Connecticut Conference on Natural Resources 2018 Program
Poster Abstracts

Legacy Vegetation Data to assist Ecological Site Description

Nels Barrett, Lily Orr, UCONN; Michael Margo, NRCS; Kenneth Metzler, Consulting Ecologist; NRCS, Amherst, MA

Ecological Sites are the fundamental land units that make up the pattern relating vegetation and soils across the local landscape. Ultimately, these ecological sites that depict landscape complexity can provide a consistent framework for organizing vegetation-soil relations and for estimating effects of disturbances or responses to management. Key to the delineation and description of Ecological sites is the geographic characterization of soils and the expression of the dynamics of associated plant communities. In this project, part of the effort of defining plant community dynamics, was the use of revitalized "Legacy" (i.e. historic hardcopy) vegetation plot data in support ecological site descriptions.

The challenge of legacy vegetation is data recovery, updating, and management. A small set of legacy vegetation data was compiled from contributing area ecologists. Sites were georeferenced based on known coordinates or plot locale. Plant nomenclature was updated to current standards in the USDA NRCS PLANTS database. Floristic plant communities portrayed in the plots were then ascribed to conform to the National Vegetation Classification standards. All site and floristic information was digitally entered into a simple "PLOTS" database (MSAccess).

The resulting modernization of legacy vegetation data into a localized geographic database allows for exploratory data analysis, as well as tailored data exports to other data repositories such as the NRCS' National Soil Inventory System (NASIS) and Ecological Site Inventory System (ESIS), and VegBank, the national vegetation plot database.

Road salt induced cation exchange in upland and wetland soil

Katherine Bell, Kelsey Witik, Ashley Helton, John Volin; University of Connecticut

Widespread applications of deicing salts (primarily as sodium chloride) create well-documented increases in soil salinity. Sodium from road salts may also exchange with other non-sodium cations in soils (magnesium, calcium, and potassium). We conducted a soil core experiment to quantify non-sodium cation loss rates from wetland versus upland soils. Soil cores (10 cm deep) were collected from a forested upland (n = 15 cores) and a wetland (n = 15 cores) with no prior exposure to road salts. To simulate road salt exposure, we added sodium chloride solutions at varying concentrations (freshwater, 3, and 6 ppt) three times a week for five weeks to the top of each soil core. Leachate from each core was collected six times throughout the experiment and analyzed for cation concentrations. Our initial results suggest both salinity treatments had higher cation concentrations in leachate relative to the freshwater control for both soil types. Concentrations of non-sodium base cations peaked between five and 12 days after the start of the

experiment, and the effect of road salts on base cation exchange increased with increasing salinity. We also found that wetland soils had higher cation leachate concentrations than upland soils. Our results suggest that both upland and wetland soils readily lose cations when exposed to sodium chloride concentrations typically observed in the field, and wetlands may be more susceptible to road-salt induced cation exchange. Future work includes a field survey of cation concentrations in wetland soils that experience a range of road salt pollution.

K-1 Environmental Education: Strategies Promoting Environmental Literacy

Justin A. Compton, Springfield College

Future environmental challenges facing the world will become increasingly complex. Young children need to be equipped for tomorrow's challenges, and we must adequately prepare our children for the environmental future they will inherit. Part of this environmental preparation needs to focus on Science, Technology, Engineering, and Math (STEM) disciplines to create scientific and environmentally literate citizens that helps them become the educated thought leaders of tomorrow. North Grafton Elementary School (NGES) is fostering K-1 environmental literacy through implementation of a school improvement plan that addresses the need for young children to develop as responsible citizens of our planet. Preliminary results show that K-1 students at NGES engaged in environmental literacy activities, such as afterschool enrichment programs are beginning to understand how people and natural systems relate to each other. Students at NGES have demonstrated increased ecological knowledge through activities that focus on awareness and are designed to develop a basis of understanding for the characteristics of environments and how they function. Preliminary results show increased understanding of habitats, biodiversity, and adaptations. Future activities will aim to further develop ecological knowledge in areas of populations, ecosystems, and niches. The NGES school improvement plan has provided the framework for increasing environmental literacy through hands-on activities and continued assessment of environmental competencies, knowledge, and student behavior.

Ecological mapping of the eastern Long Island Sound seafloor

Christian W. Conroy, University of Connecticut; Peter J. Auster, University of Connecticut & Mystic Aquarium; Ivar G. Babb, University of Connecticut; Roman N. Zajac, University of New Haven; Courtney Schneeberger, University New Haven; Olivia Walton, University New Haven

Ensuring the conservation and sustainable use of marine resources through effective policies and regulations requires information on their distribution and ecological characteristics. The states of Connecticut and New York dedicated funding from the Long Island Sound cable fund settlement to an extensive seafloor habitat mapping initiative. Building on a Pilot Phase in central LIS, the second phase focuses on the eastern Sound, from west of the Connecticut River through Fishers Island Sound. Ecological and geophysical data will be integrated to create seafloor habitat maps, estimate spatial distributions of ecological communities, and identify regions of high biodiversity. Infaunal and epifuanal communities will be characterized through sampling conducted at 90 sites selected based on image analysis of backscatter mosaics that identified seafloor habitat patches at multiple scales. Sites were selected to ensure representation of extant physical bottom types and regions of geological (and potential ecological) transitions. Seafloor ecology is being characterized using video and photographic transects as well as grab and suction

samples collected via scuba diving, the USGS SEABOSS system, and the Kraken 2 ROV. To date, 35 video transects (4275 still images) and 104 grab and suction samples have been collected. Initial sampling has provided coarse estimates of dominant faunal distributions throughout the study area. Sampling will be completed in May 2018, followed by continued analyses and integration of results to produce maps of habitats and associated ecological characteristics. These maps will be used to inform marine spatial planning and management for multiple uses of the Sound's environment.

Cyanobacteria Blooms at Five State Swimming Beaches

Abigail Davis, CT DEEP – Water Quality Monitoring, University of Connecticut; Christopher Bellucci, CT DEEP – Water Quality Monitoring; Tracy Lizotte, CT DEEP – Water Quality Monitoring

Cyanobacteria blooms are increasing in magnitude and frequency largely due to anthropogenic modifications to the environment. Some cyanobacteria species are capable of producing cyanotoxins (e.g. microcystin) harmful to human health. Therefore, the Connecticut Department of Energy and Environmental Protection (DEEP) implemented a cyanobacteria monitoring program in 2013 to help ensure swimmer safety. In July-August 2014, water samples were collected on a weekly basis at five state freshwater beaches. Using an integrated water sampling technique, DEEP staff collected surface water samples that were analyzed for general chemistry parameters, cyanotoxin concentrations, and phytoplankton/cyanobacteria cell counts. Hoboware light-temperature pendants were also launched to record daily mean values. Most of the cyanotoxin samples (80%) had concentrations below the detection limit for microcystin (0.2 µg/L). Cyanobacteria cell counts increased when daily mean water temperature reached 24.5°C. Light intensity data were unusable due to what we believe was interference from algae growth on the Hoboware pendants. Other scatterplots of cyanobacteria cell counts and nutrients did not show strong correlations. These results suggest that the environmental factors governing cyanobacteria growth are complex and interrelated. Thus, the occurrence of blooms depends on a combination of these factors in relation to the specific phytoplankton community at each site.

U.S. Geological Survey Discrete and Continuous Water Quality Sampling in Connecticut

Kaitlin Desmarais, Troy Wood; U.S. Geological Survey, New England Water Science Center

The U.S. Geological Survey (USGS) in cooperation with the Connecticut Department of Energy and Environmental Protection (CT DEEP) has been collecting water quality data from 37 sites across the state of Connecticut for many years, with some dating back to 1973. USGS personnel collect water quality samples, for the analysis of nutrients, major ions, dissolved trace elements and *E. coli* on a monthly or bimonthly basis. The data are then used by CT DEEP to generate 303(d) and 305(b) reports to congress as well as many other assessments of stream and river water quality in Connecticut. The water quality data has led to the development of trend analysis reports and nutrient load estimates for the various rivers throughout Connecticut. Routine sampling has identified seasonal fluctuations in different constituents, and helped to accurately establish the baseline quality of the states waterways. While overall water quality has generally improved over time, nutrient loading still remains a prominent issue affecting many areas. Many

changes in the concentrations of nitrogen, phosphorous, and dissolved trace elements can be traced back to management practices of wastewater discharge from municipal and industrial treatment plants, fertilizer runoff in agricultural areas and controls of non-point source pollution.

In addition to discrete water quality sampling, continuous water quality monitors have been deployed at many sites across the state of Connecticut. These monitors collect dissolved oxygen, temperature, pH, specific conductance, and turbidity at 15 minute intervals. These data help provide information about water quality with high temporal resolution about in-stream water quality processes. Continued monitoring of Connecticut's watersheds will aid in analyzing how changing land use, management practices, and climate are affecting the water quality of Connecticut.

Denitrification and N_2O Emissions in Coastal Salt Marshes

Kayleigh E. Granville, Ashley M. Helton, Sean Khan Ooi, University of Connecticut & Center for Environmental Sciences and Engineering

Denitrification is an important ecosystem function in wetlands that removes reactive nitrogen by converting nitrate to dinitrogen gas (N_2). Denitrification also produces nitrous oxide (N_2O), a potent greenhouse gas. Quantifying the balance of N_2 and N_2O production from denitrification is important for understanding the role that wetlands play in mediating the effects of excess nitrogen pollution. Our objective was to test methods to quantify denitrification rates and N_2O emissions from coastal wetland sediments. We took soil samples from three vegetation zones at varying distances from tidal creeks (*Spartina alterniflora, Spartina patens, Phragmites australis)* in five coastal wetlands in Connecticut and measured total potential denitrification and N_2O production. First, we conducted standard Denitrification Enzyme Activity assays (DEA). Because of high background concentrations of N_2 in the atmosphere, DEA uses acetylene to inhibit the transformation of N_2O to N_2 and the accumulation of N_2O over time represents a measure of total potential denitrification, but does not allow for quantification of N_2O. Thus, we conducted a second set of assays without the acetylene block to measure N_2O production. We also measured N_2 production using Membrane Inlet Mass Spectrometry from the assays without acetylene. The methods we tested allowed us to compare N_2 and N_2O emissions to determine the N_2O yield. Our preliminary results suggested that while there are no significant differences in denitrification rates among vegetation zones, there are differences in N_2O emissions. Future research using these methods will investigate how denitrification rates and N_2O emissions change temporally among coastal wetland vegetation zones.

Dissolved Oxygen Monitoring Program for Evaluating Stream Impairment

Brittney Izbicki, David Sullivan, U.S. Geological Survey

The U.S. Geological Survey (USGS), in cooperation with the Connecticut Department of Energy and Environmental Protection (CT DEEP), implemented a dissolved oxygen monitoring program during the summers of 2015, 2016, and 2017. The study was conducted as a result of the recommendations in the report "Methods to Measure Phosphorus and Make Future Projections"

by the Connecticut Academy of Science and Engineering in accordance with Connecticut Public Act No. 12-155, An Act Concerning Phosphorus Reduction in State Waters.

Twelve rivers in Connecticut were selected for the project across a gradient of in-stream phosphorous concentrations. Continuous water quality multiparameter sondes were deployed at each of the sites during the summer (June through September) to collect continuous dissolved oxygen along with water temperature, specific conductance, and pH. The data collected by USGS provided information on maximum daily diurnal dissolved oxygen concentrations that will be used with diatom community data collected by CT DEEP to evaluate biological impairment from excess phosphorus.

The goal of the project is to improve the USGS statewide data collection program for nutrients, by helping to understand the consequences of nutrient loading on aquatic biological communities. The State of Connecticut has a number of rivers with phosphorus loading from municipal wastewater treatment facilities and nonpoint source runoff. Information on diurnal dissolved oxygen concentrations and phosphorous concentrations and loads will help determine appropriate phosphorous reductions required to meet CT water-quality standards for inland non-tidal waters.

Benefits, Costs, and Decision-Making in the Residential Forest

Danielle P. Kloster, Anita T. Morzillo, John C. Volin, University of Connecticut Department of Natural Resources and the Environment; Brett Butler, USDA Forest Service Northeastern Research Station, Amherst, MA; Andrew Deener, University of Connecticut Department of Sociology, Storrs, CT; Thomas Worthley, University of Connecticut Department of Extension, Haddam, CT

The residential forest provides many benefits to communities, including stress relief, air quality improvement, and increased property values. However, the residential forest may also contribute human-perceived problems or costs, including allergens, leaf debris, infrastructure damage, and maintenance costs. Few studies have explored the impact of those costs on resident decision-making. Management by utility companies along power lines is one process shaping the residential forest that may be influenced by perceptions of benefits and costs of the forest. Our first objective is to investigate the benefits and costs of trees as identified by residents, and the connection of benefits and costs to residents' values. Our second objective is to explore how connections among benefits, costs, and values differ among people making decisions about tree management in the context of utility tree removals. The study area will span several towns in eastern Connecticut representing a spectrum of urban to rural residential areas. We will conduct one-on-one qualitative interviews with resident-homeowners who have made decisions regarding utility tree management on their property between 2014 and 2017. Applying the Means End Chain theory, we will use a laddering interview technique to explore benefits and costs that residents identify with trees and the values that they connect to identified benefits and costs. Additional interview topics will include recent experience with the utility company's vegetation management team, other tree management activities undertaken, and the resident's ideal front yard. We expect that these interviews will contribute to improved understanding of residents' decision-making about the roadside forest.

Emergent metabolic regimes of river networks

Lauren E. Koenig, Ashley M. Helton, University of Connecticut

Recent advances in measuring, modeling, and synthesizing stream metabolic rates are improving our ability to disentangle the hierarchy of controls on primary productivity (GPP) in stream and river reaches. However, we still know very little about the emergent patterns of stream metabolism at river network scales. Here we explore whether the daily variation in metabolism within individual stream reaches culminates in an emergent river network metabolic regime. To estimate river network GPP, we applied a set of modeled productivity regimes common to streams and rivers to individual reaches within simulated Optimal Channel Networks (OCNs). We found that at the river network scale, daily GPP exhibits a bimodal annual regime with seasonal peaks during the spring and summer. Although GPP in headwater streams is relatively low, the cumulative influence of spring peaks in primary productivity across a large number of headwater streams is substantial at the network scale, and river network GPP is often maximized during the spring vernal window. Additional model scenarios will explore how the range and timing of river network metabolism is affected by watershed size as well as future shifts in climate and riparian land use.

An Experimental Study on Energy and Water Uses of A Newly Developed Greenbox Farming System

Cong Liu, University of Connecticut

Recognizing the need for economical, sustainable and feasible ways of food production in highly populated urban areas, a greenbox farming system has been proposed and developed by VECNA and University of Connecticut. The system uses urban warehouses to house and operate individually controlled growing boxes for massive horticultural production. An experimental study was conducted at University of Connecticut to evaluate the energy and water uses of a model greenbox. The greenbox was built with insulated fabric materials and metal frames, sized 1 m in length, 1 m in width and 2 m in height. A forced ventilation system was built on the walls with an exhaust fan on top and air inlets at the bottom. A bench platform was housed inside the box for growing short greens with pebbles as the growing media. Light and energy was provided by using LED lamps hanging about 1 m above the growing platform. A hydroponic system was constructed to provide nutrient solutions to the growing platform. Properties of the nutrient solution, including temperature, pH, conductivity and water level, are continuously monitored by a Nutrient Controller Hub. The interior environment of the greenbox, including light, temperature, humidity, and CO2 concentration, were measured and regulated by an IPonic 614 Environmental Controller. The greenbox was located in a warehouse with available power and water supply. Separate sets of sensors were used to measure the environmental conditions inside and outside of the warehouse. All the environmental data were collected and transmitted to a dedicated computer for analysis. Lettuce was selected for this study. Young plants were transplanted into individual containers on the platform. Daily growing parameters and water use were measured manually with a LAI meter and a weighing lysimeter, respectively. The experiment was run for a 6-week period in winter climate. The results indicate that the proposed structure was capable of providing climate for lettuce to grow and mature with good quality, and

that the energy and water uses were comparable with traditional greenhouses. More experiments are planned for tests in different climatic conditions.

Using Temporal Signatures, Multispectral Imagery, Machine Learning, and Unpiloted Aerial Systems to Map the Distribution of Invasive Species in the Connecticut Forest

Nancy Marek, Chandi Witharana, Jason Parent, John Volin, and Robert Fahey, UConn NRE

The Connecticut Department of Energy and Environmental Protection (DEEP) lists invasive species as its number one concern regarding forest ecosystem health and biodiversity. Accurate invasive species occurrence maps would allow DEEP and other natural resource professionals to monitor invasive plants more effectively. This study is being conducted to determine whether Unpiloted Aerial Systems (UAS) equipped with a multispectral imagery sensor can be used to accurately map the spatial distribution of the invasive nonnative shrub species, Japanese barberry (*Berberis thunbergii*) and multiflora rose (*Rosa multiflora*), in temperate deciduous forest understories in Connecticut. We hypothesize that the multispectral imagery sensor will detect the two species in the understory largely because of their early phenology in the case of Japanese barberry and late phenology for multiflora rose as compared to native understory trees and shrubs. Innovative machine learning techniques will be applied to the UAS sensor data to test our hypothesis. In addition, the phenological development of the forest understory will be captured using time-lapse photography and ground surveys. The resulting invasive species occurrence maps will be used to explore environmental predictors (i.e., canopy density, soil type, water features, greenness index) for identifying and predicting the spatial pattern of Japanese barberry and multiflora rose across deciduous forest environments in the northeast. Our objectives, if successful, could lead to a cost-effective method for improving invasive plant management for foresters and land managers.

The UConn-Greenwich Partnership

Sarah Nahabedian, Devan Shulby; Town of Greenwich Shellfish Commission

Long Island Sound and its associated watersheds represent a trillion-dollar asset that benefits human society in countless ways. Benefits range from natural resource extraction via fishing and shellfish harvesting, to protection of coasts from wave damage and erosion, to water filtration and nutrient cycling, to recreation, tourism, research and quality of life.

Global change, whether climate change, sea level rise, invasive species, land use change, or increased transmission of pathogens and parasites, represents a chronic and sometime acute threat to any ecosystem.

Mitigating or eliminating these threats becomes incredibly complex when fully considering the many ecosystem services and various segments of society that benefit from them. Our challenges related to long-term sustainability are to:

- Understand the underlying mechanisms that support biodiversity and the ecosystem services that it provides;
- Protect and conserve diverse coastal and estuarine habitats, and the wildlife that they support;
- Maintain or enhance the ecosystem services on which human prosperity depends.

Meeting these imposing environmental challenges requires effective leaders, new multidisciplinary approaches, and collaborative efforts. In the UConn-Greenwich Partnership, we have forged a unique alliance of world-class biodiversity and environmental scientists from the Storrs and regional campuses to work with local communities and governmental agencies to intimately understand, monitor, and wisely manage the vital natural resources of Long Island Sound and its associated terrestrial watersheds.

An Analysis of Enhanced Tree Trimming Effectiveness in Connecticut using a Geospatial Approach

Jason Parent, Tom Meyer, John Volin, Robert Fahey, Chandi Witharana; University of Connecticut

We evaluated the effectiveness of an enhanced tree trimming (ETT) program, in Eversource Energy's Connecticut service area, for its ability to reduce tree-related power outages on an electric distribution system during storm events. Evaluations encompassed thirteen years of trimming (*i.e.*, 2005-2017) data and were performed for both backbone (originating directly from a substation) and lateral (offshoots of backbones) utility lines. The study site spanned the entire state of Connecticut, where the dominant vegetation is temperate deciduous forest. We controlled for variations in weather, tree cover, and wire type, by pairing ETT-treated zones with nearby untreated zones. ETT-treated and untreated control zones had the same wire type and similar percent tree cover and line lengths. Relative outage rates were calculated for each pair to indicate the performance of ETT-treated zones relative to background outage rates of untreated zones. ETT-treated backbone conductors had overall outage rates that were 0.07 – 0.09 outages/km/year lower than untreated backbones, which is a 33 - 42% reduction when compared to all untreated laterals (0.2 outages/km/year). ETT-treated lateral conductors had significantly lower outage rates, than untreated laterals, for "minor" outage types (*i.e.*, blown fuse, tripped recloser, etc.) but not for "major" outage types (broken poles or wires). Overall outage rates on laterals were reduced by 0.07 – 0.36 outages/km/year which amounts to 35-150% reduction over the outage rate for all untreated lateral zones. These results pertain to storm-damaged areas only. System-wide ETT application is predicted to reduce outages by 14-18 and 120-286 outages/year for backbone and lateral lines, respectively. Our study provides a robust empirical evaluation of ETT and also proposes a geospatial methodology that controls for variations in weather and environment.

Subaqueous Soil Survey: An example from Niantic Bay, CT

Thomas W. Privott, Mark H. Stolt; University of Rhode Island

The national Coastal and Marine Ecological Classification Standard (CMECS) recommends a soils approach for describing and classifying shallow subtidal substrates for interpretations and management of coastal ecosystems. This recommendation was made because "a more detailed classification is needed for use and management decisions". An inventory of the shallow subtidal substrates is called an estuarine subaqueous soil survey. These surveys are used to guide a number of use and management decisions such as eelgrass restoration, aquaculture siting, oyster restoration, dredging activities, docks and moorings, and carbon accounting and sequestration.

In this project, we are mapping the subaqueous soils in a 1000 hectare area of an estuary including Niantic River, Niantic Bay, and Jordan Cove between the towns of East Lyme and Waterford, Connecticut. A tide-corrected bathymetric map was made using approximately 23,000 depth measurements to identify shallow subtidal soil-landscape units such flood-tidal deltas, submerged beaches, spits, and cove. Substrates were sampled within each landscape unit to 1.5 to 2 meters with a Macaulay peat sampler or a vibracore. Morphological descriptions for each core were completed. Soil characterization included grain size distribution, incubation pH, bulk density, fluidity, reaction with hydrogen peroxide, organic matter content, calcium carbonate content, and conductivity. These data were used to create a subaqueous soils map of the estuary for use and management interpretations.

Edge Influence in Roadside Forests after Forest Management

Julia Rogers, Robert Fahey, John Volin, Thomas Worthley, University of Connecticut

Stormwise is forest management program that aims to create storm resistant forests by creating space for healthy trees to grow in roadside forests. Opening the forest canopy in roadside forests has the potential to increase edge effects into the forest, changing the abiotic environment and structure and composition of the plant communities in these forests. The objective of our study was to quantify the magnitude and depth of road edge effects on plant communities and environmental conditions in Stormwise treatments compared to control treatments throughout Connecticut. Specifically, we were interested in patterns invasive species, woody plant community structure and composition, and herbaceous plant community structure and composition with increasing distance from the road. To investigate these patterns, we established transects perpendicular to the road at eight Stormwise sites and their paired control forests across Connecticut. Along these transects, we estimated percent cover of woody and invasive plants, and measured the light environment via hemispherical photographs and a ceptometer. Our results confirmed that there was greater light availability in Stormwise sites relative to control sites (Kruskal-Wallis Test, $p < 0.0001$), and that there is a difference in the composition of the woody plant communities (linear-mixed effects model, $p<0.001$). Additionally, we found a greater depth of edge influence in Stormwise sites as compared to control sites on light environments, the abundance of invasive species, and the richness and diversity of woody plants.

A New Field Research Station for Connecticut Biologists

Chad Seewagen, Great Hollow Nature Preserve & Ecological Research Center

Great Hollow Nature Preserve & Ecological Research Center is a newly established non-profit organization in New Fairfield, Connecticut that is dedicated to natural resources conservation, applied ecological research, and experiential environmental education. Great Hollow also operates as a biological field station and welcomes external researchers from around the state, including both professionals and students, to use the property for their work. The 825-acre preserve contains second-growth deciduous forest, shrubland and old fields, a beaver pond, and freshwater stream, and is contiguous or nearly contiguous with thousands of additional acres of protected land in Connecticut and neighboring New York. Some notable fish and wildlife species that are known to occur at the preserve include wild brook trout (*Salvelinus fontinalis*), New

England cottontail (*Sylvilagus transitionalis*), bobcat (*Lynx rufus*), fisher (*Martes pennanti*), black bear (*Ursus americanus*), wood turtle (*Glyptemys insculpta*), and a variety of forest birds. On-site facilities that are available to external researchers include newly renovated housing (with kitchen and laundry), desk/office space with internet, conference room, and a wet lab. Great Hollow also offers up to $5,000 in grants each year to support biological research at and beyond the preserve. Applicants may be students or professionals of any age and career stage. We welcome inquiries about this funding opportunity and the use of Great Hollow as a field research site. Please visit www.greathollow.org to find out much more. Small grants are also become available for graduate, undergraduate, and high-school students working at the preserve. All areas of field biology are welcome, but those with a conservation application will be given preference. All of the facilities of a biological field station, including lodging and a wet lab, and welcomes external researchers. The preserve totals 825 acres and is contiguous or nearly contiguous with thousands of acres of additional protected land in Connecticut and neighboring New York State

Keeping Connecticut's Wildlife on the Landscape
Jane Seymour, CT DEEP Wildlife Division

With our forests growing back, why are so many of our wildlife species disappearing? Many of the plants and animals on Connecticut's list of Endangered, Threatened and Special Concern species depend on grasslands, shrublands and young forest, also known as Early Successional Habitat (ESH). Because we have eliminated the natural processes that created ESH, these habitats are disappearing. To bring back these habitats, and the species that depend on them, we must mimic the natural disturbances, such as fire and tree cutting, that historically provided homes for these animals.

Soil Potential Mobility Ratings of Road Salt Applications on Soils
Debbie Surabian, Maxine Levin, United States Department of Agriculture, Natural Resources Conservation Service, Beltsville, MD

During the winter season, the safety and mobility of drivers requires using the best winter maintenance practices and materials currently available. Today and likely into the foreseeable future, that means using chloride-based snow and ice control chemicals, which are the most effective and cost efficient de-icers. Despite all the benefits for traffic safety, there are also many adverse effects with respect to salting to the surrounding environment. Details on the distribution and concentrations of deicing salt in soils would help indicate both the geographic extent of deicing salt impacts and the relative importance of different pathways like runoff, infiltration, or retention in soils. The purpose of this soil interpretation is to identify soils that have the potential to retain or mobilize salts due to the application of road salts.

Soil survey interpretations are predictions of soil behavior for specified land uses and management practices. They are based on the soil properties that directly influence the specified use of the soil. Soil survey interpretations allow users of soil surveys to plan reasonable alternatives for the use and management of soils. They are used to plan both broad categories of

land use such as cropland, pastureland, woodland, or urban development, as well as specific elements of those land uses.

Trends in Urban Tree Canopy across the United States

Elliott Volin, Dr. Robert Fahey, University of Connecticut, Department of Natural Resources and the Environment

Urban forests provide a variety of ecosystem services that impact environmental and social welfare within developed areas. Prior studies have evaluated how the inequitable distribution of urban tree canopy (UTC) effect ecological and social benefits, which results in environmental and social inequalities within individual cities. However, it is not well established how such relationships vary among urban areas in different biophysical and socio-cultural regions. The objective of our study was to identify regional and continental trends in the relationships of UTC and related ecosystem benefits with socioeconomic/ demographic factors and characteristics of urban regions (e.g., development patterns, timing). To address our objective, we utilized iTree Landscape, US Census data, and other information sources to develop a data set of census block group level UTC-related response variables (e.g., percent UTC, inequity in UTC) and socio-economic/demographic predictor variables (e.g., median income, inequality in median income) for forty U.S. cities. These cities spanned seven distinct ecoregions and four socio-cultural regions. We utilized multiple regression analysis in an information-theoretic model selection framework to analyze relationships among UTC, ecosystem benefits, socioeconomic, and demographic predictor variables and then evaluated how these relationships varied among cities within and among ecoregions and socio-cultural regions. Our initial results have illustrated trends between UTC and predictors across regions, indicating that the drivers of UTC inequities are variable among cities and among biophysical and socio-cultural regions. Our findings will help identify patterns in ecosystem service inequities across the United States and provide insight into the underlying drivers of these inequities.

Remote sensing meets K-12 earth and environmental education

Chandi Witharana, James Hurd, Department of Natural Resources and the Environment; ConnecticutView Program, Eversource Energy Center, University of Connecticut

Remote sensing is no longer experts' science or technology. It exhibits immense practical implications in learning situations for novice. Remote sensing provides data, information, and immersive visualization environments critical to modeling earth, environmental, and anthropogenic processes and their complex interactions. A basic competence requested in many national and international standards of education is the ability to extract, interpret, and evaluate geographic information from maps and digital imagery independently. Despite the promise afforded by satellite imagery, immersive camera technologies, virtual globes, and 3D visualization, the actual implementation of Remote sensing in K-12 school practice still lags behind. This is mainly due to the thematic complexity, the lack of educational material, and technical know-how of the teacher. Looking at the earth from space is an unfamiliar perspective for many adolescents. However, the nadir perspective itself makes satellite imagery are interesting and motivating, if they are explained carefully, and/or embedded into a framework of additional information from texts, charts, graphics, and maps. In this poster, we aim to exhibit

our exploratory efforts to close some of the existing knowledge and technological gaps. One example study pronounces the use of Remote sensing as a virtual passport for open-ended exploration of remote landscapes such as Antarctica. Another example study exhibits Remote sensing's potential uses in social studies, especially assembling lesson plans for theme topics such as Geographic Representations: Spatial Views of the World and Geographic Interconnections: Human and Environment.

CON Road salt effects on sugar maple and black locust saplings

Kelsey Witik, Katherine Bell, Ashley Helton, John Volin, University of Connecticut

The widespread application of deicing salts increases sodium chloride (NaCl) concentrations in soils, which negatively affects roadside trees. Sodium also displaces other base cations (Ca^{2+}, K^{+}, Mg^{+}) in soils, which trees require as nutrients. To disentangle the direct (elevated NaCl) versus the indirect (depleted non-sodium base cations) effects of road salts on trees, we conducted a greenhouse experiment with sugar maple, *Acer saccharum*, (n = 65) and black locust, *Robinia pseudoacacia*, (n = 65) saplings. We applied four treatments every four days for six weeks: NaCl (50 mM), non-sodium base cations (4.375 mM Ca^{2+}, 1.25 mM Mg^{+}, and 0.375 mM K^{+}), NaCl plus non-sodium base cations (50 mM NaCl, 4.375 mM Ca^{2+}, 1.25 mM Mg^{+}, and 0.375 mM K^{+}), and freshwater control. We harvested 17 trees of each species before the experiment began to measure baseline conditions, and we harvested 24 trees of each species at weeks three and six. We measured biomass (relative growth rate), photosynthesis, and cation content of leaves at each harvest. Reducing road salt application may mitigate the direct effects of NaCl on the environment, and our study, which is currently being analyzed, will contribute to a better understanding of the effect of non-sodium base cation depletion on roadside trees thereby informing long-term management practices.

Spatial analysis of attitudes towards black bears in CT

Nicholas Yarmey, T. Morzillo, Rick Jacobson, Jason Hawley, Paul Rego, Department of Energy & Environmental Protection, Wildlife Division

The American black bear (*Ursus americanus*) is expanding its range across the northeastern US, including Connecticut, which has been accompanied by an increasing number of interactions between black bears and humans. To better understand the human dimensions of these interactions, a resident survey was used to collect data about human-black bear interactions across nine Connecticut towns where human-black bear conflicts are occurring. The survey focused on residents' experiences with black bears, attitudes towards black bears, and preferences for black bear management strategies. Most respondents (n = 1,189; 90%) have seen a black bear in their neighborhood, and many (n=577; 47%) have had a bear scatter the contents of their garbage once or more. We are assessing resident attitudes toward black bears, and how such attitudes might vary based on experience with black bears. We are also evaluating the relationship between respondents' attitudes towards black bears and additional social and ecological variables (e.g., location on the urban-rural gradient, distance from forest edge, housing density) to explain the distribution of attitudes across the landscape. The results of this

study will be used to guide management of human-black bear conflicts in a largely exurban context.