along the pollinator pathway that may occur when potted plants are brought to a new site is the introduction of the invasive Asian Jumping Worms (aka Crazy Snake Worms - *Amynthas agrestis*, *Amynthas tokioensis* and *Metaphire hilgendorfi*) which can be recognized by their jumping behavior when handled (if not too cold) and the coarse castings they make (that resemble greasy coffee grounds). To avoid getting infestations of Jumping Worms, plant seeds or bare root stock, or get plants grown in fresh soil media and kept in containers not touching the ground.

Involvement with a pollinator pathway can lead to beneficial connections between *people* within the community and beyond. Tours of plantings and hikes on the trail are suggested.

Summary focus: Air Line State Park Trail as a Pollinator Pathway

The Air Line State Park Trail is already in place, so it is easy to map or discuss specific locations along what will become the pollinator pathway. The Trail offers multiple ways to develop a pollinator pathway. Different types of habitat enhancement will make sense in different places and for different groups of people. For example,

1. Demonstration gardens whose purpose is to excite the public about pollinators.

- These gardens are examples of *You, too, can do this!* and they should be placed to be easily noticed by the public in locations such as trail heads or other points of access/intersection along the trail.
- Signage and plant labeling is a good idea.
- To draw the public in, small paths may be included within the garden.
- Aesthetically pleasing demonstration gardens are high maintenance and should be located where there is easy access for volunteers.

2. Enhancement of a variety of naturally occurring habitat types found along the Trail (*e.g.*, wetlands, Oak forests, Mixed hardwoods. etc.) creates habitat for the diversity of pollinators that naturally occur in different habitat types.

When evaluating natural sites, look for the absence of invasive plants and poison ivy and assess the current availability of multiple habitat features such as caterpillar host plants, existing nectar and pollen plants, puddled water, shelter from wind, rocks that get morning sun, sunny site conditions that would benefit from the planting of nectar and pollen plants for bees, butterflies, and others.

Early successional habitats (grassy or scrubby open areas) are valuable habitat in short supply in Connecticut. These habitat types need maintenance to remain open. Sites chosen for such management should be located where it is possible to get brush-hogging equipment in.

Development of a pollinator pathway will be a work in progress as partners get to know the areas under their jurisdiction and choose where to work. Both successes and failures or glitches should be acknowledged. New knowledge, new partners, and new connections are to be expected.

POMFRET FOCUS AREA

Watershed and Hydrology Review

Compiled by Jean Pillo, Watershed Conservation Project Manager
Eastern Connecticut Conservation District.

The Wyndham Land Trust Gellert/Valentine Preserve Site Review November 1, 2022.

The Wyndham Land Trust Gellert/Valentine Preserve properties (Preserve) was assessed as a potential connection between the ATSP and a local ice cream retail operation located on Route 97 in Pomfret, CT. These properties are in the Blackwell Brook watershed, a tributary of the Quinebaug River. In the draft 2022 Integrated Water Quality Report prepared by CT DEEP, there are no known water quality issues in the Blackwell Brook watershed. Blackwell Brook has been assessed for Habitat for Fish, Other Aquatic Life and Wildlife and found to be fully supporting. The brook has not been assessed for recreational uses. Blackwell Brook is not classified for drinking water.

The "Preserve" includes an existing trail system that connects with the ATSP at two points. The southernmost connection to the ATSP starts out almost perpendicular to the slope. Erosion was noted on parts of the trail. Installation of water bars across the grade on an angle is recommended to dissipate any accumulated flow to reduce trail erosion. Due to the existing condition of the trail, it is not recommended that the trail be promoted for mountain bike travel.

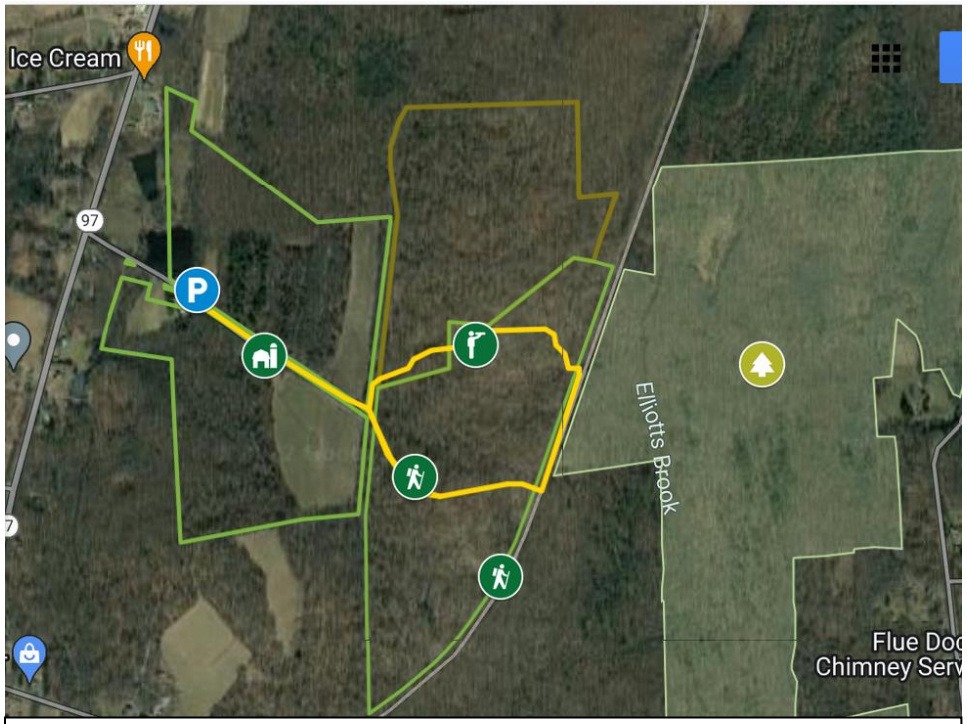


Figure 1 Existing Trail System on the Wyndham Land Trust Gellert/Valentine Preserve

Guidance for the placement of water bars can be found at this link. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5322689.pdf

Figure 3 Southern access to Gellert/Valentine Preserve showing trail erosion and recommended erosion control practice to reduce trail erosion.

The northern access to the Preserve from the Airline Trail is not perpendicular to the slope but is narrow in areas. The trail sides are made up of early successional habitat and deciduous trees. The forest appeared to have been thinned, either intentionally or from a spongy moth outbreak. There may be less impact from mountain bikes usage on this trail, but the trail is narrow in places and not wide enough for both hikers and mountain bikers to use simultaneously.

Where the two trails converge to the access path to Ayers Road, the trail follows an unpaved road.

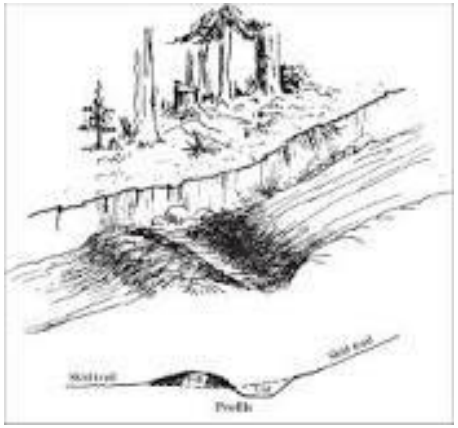


Figure 2 Sketch of a water bar that is a low tech and cost-effective type of erosion control on trails.

Figure 4 Access to Gellert/Valentine Preserve from Ayers Road.

Educational Interests to The Public

From the Wyndham Land Trust website: “Theodore Gellert donated his 125-acre property to the land trust in December 2007, and the land trust acquired the 43-acre Valentine property from siblings Robert Valentine and Mary Feathers in 2015. You can follow a rocky one-mile trail from the parking area on Ayers Road through the Gellert Preserve down to the Airline Trail. The trail continues along the Airline Trail for 300 yards before cutting back up the hill and back to the parking area. (Ayers Road is just south of We-Li-Kit Ice Cream on Route 97.)”

Figure 5 Viewshed looking south from the northern connection to the ATSP.

Recreational activities, such as hiking, will have minimal impact on the watershed ecology. Use of mountain bikes on the trail, especially steeper sections, will increase the potential for soil erosion. The landscape surrounding the trail includes early successional habitat and young deciduous trees. Wildlife viewing opportunities in this type of habitat that is in decline statewide is an additional benefit to less site disturbance.

To access to We-Lik-It Ice Cream from the Wyndham Land Trust Gellert/Valentine Preserve currently involves following Ayers Road to Route 97 (Hampton Road) and then following the state highway north about 1000 feet to the establishment. The Wyndham Land Trust property boarders the property with the eating establishment, so development of an alternate route while remaining on the preserve was considered. A review of the natural resources in the area shows that the eating establishment (noted with a star in Figure 4) is surrounded by wetland soils so any new trail access to the establishment would require a permitted wetlands crossing. These wetlands drain into a chain of ponds associated with an unnamed headwater stream. The benefit of blazing a new trail with a wetlands crossing may not outweigh the environmental benefit of maintaining the undisturbed riparian vegetation currently in place.

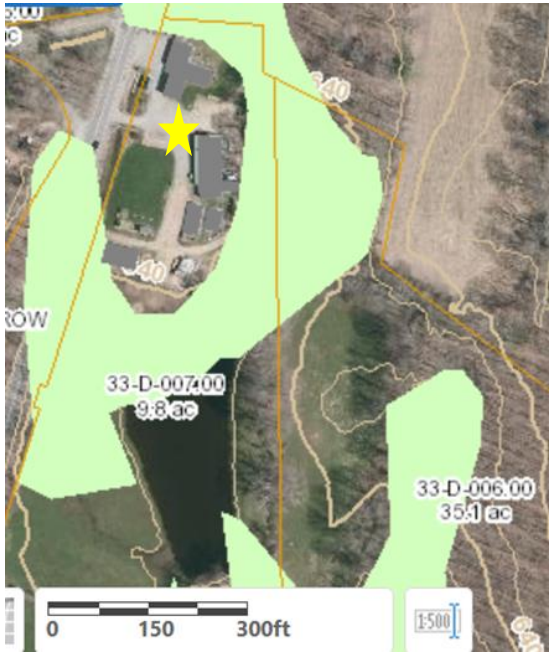


Figure 6 We Lik It Ice Cream stand

Mashamoquet -Town Park Connections
Site Review December16, 2021

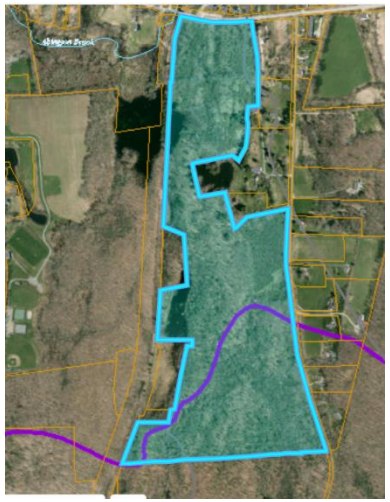


Figure 7 Eastern parcel of the Pomfret Woods. The purple line indicates a watershed divide.

Pomfret Forest is preserved open space properties that abut both sides of the Airline Trail State Park in Pomfret, CT. The land is owned by the Town of Pomfret. The majority of the land drains to the north towards Abington Brook in the Mashamoquet Brook watershed. Mashamoquet Brook drains to the Quinebaug River. Both Abington Brook and Mashamoquet Brook are listed as impaired for recreational water quality due to exceedances of *E. coli* bacteria from unknown sources. Mashamoquet Brook is listed as fully supporting Habitat for Fish, Other Aquatic Life and Wildlife. There is insufficient information on the aquatic habitat quality of Abington Brook. Portions of the parcel on the eastern side of the Airline Trail State Park are in the Blackwell Brook watershed. As previously mentioned in this report, there are no known impairments of water quality in the Blackwell Brook watershed.

There are multiple access points to visit these properties, including access from the Pomfret Recreation fields from the west and Wolf Den Road from the east. The 131 acres of land have been developed by the

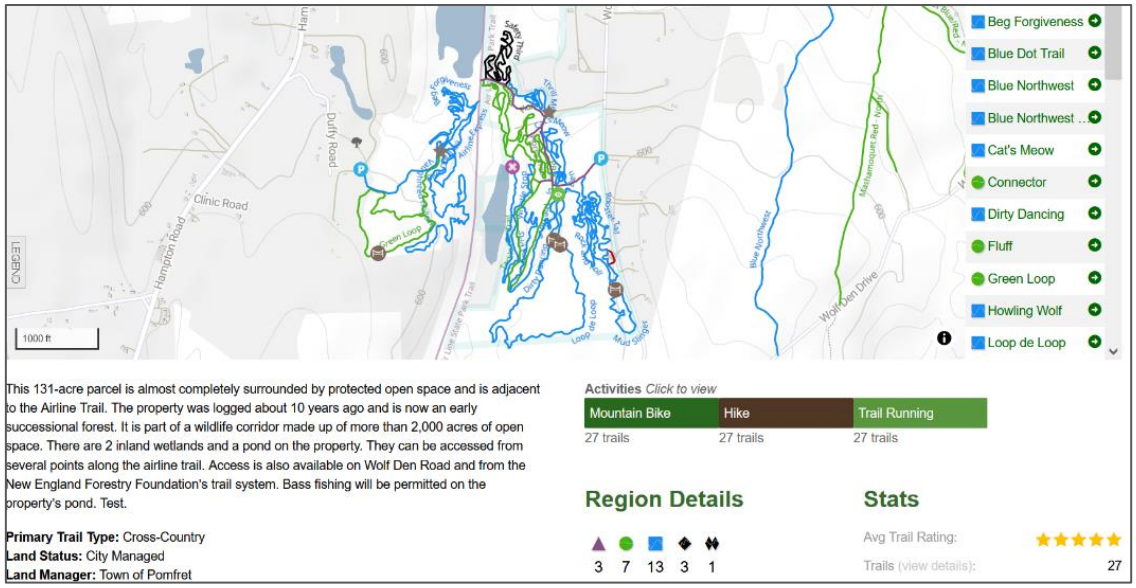


Figure 8 From the Quiet Corner New England Mountain Biking Association (NEMBA) website https://www.trailforks.com/region/pomfret-forest-45992/?activitytype=1&z=14.0&lat=41.85290&lon=-72.00029

Quiet Corner chapter of the New England Mountain Biking Association to include 8 miles of multiuse trails designed for hikers, mountain bikers and equestrian use. The trail network crosses the Airline Trail State Park.

The property is described by NEMBA as early successional forest and part of a 2000-acre wildlife corridor. The 8-mile trail network developed on the land is shown in an image captured from their website (see Figure 8). Both the eastern and western Pomfret Forest parcels can be accessed from the Airline Trail.

Recommendations

These heavy use trails in the Pomfret Forest should be monitored for signs of erosion, especially where the trails cross over or drain into wetland areas. If excess sediment movement is impacting wetland habitat, consider closing or rerouting the trail.

Alternate Route to We Lik It Ice Cream

1) From the Airline Trail State Park, just west of the Gywn Careg Inn, take Pomfret Rec field trail through the Pomfret Forest to the Pomfret Recreation Fields.
2) Head up to baseball field at top of park. There is a gate across from the baseball field. Follow a dirt road west onto Clinic Road to Route 97.
3) Take left on Route 97. The ice cream stand is less than quarter of a mile on the left.

As the Town of Pomfret land has been developed by NEMBA in part as a mountain bike trail riding destination, it makes more practical sense to reserve the Wyndham Land Trust Gellert/Valentine Preserve for foot traffic only, and direct mountain bike travelers to use the Town of Pomfret property access to the eating establishment on Route 97 from the Airline Trail State Park. The distance between the two access points from the Airline Trail State Park is less than a mile.

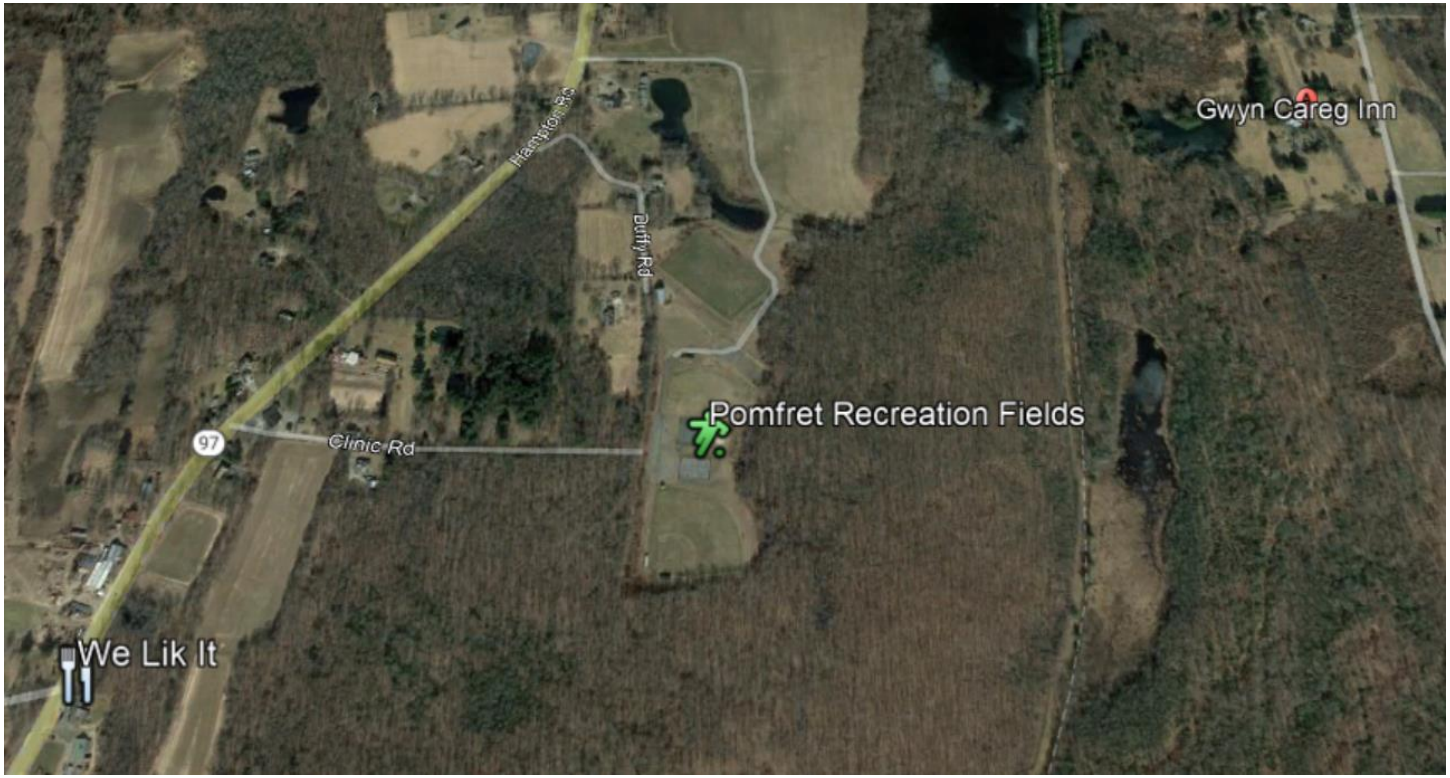


Figure 9 Proximity of the Pomfret Woods multi-use trail network to the Airline Trail State Park and a local ice cream establishment.

LEBANON FOCUS AREA – AGRICULTURE TRAIL PROXIMITY

December 2, 2021 and April 12, 2022 (*Special Site Visit To Evaluate Trail Connections To Adjacent Agriculture*)

The former Krause Farm is located at 38 Krause Road in Lebanon, CT. The land is located within the Ten Mile River watershed. The Ten Mile River is a tributary of the Willimantic River. The Ten Mile River is listed by the CT DEEP as being impaired for recreation due to an exceedance of *E. coli*. The Ten Mile River has also been assessed for Habitat for Fish, Other Aquatic Life and Wildlife and is considered fully supporting. The Ten Mile River is not classified for drinking water.

This former farm is under consideration for development as a shared farm for new farmers. Early planning includes locating a farmers' market on the farm that can be accessed from the Airline Trail State Park. At the December 2, 2021 site visit, we were unable to locate an existing trail from the farmstead to the Airline Trail State Park. In Figure 10 below, an aerial view of the land using Google Earth Pro, there are several existing trails that lead to an old farm road that crosses the Airline Trail.

Figure 10 Former Krause Farm and existing access to the Airline Trail State Park. Within the red boundary are existing access ways to the Airline Trail. are possible.

Northwest of the intersection of the Airline Trail State Park and Cook Hill Road in Lebanon is a farm with multiple cows. The farmstead heavy use area for these animals is in close proximity to the Airline Trail (note circled area in Figure 11). At the time of our April 12, 2022 site visit to this section of the Airline Trail State Park, the land between the barn and the fence adjacent to the trail right of way had no vegetation and was very muddy. There was evidence that manure contaminated stormwater runoff from the property was crossing the Airline Trail toward a wetland area on the northeastern side of the Trail. While the cows in the area had access to greener vegetated areas, many chose to stay close to the barn.

Figure 11 Airline Trail looking northeast from Cook Hill Road

Figure 12 Manure contaminated stormwater flows across the Airline Trail from an adjacent farm.

Figure 13 shows the Airline Trail right of way up to the fence line for the existing farm property. There is a limited vegetative buffer separating the heavy use area of the farmstead and the trail. The roof of the barn lacks gutters. There is limited vegetation in the heavy use area where the animals are confined. Manure contaminated stormwater runoff crosses the Airline Trail and flows toward a wetland area downslope of this section of trail. The wetland system receiving this manure contaminated flow of stormwater is hydrologically connected to a wetland system surrounding the Ten Mile River (see figure 12)

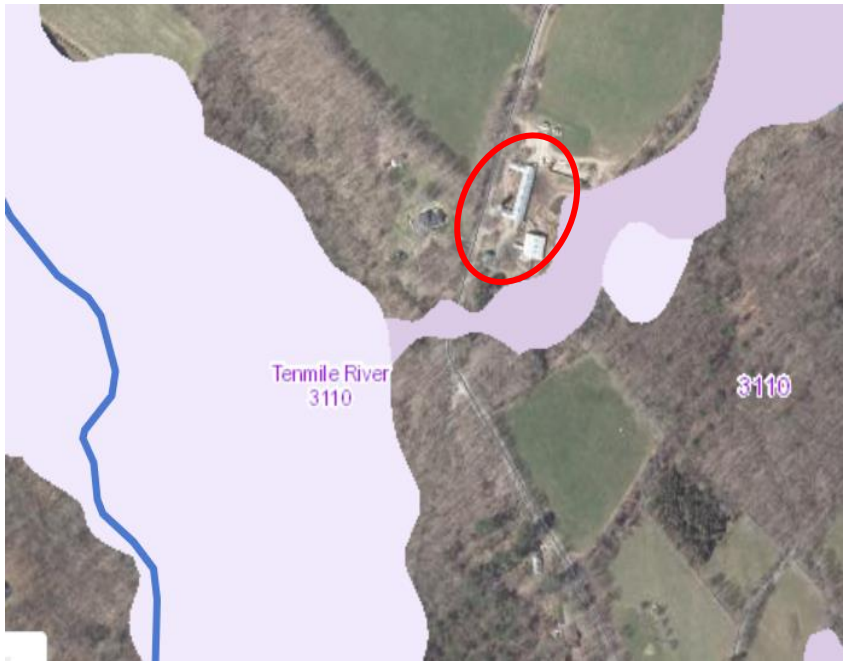


Figure 13 Farmstead with noted runoff is circled in red. Wetland soils are shown in pink. The hydrological connection of the runoff from the farm to Ten Mile River is apparent.

Recommendations for reducing contaminated runoff from impacting water quality in Ten Mile River:

1. The heavy use area of this farm appears to be reinforced with concrete (see Figure 16). Scraping manure off this surface routinely will prevent buildup and overflow of manure contaminated runoff across the Airline Trail surface.
2. Install roof gutters on all barns to collect uncontaminated stormwater and discharge this water away from any manure contaminated areas, especially the heavy use area adjacent to the Airline Trail.
3. Install a feeding ring away from the heavy use area to attract the animals away from areas where manure accumulation is problematic, especially close to the trail.

A second area of concern was noted in the same intersection of Cook Hill Road and the Airline Trail State Park. Stormwater runoff from Cook Hill Road is eroding the trail surface. It is recommended that this be addressed before an erosion gully forms at this road/trail intersection and repeated trail repairs are necessary. Installation of a culvert under the trail surface may be the best alternative. There did not seem to be the capacity to accept additional stormwater runoff directed toward the farm at the same intersection. An engineering study may be required.

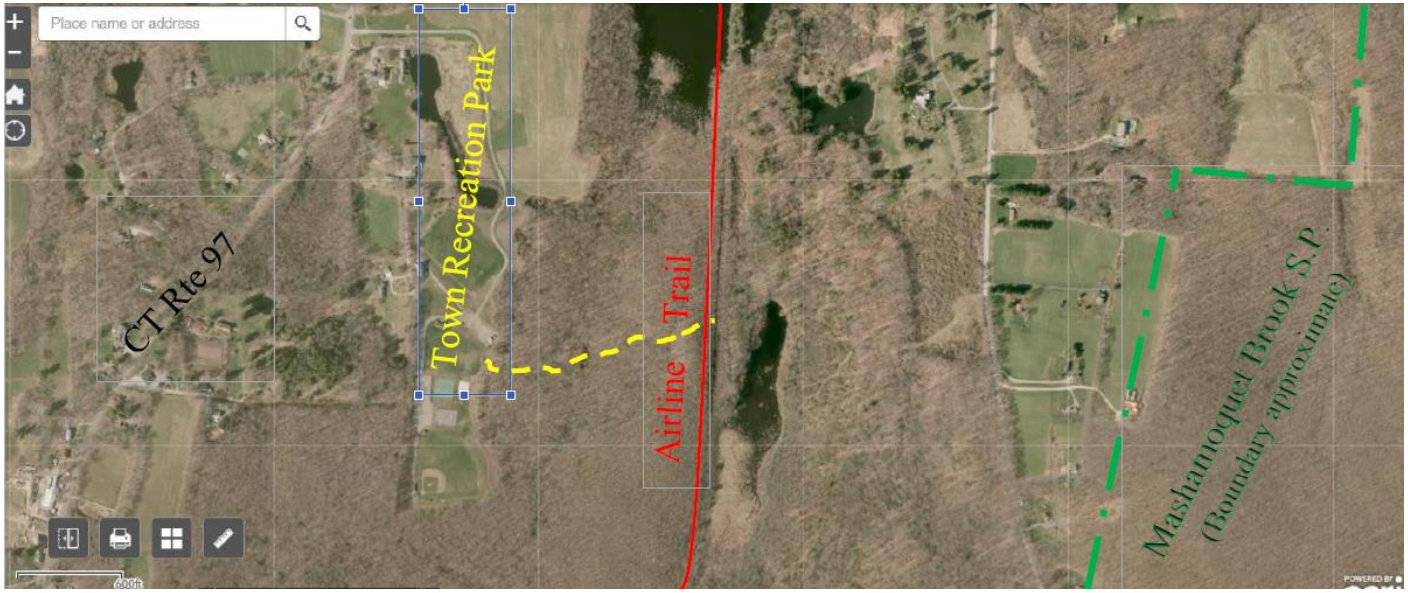
Figure 14 Airline Trail looking southwest towards Cook Hill Road. The trail surface is eroding due to stormwater

Figure 15 Aerial view of the intersection of the Airline Trail and Cook Hill Road. The red arrow indicates where the trail erosion was observed. The concrete reinforced heavy use area of the farm is circled in red.

POMFRET FOCUS AREA GEOLOGY

Randolph Steinen, PhD
Geologist - Connecticut Geological Survey, CTDEEP

TOPOGRAPHY - GEOLOGY



The Airline Trail, south of its intersection with US Rte 44, passes between the Town of Pomfret Recreation Park (on CT Rte 97) and Mashamoquet Brook State Park (Figures 1, 2). A town trail links the Airline Trail with Recreation Park and dirt-bike recreation trails (maintained by a bike club) could link (but does not yet) the Airline Trail with Mashamoquet Brook State Park. This short report describes the geological observations that can be made between the Pomfret Recreation Park and Mashamoquet Brook State Park.

Figure 1. Map showing corridor between Pomfret Recreation Park, the Airline Trail and Mashamoquet Brook S.P. Pomfret town trail shown as yellow dashed line. No formal trail has been established yet between the Airline Trail and State Park. A myriad of bicycle trails can be seen east of the Airline Trail. US Rte. 44 is just north (0.1-0.2 mi) of the upper edge of this map, but is shown on next map and also on the Mashamoquet Brook S.P map at the end of the text. Map is 2019 orthophotography from CTECO website.

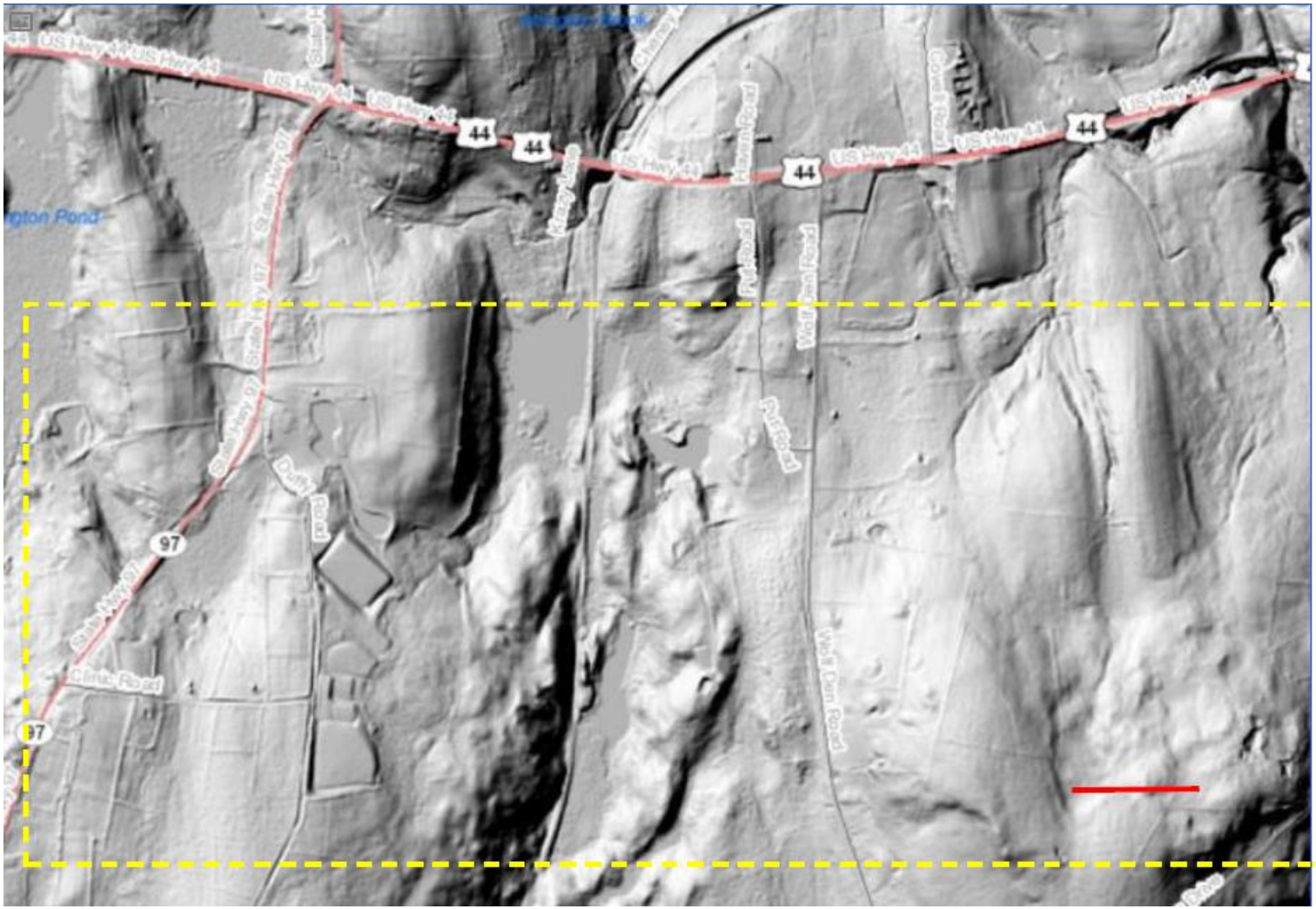
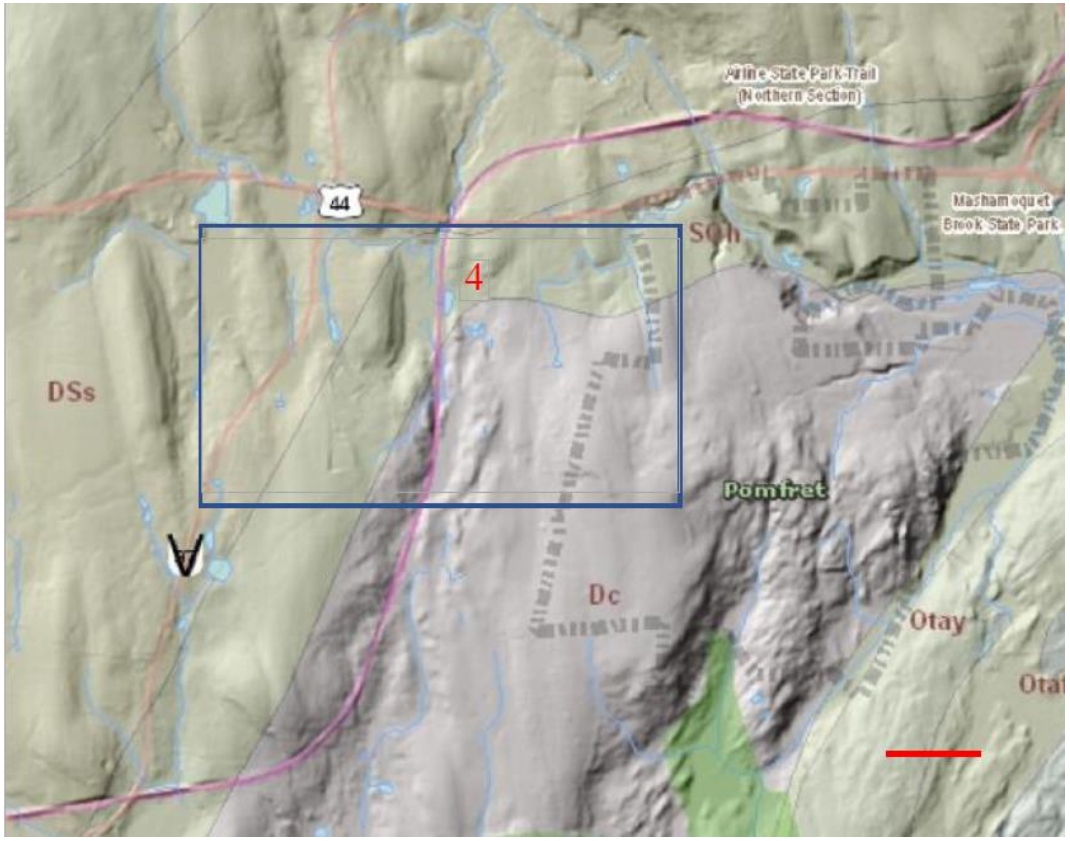


Figure 2. Hillshaded LiDAR image of slightly larger area than shown in Figure 1. LiDAR is a radar generated model (image) of the surface topography and can be thought of as a black-and-white photograph of the land surface without trees or buildings. Yellow (dashed) box indicates approximate area of Figure 1 (Airline Trail is oriented north/south near center of map). Notice the smooth hills both east and west of the Airline



Trail, as contrasted do lumpy area in the middle. Red scale bar =0.2 miles. Map from CTECO website.

Topography of the area is generally fairly gentle (Figure 2). Most hillsides do not rise steeply and the trails are easy hiking for most people….it is, however, not wheel-chair accessible. Hilltop elevations vary between 600-700 feet and valley bottoms are 500-550 feet above sea level.

Bedrock is poorly exposed in the area (Figure 3) and is covered by thick glacial soils in many places, especially the areas with smooth topography. In the lumpy areas scattered bedrock exposures may be seen, some of which form 5-10 ft. cliffs. All of the bedrock formations are composed of metamorphic rocks that formed hundreds of millions of years ago by a series of plate tectonic events1. Several different rock formations have been mapped in the area (Figure 3) but the only rocks that crop out in the area are light gray to gray gneiss2 referred to as the Canterbury Gneiss (Rodgers, 1985). The Canterbury Gneiss is the youngest formation in the

Figure 3. Bedrock geologic map of part of the area traversed by the Airline Trail in Pomfret. Approximate area of Figure 1 shown by blue rectangle . Short dashed lines (gray) mark the boundary of Mashamoquet Brook S.P. Light gray area (Dc) marks the extent of the Canterbury Gneiss. Tan colors indicate Hebron Gneiss (SOh) and the Scotland Schist (DSs). Otay and Otaf are Tacnic Hill Formation. Green area at bottom of map is Natchaug Forest. Number 4 indicates location of Figure 4. Map after Rodgers, 1985). Red scale bar approximately 0.4 mi. (compare with scale in Figure 1).

area. The Canterbury Gneiss ranges in composition from metadiorite to metagranite and is composed of feldspar, quartz, and small amounts of biotite mica. It is medium- to coarse-grained and weakly foliated, but may display lineations of biotite mica. It is of Devonian age.

The Scotland Schist2 is a gray to silvery, locally rusty weathering schist composed mostly of biotite and muscovite mica. Where muscovite mica is more prevalent the schist is silvery. The Scotland Schist does not crop out in the area. It is Siluro-Devonian in age.

1. The interested reader can refer to the following for a technical description of the events: Wintsch and others, 2012, and 2014 cited in the references. See also Stone and others, 2012, p. p. 8-11, for a short summary.

2. A gneiss is a light and dark, medium- to coarse-grained metamorphic rock characterized by compositional banding of light and dark minerals. A schist is a layered metamorphic rock whose layering is primarily defined by parallel alignment of micas.

Figure 4. Canterbury gneiss. A. Low cliff along bike trail to west of Airline Trail south of US Rte 44. It is light colored and here forms low (~3-5 ft high) cliffs. B. Gray gneiss with faint lineation seen on foliation plane. Pen is 5.5 inches long.

The Hebron Gneiss also does not crop out in the local area but boulders of Hebron Gneiss may be found along the trail in the Pomfret Recreation Park (Figure 5). The Hebron Gneiss is dark gray schist interlayered with greenish gray calc-silicate gneiss. It is fine- to medium-grained with millimeter to centimeter layering. It is Siluro-Ordovician in age.

The more recent geological history, that is, the end of the last Ice Age, is the most interesting part of the geologic story in this area. Only 22,000 years ago this area was near the end of an ice age. Glacial ice covered the northern part of North America as far south as the north shore of Long Island. A glacier is an accumulation of ice that is thick enough that the stress of its weight causes it to flow either downhill, as in the case of mountain glaciers, or from areas of thicker ice toward areas of thinner ice, as in the case of continental glaciers. In eastern Connecticut the ice was a mile or more thick at its height and flowed from north-northwest to south-southeast. Flowing ice scrapes over the underlying bedrock and freezes into cracks and crevices, gradually weakening the rock and pulling rock fragments away from the rock surface. In the process it grinds rock into a mixture of mud, sand, and gravel particles, which it deposits either beneath it as it flows, or later,

when the ice melts. Both processes formed the glacial soils that cover New England. These soils are referred to as till. The ice sculpts the land by erosion or deposition into elongate hills, some of which are covered by thick till. Those covered by thick till are referred to as drumlins. Stone and others

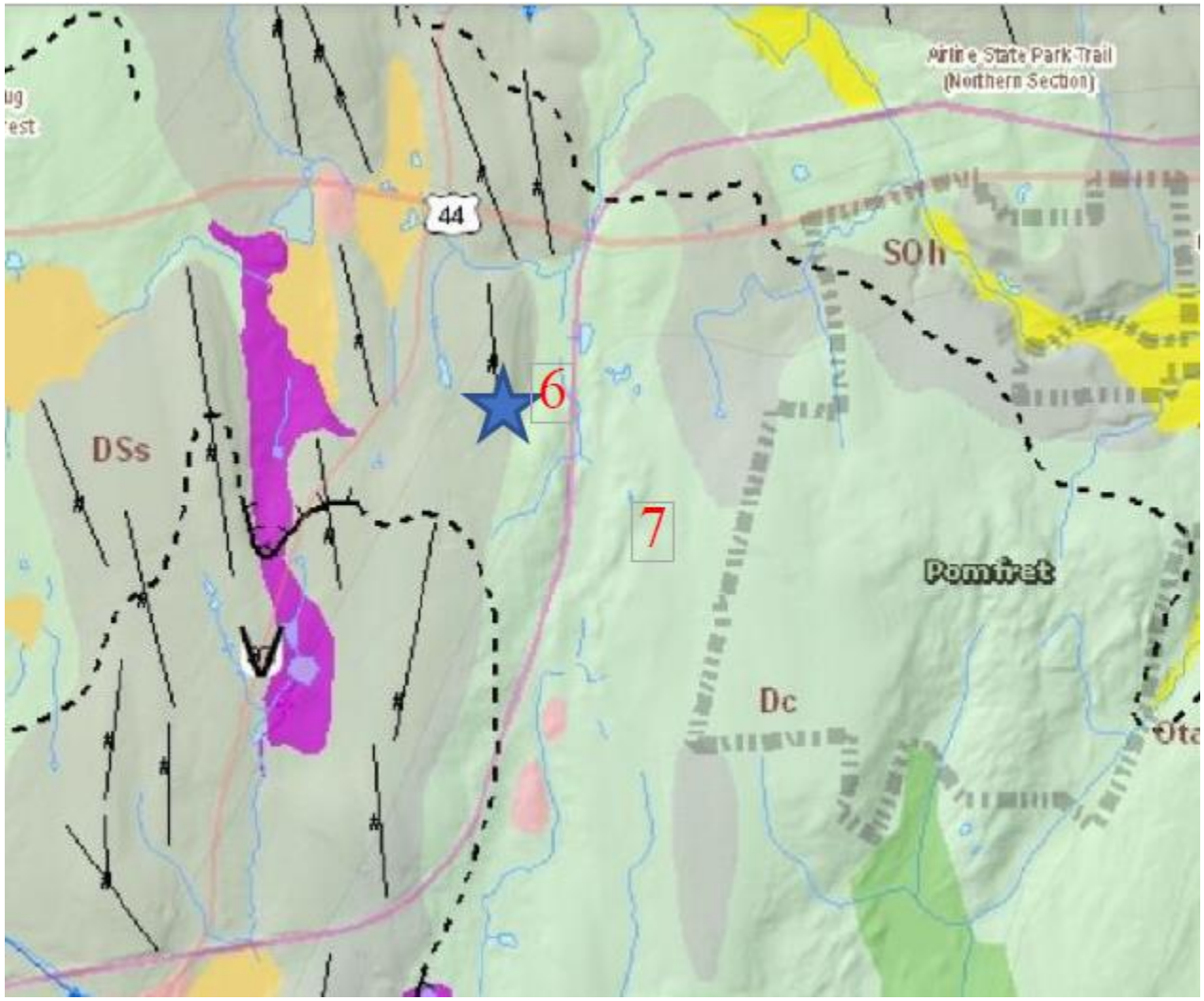


Figure 5. Quaternary Geologic map of the area adjacent to the Airline Trail in Pomfret. Blue star indicates approximate location of Pomfret Recreational Park. Green areas are covered by till, gray areas by thick till (greater than 15 ft). Orange, yellow, purple, green, and pink areas are various sand and gravel deposits. Black dashed lines are interpreted southern edges of the ice where rocky debris was deposited. Straight black lines show drumlin axes which presumably indicate direction of ice movement during formation of each drumlin. Numbers 6 and 7 are approximate locations of pictures in Figures 6 and 7. Gray dashed outline is the boundary of Mashamoquet Brook S.P. Geology from Stone and others, 2005.

(2005) indicate that the smooth, elongate hills in Pomfret Recreation Park and vicinity (Figure 5) are drumlins.

Climate began warming 21-22,000 years ago because of greater amounts of solar radiation reaching the northern hemisphere. Because it was warmer in the south, the southern edge of the glacial ice gradually melted back to the north. By 19,000+ years ago the southern edge of the glacier had melted back to the Pomfret area in eastern Connecticut. A lobe of glacial ice extended in the low areas along the eastern side of what is now the Pomfret Recreation Park. As a result, a poorly developed recessional moraine developed there and to the south along the edge of the ice lobe. A slight concentration of boulders (Figure 6) marks the location of the morain edge as seen on one of the Recreation Park trails. The boulders are composed mainly of Hebron Gneiss, but also boulders and large rocks of both Canterbury Gneiss and rocks from farther north can be found.

Figure 6. Angular to slightly rounded boulders and large rocks along Recreation Park trail on the eastern slope of a drumlin exhibiting smooth topography (see Figure 5 for location). Compare to amount of rocks seen on higher parts of the drumlin in the Recreation Park. A. Small boulders and rocks composed mainly of Hebron Gneiss. B. Small boulders and rocks composed of Canterbury Gneiss and Hebron Gneiss along same trail.

Another set of boulders (Figure 7) can be found on the east side of the Airline Trail in the bike park. This set contrasts to the morainal boulders in that they are of only one composition, and they are mostly well-rounded. Those boulders are composed entirely of Canterbury Gneiss. They are interpreted as deposits of a meltwater stream flowing over and eroding local outcrops of Canterbury Gneiss.

Figure 7. Rounded boulder field deposited by a meltwater stream. See Figure 5 for location.

References cited:

Rodgers, John, compiler, 1985, Bedrock geological map of Connecticut. Connecticut Geological and Nat'l Hist. Surv., Connecticut Natural Resources Atlas Series, scale 1:125,000

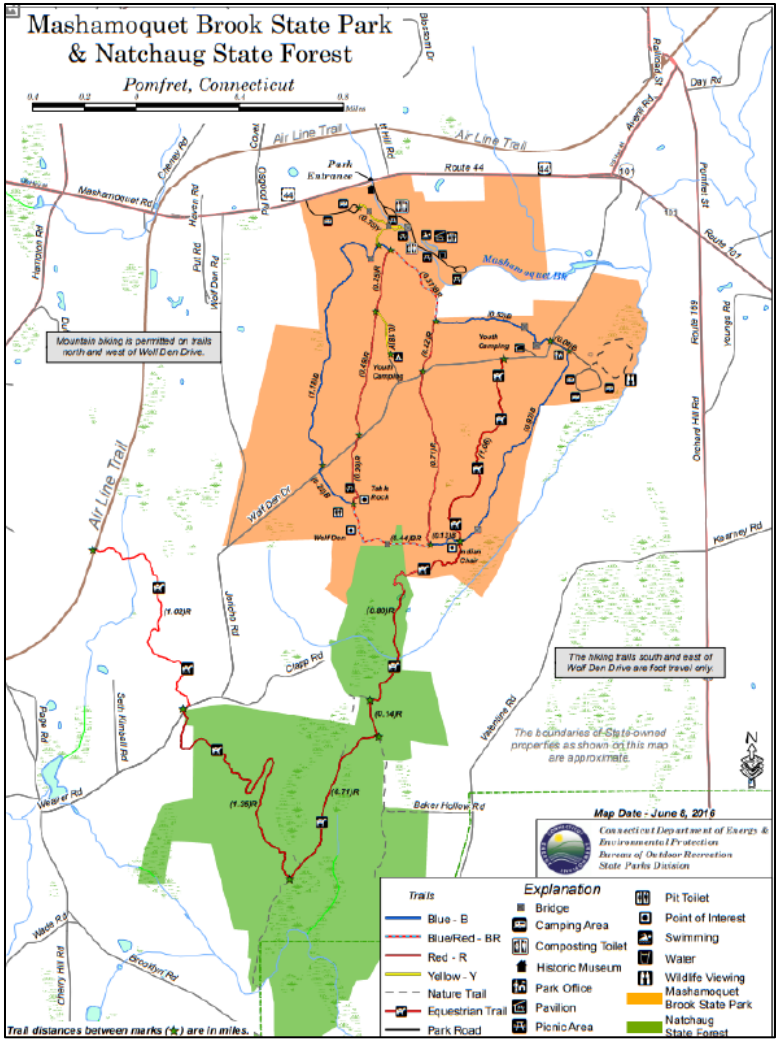
Stone, J.R., and others, 2005, Quaternary geologic map of Connecticut and Long Island Sound Basin. U.S.Geol. Survey Scientific Investigations Map 2784, scale 1:125,000

Stone, J.R., and others, 2012. Connecticut

Terrior. Geol. Society of Connecticut Fieldtrip Guidebook No. 3, 40p.

Wintsch, R.P., and others, 2012. Temperature-time paths tie the tales of two forelands: the Narragansett and Hartford Basins. Geol.Soc. Am NE Section Guidebook for Fieldtrips, p. C-1 to C-32.

Wintsch, R.P., and others, 2014, Crustal thickening by tectonic wedging of the Ganderian rocks, southern New England, U.S.A:….Journ. Structural Geol., 69:428-448.



Appendix Figure 1. Trail map of Mashamoquet Brook S.P. and adjacent area.

HEBRON FOCUS AREA

(Note that the Hebron Survey is based on an in-depth analysis of specific parcels for the town of Hebron as part of an Environmental Review Team Report. This report serves as an example of how natural resources and wildlife should be evaluated at a baseline level for potentially impacted area near and on the Air Line State Park Trail system.)

WATERSHED ANALYSIS

Kelly Starr, Natural Resource Specialist,
CT River Coastal Conservation District

Overview of Watersheds and Best Management Practices for Water Quality Protection

The Bernstein Property is located within the Jeremy River, Raymond Brook, and Judd Brook subregional basin/watersheds. The Hibbert property is located within the Jeremy River and Raymond Brook subregional basin/watersheds. These smaller basins/watersheds are located within and contribute to the regional basin, the Salmon River Watershed. The Jeremy River Watershed is the largest of the three watersheds, approximately 12.87 sq. acres, followed by Raymond Brook Watershed 9.04 sq. acres, and Judd Brook Watershed 5.11 sq. acres. The Salmon River Watershed and all the contributing basins/watersheds are in the Connecticut River Major Basin. The land cover of the watershed is mixed, according to the University of Connecticut Environmental Conditions Online, Land Cover and Change GIS data layer (https://cteco.uconn.edu/ctraster/rest/services/landcover).

The land cover data are from 2015 and presented by basin, which includes: the Jeremy River, Judd Brook, Raymond Brook, Meadow Brook, and Pine Brook subregional basins. Although the data are a few years behind, they still provide a good baseline for the land cover and how it has changed. Much of the basin where the properties are located is forested (65-75%), followed by developed (15.1- 20%), impervious cover (6-10%), agriculture fields (4.1 -8%), and turf and grass (3.1-8%). The GIS data layer also provides information for the percent land cover change for 1985 to 2015. In that 30 year time span, the forest cover decreased (5.0 - 9.9%), impervious cover increased (0.6 -1%), agricultural fields decreased (15.5-29.9%), and turf and grass increased (50.1-75%). The basin area that was mapped surrounding the properties is predominantly forested and undeveloped, which has a considerable impact on protecting water quality.

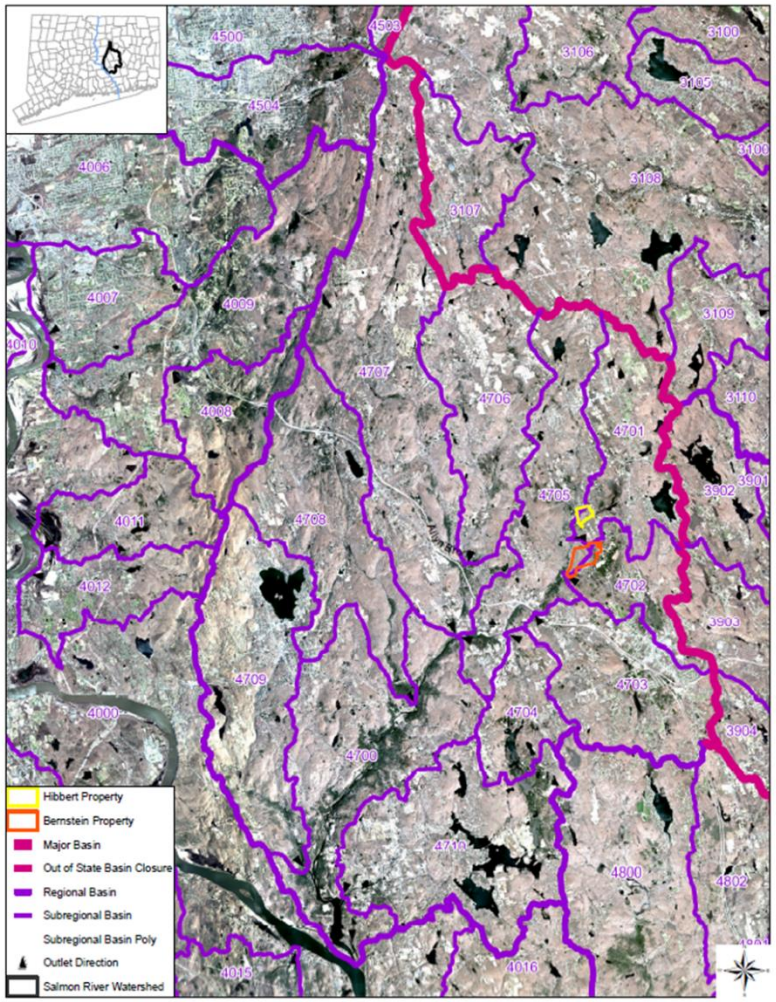
However, as in any watershed, an increase in development and changing landscapes have one of the biggest impacts on water quality. When an area is developed, the natural drainage changes, impervious surfaces concentrate the stormwater, preventing infiltration and increasing the amount of water that is flowing across the ground surface, picking up pollutants and sediment that will eventually flow into receiving

waters. The changes in infiltration also affect groundwater recharge and the base flow of streams, and contribute to an increase in flooding, especially downstream.

Land development is going to continue within the watershed, but there are ways that it can be balanced to protect water resources and water quality. When development is proposed, the pre-development drainage should be maintained by reducing impervious surfaces and incorporating Low Impact Development (LID) practices or green infrastructure that will allow the stormwater to filter into the ground close to the source. Site development plans need to be reviewed to ensure these practices are incorporated to reduce stormwater runoff and prevent erosion and sedimentation and other water quality impacts. Also, maintaining vegetated buffers along watercourses and sensitive natural areas is critical to help protect water quality by reducing erosion; and filtering sediment and nutrients/pollutants by slowing the flow of surface water, allowing sediment and other pollutants to settle out and be trapped before reaching the watercourse.

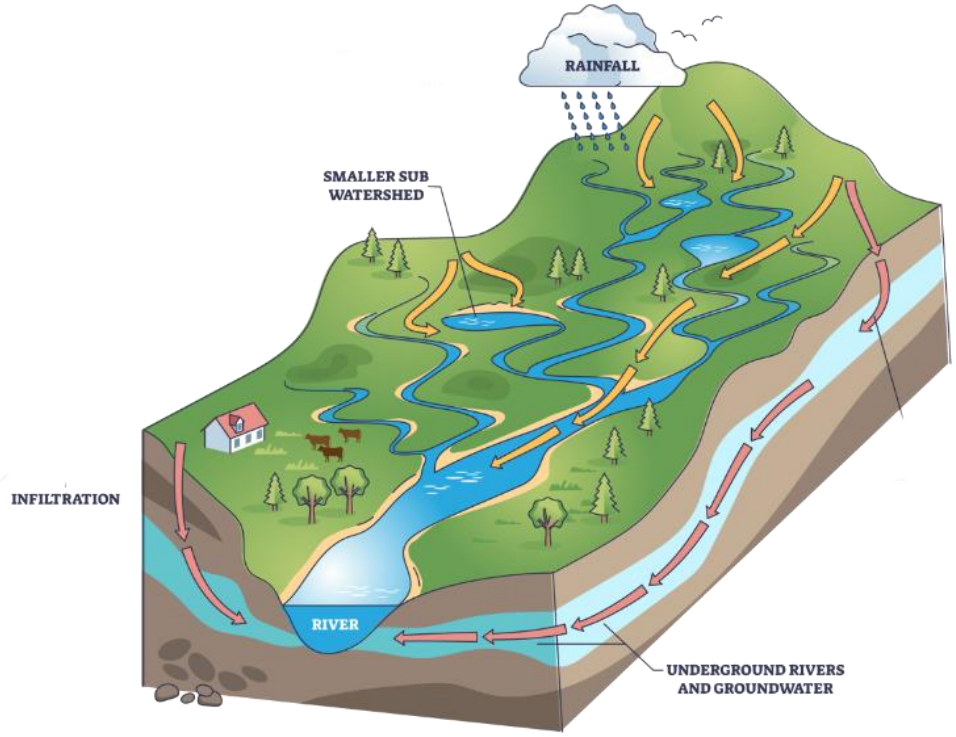
With careful planning that considers the overall cumulative impacts of development within the watershed, a balance can be achieved where development can occur, and water quality and natural resources are protected. Water quality/water resources can also be protected on an individual level by residents in the watershed and promoted through education and outreach. For example, the Connecticut River Coastal Conservation District's Backyard Water Resources Guide includes a variety of actions that can be taken by residents/landowners in the watershed to protect the health and quality of backyard streams, ponds, lakes, and wetlands.

Location of the Hibbard and Bernstein Properties in the Salmon River and Subregional Basins
4705 Jeremy River Watershed
4701 Raymond Brook
4702 Judd Brook



This guide offers many simple, safe, and environmentally sound practices for lawn and landscape care, septic system maintenance, hazardous household product use, erosion prevention and stormwater runoff control. The intent of this educational tool is to build

community awareness and appreciation for protecting local and regional water resources, and to promote individual backyard stewardship. Hard copies are available for distribution from the conservation district office (ctrivercoastal@conservect.org or 860-346-3282).



GEOLOGY

Randolph Steinen

Geologist, Connecticut Geological Survey (Retired CTDEEP)

Topography

Raymond Brook enters the Hibbert open space property at roughly 360 ft elevation and flows into Jeremy Brook, which drops to about 250 ft at the south side of the Bernstein open space parcels, a distance of a little less than 2 miles (see topographic map presented earlier in this report). The hillsides along its valley are gently sloping and rarely rise to more than a hundred feet above the level of the water courses. Maximum elevation in the Hibbert space is just over 450 feet. The Airline Trail and trails within the adjacent open space areas are all relatively gentle also and can be traversed by hikers of all abilities. The Airline Trail is wheelchair accessible, but the side trails are not.

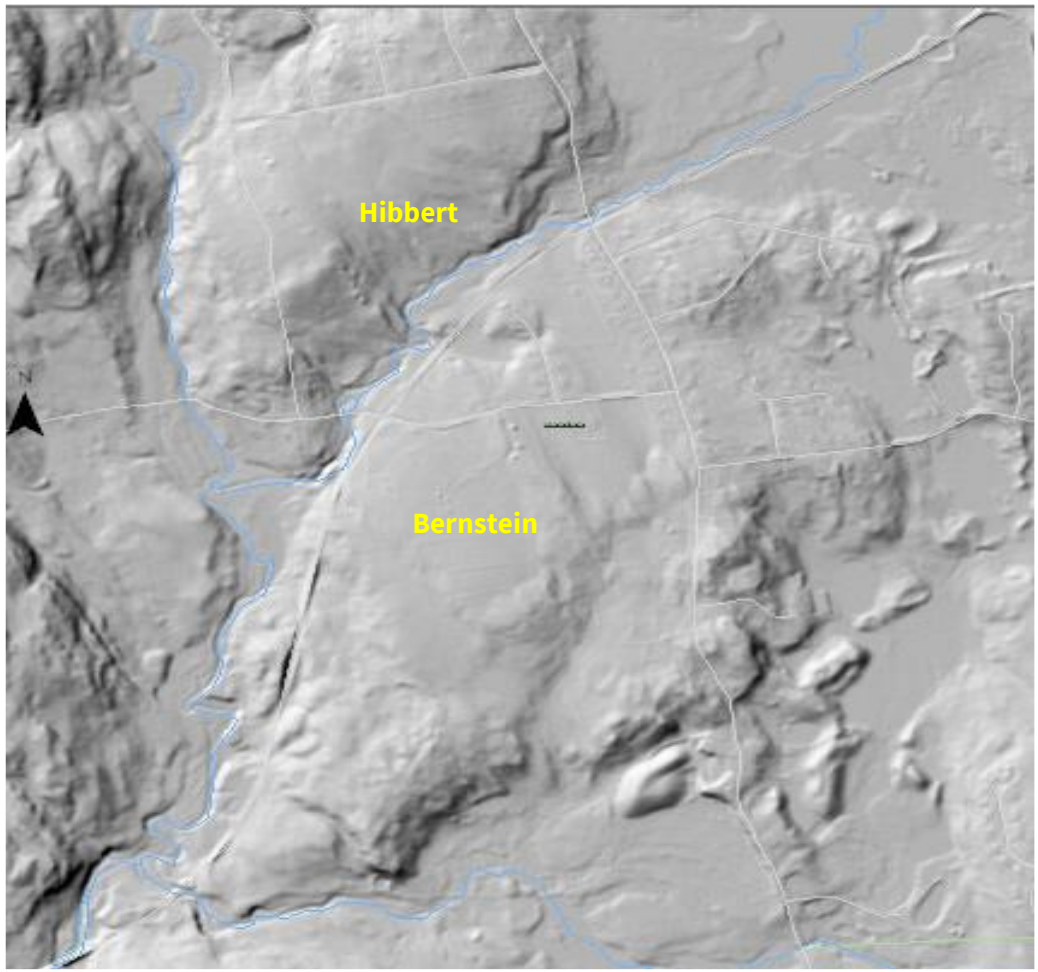


Figure 1. LiDAR image of Hibbert and Bernstein Open Space parcels. LiDAR is a radar generated image of the earth-surface that appears like a black and white photograph without forests (radar penetrates the canopy) or buildings (computer processing removes regular geometric objects). LiDAR gives the observer a feel for the lay of the land. The smooth areas are covered by glacial soils referred to as till. Dark shadowed areas have steeper relief, in some places caused by rock outcrops and in other places by steep-sided deposits of sand and gravel, some of which were generated by mining in the southeastern corner of the Bernstein parcels. Map width is approximately 1.5 mi.

Quaternary Geology. Figure 1 is a LiDAR image of the Hibbert/Bernstein open space parcels that shows the topography to be generally fairly smooth. This is a result of glacial erosion/deposition during the last Ice Age. Glacial ice cannot support its own weight if the ice is greater than several hundred feet thick. In that case the glacial-ice flows, downhill if it's on a mountain-side or from areas where the ice is thicker toward areas of thinner ice (usually this is toward the edge of the ice) if it's on a continent. The ice flowed from north-northwest toward south-southeast in most of Connecticut. As the ice flows it scrapes the rock, eroding high areas and smoothing the topography. The ice then deposits the eroded debris, in localized places beneath the moving ice, but over all the land when it melts. The rocky glacial soils of New England are a product of glacial erosion and deposition. Melt water streams eroded the glacial soils in some places and deposited sand and gravel in others.

Most of the area of both the Hibbert and Bernstein parcels is covered by a glacial soil referred to as till (Figure 2), the debris left when the ice melted. As such, till covers almost all of the bedrock (ledge) in this area. The till mostly is 5-10 feet thick, but in places may be 15 feet or more thick.

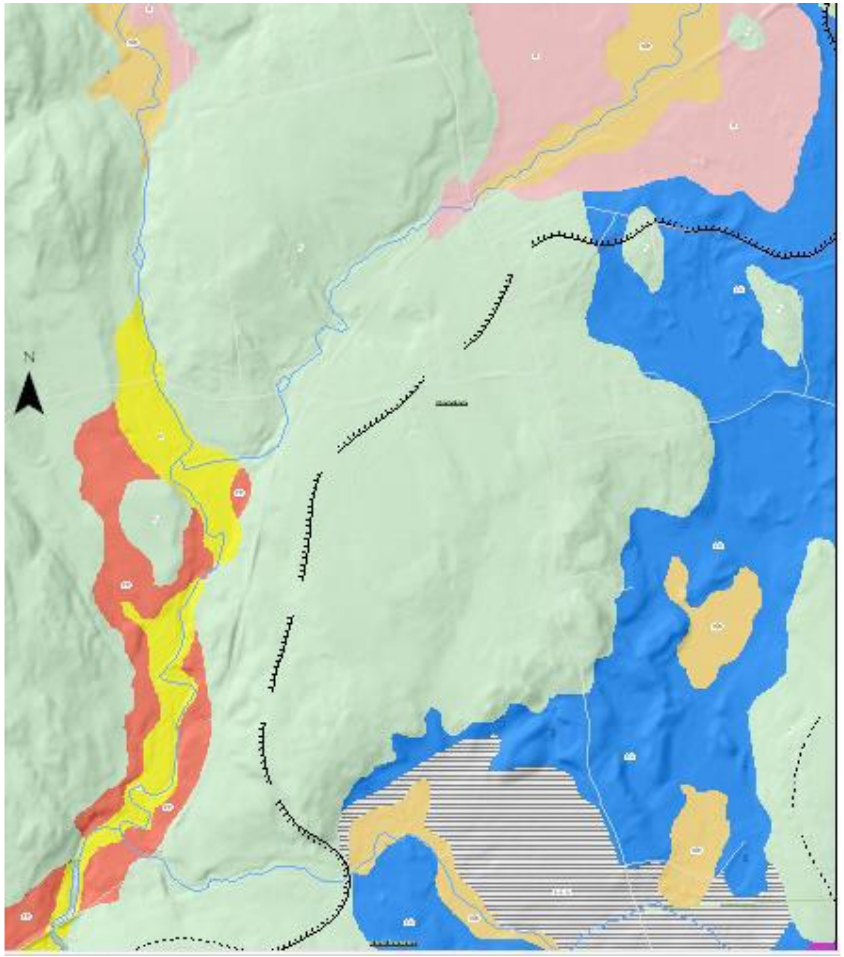


Figure 2. Map showing glacial deposits from Stone and others, 2005. Green area is covered by glacial till. Yellow area is modern river alluvium. All other colors are various sand and gravel deposited by meltwater streams. Black hachured line is an interpreted edge of glacial ice approximately 19,000 years ago.

Sand and gravel deposits are found on the Bernstein parcels and locally in the stream and river valleys on the Hibbert parcel (Figure 2). The sand and gravel have been extensively mined in the southeastern part of Bernstein area.

Bedrock Geology. The entire area reportedly is underlain by rocks of the Hebron Gneiss and irregular areas of pegmatite (Lundgren and others, 1971; Rodgers, 1985). The gneiss is Siluro-Ordovician in age (440-450,000,000 +/- years; Rodgers, 1985). It is fairly widespread in the central part of eastern Connecticut. Bedrock (ledge) composed of Hebron Gneiss, however, is not widely exposed on the subject parcels and was seen at only two locations during field investigations in the Fall, 2021: along Raymond Brook at a damsite on the Hibbert parcel

(additional outcrops can be found along the trails in the Hibbert parcel) and along the Airline Trail at a tributary stream crossing at the south-western corner of the Bernstein parcels. No other outcrops were found on the Bernstein property. LiDAR imagery (Figure 1) suggested that outcrops likely were not exposed, and the parcel was not extensively explored.

The Hebron Gneiss is not very resistant to erosion and in most places is covered by unconsolidated deposits left by glaciers at the end of the last Ice Age. It contains irregular pods and layers of pegmatite, which are resistant to erosion; most outcrops of Hebron Gneiss are found associated with the pegmatite. Good exposures of the Hebron Gneiss may be found along near-by highway road cuts (Figure 3), Connecticut Route 2 to the south and U.S. Route 6 to the north. Those road-cut exposures show that the gneiss is layered, gray, and contains prominent pods and lenses of pegmatite, white areas in the illustrations.

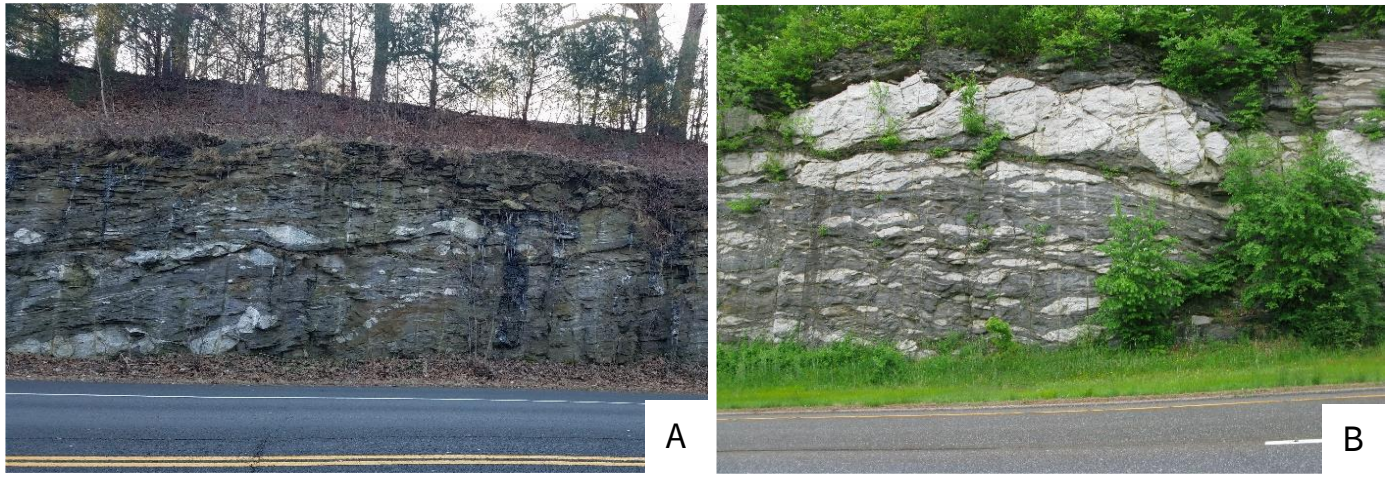


Figure 3. Road-cut outcrops of Hebron Gneiss exposed along nearby highways. White pods on the rock are pegmatite, gray layered rock is Hebron Gneiss. A. U.S. Route 6 roadcut in Andover, CT. Outcrop height approximately 8 ft. B. Connecticut Route 2 roadcut near Salem, CT. Outcrop height approximately 8 ft.

The gneiss is fine- to medium-grained, gray to greenish gray calc-silicate gneiss and quartz-biotite schist and schistose gneiss (Figure 4A., B.). The calc-silicate rock contains calcic-plagioclase feldspar, quartz, brown biotite mica, and calcic amphibole and pyroxene. The interlayered quartz-biotite schist contains quartz, brown mica, and minor plagioclase feldspar. Most layers of calc-silicate and schist are inches thick, but individual layers may be more thinly laminated. They are interlayered in most outcrops, but one or the other may predominate. On the Hibbert parcel, only quartz biotite schist was found associated with the pegmatite. Calc-silicate rocks were only seen as loose fragments in the glacial soils. The pegmatite pods consist of coarse-grained quartz and potassium feldspar with minor plagioclase feldspar and traces of mica (Figure 4C.), usually biotite in the Hibbert parcel (biotite is reported also in adjacent areas by Lundgren and others, 1971, p. 11-12). Pegmatite pods are poorly foliated, where seen on the Hibbert parcel.

The overhanging rock on the northwest side of Raymond Brook on the Hibbert parcel is the main area of outcrop and the only one studied in the area of the Hebron section of the Airline trail. There, layer-like pods of pegmatite hold up outcrops where the pegmatite is in contact with the Hebron Gneiss (Figure 5)

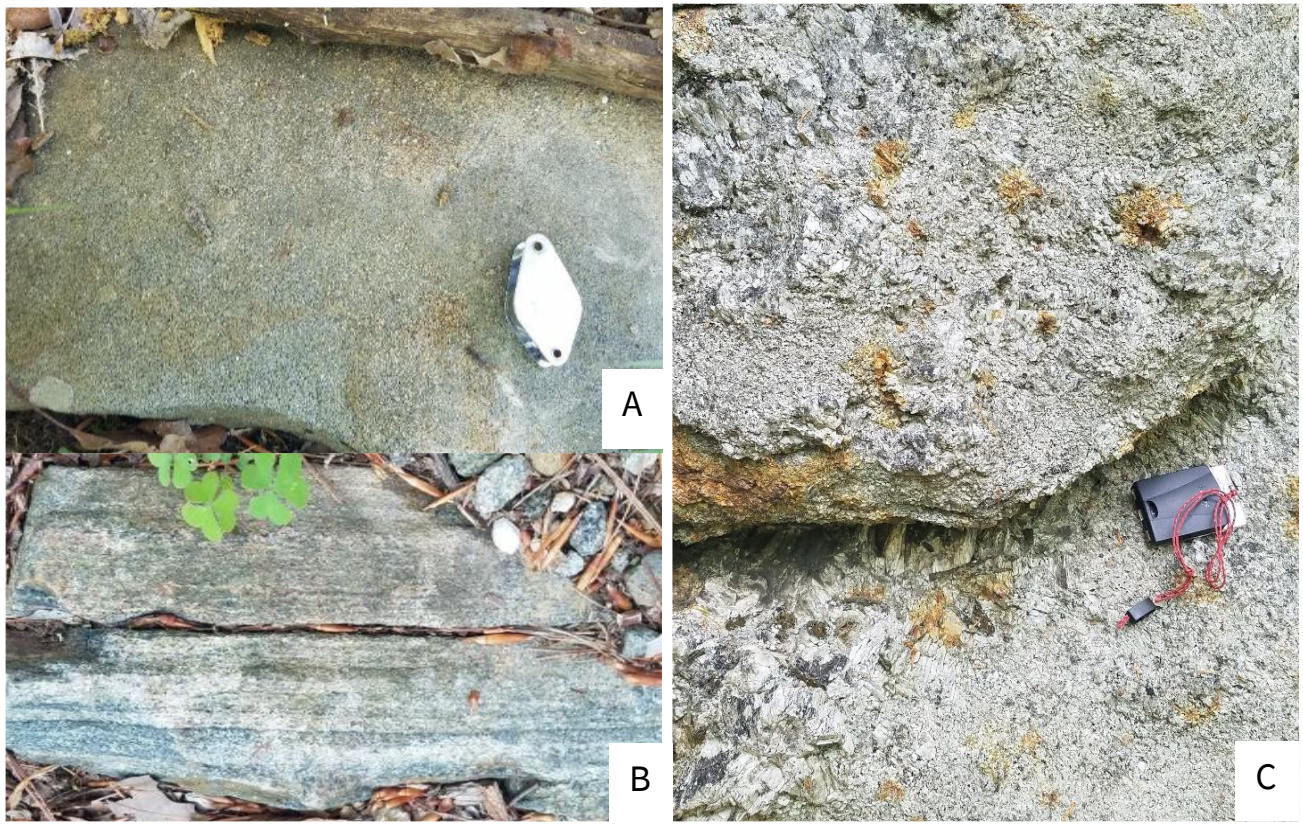
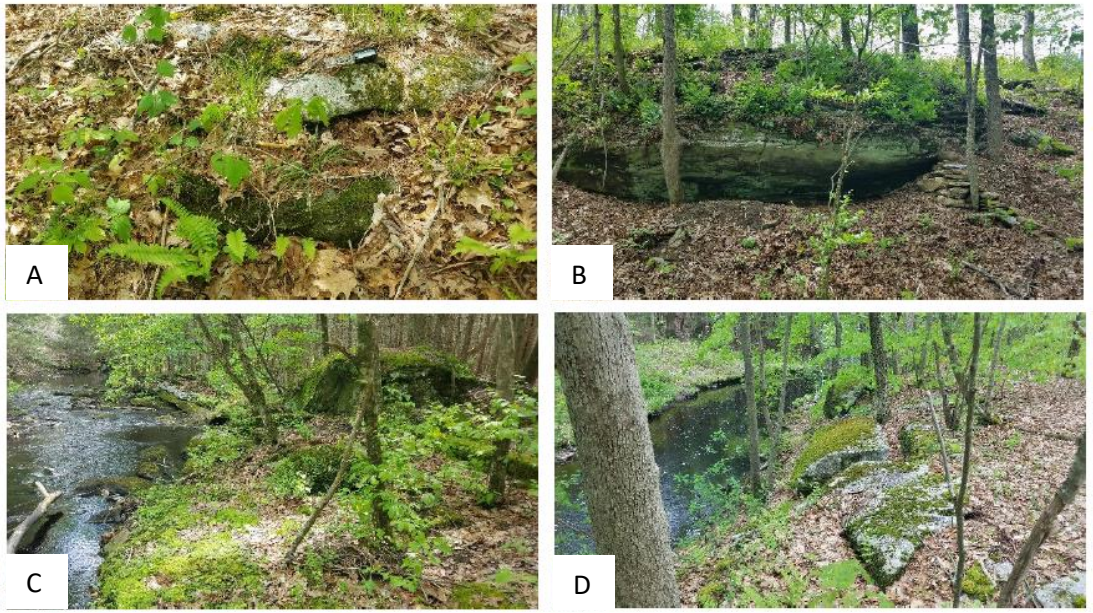


Figure 4. Representative samples of Hebron Gneiss (A., B.), and pegmatite (C.). A. Loose piece of quartz-biotite gneiss, looking on a foliation plane; rock would appear layered if looking perpendicular to foliation plane. Dark mineral grains are biotite mica. Lighter material is mostly quartz, and perhaps some plagioclase feldspar. Hand-lens is 1.5 inches (4 cm) long. B. Calc-silicate gneiss; looking at a cross-section (i.e. perpendicular to foliation planes) of a loose specimen. Greenish layers contain calcium bearing amphibole and/or pyroxene the gray layers contain feldspar, quartz and biotite mica. Oxalis leaves for scale. C. Large glacial boulder of pegmatite. Larger white crystals composed microcline feldspar. Small gray areas are quarts. Black minerals are biotite. Black compass is 2.5 inches wide.

Figure 5. Outcrop images of Hebron Gneiss and associated pegmatite at the Hibbert Open Space



Parcel. A. Low outcrop of pegmatite with calc-silicate gneiss (covered by mosses). Outcrop is north of overhanging outcrop on the Mill-Site Path shown on Old Hibbert Property Trail map. Open compass on outcrop is 8.5 inches (21 cm) long. B. Overhang outcrop shown on trail map. Most of the outcrop is formed by pegmatite. Hebron Gneiss is below the pegmatite and forms part of the overhang and also on top of the pegmatite in the form of several thin layers. Outcrop height about 8 feet (almost 3 m.). C. Pegmatite layer on west side of Raymond Brook just upstream from former dam location. In distance the white layer is pegmatite, the moss covered layer below white layer is calc-silicate gneiss. D. Pegmatite layer on west side of Raymond Brook upstream from Figure 4C. Top of outcrop about 10 feet above river level.

References.

Lundgren, L., Jr, Ashmead, L, and Snyder, G.L., 1971, The bed rock geology of the Moodus and Colchester quadrangles: Connecticut Geological and Natural History Survey Quadrangle Report #27, 24p.

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., and others, 2005, Quaternary geologic map of Connecticut and Long Island Sound Basin. U.S.Geol.Survey Scientific Investigations Map 2784, scale 1:125,000

SOILS AND WETLANDS

Edward Pawlak
Registered Soil Scientist- Certified Professional Wetland Scientist
Connecticut Ecosystems LLC

INTRODUCTION

Connecticut Ecosystems LLC inspected the Hibbert and Bernstein Open Space properties on several occasions in the spring of 2022: April 5 and 15, May 5, and June 10, in order to characterize the wetlands and watercourses contained therein, assess their functional values, and develop management recommendations for them.

BERNSTEIN OPEN SPACE PROPERTY

Soils

The NRCS Soils Map shows eight wetland soil map units on the Bernstein property: Ridgebury fine sandy loam (#2); Ridgebury, Leicester and Whitman soils (#3); Walpole sandy loam (#13); Scarboro muck (15); Timakwa and Natchaug soils (#17); Rippowam fine sandy loam (#103); Limerick and Lim soils (#107); and Saco silt loam (#108). These poorly or very poorly drained soils support large, wooded wetland systems that stretch across the property, and flank Judd Brook along the southern property boundary. The majority of the wetland and non-wetland soils on the property were derived from glacial till parent materials, although some are derived from sand and gravel outwash or partially decomposed plant materials.

Wetland Characterization

The National Wetlands Inventory (NWI) Map shows the locations of the wetlands on the Bernstein property. Furthermore, this map characterizes these wooded wetlands as “Palustrine Forested Broad-Leaved Deciduous, Seasonally Flooded/Saturated”. This characterization was confirmed during the inspections of the Bernstein property.

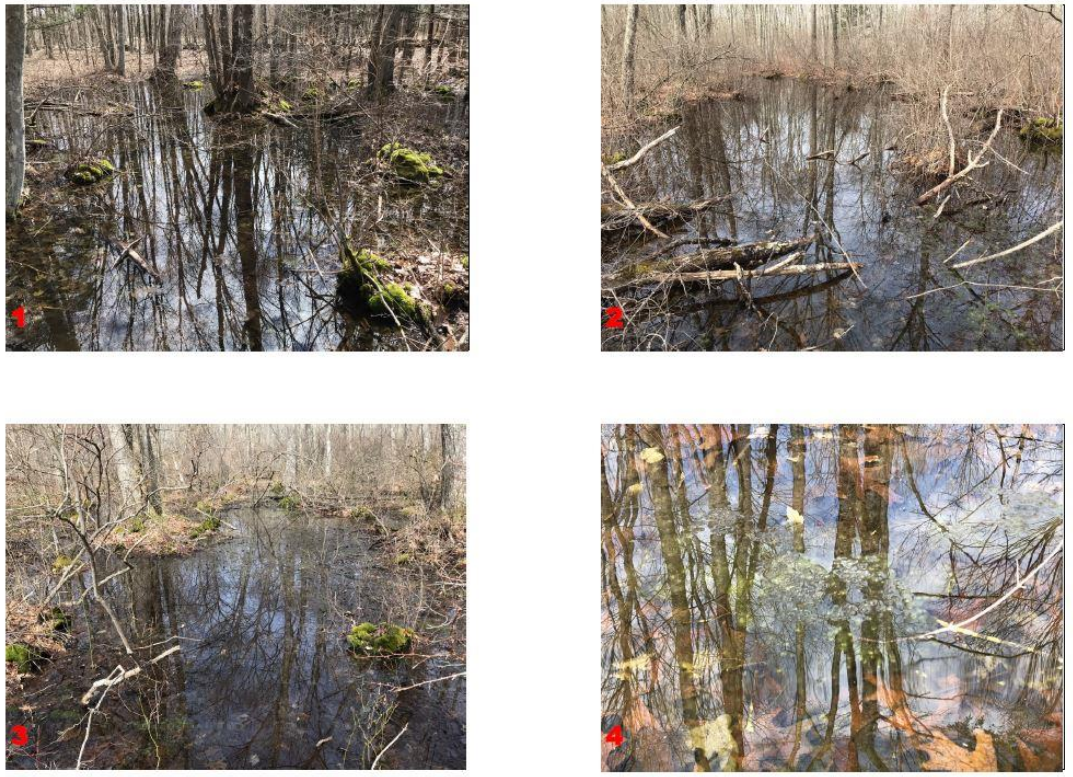
The wooded wetlands in the central portion of the Bernstein property occur on very gentle slopes, and as a result they contain extensive shallow inundation during the spring months (Photos 1-3). Within this matrix of shallow flooding are a number of “cryptic” vernal pools that contained Wood Frog and Spotted Salamander egg masses in the spring of 2022 (Photo 4).

The dominant vegetation in these wooded wetlands is red maple, sweet pepperbush, highbush blueberry, sphagnum moss and skunk cabbage. The wetland corridor on the eastern half of the property contains a headwaters watercourse that flows in a southerly direction (Photo 5). The substrate in the lower reaches of this watercourse consists of cobbles, gravel and flat stones (Photo 6). Wetlands adjacent to this watercourse provide a source of clean, cool groundwater discharges.

(Photo 7). Stoneflies and other pollution-intolerant benthic macroinvertebrates were collected during a “kick” sample of this watercourse (Photo 8). This headwater stream flows into a large, wooded wetland south of the Bernstein property (Figure 1).

Judd Brook flows along the southerly boundary of the Bernstein property. Riparian wetlands adjacent to the brook are limited due to topography. Stream surveys by the Connecticut Department of Environmental and Energy Protection Fisheries Division found the following species at a sampling location in Judd Brook immediately east of the Airline Trail: American Eel, Blacknose Dace, Longnose Dace, Common Shiner, Fallfish, and Atlantic Salmon (stocked). The presence of American Eel is of particular note. This catadromous fish lives in freshwater and breeds in marine water.

A small former agricultural pond is located on the eastern end of the property, adjacent to Old Colchester Road (Photo 10). Much of its surface was covered with duckweed, indicating a high nutrient level.



Bernstein Property Hebron, CT 4/5/2022 1-3: Cryptic vernal pools embedded within large seasonally floodedwooded wetland system 4. Wood Frog egg mass within cryptic vernal pool

Wetland Functions and Values

The wetlands on the Bernstein property provide a variety of functions/ecological services:

- Groundwater Discharge and Recharge - Active wetland groundwater discharges support the baseflow of the headwaters stream described above, and ultimately Judd Brook, to which it is tributary. These groundwater discharges also modulate the water temperature of these resources, which is critical to the aquatic organisms that live there. Groundwater recharge likely occurs in the wetlands during the drier summer months, when the groundwater table is lower and does not preclude infiltration.

Bernstein Property Hebron, CT 4/5/2022 5. Headwaters stream with a high gradient channel in its lower reach 6. Gravel, cobble and flat stone substrate in headwaters stream 7. Active groundwater discharge in wetland adjacent to headwaters stream 8. Stonefly collected from headwaters stream

Bernstein Property Hebron, CT 6/10/2022 9. Judd Brook 10. Former agricultural pond

Floodflow Alteration - The large gently sloping, densely vegetated wetlands detain and slowly release a significant amount of stormwater, protecting downstream structures.

- Pollutant Removal - The gentle slopes and dense vegetation that characterize the wooded wetlands remove a variety of solid and dissolved pollutants from stormwater runoff.
- Production Export - Biomass generated by the dense vegetation in the wetlands decompose and is seasonally exported into Judd Brook, supporting the biota in the river and in downstream aquatic systems.
- Wildlife Habitat – The “cryptic” vernal pools in the wooded wetlands support the breeding and development of Wood Frogs and Spotted Salamanders. The headwaters stream likely provides habitat for aquatic salamanders such as the Two-Lined Salamander and the Northern Dusky Salamander. Numerous songbirds were observed throughout the Bernstein property.

- Finfish Habitat (Judd Brook) – CTDEEP has documented a diverse finfish community within this perennial watercourse. The presence of American Eel in Judd Brook is significance, as it suggests a lack of migration barriers (i.e., culverts, dams) between Judd Brook and the Long Island Sound.
- Recreation – A trail that leads east from the Airline Trail, and which runs roughly parallel to Jordan Brook, provide excellent views of the brook. • Educational/Scientific Value – All of the wetland and upland habitats described above could potentially serve as educational sites for a variety of investigations, including wildlife studies, functions and values of headwater streams, and a vernal pool ecology.

HIBBERT OPEN SPACE PROPERTY

Soils

The NRCS Soils Map shows three wetland soil map units on the Hibbert property: Ridgebury, Leicester and Whitman soils (#3); Timakwa and Natchaug soils (#17); and Fluvaquents-Udifluvents complex (#109). These poorly or very poorly drained soils support large, wooded wetland systems that extend east of the Airline Trail.

The Fluvaquents-Udifluvents complex soils are derived from alluvial materials. The Timakwa and Natchaug soils were formed from partially decomposed plant materials. The remaining soils on the property were derived from glacial till parent materials.

Wetland Characterization

The National Wetlands Inventory (NWI) Map shows the locations of the wetlands on the Hibbert property. Furthermore, this map characterizes these wooded wetlands as “Palustrine Forested Broad-Leaved Deciduous, Seasonally Flooded/Saturated”. This characterization was confirmed during the inspections of the Hibbert property.

Several large riparian wetlands occur south of and adjacent to Raymond Brook (Photo 15). Wood Frog egg masses were identified in one of these a cryptic vernal pools (Photo 16). Several of the riparian swamps contain headwater streams that discharge cool, clean water into Raymond Brook (Photo 17). A Two-Lined Salamander was found in one of these streams beneath a large flat stone.

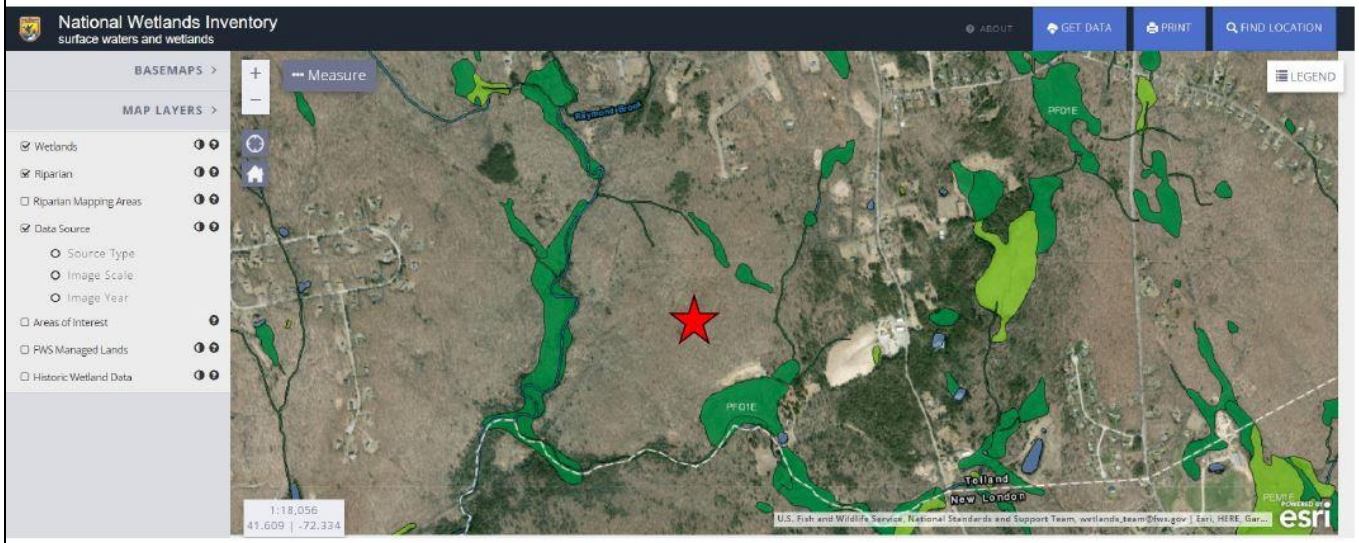


Figure 1. Bernestein Open Space Property NWI Map
Hebron, CT
Connecticut Ecosystems LLC
June 18, 2022

Hibbert Property Hebron, CT 4/15/2022 Raymond Brook 11. Boulder and cobble riffle 12. Large pool formed at sharp bend in channel 13. Undercut bank 14. Sedge marsh adjacent to channel

Raymond Brook

Raymond Brook flows westerly across the Hibbert property. This watercourse is characterized by alternating fast-flowing riffles (Photo 11) and large pools or runs (Photo 12). American Toads were trilling within these pools along the entire reach of Raymond Brook on the property.

Undercut banks were common along Raymond Brook (Photo 13). A large sedge marsh lies adjacent to the brook on the northern end of the property (Photo 14).

Hibbert Property Hebron, CT 5/5/2022 15. Large riparian wooded swamp dominated by skunk cabbage in the understory 16. Seasonally flooded riparian wetland that contained a cryptic vernal pool with Wood Frog egg masses 17. Headwaters stream in riparian wetland that is tributary to Raymond Brook

Stream surveys by CTDEEP Fisheries Division found the following species at a sampling location in Raymond Brook on the Hibbert property: American Eel, Bluegill Sunfish, Brook Trout (stocked), Brown Trout (stocked), Blacknose Dace, Longnose Dace, Chain Pickerel, Pumpkinseed and White Sucker. The presence of American Eel in the brook is significant, as noted above for Judd Brook.

Wetland Functions and Values

The wetlands on the Hibbert property provide a variety of functions/ecological services:

- Groundwater Discharge and Recharge - Active wetland groundwater discharges within headwaters streams support the baseflow of Raymond Brook, to which the streams are tributary. These groundwater discharges also modulate the water temperature of these resources, which is critical to the aquatic organisms that live there. Groundwater recharge likely occurs in the wetland during the drier summer months, when the groundwater table is lower and does not preclude infiltration.
- Flood flow Alteration - The large gently sloping, densely vegetated wetlands detain and slowly release a significant amount of stormwater, protecting downstream structures.
- Pollutant Removal - The gentle slopes and dense vegetation that characterize the wooded wetlands remove a variety of solid and dissolved pollutants from stormwater runoff.
- Production Export - Biomass generated by the dense vegetation in the wetlands decompose and is seasonally exported into Raymond Brook, supporting the biota in the river and in downstream aquatic systems.
- Wildlife Habitat – The “cryptic” vernal pool in the wooded wetland supports the breeding and development of Wood Frogs. A Two-Lined Salamander was observed within one of the headwater streams on the property. Numerous songbirds were observed throughout the Hibbert property.
- Finfish Habitat (Streams and Rivers) – CTDEEP has documented a diverse finfish community within this perennial watercourse. The presence of American Eel in Raymond Brook is significant, as noted above for Judd Brook.
- Recreation – A gravel road trail that provides access to the property from Old Colchester Road provides excellent views of Raymond Brook.
- Educational/Scientific Value – All of the wetland and upland habitats described above could potentially serve as educational sites for a variety of investigations, including wildlife studies, functions and values of headwater streams, and a vernal pool ecology.

Landscape Context

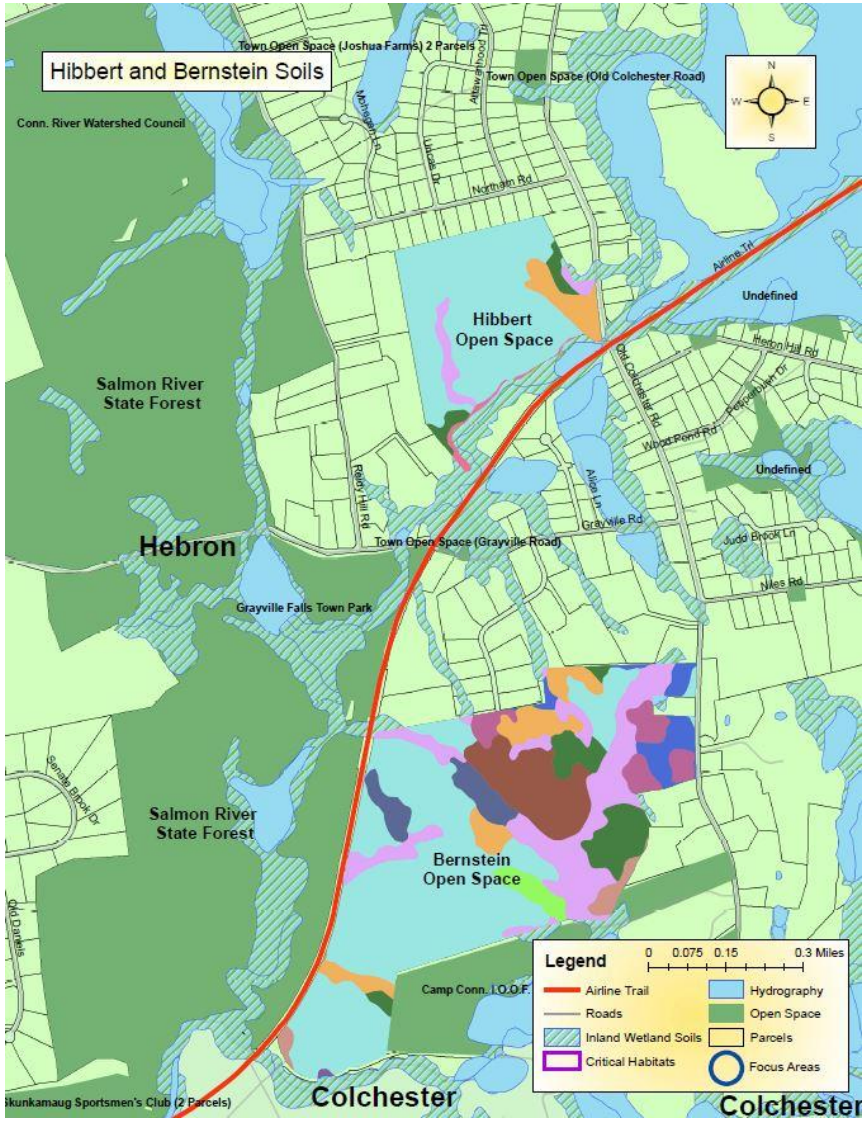
It is important to consider the larger landscape in which the two subject properties are located. This landscape block, approximately 2,800 acres in size, is shown in Figure 3. It is bounded to the north by Hope Valley Road, to the east by Old Colchester Road, to the south by Old

Hartford Road, and to the west by Jones Street. It includes two lightly traveled roads – Reidy Hill Road and Grayville Road. This landscape block is almost entirely wooded, and includes three significant perennial watercourses: Raymond Brook, Jeremy River, and Judd Brook.

Many wildlife species that are declining or rare in Connecticut require large unfragmented landscape blocks to supply their habitat requirements for breeding, nesting, feeding, cover, overwintering, etc. Examples of these “area -dependent” species include Eastern Box Turtle, Wood Frog, Bobcat and Ovenbird.

Large, wooded unfragmented landscape blocks are essential for the health and ecological integrity of perennial and seasonal watercourses, and all of the biota that they support.

The two subject properties are critical elements of this approximately 2,800 acre lightly fragmented landscape block.



MANAGEMENT RECOMMENDATIONS

- It is strongly recommended that the forest canopy that covers most of the two subject properties be maintained.
- An existing trail on the southern portion of the Bernstein property provides excellent views of the adjacent Judd Brook. This trail should be maintained and perhaps enhanced with the addition of informational signage.
- The headwaters watercourse that flows south through the central portion of the Bernstein property is flanked by a zone of very dense invasive shrubs (Japanese Barberry and Multiflora Rose). Consideration should be given to a multi-year program to remove these invasive shrubs and slowly, over time, replace them with native shrubs.

FORESTRY

Nathan Piché

Forester 1, State Lands Management Program CTDEEP

Overview

The Hebron section of the Airline State Park Trail contains both the Salmon River State Forest and the Raymond Brook Wildlife Management Area, both of which contain diverse forest, riparian and wetland habitats while creating important public land access opportunities for the community. The acquisition of the Hibbert and Bernstein properties complement these adjacent state properties well, creating a conserved corridor of land along the trail.

The greatest threat to forestland in Connecticut is development, which fragments and degrades habitat while adding complexity to landscape level management and conservation efforts. Protecting these properties from future development through town ownership is a major success for these forestlands and for the wildlife that live within them.

Important Elements of the Forest

The Hibbert and Bernstein properties contain forested wetlands/red maple lowlands which filter and store water, riparian hemlock stands that filter water and shade rivers to keep the water cool for many aquatic species, and stands of oak, hickory and other deciduous tree species on uplands sites that provide a mast crop that is vital for a plethora of wildlife species. In the anthropogenic sense of time these tree communities within the forest often appear stagnant; however, they are ever changing due to growth, insects, diseases, and weather events. These changes in the forest over time, along with interesting land use histories such as charcoaling and milling, present excellent educational opportunities.

Photo 1.0. Sponge moth defoliation, leading to oak mortality, has long term impacts on the forest. The forest is ever changing, growing, adapting, and evolving to stressors.

Forest Health Concerns

- Invasives – Primarily Japanese barberry. Honeysuckle, multi-flora rose, bittersweet, and burning bush are also present on both the Hibbert and Bernstein properties.
- Emerald ash borer
- Beech leaf disease
- Beech bark disease
- Historical spongy moth defoliation and subsequent oak mortality – notable outbreaks in the late 1970's, early 1980's as well as 2017 and 2018.

Conservation Opportunities

The diversity of forest and habitat types/elements of the forest are important to protect, conserve, and enhance through a combination of both passive and active management. Of particular interest is the continuation of oak species in the landscape. Due to deer's preference to browse oak species over others as well as the absence of frequent low-intensity fires, many oak species are being outcompeted by black birch, red maple, and American beech. Well planned and well executed forest management activities can enhance habitat elements of the forest while providing conducive conditions for the continuation of oak on the landscape in the future. Hunting is also an important recreational

Photo 1.1. Photo of the bark from an ash tree. D shaped exit holes from emerald ash borer, visible on this tree, are present. Ash trees are also "blonding" due to woodpecker activity and crowns are thinning and dying back.

Photo 1.2. Photo of beech leaves infected with beech leaf disease. The dark banding of the leaves are the first signs of this disease. This is caused by a nematode.

and management use to consider as it aids in balancing the available habitat with the number of deer within it, resulting in a healthier forest vegetation condition.

These properties also contain areas that are dominated by invasive plant species such as Japanese barberry, burning bush, multi-flora rose, bittersweet, and honeysuckle. These areas provide dense cover, an important habitat element; however, through strategic management of invasive plants these areas could be enhanced to maximize their wildlife habitat value.

Photo 1.3. Photo of Japanese barberry in the forest understory. Invasive plants such as this often out complete and displace native vegetation.

PASSIVE & ACTIVE MANAGEMENT

There is a place and time for both active and passive forest management. Both approaches have value and are important to the health of the forest and its habitats, on both a small parcel scale as well as a landscape scale. In the southwest corner of the Bernstein property there is a stand of pole sized hardwoods (6”-10” diameters) that grew in after many of the dominant trees died due to spongy moth defoliation in the 1970’s and 1980’s. A stand of trees such as this could be

thinned to improve the future growth, quality, and mast production of selected trees. The property also has ridge tops growing a high density of white oak advance regeneration that could be released to additional sunlight to graduate these seedlings and saplings into the upper canopy of the forest to serve as the future forest for the next generation.

Meanwhile, there are other sites within the property such as forested wetlands, riparian areas, and areas with historical and/or cultural significance where passive management is more appropriate. Long term passive management (150-200 years +) results in a late succession, old forest condition, with trees of various age classes that creates structural complexity within the forest. Many of the forest stands on these properties are currently even aged and range in age from approximately 50 to 100 years old. Therefore, if uneven aged, old forests are a goal to have, uneven aged silvicultural practices could be employed to create more structural diversity within the forest that mimics natural stands of late succession, old forests. Employing both passive and active management, where appropriate, creates a mosaic of habitat elements on the forest landscape, meeting the needs for the widest range of wildlife species.

Photo 1.4. Pole sized (6”-10” diameters) stand of hardwoods dominated by oak species that grew in after many of the dominant trees succumbed to spongy moth defoliation in the 1970’s and 1980’s.

Photo 1.5. Ridge top stand of oak with a high density of white oak advance regeneration.

BEST MANAGEMENT PRACTICES

When conducting active management, it must be acknowledged that there is risk involved. There are liability risks, risks of spreading invasive species, erosion risks, and risks to threatened, endangered and/or of special concern wildlife species. Careful planning and forethought can minimize these risks so that management can take place that is designed to improve the overall condition, health and/or quality of the forest and the habitat it provides. Below is a list of best management practices when conducting active forest management.

- Always seek professional advice from experienced, licensed individuals. CT DEEP service foresters are a great place to start. Private consulting foresters also provide technical advice and services.
- Have an agreement in writing. A work order, service agreement or contract sets the terms and helps manage expectations. An important element of these agreements is insurance, which protects both the landowner and the service provider.
- Follow Natural Diversity Database Review recommendations to avoid negative impacts to threatened, endangered and/or of special concern species. This may include specific working timeframes, areas to avoid, and habitat elements to preserve.
- Thoroughly prepare the site. This includes marking property boundary lines, marking trees to cut, marking trees to leave, marking trails, designing water crossings (if necessary), and designating access points. A well-prepared site will increase operator efficiency, avoid negative impacts to the land and residual trees, avoid potential conflicts as well as manage expectations on how the project will be carried out.
- Follow best management practices for water quality while harvesting forest products. This may include water bars, temporary bridges, and sediment control structures such as hay bales or silt fences. This applies to recreational trail construction/maintenance as well.

Photo 1.6. Photo of a managed site within Salmon River State Forest where the goal was to create a more structurally diverse, late succession, old forest condition. A selection harvest was completed in 1985 that opened canopy gaps, allowing sugar maple to regenerate (now pole sized trees in this photo), while retaining old legacy trees to serve as habitat and to increase the structural complexity of the forest canopy.

- If present, manage invasive species prior to and/or after any tree cutting by mechanical or chemical means.

Monitor results. Forests change over time through natural growth, succession, and disturbances. A forest can be tended to in the same way a gardener tends to their garden. Areas where active management was employed should be monitored and follow-up work can be completed to achieve the desired forest and/or habitat goals. Monitoring results can also be fun as it pairs well with berry picking and bird watching!

FISHERIES

Matthew Goclowski

Fisheries Biologist Natural Resources Division, CTDEEP

Near the Bernstein Property, Judd Brook flows along the southern boundary of the property. The stream supports a fish community that includes common resident species such as Blacknose Dace, Longnose Dace, Common Shiner, Fallfish, Tessellated Darter, and White Sucker as well as the catadromous American Eel. Prior to 2011, Judd Brook had been stocked with Atlantic Salmon fry as part of the Fisheries Division's Atlantic Salmon restoration efforts in the Salmon River watershed. There is currently no special management or active stocking program at Judd Brook.

An unnamed tributary of Judd Brook flows along the eastern portion of the property. The Fisheries Division has not conducted any sampling at this location; however it likely supports a similar fish community to Judd Brook.

Blacknose Dave: This fish tends to inhabit headwaters, creeks, and small rivers with swiftly moving water. However, fry mature in slower moving portions of the habitats like shoals and pool margins. The species as a whole prefers cool, rocky areas and uses the stones to rest under and around. They also use overhanging vegetation and undercut banks for additional refuge. In the winter, they migrate from headwater streams into rivers and can be found in deeper water under banks. It is dark brown to olive on its dorsal surface and silvery white below, the two shades separated by the darkly pigmented lateral line. In the breeding season, males develop darker pigmentation and an orange lateral line. Blacknose dace live in rocky streams and rivers where they feed upon small invertebrates and microscopic biological matter and provide forage for larger fish.

Longnose Dace: This fish can be mistaken for suckers because of their subterminal "sucker-like" mouth. However, longnose dace (like all members of the family cyprinidae) lack small fleshy projections, called papillae, on their mouths. Juveniles have a black lateral line that extends from the beginning of the eye to the caudal fin that fades as the fish matures. The lateral line in juveniles is not present in all populations. In adults, the dorsal side is dark green to black, the lateral side is darkish to silvery with mottling often present, and the ventral side is pearly.

Common Shiner: The common shiner is silvery colored (sometimes bronze) and has an "olive back with a dark dorsal stripe. The common shiner is a freshwater fish found in North America. Adults inhabit rocky pools in small to medium rivers. They can live to be approximately 6 years old. They are considered sexually mature by 7.4 cm. Breeding males have a pinkish tint over most of their body and small bumps or tubercles on their head.

Fallfish: This fish generally measures about 5 in (13 cm) in length, but individuals occasionally grow to 15 in (38 cm)[2] with exceptional specimens of more than 19 in (48 cm) having been recorded.[3] Juvenile fallfish have a dark stripe that runs down the center of their body. They are a silvery shade on the top and sides of the body, but have a white shading on the belly. Breeding males develop a pinkish tone on the opercular region, although the species does not develop bright breeding colors.

Spawning males build stone nests, known as a redd, which form a prominent part of the bottom on many streams throughout the northeast. Spawning is communal with both males and females joining the nest builder. Fallfish are often encountered when fishing for more desirable species, but their large size, dogged fighting style, powerful runs on light tackle, and willingness to strike make them a worthy quarry in their own right. They will readily take bait, lures, and flies, and have been known to strike lures almost as large as themselves.

Tessellated Darter: freshwater ray-finned fish, a darter from the subfamily Etheostomatinae, part of the family Percidae, which also contains the perches, ruffes and pikeperches. Tessellated darters eat crustaceans and small insects when they are small, gradually shifting to larger insects as the fish get bigger. Male tessellated darters guard nests of fertilized eggs until the fry (young) are free-swimming and have been observed to engage in alloparental (adoptive) care of previous nest inhabitants' eggs. Alloparental care is associated with increased male reproductive success in this species. Males frequently engage in filial cannibalism (consumption of their own offspring)

White Sucker: a long, round-bodied fish with a dark green, grey, copper, brown, or black back and sides and a light underbelly. The fish also has typical features of primitive Cypriniformes fishes, such as a homocercal tail, cycloid scales, and dorsal, pectoral, and pelvic fin rays. When full grown, it can reach lengths of 12–20 in (30–51 cm) and weigh 2–6 lb (0.91–2.72 kg). The fish's suckermouth, with its fleshy lips, is located in an inferior position at the bottom of its head, as the fish obtains its food from bottom surfaces. The white sucker is often mistaken for different species of suckers and redhorses, but can be distinguished by the complete lateral line system containing 55-85 small scales. The white sucker is able to use chemosensory to sense and avoid predators and other conspecific species during day and night. The white sucker is highly adaptable to different habitats and changing environmental influences.

HERPETOLOGY

Hank Gruner, Conservation Biologist/Herpetologist, Consulting
Dennis Quinn, Herpetologist, Quinn Ecological, LLC

Amphibian and Reptile Management Considerations

Bernstein and Hibbert Open Space Properties, Hebron, CT

The Bernstein and Hibbert properties include a mix of upland and wetland habitats including frontage on Judd Brook (Bernstein) and Raymond Brook (Hibbert). The two parcels are ecologically connected to a broader network of relatively large and intact properties, including the Salmon River State Forest and the Raymond Brook Marsh Preserve. This network supports a diverse community of amphibians and reptiles, including several state-listed species (endangered, threatened, special concern, State of Connecticut Endangered Species Act), as well as non-state listed species recognized as species of Greatest Conservation Need in the State's 2015 Comprehensive Wildlife Action Plan.

This report discusses management considerations for those species and their critical habitats that should be included within land use planning activities (e.g., recreation, forestry, habitat management, etc.). A comprehensive review of amphibian and reptile conservation in Connecticut for those interested in greater detail can be found in Klemens et al 2021. Additional guidance regarding habitat management for amphibians and reptiles can be found in Mitchell et al 2006).

Ed Pawlak, a wetland scientist, conducted wetland surveys on the properties including an investigation of vernal - breeding amphibian species (e.g., wood frog, spotted salamander). We refer to his report on species occurrence and habitats. Where vernal pool species have been documented, it is recommended that forestry habitat management guidelines be implemented for activities surrounding vernal pools identified on the properties (refer to:(Calhoun and deMaynadier, 2004) Microsoft Word - Final_BDP.doc (army.mil).

These forestry habitat management guidelines are also applicable to the ribbon snake (*Thamnophis sauritus*, state-listed special concern) and spotted turtle (*Clemmys guttata*, state-listed special concern) which utilize a mosaic of wetlands, including vernal pools, and upland habitats. Populations of spotted turtles and ribbon snakes have been documented within the area.

Eastern Box Turtle and Spotted Turtle
Source CT.Gov

A. Eastern Hog-nosed B. Ribbon Snake C. Black Racer Snake D. Smooth Green Snake

The eastern box turtle (state-listed special concern) has also been documented from the area. The reverting fields located in the northeast section of the Hibbert property may provide important habitat for this species which utilizes a mosaic of forest and early successional habitats. Early successional habitats are limited in occurrence in the area and maintaining these fields in an early successional stage will

support a diversity of wildlife, including the smooth green snake (*Opheodrys vernalis*, state-listed special concern), eastern hog-nosed snake, (*Heterodon platirhinos*, state-listed special concern), and black racer (*Coluber constrictor*, GCN species), among others.

In maintaining early successional habitats, it is important to follow best management practices to prevent unintended impacts on wildlife. This is especially important in the case of eastern box and other turtles where individual mortality can have a significant long-term negative impact on populations due to their reproductive life histories (i.e., long-lived, delayed sexual maturity, low fecundity). Mowing is often a source of mortality, thus, it is recommended that guideline for mowing in rare turtle habitat are implemented (refer to: Massachusetts Division of Fisheries and Wildlife 2009 mowing guidelines for rare turtle habitat).

The Jeremy River system, including its Judd Brook and Raymond Brook tributaries, provides habitat for the wood turtle (*Glyptemys insculpta*, state-listed special concern). Wood turtles utilize a mosaic of in-stream and surrounding upland habitats that extend linearly along broad stretches of riparian systems. Because of this, efforts that connect networks of rivers and streams, and protect surrounding habitats within zones extending from 300-1,000 feet from the edges of these watercourses, is critical for long-term conservation of this species. Management considerations within these zones depend upon the suitability of the habitat present for supporting needs of the turtles, as well as the land use(s) planned for the site (refer to: Northeast Wood Turtle Working Group guidelines).

The stretch of Judd Brook bordering the southern portion of the Bernstein property (from the Airline Trail east to the Camp Connecticut parcel boundary) does not include primary in-stream or surrounding habitat important for wood turtles. This section of the brook is situated within a slight ravine and heavily shaded with hemlock, and lacks a well-developed floodplain. Instream habitat is characterized by a rocky substrate and relatively rapid flow.

Although this stretch of Judd Brook may not hold wood turtles, it is ecologically connected to habitat in the Jeremy River just to the west, and suitable habitat just to the east where the brook abuts the Camp Connecticut parcel. Just east of the Bernstein/Camp Connecticut parcel the characteristics of Judd Brook change, with the presence of a riparian floodplain, and early successional habitat adjacent to the brook. Although this stretch of the brook was not visited, these changes are clearly evident on a 7.5 - minute topographic map of the area (Colchester Quadrangle).

In contrast, Raymond Brook, which flows through the Hibbert property contains suitable wood turtle habitat, especially along the southeast section of the brook. This stretch includes open and forested riparian habitat south of the brook, and two sections where the brook has been historically “pooled”. These sections feature relatively slow, deep water with an open canopy and shrub/herbaceous vegetation along the banks.

Several areas of early successional habitat are located within 300 feet of the brook on its north side. These include two small openings where structures appear to have been removed. The presence of an open canopy and areas of exposed, dry soil render these sites suitable as

nesting habitat. During a survey of the site conducted on June11th (middle of turtle nesting season), a single “test hole” excavated by a female turtle seeking to deposit eggs was observed, although it is not possible to determine what species of turtle was involved. South of these two openings and closer to the brook there is a larger opening that features a partially canopied upper slope dominated by herbaceous growth, and a lower open canopied wetter area, also dominated by herbaceous growth. These areas provide ideal “near stream” basking and foraging habitat for wood turtles.

Management considerations for the wood turtle are challenging where the goal is to provide recreational access and use of a property. Wood turtles are highly vulnerable to loss of individuals due to incidental collection, especially female turtles seeking nest sites. Careful consideration of the location of trails and parking areas adjacent to the watercourse is important to prevent unintended impacts on the resident population. A network of trails exists on the property, including an unimproved access road that skirts a section of the river with suitable turtle habitat, and several loops that lead to and/ or traverse the adjacent early successional habitats.

If the primary goal is ecological and the conservation of biodiversity the following recommendations should be considered:

- Focus public access on the southern Airline Trail (south) and Northam Road (north) points, and the western and interior trails.
- Minimize access to the northeast section of the property and the trails that traverse the early successional habitats.
- Maintain the existing openings in the northeast in early successional stages utilizing best management practices with management activities occurring during the period October- February.

If the primary goal is to provide passive recreational use and access the following recommendations should be considered. The collection of additional data (e.g., wood turtle movement and habitat use), beyond the scope of this ERT, and engaging a biologist with experience in wood turtle ecology to participate in the design and planning of planned improvements should also be considered.

- Eliminate the short section of trail branching south from the main access road that passes through the southern opening before dead-ending just above the brook.
- Maintain the lower opening adjacent to the brook in an early successional stage utilizing best management practices with management activities occurring during the period October- February.
- Allow the two small upland openings located off of the trail to re-vegetate to shrub/herbaceous growth stages absent patches of bare soil to avoid attracting turtles to nest.

- If creation of a parking area at the Old Colchester Road entrance is planned, it should avoid establishing any permanent areas of open canopied bare soil, whether in the parking area proper, or along the edges, to avoid attracting nesting turtles. Any temporary areas of open bare soil created during construction should be fenced off with standard silt/erosion fencing, or alternatively, the placement of hay bales, until vegetated.

References Cited

Calhoun, A.J.K. and. P. deMaynadier. 2004. Forestry habitat management guidelines for vernal pool wildlife. MCA Technical Paper No. 6, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York.

Klemens, M.W., H.J. Gruner, D.P. Quinn, and E.R. Davison. 2021. Conservation of Amphibians and reptiles in Connecticut. CT Dept. of Energy and Environmental Protection, Hartford, CT.

Massachusetts Division of Fisheries and Wildlife. 2009. Mowing advisory guidelines in rare turtle habitat: Pastures, successional fields ad hayfields. Massachusetts Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program.

Mitchell, J.C., A.R. Breisch, and K.A. Buhlmann. 2006. Habitat management guidelines for amphibians and reptiles of the northeastern United States. Partners in Amphibian and Reptile Conservation, Technical Publication HMG-3. Layout 1 (northeastparc.org)

Northeast Wood Turtle Working Group. A guide to habitat management for wood turtles (*Glyptemys insculpta*). Technical_Assistance_Booklet_62617 (northeastturtles.org)

ORTHINOLOGY

Andy Rzeznikiewicz, CT Audubon – Pomfret Center

eBird Checklist - 6 Jun 2022 - Bernstein/Hibbert town properties - ...

CHECKLIST S112307146

Mon 6 Jun 2022 5:30 AM Edit date and effort

Bernstein/Hibbert town properties lfJ

Tolland County, Connecticut, United States Edit location

Andy Rzeznikiewicz

Jeanne Davies

Traveling Complete

.:. 1 O 5 hr ■ 4 mi

Bird survey

Bald Eagle – Raymond Brook Marsh
Stan Malcolm

2 Mourning Dove
4 Red-bellied Woodpecker
4 Downy Woodpecker
1 Hairy Woodpecker
3 Pileated Woodpecker
10 EasternWood-Pewee
6 Acadian Flycatcher
1 Eastern Phoebe
1 Great Crested Flycatcher
8 Yellow-throated Vireo
25 Red-eyed Vireo
3 Blue Jay

1 American Crow
14 Black-capped Chickadee
8 Tufted Titmouse
2 Tree Swallow
8 White-breasted Nuthatch
1 Brown Creeper
6 Blue-gray Gnatcatcher
1 HouseWren
18 GrayCatbird
20 Veery
2 Hermit Thrush
4 Wood Thrush

8 American Robin
2 Song Sparrow
12 Eastern Towhee
4 Baltimore Oriole

3 Brown-headed Cowbird
25 Ovenbird

8 Worm-eatingWarbler

4 Louisiana Waterthrush
3 Blue-winged Warbler

6 Black-and-white Warbler

10 Common Yellowthroat

6 American Redstart

4 Yellow Warbler
1 Chestnut-sided Warbler
2 Pine Warbler
8 Scarlet Tanager
4 Northern Cardinal
8 Rose-breasted Grosbeak
1 Indigo Bunting