Connecticut Conference on Natural Resources 2016 Program

All abstracts

Water Quality, Waterbody Classification and Land Cover

Oral Presentation

Janet R. Barclay

Connecticut, like many states, classifies waterbodies according to groups of designated uses. The classes are not intended to indicate water quality, though one might assume they are related to water quality. Additionally, land use, and likely forest fragmentation, influence water quality; however, land use and forest fragmentation patterns are not typically part of waterbody classification systems. To determine the relationships among water body classification, water quality, land cover, and forest fragmentation in Connecticut, we analyzed existing water quality data for the State of Connecticut from the United States Geological Survey and the Connecticut Department of Energy and Environmental Protection and land cover data from the National Land Cover Dataset. Connecticut uses a unique classification system that includes separation of drinking water sources (Class AA waterbodies) and waterbodies receiving waste water discharges (Class B waterbodies). Compared with Class AA waterbodies, Class B waterbodies tend to have higher levels of nitrogen, solids, some ions (chloride and sodium), and certain metals (copper and lead). Class B watersheds have less forest cover, more development and more impervious cover than Class AA watersheds. We identified a subset of Class B waterbodies with "Class AA-like" water quality. These Class B waterbodies have upstream land cover that is "AA-like" and less forest fragmentation than either Class AA or the bulk of Class B watersheds. We found that water quality is more closely correlated with land use and forest fragmentation parameters than with water body classification.

Developing Provisional Ecological Sites using Soil Catena Models

Poster

Nels Barrett

Ecological Sites are the fundamental land units that make up the pattern relating vegetation and soil across the landscape at a local scale. Ecological sites within a complex landscape setting provide a consistent framework for organizing vegetation-soil relations and for estimating effects of disturbances or responses to management. The Natural Resources Service (NRCS) is committed to developing provisional ecological sites to cover all soil components completely within each Major Land Resource Area (MLRA) across the US over the next 5 years. To rapidly approximate ecological sites at a provisional level, pre-existing ecological information relevant to the soils and vegetation was used. Existing soil catena models were used to describe different parent materials and soil sequences and properties related to landscape position and wetness. Vegetation information was obtained from pre-existing sources (e.g., State Natural Heritage Programs) from accounts of native plant communities with generalized descriptions of living and site conditions. Changing vegetation patterns reflecting the ecological and environmental nature of the land surface form toposequences. Using soil catena charts

as a reference for soil sequences, native plant communities were matched and assigned to individual soil series (based on soil temperature class, lithology, parent material, soil drainage class, soil texture, and presence of restrictive layer, as well as personal observation, and consultation with area ecologists.) The resulting series of Ecological Site shows the combined vegetation toposequence/soil catena, for selected parent materials. These provisional ecological sites are hypothesized soil-vegetation combinations proposed for future clarification, testing, and refinement using field reconnaissance and plot data.

Influence of silicon and Fusarium palustre on dimethylsulfoniopropionate levels in Spartina alterniflora

Oral Presentation

Magali Bazzano

The salt marsh intertidal zone in the Northeast is dominated by Spartina alterniflora. In Connecticut, salt marshes have suffered a dieback called Sudden Vegetation Dieback (SVD). The initial stressors that lead to SVD are not clear, yet herbivory by Sesarma reticulatum and disease from Fusarium palustre have been associated with the dieback. S. alterniflora from SVD marshes in GA were shown to have low levels of dimethylsulfoniopropionate (DMSP) (a putative stress metabolite) and higher levels of Si compared to healthy plants. Surveys in SVD sites and healthy sites in CT in 2015 confirmed these trends. Subsequent studies addressed whether applying Si with or without the Fusarium pathogen would affect DMSP levels in S. alterniflora. Plants treated with both Si and F. palustre in the greenhouse had elevated levels of DMSP where there was only a marginal effect individually compared to untreated controls. The conflicting data between field and greenhouse experiments may suggest that the role DMSP in plant health is unclear.

Invasive Aquatic Plants

Workshop

Gregory Bugbee

Invasive aquatic plants threaten to forever change Connecticut lakes and ponds. These plants degrade native aquatic ecosystems, impede recreation, and reduce home values. Invasive plants have few natural enemies to control their growth and once established costly long term management programs are often needed. The Connecticut Agricultural Experiment Station's Invasive Aquatic Plant Program (CAES IAPP) has conducted over 200 vegetative plant surveys of Connecticut's lakes and ponds and found that nearly 60% contain one or more invasive species. Eurasian watermilfoil (Myriophyllum spicatum), minor naiad (Najas minor), curlyleaf pondweed (Potamogeton crispus), variable-leaf milfoil (Myriophyllum heterophyllum) and fanwort (Cabomba caroliniana) are the most common. Brazilian waterweed (Egeria densa), water chestnut (Trapa natans) and hydrilla (Hydrilla verticillata) are less frequently found but these plants may be making inroads due to climate change. Connecticut may be the "Gateway to New England" for plants adapting to a warming world. Controlling the spread of invasive aquatic plants requires a multifaceted approach including; prevention, early detection, rapid response, and a variety of in-lake management techniques. This workshop will explore these approaches

and train attendees to identify Connecticut's invasive aquatic plants using simple plant features and live specimens.

Tree Sway Dynamics in Northern Deciduous Forests

Oral Presentation

Amanda Bunce

In New England, nearly 90% of power outages during a storm event are caused by tree failure. Roadside forest management could hold a solution. Trees grow to resist the wind force they are exposed to, so increasing wind exposure with forest management practices could increase a trees' wind firmness. This study seeks to understand how tree movement is affected by wind, tree, and forest characteristics with the goal of predicting how changes in forest condition can affect tree wind firmness. The swaying motion of forty trees, of 9 different species, was monitored before and after a forest thinning treatment designed to increase the trees' wind exposure. Motion was measured with biaxial clinometer sensors, allowing us to determine the trees' vibrational frequency and the degree to which the trunk is bent. Data have been collected for one year prior to treatment and will continue to be collected for several years after. Characteristics of individual trees and surrounding forest conditions are being analyzed to determine their utility in predicting tree sway motions and how these motions may be affected over time, given greater wind exposure. Preliminary analyses suggest that tree vibrational frequency is predictable by the structural characteristics of the tree, but is independent of stand characteristics and wind fluctuation. Displacement of the trunk, on the other hand, is caused by the wind force and influenced by tree and stand structural characteristics. This research will help guide forest management efforts aimed at increasing wind firmness of roadside trees and forests.

Talbot WMA Dam Removal Project in Scotland, CT

Oral Presentation

Paul Capotosto

The State of CT DEEP, Wetlands Habitat and Mosquito Management (WHAMM) Program does lots of Integrated Marsh Management Projects with our low ground pressure equipment. Because of the lgp excavators and other pieces of equipment and the knowledge of running that equipment, the crew is often called upon to do odd freshwater projects like this small dam removal project in the Talbot Wildlife Management Area in Scotland, CT. Several partners were involved in this project including the U.S. Fish and Wildlife Service, the Natural Resource Conservation Service, the CT DEEP Inland Fisheries Division, the CT DEEP Wildlife Division and the WHAMM Program. The dam removal project consist of removing a small dam along an unnamed watercourse in the Talbot WMA located in the town of Scotland, CT. The dam is 6 feet in height from the top of the dam to the outlet pipe elevation. The water control boards have been removed for some time and there is a clearly defined channel with a vegetated floodplain exists in the former pool area. The dam was removed to allow aquatic organism passage along the unnamed watercourse. The NRCS provide the engineering plans and permits, the USFWS provide a hydraulic hammer for the Volvo lgp excavator, the CT DEEP Inland Fisheries provided technical and on the ground assistance and all the on the ground work was completed by the WHAMM

Program. The WHAMM Program used lgp excavator, a mini excavator, a skid steerer and hand tools to complete the job. Once the dam was removed, the site was graded and the crew had to create a riffle pool and then all areas were seeded and stabilized.   Funding was secure from the NRCS through the CT DEEP Wildlife Division, Habitat Management Program.   In-kind match of the WHAMM Program was also used to match the federal funding.

Data Makeover: Using a Story Map to Tell Your Story

Oral Presentation

Cary Chadwick

If there's one thing that a good map does well is tell a story. Gone are the days of paper maps, but while digital maps have become increasingly sophisticated, it's arguable whether they have advanced the art of storytelling. Enter the Story Map. Story Maps are interactive, web-based applications that combine geographic information with text and multimedia content including photographs, charts, graphs and video. They allow content to be accessed on web browsers, tablets and smartphones. And now, more than ever before, Story Maps are easy to create and can be built by just about anyone.

Educators at UConn's Center for Land use Education and Research (CLEAR) have been busy doing just that. This presentation will introduce several exciting Story Maps that the Center has recently developed, including ones focusing on CLEAR's Connecticut's Changing Landscape project (an award winner), research on Low Impact Development in Connecticut, and changes to Connecticut's coastline over the past 80 years. The presentation will focus in detail on the recently released Story Map "The Bears are Back, Getting to Know Connecticut's Bears," based on research conducted by UConn's Wildlife and Fisheries Conservation Center using genetic methods to identify individual bears from DNA contained in hair samples. We will tour the website, touching on the technology behind it and demonstrating how this medium can be an engaging way to bring research data to life -- hopefully leaving you inspired to go home and create your very own Story Map.

Characteristics of the Portable Band Sawmill Operator Community in CT

Oral Presentation

Frances Pacyna Champagne

During 2015 a survey was conducted of portable band saw mill owners and operators (PBSOs) in CT to help determine the capacity for PBSOs to help address small-scale forest management needs. The decreasing average size of forested parcels, the interest in small-acreage treatments for wildlife habitats and roadside forest management activities all call for scale-appropriate management approaches for tree harvesting and vegetation management. Corresponding value-added processing for wood products such as with portable band saw mills has the potential to foster local markets and utilization of wood products in the small quantities produced. Little is known about the PBSO community and the survey explored the demographics, activities, knowledge levels and educational needs of the PBSO community. Results of the survey reveal key information about age and income demographics, harvesting and operational practices, marketing interests, and knowledge gaps.

Relationship between Dragonfly Nymphs & Abiotic Variables

Poster

Cara Cifarelli

The dragonfly is a macroinvertebrate that uses its environment for survival. For instance, the organism uses sediment to help with growth and development, and uses water depth for protection and resources. To analyze the correlation between the dragonfly and the abiotic variables, a series of experiments will be conducted to test different factors. The first experiment will focus on determining which size/type of sediment an abundance of dragonfly nymphs choose in a man-made environment located in the laboratory. The second experiment will also take place in a man-made environment and will determine whether or not the dragonfly nymphs have a preference to water depth. Lastly, the third experiment will compare and contrast a man-made environment to a natural environment located in Connecticut. For all three experiments, the water present will be tested for its quality. Once completed, these tests will help draw conclusions as to what the mutual relationship between the abiotic variables and the dragonfly nymphs is. This study will run over a course of five months.

An Experimental Design to Manipulate Three Levels of Large Herbivore Browsing in southern New England

Oral Presentation

Justin A. Compton

With the recent recolonization of moose (Alces alces) in northern temperate forests it has been challenging to determine the role of herbivory by white-tailed deer (Odocoileus virginianus) in shaping regeneration and recruitment of hardwoods. We created an experimental design in central New England that manipulated three levels of large herbivore diversity (moose + deer, deer only, and neither). At each site, we constructed a full exclosure (fence to the ground to keep out moose and deer), a partial exclosure (fence two-feet off the ground to keep out moose but allow deer in), and a control plot (no fencing). We monitored effectiveness of the experimental design with animal-activated cameras. Data collected from animal-activated cameras between 2008-2011 from 6 sites indicate moose and deer visits in control plots were similar (paired t test; t = 0.19; DF = 4; P = 0.86). Deer visitation rates within partial exclosure (0.27 visits wk-1; SE = 0.11) and control plots (0.52 visits wk-1; SE = 0.19; paired t test; t = -1.15; DF = 4; P =0.31) did not differ. One site had a higher visitation rate in the control, causing the higher control mean. Our preliminary results indicate the effectiveness of our experimental design in excluding one large herbivore while simultaneously not altering another large herbivores movements within the treatments.

Assessing Coastal Erosion Hazard Vulnerability in Connecticut

Poster

Nathan Corcoran

Over 2 million people live in shoreline towns and cities in Connecticut. The current USGS Coastal Vulnerability Index ranks the entire Connecticut coast as having a low risk to erosion, yet large areas in the state have experienced significant erosion during 20th and 21st century hurricanes. In this study, we assess coastal erosion hazard in Connecticut in fine detail by incorporating high resolution datasets for geomorphology, coastal slope, historic rates of erosion/accretion, and mean tide range. Specific datasets we use in our analysis include: 1) the Environmental Sensitivity Index, which classifies the current shoreline interface according to grain size and type of vegetation; 2) a CT state surficial deposits map and soils map, which were mapped at 1:24,000 and 1:12,000, respectively; 3) 1 m LiDAR DEMs acquired in 2006 and 2012; and 4) the Shoreline Change Project, which accessed shoreline erosion and accretion using 1880 survey maps and aerial photographs. From preliminary investigation we have determined that the vulnerability is more complex than previous studies have shown. Important variations exists for the material exposed along the coast and in coastal landforms in general, such as manmade structures, bedrock outcrops, glacial deposits varying from sand to boulders, sand dunes and salt marshes. To help organize these variations we reclassified Environmental Sensitivity Index and surficial deposits in ArcGIS and set up a ranking system based on resistance to erosion. The ranking we use is 1-5, where 1 is most resistant; it is similar to the USGS classification but as applied to the CT coast. The geomorphic vulnerability is mostly 3-5 with clear variations in rocky more resistant areas and sandy, more vulnerable areas. LiDAR based topography and slope analysis indicates slopes range which we were also able to rank. When combining the rankings we see a clear picture of the erosion vulnerability, giving decision makers a better idea of how to manage the coastline.

Angling-Induced Evolution in Connecticut Largemouth Bass

Oral Presentation

Justin Davis

Recent research on Largemouth Bass has shown that individual bass vary in their vulnerability to angling, that angling vulnerability is heritable, and that angling vulnerability is correlated with other physiological and behavioral traits. Previous research by the DEEP Inland Fisheries Division (IFD) demonstrated that bass in Connecticut unexploited drinking water reservoirs were much more vulnerable to angling than bass from public lakes, a dynamic we now believe may be partially attributable to selection against high vulnerability in public lakes. If such selection has occurred, then bass populations in the State's multiple unfished reservoirs may present an opportunity for remediation. A "common garden" experiment, in which young-of-year bass from two public lakes and two unexploited lakes were raised together in a common environment, revealed that bass from unexploited lakes had significantly higher resting metabolic rates. Previous research has demonstrated a strong positive correlation between resting metabolism and angling vulnerability; therefore, this finding suggests that selection against high angling vulnerability and associated traits has occurred in public lake bass populations. We also transplanted adult bass from an unfished reservoir to a public lake in the early spring to assess whether transplanted reservoir bass would make a significant contribution to that year's spawn. Subsequent parentage analyses of young-of-year bass revealed substantial genetic introgression by transplanted reservoir bass, suggesting that periodic supplemental stockings of reservoir bass may provide an opportunity for genetic remediation. IFD is now considering additional experimental transplantations of bass from unfished reservoirs into public lakes to further assess management utility.

Are We There Yet?: The State of LID In Connecticut

Oral Presentation

David Dickson

For over twenty years, the NEMO program at UConn CLEAR, the Department of Energy and Environmental Protection (DEEP) and countless others have been researching and working with communities on the use of Low Impact Development (LID) tTechniques (also referred to as Green Infrastructure) to address the water quality and quantity problems associated with stormwater runoff. In January, DEEP upped the ante by issuing a new MS4 general permit that calls for more stringent management of stormwater, including many requirements to enhance the use of LID. So the time seems ripe for an assessment of where CT tTowns are in terms of LID.

Last year the NEMO program decided to conduct a small research project to take the temperature of LID in CT's cities and towns. The plans and regulations of 85 of Connecticut's 169 municipalities were reviewed for LID-related language. Follow-up telephone interviews were then conducted with 78 individuals involved in the land use planning process in those towns. In sum, the results show that there is general awareness and support of LID, although it has not yet been well integrated in land use regulations. Much remains to be done in terms of education and support for towns to help them push LID further. This presentation will highlight the findings of this study, share the top 5 drivers and barriers to LID at the local level, and showcase a new Story Map (interactive website) that will help communities learn from each other as they transform LID from an afterthought to a priority.

Coastal wetland ecosystem function at the intersection of sea level rise and urban runoff

Oral Presentation

April Doroski

Coastal wetlands are located at a vulnerable interface experiencing both contaminated runoff from developed lands and saltwater intrusion from sea level rise. These anthropogenic stressors may threaten the capacity of wetlands to perform ecosystem functions such as excess nitrogen removal via denitrification. We examined the effects of soil electrical conductivity (EC, a measure of salinity), ammonium, cation exchange capacity (CEC), and metal concentrations on potential denitrification rates in 36 tidal wetlands on the coast of the Long Island Sound. Soil cores were collected in June 2015 from saltwater, brackish, and freshwater tidal wetlands and analyzed at 0-5cm (top layer) and 5-10cm (bottom layer) depth intervals. Results of a multiple linear regression model selection for potential denitrification rates in the top layer include EC, ammonium, CEC, lead, and zinc in the best fit model ($r2$ =0.46; $p<0.05$). Potential denitrification rates were positively related to ammonium, CEC, and zinc, and negatively to EC and lead. Results for potential denitrification rates in the bottom layer include manganese and iron in the best fit model ($r2$ =0.29; $p<0.05$). Potential denitrification rates were positively related to manganese and negatively to iron. The results suggest a potential suppression of denitrification with elevated salinity and lead, particularly at the oxic-anoxic interface and potential enhancement of denitrification with increasing manganese in deeper anoxic soils. Denitrification potential in the top layer may be more strongly influenced by parameters associated with runoff and tidal flow while in the bottom layer, denitrification potential may be more closely coupled with redox-sensitive metals.

The status of tidal marsh birds in Long Island Sound

Oral Presentation

Chris S. Elphick

Since 2010 the Saltmarsh Habitat and Avian Research Program (SHARP) has been studying the status of tidal marsh birds throughout the Northeast and Mid-Atlantic States. This work has involved a combination of surveys designed to assess the distribution and population sizes of species that depend on tidal marshes, and demographic studies focused on tidal marsh specialists. Surveyed patches contained >60% of the saltmarsh habitat in Connecticut, and data on 21 Species of Greatest Conservation Need were collected. Analysis of point count data suggests that the state supports ~150 clapper rails, ~800 willets, ~1600 saltmarsh sparrows, and ~1000 seaside sparrows. Comparison of contemporary survey results with historical data suggests that, since 1998, clapper rail numbers have declined by ~13% per annum, considerably worse than the regional average, and that saltmarsh sparrows have declined by ~9.5% per annum, consistent with the regional pattern. No population change was detected for willets or seaside sparrows. Demographic data further suggest that saltmarsh sparrow populations currently have consistently negative growth rates both locally and throughout the region, although rates for sites in Long Island Sound are among the lowest across the species' range. Tidal restrictions appear to have played an important role in causing saltmarsh sparrow population declines, and sea-level rise is expected to exacerbate future declines. Demographic projections suggest that saltmarsh sparrows will disappear from many Connecticut sites within the next 50 years. The state's seaside sparrow population is also projected to disappear as the northern edge of the species' range contracts.

Avoidance of development by 'suburban' black bears

Oral Presentation

Michael Evans

As human development expands, it is important to understand how wildlife respond to developed landscapes. To evaluate adaptation to human development, we examined fine scale selection for anthropogenic landscape features among black bears within a developed landscape. Our objectives were to identify movement patterns indicative of perceived risk, or acclimation by testing for selection differences between seasons, according to reproductive status, and across development contexts. Hourly GPS data was collected from 23 female bears in 2013, 22 females in 2014, and 23 in 2015. Area-weighted mean housing densities within 95% kernel home ranges were between 2.36 – 214.43 houses/km2. We used step selection functions to estimate selection for anthropogenic features, while accounting for natural habitat. Housing models included distance to local roads, and whether steps ended in developed land cover. Road models included distance to highways, and whether steps crossed highways. We fit separate models to summer (May 1 – Aug. 31) and fall (Sept. 1 – Nov. 31) movement data and ranked models using AIC for each bear. We compared selection coefficients for anthropogenic features between seasons and reproductive status using ANOVA, and as a function of development using mixed-effects regression. Bears avoided developed land cover, and local roads. Avoidance of local roads increased with increasing development. Developed land cover was selected only during the fall,

among bears without cubs. Bears without cubs were also more likely to cross highways. These findings indicate that bears perceive anthropogenic features as risky, regardless of land-use context, and provide evidence against acclimation to development.

Exotic earthworm species inventory and ecological associations at White Memorial Foundation

Poster

James Fischer

Exotic earthworms are increasingly recognized as organisms that change northern forest ecosystems by influencing soil biological communities, vegetation patterns, and some vertebrate populations. Our project goals include an earthworm species inventory and patterns of vegetation and soil arthropods associated with earthworm disturbance on The White Memorial Foundation. We conducted a species inventory in 2014 by mustard sampling on 81 geographically stratified randomly sampled points and an additional 31 non-randomly selected points. A total of 14 different earthworm species were observed, of which only 1 species is recognized as endemic to North America. We also observed a significant negative correlation between percent cover of native plant species (r = -0.3275) and a significant positive relationship with percent cover of invasive plant species (r = 0.4502). We initiated several projects in 2015 that explored the relationship between exotic earthworms and black-legged ticks. We observed that tick abundance declined significantly as earthworm biomass increased amongst 16 0.5 hectare plots dominated by sugar maple and white ash. We observed a positive relationship between soil bulk density and earthworms, as well as number of nymphs and bulk density. We also observed that mice inhabiting plots with greater earthworm abundance had higher larval tick burdens. A notable percentage of mice had nymphs feeding on them as late as September in the plots with abundant earthworms, leading us to hypothesize that there will be a greater percentage of infected nymphs next season due to the greater degree of overlap in tick life stage phenology. This creates a paradox in areas with abundant exotic earthworms; fewer black-legged ticks but a greater proportion of infected ticks.

Key Players Inform Plan For Connecticut Shellfish Sectors

Oral Presentation

Tessa Getchis

The Connecticut Shellfish Initiative (CSI) is a multi-year planning effort to grow commercial and recreational shellfisheries and natural shellfish populations. The product is a vision plan that identifies recommendations to achieve this growth. The Initiative is stakeholder-based with individuals identifying and prioritizing sector needs.

Three scoping workshops resulted in a list of recommendations were proposed, distributed widely and then revised based on comments received. The next step in the process involved priority-setting workshops. Stakeholders (n=81) voted on each recommendation with four possible choices: high priority, low priority, needs discussion, or do not know. A steering committee comprised of shellfish interest groups across the state is considering the recommendations and specific actions proposed by sector groups for inclusion in the vision plan.

To garner public support for shellfish sector growth, an important goal of the Initiative is to measurably enhance the public visibility of Connecticut's shellfish sectors and resources. A pilot-scale study was developed to inform the development of a public engagement program. Survey participants (n=296) were asked to answer four multiple-choice questions about Connecticut shellfish sectors. The majority of respondents received an average score of 64.5%. Respondents from towns with an industry presence had the highest scores with an average of 85.7%. Overall, respondents were least familiar with recreational shellfishing with 40% selecting the appropriate answer to the question on this topic. This information in concert with data from a planned comprehensive public survey will allow us to create a public engagement program with targeted information and audiences.

Decline in migratory avian insectivore populations: is Amazonian deforestation to blame?

Oral Presentation

Gideon Hartman

Over the past half-century many migratory bird populations have declined dramatically. These declines are not uniform across species or area, and North American breeding populations of birds that feed exclusively on insects show especially strong and ongoing declines. Understanding if, or how, these declines are linked has been hampered by the "invisibility" and inaccessibility of neotropical migrants when they are on their wintering grounds in South America. Hypotheses to date include the use of pesticides in agriculture, habitat loss on the breeding grounds, and a decline in Neotropical forests that support wintering birds. However, neither a conclusive answer for any single species, nor a unifying single answer for the whole suite of declining species, has emerged. We conducted a pilot stable isotope study of feathers taken from wild Chimney Swifts (Chaetura pelagica), a migrant aerial insectivore whose wintering grounds are poorly studied.

We sampled wild swift feathers to obtain dietary and environmental information that reflects local conditions during the formation of different feathers.

Preliminary results from winter-grown feathers suggest that CT chimney swift populations rely exclusively on upper canopy rainforest flying insects as a dietary source. Our preliminary results provide striking evidence that chimney swifts are declining in proportion to the reduction of Amazonian rainforest available to produce upper canopy insects. This may explain the simultaneous decline of multiple species of migratory avian insectivores that otherwise have little in common.

The Effects of Aspirin Contaminated Water on Lemna Minor

Poster

Shanelle Haughton

Pharmaceutical products (i.e. anti-inflammatories, antibiotics, antidepressants, oral contraceptives, etc.) have been detected in sewage, surface water, ground water, and drinking water. When prescribed pharmaceuticals are ingested, only a portion of the active ingredient of the drug is metabolized; a portion of the consumed pharmaceutical are excreted through urine as metabolites and as an unused product in solid waste. Very few treatment solutions for pharmaceutical pollution are under

investigation. Also, the long term effects of pharmaceutical pollution on human health, aquatic life and even our food supply still have not been determined.

This is a multi-phase study investigating the effects of pharmaceutical pollution using a simple aquatic plant, Lemna minor (duckweed), as a model organism. This study will also investigate the bioremediation success of duckweed in pharmaceutical (aspirin) contaminated water. So far, the LD50 of duckweed in aspirin contaminated water and the effects of aspirin on the pH of water were determined. The effect of aspirin on duckweed in buffered aspirin solution was also determined. The next phase of research involves introducing the bacterium Acinetobacter calcoaceticus P23, a plant growth promoting bacterium (PGPB), to duckweed and observing the effects of the bacterium on duckweed health in aspirin contaminated water. It is hypothesized that PGPB will increase duckweed health and may also increase bioremediation success. Future directions of this study include investigating bioremediation success of duckweed in aspirin contaminated water and the effects of other forms of pharmaceuticals on duckweed.

Habitat Restrictions for Fish and American Lobster with Changing Bottom Water Temperature: Results of a High Resolution Climate Change Model for Long Island Sound

Oral Presentation

Penny Howell

Twelve fish species captured in CT DEEP Long Island Sound (LIS) Trawl Survey and not subject to harvest were chosen from defined cold and warm 'temperature guilds' to generate abundance-water temperature relationships. ANOVAs of 5-year segments showed that relationships were similar from 1992-2013, but only statistically significant for spring data. Habitat Suitability Indices (HSI) were generated from these relationships (rescaled 0 to 1) and merged with the LIS-extended NYHOPS Model daily mean bottom temperatures for each Survey station from 1979-2013. Resulting spring area-day frequencies (ADF) showed that 59% had preferred temperatures (HSI=>0.8) for the cold fish guild and 31% for the warm fish guild. For lobster, their preferred temperature range (12-180C) and stress threshold (200C) was used in place of empirical data to avoid harvest removal bias. Resulting annual ADF of lobster preferred temperature decreased over the time series, while ADF above the stress threshold increased. HSIs were applied to a Transient Climate Response (TCR) projection of temperatures based on a 20-year 1% global increase in CO2. TCR projections showed that preferred temperature ADF increased ~9% for the cold fish guild, due to a decline in temperatures <70C, and increased ~20% for the warm fish guild. ADFs unsuitable (HSI<0.3) for the warm guild decreased to half historic values, greatly increasing the probability of competition between the guilds. For lobster, TCR projected preferred temperature ADF shifted earlier in spring but delayed in fall by about a month. Projected ADF above the stress temperature increased to 31% from 18% in 1980-2012.

The time has come to atlas Connecticut birds (again)

Oral Presentation

Min Huang, Chris S. Elphick

Biological atlas projects describe the geographic distributions of species and can help form the basis for ecological understanding and conservation planning. Repeat atlases also provide information on population change and have now been implemented in many regions. The first Connecticut atlas focused on breeding birds and was conducted in the early 1980s. All states adjacent to Connecticut and many others in New England have completed or initiated second atlases in recent years, and we argue that it would benefit Connecticut to do the same. We are developing a plan that would go beyond the traditional approach of mapping breeding distributions. Additionally, and for the first time in Connecticut, we plan to collect systematic data on bird distributions during the non-breeding season, to estimate species population sizes, to model species occurrence and relative abundance across the state, and to test alternative models to better identify the factors that determine species distributions. We anticipate that this project will help inform specific conservation initiatives focused on Species of Greatest Conservation Need that occur in Connecticut, will improve status assessments for bird species listed in the state, and will provide the basic data required for evidence-based conservation planning at town and state levels. We envision that citizen-scientists will play a large role in the data collection, and that this project will serve to engage and galvanize the birding community to partner more fully with the state in advancing the conservation of natural resources.

Growth rates of Channel Catfish in Connecticut lakes

Poster

Jason Jaffee

Channel Catfish are popular among anglers across the U.S. as both sport and food fish. Although they are not native to Connecticut, a naturalized population of Channel Catfish have been present in the Connecticut River since the 1970s, and they have also been sporadically reported from many other Connecticut waterbodies. To create new angling opportunities, the Connecticut Department of Energy and Environmental Protection Inland Fisheries Division (IFD) began stocking Channel Catfish into twelve Catfish Management Lakes (CMLs) in 2007. The stocking program successfully created several popular fisheries, and was therefore expanded and currently includes 27 CMLs statewide. Given that IFD purchases catfish from a commercial hatchery, and the large number of waterbodies now served by the stocking program, optimization of stocking rates is imperative to ensure cost-effectiveness. As an initial assessment of post-stocking performance of hatchery-reared catfish, we assessed growth rates of Channel Catfish collected from two CMLs: Lower Bolton Lake and Silver Lake. We prepared and analyzed pectoral spines and otoliths from fish collected from both lakes in 2011-13, focusing on inter-reader agreement produced by each type of calcified structure (precision) and inter-structure agreement of age estimates for individual fish (bias). We also compared the growth rates of stocked catfish in CMLs to those for the naturalized population of Channel Catfish in the Connecticut River. These assessments will provide IFD with valuable insight into the appropriateness of current catfish stocking rates, as well as the best calcified structure to employ in future population assessments at CMLs.

Developing NDDB's Most Wanted

Poster

Shannon Kearney-McGee

The Connecticut 2016 Wildlife Action Plan has identified rare and vulnerable species and habitats as a focus of conservation actions, while Connecticut's Green Plan incorporates these species and habitats as a focus of land protection. Given that resources for both land management and land acquisition are limited in our current economic climate, an effort should be made to identify and prioritize conservation targets in order to maximize conservation benefits. Currently, there is not a good decision guide for prioritizing land purchase and management with respect to rare and vulnerable species and habitats in Connecticut. To help guide these decisions, the Natural Diversity Database (NDDB) is developing a suite of spatial layers to (1) identify biological core habitat to focus management actions and (2) identify parcels that are critical for protecting the most vulnerable species and habitats through land protection. We will present and solicit feedback on available data layers and our process for ranking.

Human Dimensions of Rattlesnake Conservation in Connecticut

Poster

Lindsay Keener-Eck

Timber rattlesnakes (Crotalus horridus) are endangered in Connecticut, yet human-caused mortality remains a primary contributing factor for population declines. To date, there is little knowledge of how New Englanders perceive and interact with venomous snakes near their homes. This study will address this gap in our knowledge. Research objectives are to 1) better understand private landowners' perceptions and attitudes toward timber rattlesnakes, given relevant situational factors, 2) better understand amount of support for rattlesnake conservation strategies from landowners who reside near rattlesnake habitat, 3) better understand residents' willingness to report potential poaching activity, and 4) evaluate the effectiveness of informational outreach. Data will be collected from residents who live adjacent to a known rattlesnake population. First, we will characterize landowner attitudes, knowledge, risk perceptions, and behaviors toward timber rattlesnakes. We will also evaluate landowner support for conservation actions and potential use of the Turn-in-Poachers (TIP) hotline to report suspicious activity near rattlesnake habitat. One month later, we will provide residents with an information packet about timber rattlesnakes and a magnet which lists phone numbers to call for assistance in the event of a rattlesnake encounter. Finally, we will re-contact landowners six months later to inquire about retention and utilization of outreach information, changes in perceptions of rattlesnakes, and actual behaviors related to rattlesnake encounters experienced during the 2016 snake activity season. Knowledge we gain from this study will provide wildlife managers with information to increase effectiveness of public outreach aimed at reducing rattlesnake mortalities across their northeast range.

A Media Perspective on Storm-Related Power Outages

Oral Presentation

Danielle P. Kloster

Media portrayal of catastrophic events, such as winter storms and hurricanes, can influence the public's perceived risk of such events, and prioritization of resources allocated to recovery and mitigation efforts. Our objectives were to assess: (1) stakeholders represented in newspaper coverage of storm-related power outages, (2) on whom or what stakeholders place the blame for outages, (3) solutions

offered, and (4) impacts of power outages and downed trees that are emphasized in coverage, such as loss of business or human safety. We applied content analysis to assess more than 750 newspaper articles focused on storm-related power outages in the Northeast. We focused on articles from the New York Times and several local newspapers from August 21, 2010 to November 2, 2014, to capture the time period including and after the events of Tropical Storm Irene, the 2011 October Snowstorm, and Hurricane Sandy. We found that members of the general public were represented in coverage more than observed in media portrayal of other environmental risks, such as oil spills. Improved forest management around power lines was not offered as a solution. Rather, government and utility officials focused on technology-based solutions, such as micro-grids. The general public offered individually-based solutions, such as purchase of a generator. The media emphasized dramatic impacts of power outages and downed trees, such as on safety, transportation, and property damage. These results can assist utility companies in understanding public perceptions of power outage risks and impacts and the limited solutions that have been presented in the media.

Wood Reuse from Utility Company Vegetation Management

Poster

Danielle P. Kloster

Vegetation management by utility companies along power lines generates large quantities of wood requiring disposal. To reduce waste and promote reuse of potentially valuable wood products, the University of Connecticut has partnered with United Illuminating (UI) to develop an experimental protocol to maximize reuse of cut trees, including trimming branches close to the trunk and identifying straight logs more than eight feet in length to preserve for saw logs. A pilot project implementing the experimental protocol began in the Town of North Haven in Summer 2015. To evaluate the efficacy of the new tree cutting protocol, in Fall 2015 we interviewed members of tree crews engaged in the pilot project. Interviews focused on crew member understanding of the new protocol, compliance with the protocol, and concerns regarding adoption of the protocol. Results suggest inconsistent understanding of expectations for, and several concerns about, the new protocol, including crew safety, particularly for logs higher than the utility lines, and the potential increase in time required to follow the protocol. Based on these findings, we recommend revision and simplification of the protocol to accommodate tree crew concerns about time and safety.

Local conditions versus regional processes in structuring aquatic plant metacommunities

Poster

Jason D. Lech

Understanding the processes that determine how aquatic plant species are distributed among lakes is important for both managing invasive species and for conserving biodiversity of native species. Aquatic plants in lakes and ponds inhabit discrete local communities that are linked by dispersal, with groups of such communities forming a metacommunity. Aquatic plant metacommunity structure results from both local conditions (e.g. water quality) and regional processes (e.g. dispersal between lakes or ponds); however, the relative importance of these processes is unclear. I used a metacommunity framework

based on consideration of coherence, turnover, and boundary clumping to distinguish among a number of metacommunity structures for aquatic plants in 89 lakes in Connecticut. I evaluated the associations between species distributions and a spectrum of factors that characterize water quality, lake morphometry, lake connectivity, and watershed urbanization to determine the relative role of local conditions versus regional processes in structuring the metacommunity. Species distributions among lakes responded more strongly to local water quality conditions than to factors related to dispersal. Moreover, the metacommunity had Clementsian structure, suggesting that distinctive groups of species (compartments) are associated with particular water quality characteristics.

Correlation between phosphate data and the relative abundance of diatoms from five rivers of the Housatonic River Drainage Basin

Poster

Yolanda Lee-Gorishti

Students from Crosby High School in Waterbury, CT, analyzed diatom samples from five rivers within the Housatonic River drainage basin. Diatom samples were collected by nine Connecticut High Schools participating in Project Periphyton. Three Diatom Species were selected and the relative abundance of these diatom species in their habitat was calculated and compared to the phosphate data from Connecticut Rivers using the USGS Sparrow Program, GIS, and standard statistical analyses. The objective was to correlate these diatoms with the loads of phosphates on the streams.

Collaborative Conservation in Fairfield County

Oral Presentation

Mary Ellen Lemay

The Fairfield County Regional Conservation Partnership (FCRCP) brings together land trust leaders, conservation commission members, and other conservation groups to work collaboratively on land protection efforts in Fairfield County, the most populous county in Connecticut. FCRCP is an organization whose mission is to protect, connect, and restore the natural landscapes of Fairfield County. Our goal is to increase the pace and scale of land conservation across town and organizational boundaries in order to connect the valuable and contiguous areas of land that are most critical to mitigate the impacts of climate change and economic development. We are identifying priority areas, engaging the community, informing landowners, and supporting projects that will help to advance our goals.

One such project has been the FCRCP's Strategic Conservation Map, a key tool developed to guide and inform FCRCP partners through the use of GIS technology. In order to effectively target conservation efforts, FCRCP partners built a co-occurrence model in ArcGIS to identify areas that are climate-resilient and rich in natural resources, tailoring the model specifically to fit our suburban and ex-urban landscape. In this presentation, we will describe the datasets that contributed to our co-occurrence model and explain how we integrated the final model with on-the-ground knowledge of local land trusts to identify potential priority areas and opportunities for cross-boundary collaboration. We will also display the final product of this project: the FCRCP's Strategic Conservation Map.

Beyond protection: expanding "conservation opportunity" to redefine conservation planning in the 21st Century

Oral Presentation

Marjorie Liberati

The protected lands estate increased dramatically during the 20th century and forms the backbone of current fisheries and wildlife conservation in North America. However, there is increasing evidence that modern conservation goals cannot be achieved by only focusing on adding new acreage. In the 21st century, expanding the vocabulary of conservation planning well beyond land protection alone harbors several practical advantages. We suggest a conceptual framework that considers suites of objectives to translate the broad goal of "conservation" into multiple implementation-specific objectives. These objectives form the "PCRM-PI" approach: protect, connect, restore, manage, partner, and inform. We use a case study for American woodcock, a species of regional conservation concern, to illustrate the limitations of protection-centric planning and how expanding the conservation opportunity concept can help planners do more on the landscape. In our case study, Connecticut was unlikely to reach its acreage goal for woodcock under the American Woodcock Conservation Plan by focusing on protection alone, regardless of the state's ability to purchase land or easements. A broader conceptualization of conservation objectives and incorporation of decision making approaches that explicitly consider trade-offs provides opportunities to bridge planning-implementation gaps and translate broad, landscape-level conservation goals into implementable actions. We suggest that the PCRM-PI approach, nested within a planning framework, is a way to expand the conservation opportunity concept, bridge gaps between planning and management, and make 21st century conservation planning efforts more effective.

Connecticut Department of Energy and Environmental Protection Long Island Sound Ambient Water Quality Monitoring Program: Overview and Analysis of Program Data

Oral Presentation

Matthew Lyman

Since 1991, the Connecticut Department of Energy and Environmental Protection (CTDEEP) has been monitoring the water quality of Long Island Sound (LIS). Year-round monthly sampling includes monitoring for nutrients, chlorophyll a, biological oxygen demand, and water column profiles of temperature, salinity, pH, irradiance and dissolved oxygen. Additional biweekly summer sampling at 25-35 stations provides data on the recurrent low dissolved oxygen condition known as hypoxia. The program has been expanded over the years to include monthly phytopigment, phytoplankton and zooplankton monitoring. The monitoring program is currently conducting a pilot program in cooperation with NOAA National Marine Fisheries Service using a fast response fluorometer (Satlantic FIRe) to determine phytoplankton health. Staff will provide an overview and general analysis of monitoring program data and discuss changes in program design over the years. Results of the ongoing pilot program will also be discussed. An extensive long-term database exists and is available by request. The CTDEEP encourages the research community to make use of the monitoring program and the

resultant data base as an aid to complementary research and assessment efforts in Long Island Sound and elsewhere.

Watching the Watershed: E. coli monitoring of the Scantic River

Poster

Kirsten Martin

The Scantic River Watershed Monitoring Program began in 2010, and focused on monitoring water quality at all road crossings of the Scantic River. Beginning in spring of 2015, the Scantic River Watershed Association and the East Windsor American Heritage Rivers Commission partnered with the Connecticut River Watershed Council and the University of Saint Joseph to begin a limited E. coli monitoring program of the river. Several sampling sites were located in the towns of Enfield, CT and East Windsor, CT, and the sites were sampled weekly. Total fecal coliform levels were uniformly high across most locations, but E. coli levels varied widely between the two towns. The poster presentation will discuss the health impacts of E. coli contamination, the testing methodology, and a summary of the results,. Possible sources of the E. coli will also be discussed.

Hatchery introgression in Connecticut's Brook Trout populations: identifying the five W's for better management

Oral Presentation

Nathan Lucas

Brook Trout Salvelinus fontinalis is one of the few native salmonid species in Eastern North America. Once widely distributed throughout the region, sensitivity to land use changes and habitat degradation now restricts many Brook Trout populations to small, isolated headwater streams where conditions remain suitable. Their popularity among anglers as a sport fish has led to the raising and stocking of hatchery fish to provide enhanced recreational fishing opportunities in ponds and streams across Southern New England. This practice of stocking hatchery fish, however, can have unintended consequences when stocked individuals survive to reproduce in wild populations through a process known as outbreeding depression. Although a conservation concern for wild Brook Trout, little is known about the prevalence and spatial distribution of introgression at the landscape scale. The objectives of this study were to identify where and when introgression has occurred in Connecticut's populations of Brook Trout as well as why certain stream systems exhibit higher rates. We collected tissue samples from over 50 headwater populations and used a series of individual based analyses to identify evidence of introgression. Admixture coefficients were estimated and correlated with a suite of watershed variables to identify environmental conditions most commonly associated with hatchery introgression. This assessment will be used to aid in decision making processes of best management practices for future stocking efforts to reduce alterations to the genetic composition and structuring of wild trout populations.

 Long Term Temperature Trends in Long Island Sound and Coastal Connecticut

Oral Presentation

James O'Donnell

We have assembled and quality checked a large and diverse array of observations of temperature in Long Island Sound. We have included the data from the both the eastern and western extremities of the estuary. Our analysis of the seasonal cycle at the Millstone Power Plant record showed that the seasonal rate of change of temperature was smallest in January-March and July to September, so we chose these times to examine longer term trends since they would be less prone to bias by irregular sampling. Four records were assembled for the winter and five for the summer. An index of the summer and winter temperatures was created by computing the mean difference between contemporaneous segments of the observation records. Three empirical constants were used in the summer and four in the winter. The data were then bin averaged in three year intervals to create records that span 1930 to 2012 in the winter and 1915 to 2012 in the summer. We conclude that water temperatures in the interval 1960-2010 were anomalously cool in both the winter and the summer, whereas the winters between 1945 and 1955 were anomalously warm. Since 1965, temperatures in both the summer and the winter have been rising. We show that the winter temperature index is very highly correlated with the water temperatures at Woods Hole, MA, and air temperatures at Bridgeport, CT. This allows the LIS temperature index to be extrapolated backwards in time and the recent changes can be then viewed in a longer context. The recent warming trend is rapid, but not inconsistent earlier periods of warming. The long term warming rate is consistent with global trends at 1oC/century.

Remotely Assessing Utility Lines for Roadside Tree Hazards

Oral Presentation

Jason Parent

Trees are a major cause of power outages during storms in Connecticut. The Eversource Energy Center, at the University of Connecticut, is tasked with developing new approaches of managing vegetation to reduce outages as well as create models to predict the magnitude and location of outages prior to storm arrival. A key precursor to successfully accomplishing these tasks is to identify where tree hazards are located. Statewide airborne laser scanner (ALS) data provide an opportunity to remotely map potential tree hazards along Eversource's 27,000 km of utility lines in Connecticut. This research evaluates the ability of Connecticut's ALS data to accurately measure forest tree heights and map locations where trees are in close proximity to power lines.

Airborne laser scanner data were evaluated using field measurements from nearly 1200 trees which included 17 deciduous species. The ALS-based estimates consistently underestimated tree heights by 0.1 to 2.1 m, depending on species, with an average underestimate of 1.3 m. A model of forest canopy height was derived from the ALS data and used to map locations where the forest canopy was tall enough that trees could strike power lines in the event of a windthrow. Future research will investigate environmental factors, quantifiable through remote sensing or existing statewide geospatial data, that can help predict the likelihood of tree failures at locations where trees have potential to strike power lines. This research will help direct vegetation management efforts to locations with the greatest utility risk as well as improve storm outage prediction models.

A Long Island Sound Collaborative Plan - LIS CCMP 2015

Oral Presentation

Mark Parker

Over the last 400 years human settlement and activity in and around the Long Island Sound (LIS) watershed have impacted (for better or worse) the ecologic personality of the LIS ecosystem. The Sound has transitioned from a natural pre-colonial state into what we call today 'The Urban Sea'. Today the LIS Urban Sea continues to struggle with seasonal hypoxia (low dissolved oxygen), loss of fish and shellfish species, loss of eel grass beds (due to nutrient pollution), increased beach closures (due to pathogens), harmful algal blooms, sea level rise and other climate change stressors caused by human activity on land and in the water. This presentation describes the actions that federal, state and local agencies and governments have taken and will be taking to restore LIS to health and abundance.

 In 1994 federal, state and local partners in the Long Island Sound region, adopted a 20-year management plan for protecting and improving the health of Long Island Sound. By 2014 the LISS partners had accomplished much, and worked together to reduce nitrogen discharges by 40 million pounds a year, restored 1,625 acres of habitat, reopened 317 miles of fish passage, and involved hundreds of thousands of people in education and volunteer projects to help bring LIS back to health and abundance, but realizing more needs to be done. Now these partners, under the Long Island Sound Study, have developed a new Comprehensive Conservation and Management Plan to move forward to achieve more ambitious ecosystem targets for the next 20 years.

Park Watershed: What is Urban-Suburban Citizen Stewardship?

Oral Presentation

Mary Rickel Pelletier

This presentation reviews the evolution of Park Watershed, and summarizes what urban-suburban citizen stewardship can accomplish, as well as why a collaborative professional network is essential to revitalization of nature within Connecticut's Capital City. Park Watershed is a 501c3 urban-suburban citizen stewardship organization formed to conserve and revitalize the Park River regional watershed. This watershed stretches east 78 square mile from the Metacomet Ridge to its confluence with the Connecticut River. West Hartford, Hartford and Bloomfield as well as large areas of New Britain, Farmington, Newington and Wethersfield are within the Park River watershed. A primary organizational focus is implementation of the 2010 North Branch Park River Watershed Management Plan to minimize the impacts of non-point source pollution on water quality.

In addition to work along the North Branch, Park Watershed comments upon a wide array of threats to area natural resources. For example, opposition to a proposed Kinder Morgan gas pipeline, the Northeast Energy Direct (NED) which would involve construction through Class I and Class II lands that surround the MDC balancing reservoirs that are headwaters of the Park River watershed. Other conservation challenges include a proposed bottled water facility, unabated development, dumping, non-point source pollution, and flood control management. The range and frequency of issues highlight the need to re-envision urban-suburban natural resources with respect to 21st century quality of life

interests, security, and climate change. This presentation describes current research, planning, and cooperative project partnerships – as well as design strategies drawn from project work in other watersheds.

Eighty years of Vegetation Change at the Barn Island WMA

Oral Presentation

Ron Rozsa

Barn Island has been the subject of numerous vegetation studies but all are post mosquito ditch construction in 1932. Aerial photography (1934) was used to create a pre-ditching toposequence model. The natural marsh is flooded by four primary creeks (low drainage density). Dominant landforms are the wide and continuous grassy creekbank levees and the interior high marsh plains supporting wet panne vegetation. When high tides exceed the height of the levees, the levee and high marsh plain are flooded.

Aerial photo interpretation reveals that wherever a colonial ditch was constructed, new levees formed adjacent to these ditches thus restoring levee continuity and flooding patterns. This suggests that there was ample sediment supply to affect repair of levee damage and restore flooding patterns. Mosquito ditching creates high drainage density and short-circuits the natural flow patterns such that the rising tides flood the interior marsh first and reduce levee flooding. Levee repair is replaced by long-term gradual levee shrinkage.

Long-term vegetation studies suggest an organized progression of change toward the pre-ditching condition. The abundance of Spartina patens in 1947 is likely a response to the drainage caused by ditching. In the ensuing decades the vegetation reverts to panne vegetation and as the levees shrink, the meadow grasses are replaced by forb panne. Elimination of ditches may be necessary to restore a marsh landscape that is in equilibrium with sea level rise.

Storm-Driven Nitrogen Export from Headwater Streams Along a Rural-to-Urban Land Cover Gradient

Oral Presentation

Jason R. Sauer

We investigated the distribution and overall magnitude of nitrogen (N) flux during storm events along a rural to urban watershed land use gradient in headwater streams of the Farmington River watershed in

Connecticut. Four headwater streams that ranged in their watershed urban land cover from 4% to 59% were monitored from April to November in 2015. Streamflow was monitored continuously at 15-minute intervals, autosamplers collected water during storm events, and bi-weekly grab samples were collected during baseflow conditions. Water samples were analyzed for inorganic N (ammonium and nitrate), total N, and chloride concentrations. We used streamflow and N concentrations to calculate mass export during both storm events and baseflow. During the sampling period, we were able to capture 5 storms at 4 locations and 8 storms at 3 locations. We expect to see elevated N concentrations and fluxes in streams with more developed watershed land cover. We also expect the majority of N export from headwater streams to occur during storm flow, though this hypothesis may be complicated by 1) low rainfall during the collection year compared to regional averages, and 2) elevated N concentrations during baseflow conditions in streams with developed watershed land cover. Elevated baseflow N concentrations suggest that a substantial proportion of N loads do not reach streams via surface runoff but rather recharges the groundwater to be later discharged to streams. We posit that increased watershed urbanization and storm intensification will likely alter the timing and magnitude of N export from headwater streams.

Paying Respect to the Elders in Marine Recreational Fisheries Management

Oral Presentation

Eric Schultz

Larger and older individuals often produce disproportionally large numbers of recruits to future yearclasses, because of allometric relationships in batch fecundity, offspring size, and spawning frequency. Unfortunately, such so-called maternal effects are not typically accounted for in evaluating the potential effect of management regulations on sustainability of harvested populations. Furthermore, minimum length regulations that maximize harvest often do so at the expense of maintaining a natural size-structure in the population, with the potential to cause severe size-truncation. We adapted a structured population model to incorporate maternal effects and alternate length limits to the fishery, including a range of minimum length limits and harvested slot limits. We calibrated the model to represent Tautog, a marine fish species with a substantial recreational fishery that is chronically overfished, and included other representative life history patterns. We found that the impact of alternate length limits on biological reference points was sensitive to maternal effects. In particular, stock sustainability was enhanced by restricting the harvest of elders, when offspring quantity increases disproportionally with maternal size as well as when offspring quality increases with maternal size . We call for more empirical work on maternal effects and their incorporation into stock assessments and management strategies.

Shifting Sources - Point Source vs. Nonpoint Source

Oral Presentation

Kelly L. Streich

The Long Island Sound (LIS) nitrogen reduction plan or Total Maximum Daily Load (TMDL) to obtain DO standards, approved in 2001, specifies a 58% reduction in nitrogen from an estimated baseline load (CTDEP and NYSDEC, 2000). For Connecticut (CT), this equates to a 63.5% reduction in point source nitrogen and a 10% reduction in nonpoint source nitrogen. Early modeling of the nitrogen load (i.e. 1990 baseline) found point sources to be the dominant fraction of nitrogen loading to LIS. As such, implementation efforts focused on the installation of denitrification technologies at wastewater treatment plants (WWTPs). Modeling to ascertain the "current" nitrogen load indicates that aggressive point source implementation efforts have resulted in a substantial reduction of nitrogen and shifted the dominant pollution source towards nonpoint sources and stormwater. (It is important to note that at the time the TMDL for LIS was developed, stormwater was grouped in the nonpoint source category. Since 2004, most stormwater discharges in CT have been subject to a NPDES permit.) A nitrogen loading trends study conducted by the USGS demonstrates an increase in nitrogen loads coincident with increased stream flow as the result of precipitation events (Mullaney and Schwartz, 2013). In 2013, CT together with the other LIS watershed states (NY, MA, NH, and VT) conducted an evaluation of nonpoint source and stormwater efforts to qualitatively assess the effectiveness of implementation efforts relative to nonpoint source and stormwater (CTDEEP, 2013). As nonpoint source and stormwater become a larger factor in nitrogen loading to LIS, we anticipate future efforts will focus on permitted stormwater discharges, septic system management, and LID/Green Infrastructure improvements.

CT Watersheds: Protection and Restoration Priorities

Oral Presentation

Chris Sullivan

Per Clean Water Act requirements, the Connecticut Department of Energy and Environmental Protection (CT DEEP) prioritized a list of watersheds to focus water quality efforts through 2022. Initial screening used the RPS Tool which gives an objective ranking of watersheds based on indicators and weights. Utilizing indicators in three categories (ecological, stressor, and social), the RPS Tool generated a ranking that accounts for the relative restorability of evaluated watersheds. CT DEEP staff worked with EPA to enhance the RPS Tool utilizing CT specific data to further evaluate watersheds in Connecticut. Three scenarios were developed for evaluation: general watershed health, stormwater impacts, and nutrient impacts. Indicators and their weights for each scenario were selected within the Tool for analysis. Each scenario was analyzed for protection and for restoration, resulting in six ranking lists of watersheds. These lists of watersheds were further refined by a re-sorting in Microsoft Excel. A tiered decision matrix removed subsets of watersheds at each step. Following this process resulted in two final lists. One list of 20 watersheds ranked for protection and a second list of 40 watersheds ranked for restoration. Only watersheds in all three scenario lists for protection or restoration were placed on the DRAFT CT DEEP priority list. This DRAFT list was provided to EPA and has since been further revised by CT DEEP. The list of priorities will be further revised from feedback during a public engagement period. Additional enhancements to the RPS Tool for local basin review further enhances evaluations.

Connecticut Garnet Trail: Short Hikes to Discover the State Mineral

Poster

Margaret A. Thomas

The Connecticut Garnet Trail is a collection of sites where the State mineral, almandine garnet, can be discovered in State parks and forests, and other public access properties. There are currently 10 sites included in the trail, chosen by ease of access, geologic setting, and mineralogical diversity. An interactive map and trail guide, available online as an ArcGIS storymap, details the locations and hikes, provides geologic descriptions, and parking directions. Photography of the trailhead, host rock, and mineral portraits are also available. www.depdata.ct.gov/maps/GarnetTrail/index.html#

Almandine garnet, $Fe_3Al_2(SiO_4)_3$ is a deep red to red-brown mineral common in stratified metamorphic rocks of eastern and western Connecticut. With a hardness similar to quartz, garnet is a historically important industrial mineral of Connecticut, mined in Litchfield County (1870s) as an abrasive. Gem quality garnet is translucent, and is rare in Connecticut.

Garnet commonly originates from aluminum rich ocean sediments metamorphosed by burial and deformation during mountain building events over millions of years. Mineral assemblages containing garnet are important geothermometers and geobarometers reflecting metamorphic conditions.

The trail showcases easy to reach garnet locations, promotes outdoor recreation, and provides environmental education. Publication of this information is not an endorsement to collect minerals on State land. The sites are presented for all to enjoy, and visitors are expected to take nothing but photographs.

This project was funded through the DEEP Recreational Trails Program, and was implemented through a cooperative agreement between the Department of Energy and Environmental Protection and the University of Connecticut.

Analysis of Land Use Changes and Major Driving Forces in Connecticut

Poster

Wenjie Wang

Land use change is one of the major driving factors to the introduction and spread of alien invasive species and it plays an important role in structuring the extent, pattern, and timing of woody plant invasions across the New England. The primary objective of this study is to predict and analyze the future land use and land cover (LULC) change in Connecticut using the Multi-Layer Perceptron Markov (MLP_Markov) model. The LULC maps in 1996, 2001 and 2006 was used in the study. The net deciduous forest loss for the period of 1996–2001 was 2,289 ha. For the period of 2001-2006, the net deciduous forest loss was 2,505 ha. A LULC map in 2006 was predicted based on real LULC maps of 1996 and 2001 for validation, which showed that the model had very high ability to predict future LULC (Kappa = 0.9961). The LULC map of 2018 was predicted by using the MLP_Markov model. The model predicts that the study area will lose 5,535 ha deciduous forest and gain 3,502 ha built-up area from 2006 to 2018. The Cramer's V values are used in the model, which describes the quantitative level of the association of a driving factor with all LULC classes. The results show that the total area of forest has been decreasing

and the decrease is mainly caused by urban development and other human activity in Connecticut. Moreover, it is also found that forest areas near built-up areas and agriculture lands appear to be more vulnerable to conversion. The predicted results will be used for further study about invasive species.

Modeling Tree Threats to Overhead Power Lines Using LiDAR

Oral Presentation

David W. Wanik

Trees are a threat to power lines when they are close enough and tall enough to contact them in the event of a partial or whole tree failure; and the interaction of trees and overhead lines is the leading cause of power outages on electric distribution networks. In this paper, we investigate the use of vegetation management (e.g. tree trimming) and LiDAR-derived hazardous tree information (HazPix) for predicting damage to the eastern division of Eversource Energy (formerly Connecticut Light & Power) service territory during Hurricane Sandy (2012). In addition, we show the benefit of using attributes of the overhead lines (for example, percentage of bare or covered wire; percentage of backbone or lateral circuit). Random forest regression was used to predict a binary response variable denoting whether or not any damage occurred in a 0.5-km grid cell. Five model forcing complexities were evaluated by selecting the model with the most improved error metrics. Although all model forcing complexities improved the damage prediction relative to a baseline model, the model forced with HazPix data was the most accurate model for predicting hurricane damages. Additionally, we ran a sensitivity analysis using the HazPix data that showed an increase in the number of HazPix could increase hurricane induced damages by more than 20%. As LiDAR data becomes more widely available for New England, HazPix can be incorporated to improve existing damage prediction models and facilitate vegetation management impact assessment studies.

Statewide Elevation Mapping, and Imagery Too

Oral Presentation

Emily Wilson

CT ECO now has a statewide, seamless set of Lidar-derived elevation. Hurray! Several years in the making, the bare earth digital elevation model is a quilt of 7 datasets captured through projects of USDA NRCS, USGS, FEMA and NOAA. The datasets have been geo-processed to make the elevation, hillshade, shaded relief, slope and aspect available on the web in a fast and easy to access way. The layers are interesting and revealing and finally, no one is left out. But wait there's more! In the spring of 2016, for the first time Lidar will be collected in a single project for all of Connecticut. And that's not all! Also a first, 3 inch aerial imagery will be collected for the entire state. This talk will cover the existing statewide Lidar elevation data and how to access it on CT ECO. It will also explain what is coming with the 2016 acquisitions. CT ECO, Connecticut Environmental Conditions Online, is a website that is a collaboration between CT DEEP and UConn CLEAR for making Connecticut's natural resource geospatial information available http://cteco.uconn.edu.

Restoring a Coastal Meadow at Dodge Paddock, Stonington, CT

Poster

Roger Wolfe

Surrounded by stately homes and gardens on the shores of Little Narragansett Bay, Dodge Paddock is a 3-acre field/wet meadow/dune complex in the heart of the Borough of Stonington, owned and managed by the Avalonia Land Conservancy. Considered a gem in this quaint yet bustling coastal town, the trails and beach are used for passive recreation, environmental education, and bird watching. However, Dodge Paddock is not without issues: stormwater runoff and tidal flooding produce sporadic mosquito infestations and invasive plants threaten the floristic community and need constant attention. Following Superstorm Sandy, a breech through the dune and the installation of a Smart Ditch liner by the DEEP ensures drainage and tidal flow and is being monitored for efficacy. Integrated management plans for stormwater, invasive plant control and native plant establishment are being developed in conjunction with several stakeholders including the CT DEEP, CT Sea Grant, and Mystic Aquarium. A grant from the National Fish and Wildlife Foundation/Long Island Sound Futures Fund was awarded for landscape restoration and ongoing public education and participation regarding coastal resiliency in a changing landscape. A landscape plan is being developed and additional funds are being sought to continue with invasive plant control and to revegetate portions of the Paddock with native plantings. The plan calls for combinations of plants that will attract wildlife, stabilize the soil, and be aesthetically appealing. Opportunities exist for monitoring and research as well as continued environmental education and passive use.

The physics and mechanics of directional tree felling – a vector analysis

Poster

Thomas Worthley

A photo montage and diagrammatic explanations will explain the art of directional tree felling – that is, directing a harvested tree to fall where you want it. Using a collection of photographs and vector diagrams with an "against-the-lean" example, step-by step methods of assessing lean, predicting movement, controlling the fall all the way to the ground and remaining safe will be illustrated.

Case studies of small-scale forest harvesting in CT

Oral Presentation

Thomas Worthley

During the summer, fall and winter of 2015 roadside forest management silvicultural treatments were implemented at three separate sites in CT. Various small-scale forest harvesting equipment combinations were tried and tested under a variety of forest and terrain types. Tree-felling and processing times, skidding times and distances and product volume and value were tracked. This multi-media presentation will share observations and experiences and will reflect on the applicability of the methods tested to address roadside forest management and other small-scale harvesting needs.

Benthic community patterns across west-central Long Island Sound sea floor landscapes and implications for conservation, management and spatial planning

Oral Presentation

Roman Zajac

In October 2012 and May 2013, sea floor landscape patches were sampled in the area of Stratford Shoal in Long Island Sound (LIS) to characterize epifaunal and infaunal communities. This study was a component of the initial phase of a sound-wide ecological mapping project. Sea floor landscape structure was quantified by analyzing backscatter collected by NOAA using image segmentation. Six large scale patch types were identified, with varying levels of within-patch variation across the study area.   Epifaunal and infaunal communities were generally related to large-scale patch structure. However, there was significant meso- and small-scale spatial variation in diversity and community structure in some areas, and along transitions among patches. Seasonal differences were also significant in some locations for a subset of the fauna. When compared to historical data, the analyses revealed long-term temporal trends in both epifauna and infauna that suggest potential state changes in the benthic component of the LIS ecosystem in this region. Our results provide a detailed characterization of benthic communities that should prove valuable for conservation, management and spatial planning (e.g., based on spatial rarity of community types, stability in community composition) . We suggest that it is critical to assess spatial and temporal variation in benthic communities relative to sea floor landscape structure in as much detail as possible in order to help insure the success of such efforts.

The Effects of Road Salts on Denitrification in Ephemeral Wetlands

Oral Presentation

Mary Zawatski

Ephemeral wetlands, although small in size and only temporarily inundated, provide important habitat for many species and support enhanced carbon and nitrogen cycling relative to the surrounding forest floor. As human development increases, ephemeral wetlands are polluted by runoff from impervious surfaces, including chemical deicer (i.e., road salts). To understand the effects of road salt on rates of denitrification in ephemeral wetland ecosystems, we measured potential denitrification rates in soils collected from ephemeral wetlands that span a gradient of road salt exposure (peak conductivity ranging from 0.042 to 1.450 mS cm-1). We also analyzed soils for an array of metals (Cr, Mn, Fe, Ni, Cu, Zn, As, Sr, Pb), water extractable Cl-, and KCl extractable NH4+ and NO3-. We found that denitrification potential is negatively correlated to salinity (r2 = 0.31, p<0.05) and positively correlated to organic matter content (r2 = 0.45, p<0.05). Salinity may directly inhibit denitrifiers, or the negative relationship may be caused by lower organic matter content in higher salinity soils (r2 = 0.29, p=0.05). Additionally, we found that denitrification potential increases with manganese concentration in soils (r2 = 0.32 , p<0.05), and that, while not statistically significant, manganese concentration tends to decrease with salinity. Our results suggest that interactions between salinity, manganese, and organic matter may drive the denitrification capacity of ephemeral wetlands.

Land cover change and forest fragmentation in Long Island Sound Watersheds

Oral Presentation

Ruiting Zhai

Invasive species are one of the major threats to biodiversity. There is overriding evidence that land use history and land use change predictions are important to understand and forecast invasive species distributions. And many studies have shown that invasive plants are more abundant at fragment edges than in the interior of fragments. In this paper, we study the past land cover change of Long Island Sound Watersheds from 1992 to 2006, and use Markov Chain to predict the future land cover change of 2018 and 2025. Two methods logistic regression and neural networks, which are built-in modules in Idrisi, are used to combine potentially important drivers (i.e., elevation, road density, soil type, population density, and income) and to create transition scenarios for Markovian processes. In addition, the analysis focus on forest change and forest fragmentation, which are more related to woody invasive species. Higher transitions were found in the boundaries between different land cover types. The study concluded that the loss of the forest and increasing of forest edges would continue. Identifying the land cover change and forest fragmentation will aid ongoing efforts to better predict where invasive plants may occur in unsampled regions.

Living Shorelines and the CT Coastline: What are our Options?

Oral Presentation

Jason Zylberman, Julianna Barrett

Living shorelines are a shoreline erosion control technique that is receiving national attention as a way to protect coastal and riparian shorelines from erosion while enhancing or creating natural habitat and ecosystem services. Numerous agencies and groups in Connecticut are evaluating sites for potential living shorelines, implementing innovative techniques and conducting outreach with municipal officials and coastal engineers on living shorelines as alternatives to structural solutions to erosion. This presentation will describe the different types of living shorelines, questions and concerns with implementation, and the need for monitoring and outreach efforts. In addition, an automated geospatial model has been developed for Connecticut which determines the suitability of living shoreline treatment options for the Long Island Sound shoreline. The living shoreline site suitability model uses coastal conditions and site characteristics to determine stretches of coastline suitable for living shorelines in Connecticut. Factors such as fetch, bathymetry, erosion rates, marsh, and beach are taken into consideration in producing site suitability. Outputs from the geospatial model include Beach Enhancement, Marsh Enhancement, as well as two hybrid design options: Offshore Breakwaters and Marsh with Structures. Results from this study reveal that overall 46.52% of the Connecticut shoreline is suitable for living shoreline design options. The model is a crucial first step for environmental planners, homeowners, environmental engineers, and consultants in considering shoreline protection alternatives to shoreline hardening.