

NEAFWA ABSTRACT ARCHIVES: 2015 Posters

Fisheries Posters

Diadromous Fisheries

What happens after large scale river restoration? Monitoring the Penobscot River Restoration Project

Molly Payne Wynne, George Aponte Clark, Cheryl Daigle — Penobscot River Restoration Trust

Cumulative effects of dams pose known adverse impacts to the recovery of sea-run fish populations. The Penobscot River Restoration Project, an unprecedented collaboration of the Penobscot Indian Nation, seven conservation groups, hydropower companies, and state, federal, and tribal resource agencies, restores access to sea-run fisheries habitat through a combination of dam removal, fish passage improvements and reconfigured hydro operations. This ecosystem-focused effort addresses the full assemblage of 11 native fish species by strategically removing selected dams and improving fish passage at others; vastly improving habitat connectivity while maintaining energy generation. After reaching significant restoration milestones including removal of Great Works Dam (2012) and Veazie Dam (2013), improved passage at Milford (2014), and the construction of a fish-bypass at Howland (slated to be complete in 2015), effects are visible. River herring counts are one example; with the help of Agency stocking efforts, over 300,000 individuals were counted post dam removal in 2014 at Milford fish lift and Blackman Stream. Baseline monitoring of biotic and abiotic river conditions began in 2009 “pre dam removal” and the “post dam removal” phase of monitoring, funded primarily by NOAA, has begun. This noteworthy program, comprehensive in scale and scope, aims to provide detailed information on how Penobscot River and Gulf of Maine ecosystems respond to large scale river restoration. We present a summary of activities, current findings and observations, and future research aims for 9 priority studies focused in geomorphology, water quality, fish community, fish passage, fish migration and habitat use, wetlands and marine nutrients.

Inland Fisheries

Distribution and density of three uncommon or imperiled unionid species in northern New York

John E. Cooper, Cooper Environmental Research

The New York Natural Heritage Program lists Eastern pearlshell *Margaritifera margaritifera* as imperiled, and Pocketbook *Lampsilis ovata* and Yellow lampmussel *Lampsilis cariosa* as uncommon in New York. The population and distribution of these mussels in the lower Salmon and Little Salmon rivers (Franklin County, NY) were estimated using double sampling at 10 transects from 2005 through 2012. Thirteen species of mussels were collected in the study area dominated by Eastern elliptio *Elliptio complanata* (89%). Pocketbook, Yellow lampmussel, and Eastern pearlshell each represented 1% or less of the living mussels collected in transects and the distribution of empty shells of Pocketbook was similar to those living. Yellow lampmussel empty shells were more abundant (49% of those collected) at the most upriver part of the Little Salmon River where no living Yellow lampmussel was collected. Eastern pearlshell was found only in 2012. Comparison of midden shells revealed a greater concentration of Pocketbook (90% of those collected in middens) at the lower part of the Salmon River that was not associated with a transect. This midden also produced 72% of Yellow lampmussel collected in all middens. Density of Eastern pearlshell, Pocketbook, and Yellow lampmussel was one-tenth of the average density of all mussels and 95 times less than the density of Eastern elliptio.

Characterizing Biogeochemical Regimes in Rivers with Natural Dams

Joshua Dallesander, Olivia Thorndike, Lindsay St.Pierre, Denise Burchsted — Keene State College

Roads can be washed away and flooded due to the transformative properties that natural dams have on

river networks. Because of this, people tend to remove natural dams like beaver dams and log jams even though they provide vital ecosystem services including removal of excess nutrients, protection of biodiversity, and mitigation of increased flooding and droughts. The purpose of this study is to analyze the impacts that natural dams have on the water chemistry of river networks, which corresponds with the provided ecosystem services such as water temperature regulation, nutrient availability, and habitat. To do this, water chemistry parameters were systematically measured along twelve rivers with natural dams in southwestern and central New Hampshire. Our study rivers were divided according to reach type so that data could be collected at the midpoints of each reach and upstream and downstream of natural dams. At each site, we measured pH, dissolved oxygen, conductivity, oxidation reduction potential, and temperature. Samples were taken back to Keene State College and pH was measured with bench top equipment. Analysis of the stream walk data determined that natural dams do affect water chemistry in river networks. There is a statistically significant difference between free-flowing reaches, beaver meadows, and beaver ponds in regard to the pH and dissolved oxygen levels. The findings of this study could improve modern river management by gaining a better understanding of the inherently erratic nature of river networks.

Baseline Fish Survey and Habitat Assessment of the U.S. Navy's Great Pond Outdoor Adventure Center

Tyler Gaudet, Deena Anderson, Brian Dresser — Tetra Tech; Ian Trefry, U.S. Navy; Kevin Gallant, Maine Department of Inland Fisheries and Wildlife

The U.S. Navy's Great Pond Outdoor Adventure Center (GPOAC), located in central Maine, provides recreational freshwater fishery opportunities for military personnel, but fish communities and their associated habitats have not been well characterized. This study provided a baseline of the existing fish community and may help determine the level of recreational fishing pressure that GPOAC waters can sustain. Additionally, the GPOAC falls within designated Critical Habitat for Atlantic salmon on the Union River. These data will also provide input for the facility's Integrated Natural Resource Management Plan (INRMP). A collaboration in effort resulted in a multi-agency approach; Maine Department of Inland Fish and Wildlife (MDIFW) biologists performed boat electrofishing surveys in Great Pond, while Navy, U.S. Fish and Wildlife, and Tetra Tech biologists performed habitat assessments and backpack electrofishing surveys in Collar Brook. Of the 303 total fishes collected in Great Pond, 43.2% were common shiner; other recreational species collected were brook trout, pickerel, smallmouth bass, and sunfishes. Blacknose dace were the most abundant of the 119 total fishes in Collar Brook, making up 33.6% of the catch; brook trout and sunfishes were also present. These fishery data demonstrate that the GPOAC supports healthy populations of native fishes. The collaborative nature of this survey provided MDIFW access to otherwise restricted areas and data sharing, which helped all agencies involved.

A comparison of fish assemblage structure in lakes with and without alewife (*Alosa pseudoharengus*): Investigating the impact of reintroducing alewife on littoral fishes.

Brian Eaton, Unity College student; Pamela MacRae, Unity College professor; Richard Lee, Unity College student

The removal of numerous dams on the east coast has been proposed to allow for restoration of diadromous fish species to their spawning habitats. Removal of dams may result in the reintroduction of many diadromous fish to inland lakes and rivers they have been blocked from for decades or more. This study examined the littoral fish assemblage in lakes with and without alewife, *Alosa pseudoharengus*, in central Maine. Eight lakes were sampled between late August and early October in 2014; four lakes with alewife present and four with alewife absent. Seine nets were used by hand on the shorelines of each lake to collect littoral fish, and fish species were identified to species and counted. Species presence absence, total catch and a correspondence analysis were used to compare assemblages of the littoral community in

lakes sampled. A total of 3,197 fish were caught, comprising sixteen species. Overall, species composition was similar in lakes with and without alewife, although species such as smallmouth bass, fallfish, and white perch were more often caught in alewife lakes, while species such as American eel and three-spined stickleback were more often caught in lakes without alewife. However, this study revealed very few differences in the littoral fish community inhabiting lakes sampled. Based on this small study, the potential reintroduction of alewife to lakes in central Maine associated with the removal of dams would not have a detrimental impact on the littoral fish assemblage.

Investigation of GoPro Video Camera Sampling of Freshwater Fishes in Multiple Habitat Types

Michael McGuinness, Denise Burchsted — Keene State College

River networks are patchy systems full of natural dams, such as beaver dams and log jams. The pools and meadows created by natural dams provide important thermal refugia and nursery grounds for many species of fish. Although these areas are essential to many species and life stages of fish, there is little research of the dynamics of these unique wetland habitats. Part of the reason for this is simply that beaver ponds and meadows are difficult to sample. Standard sampling methods such as electrofishing, snorkel surveys, and seining are challenging to implement due to the fine-grained sediments, variable depth, and amount of vegetation found within these habitats, as well as their often remote locations. To address these issues, we investigated the use of a GoPro video camera in these difficult to sample areas. This poster presents both the challenges as well as the useful insight gained with underwater video sampling. We conclude with recommendations to implement video sampling of riverine fish communities. Video technology can improve our understanding of river networks beyond the habitat types that are most easily sampled, providing us with the information necessary to manage the wide range of freshwater habitat that makes up our full river networks.

Using Genetics and Cost-Distance Modeling to Uncover Stream Network Features that Structure Brook Trout Populations

Lucas Nathan, Jason Vokoun — University of Connecticut

In stream networks, population connectivity can be influenced by a wide array of anthropogenic and natural barriers. Some can be readily observed (e.g. dams and waterfalls), yet others may be more ambiguous in terms of their detectability as well as their influence on movement patterns between populations (e.g. water temperature and watershed land use). Brook trout *Salvelinus fontinalis*, native to the East Coast, are found in landscapes that are both relatively densely populated and which span gradients from mountains to coastal plains. Fragmentation of historically wide spread populations due to abiotic and biotic alterations has restricted many populations to small, isolated headwaters where suitable conditions remain intact. The dynamics within and between these isolated populations is of conservation importance and is the objective of this study. We utilized a suite of habitat and landscape-level variables, combined with genotypes at eight microsatellite loci from 400 individuals collected throughout a heterogeneous Connecticut stream network. We then analyzed these data using cost-distance estimations within a causal model framework to identify which variables most likely contributed to the observed patterns of genetic structuring. Using the model, a resistance surface was then built to represent the theoretical cost of an individual moving within and between populations. This surface will be later used in conjunction with others generated from complimentary networks to predict future brook trout population viability across a changing landscape and identify areas of enhanced conservation potential.

A Stream Classification System and Map for the Appalachian Landscape Conservation Cooperative.

Arlene Olivero Sheldon, Mark G. Anderson —The Nature Conservancy Eastern Conservation Science Eastern Regional Office, Boston, MA

This project developed a hierarchical classification system and map for stream and river systems in the

Appalachian LCC region, covering parts of 17 states, including 8 NEAFWA states. The product is not intended to override state stream classifications, but is meant to unify existing geomorphic and hydrologic classifications that occur within the LCC and consistently represent the natural flowing-water aquatic habitat types across this region in a manner deemed appropriate and useful for building ecological flow ecology relationships and other conservation planning tools looking at aquatic biodiversity patterns across the region. The classification uses six primary classification attributes to define habitat types. These variables include size, gradient, geology, temperature, hydrologic class, and valley confinement. Each National Hydrography Dataset Version 2 reach (1:100,000) was tagged with these classification attributes. Ecologically meaningful class breaks within each of the six variables were developed and the resultant variables and classes combined to yield a regional taxonomy. The full types can be simplified using recommended prioritization and collapsing rules.

Northeast Lake and Pond Classification System

Arlene Olivero Sheldon, Alexandra Jospe, Mark G. Anderson —The Nature Conservancy, Eastern Conservation Science, Eastern Regional Office, Boston, MA

We developed a mapped classification of lakes and ponds based on variables that structure lacustrine natural communities and that could be mapped consistently across Northeastern US. The classification was built upon four key attributes: water temperature, trophic state, alkalinity, and depth. Water temperature was classified into three classes (very cold, cold-cool, warm). Trophic state, representing the productivity of a lake, were mapped into four classes (oligotrophic, mesotrophic, eutrophic, and hypertrophic). Alkalinity was grouped into three classes (high, medium, low). Depth was divided into two classes (lake, pond) based on a light penetration zone. A steering committee of state and regional experts contributed sampled data with measured values of these and other variables for waterbodies in their states. Additionally, we received lake survey information from the National Lake Assessment and the New England Lake and Pond Survey. The classification was mapped to every waterbody in the region ($n = 32,651$) using the National Hydrography Dataset Plus, and for each waterbody we generated over 100 landscape variables including: surface area, elevation, latitude, longitude, geology, and land cover in the buffer zone. We used Random Forest software to develop a predictive model for each variable class. All waterbodies were assigned to one of 68 classification types based on the combination of the four variables, for example “warm, eutrophic, medium alkalinity lake.” The classification may be simplified using combinations of only two variables, such as temperature and trophic level, which yields between 9-12 types.

Investigating Genetic Similarity Among Extant Bridle Shiner Populations in Connecticut: Prerequisite Information for Restoration of Extirpated Locales

Andrew Ransom, Jan-Michael Hessenauer, Jason Vokoun — Wildlife and Fisheries Conservation Center, Department of Natural Resources and the Environment, University of Connecticut, Storrs, CT

Bridle Shiner (*Notropis bifrenatus*) is a freshwater minnow of conservation concern throughout much of its range (southern Canada to South Carolina). Much of its habitat is centered on the Northeastern US coastal watersheds, for which Connecticut has an abundance of locations. In the 1960s, sampling documented the species at over fifty locations statewide, but by the 1990s, the number of locations extant was less than ten. Our objective was to investigate the genetic relatedness among the remaining extant populations in Connecticut. We genotyped individuals at 8 microsatellite loci, and calculated population F_{st} values. These findings will provide guidance for ongoing planning for species restoration by elucidating statewide patterns of genetic similarity of remaining populations. This project will ensure that future fish introductions appropriately conserve regional genetic diversity to the greatest extent possible.

Biological Aspects of the Channeled Whelk (*Busycotypus canaliculatus*) and Knobbed Whelk (*Busycon carica*) in Narragansett Bay, Rhode Island

Thomas E. Angell, Rhode Island Department of Environmental Management, Division of Fish and Wildlife, Marine Fisheries Section

The channeled whelk (*Busycotypus canaliculatus* (Linnaeus, 1758)) and knobbed whelk (*Busycon carica* (Gmelin, 1791)) occurring in Rhode Island waters have been harvested over the past 125 years as a means to control predation on more economically-important clam and oyster populations; for over 100 years as a food-source bycatch and economic supplement in southern New England lobster and finfish fisheries; and over the past approximately 35 years as a directed fishery as the economic viability of predominantly ethnic markets for whelks has increased. In spite of this relatively long history of exploitation, little is known regarding the life history traits (growth rates, size-at-maturity, age-at-maturity) of these whelk species in the northern extent of their range. Recent (2006-2012) substantial increases in fishing effort directed on the RI whelk resource in terms of both number of fishers reporting whelk landings and reported whelk landings, combined with increasing ex-vessel prices for whelks have raised concerns regarding the sustainability of the resource. The RI Division of Fish and Wildlife initiated a data collection program in 2012 to provide this basic biological information needed for fishery management purposes. Sea sampling collected whelk population size structure and fishery catch and effort data (CPUE) by species. Laboratory research collected detailed morphological, anatomical, and physiological data for estimation of biological reference points (growth rates, size- and age-at-maturity) by species and sex. Recently updated stock assessment analysis (2014) using a biomass dynamic model (BDM) indicates that fishing mortality has risen and is now above F_{msy} , so overfishing is likely.

Analysis of trends in fish assemblages in Narragansett Bay, RI/MA

Janet Nye, SUNY Stony Brook, NY; Suzanne Ayyazian, Brenda Rashleigh — U.S. EPA, Narragansett, RI

Estuarine fish are highly valued resources that are affected by several factors, including climate, landscape, pollution, and fishing pressure. Here, we examine patterns of variability in estuarine fish assemblages in Narragansett Bay, an estuary located in Rhode Island and Massachusetts, through time. We used data collected in a trawl survey conducted by the Rhode Island Department of Environmental Management for the years 1980 – 2012, separated by season, and grouped by upper, middle, and lower sections of the Bay. Our explanatory data included temperature, wind, precipitation, river flow, nitrogen load, cormorant abundance and regional-scale climate variability over the same time period. There was high variability in fish species abundance across sites and through time; with climate variables associated with trends in some species. Nitrogen loads increased and then decreased through the time period, and a shift in fish species composition associated with nitrogen load could be detected. A systems-level understanding of the historic trends in fish assemblages in relation to multiple stressors can support the management of the valued finfish species and the whole estuarine system.

The Rhode Island Coastal Research Trawl Survey, a 35 year look at Narragansett Bay, Rhode Island and Block Island Sounds.

Scott D. Olszewski, Principal Investigator; Richard Mello, Vessel Captain; Patrick Brown, Assistant Vessel Captain — Coastal Trawl Survey RIDEM Marine Fisheries

The Coastal trawl survey started as a seasonal research survey to characterize local coastal fish stocks and over the years has grown into an important tool for state and regional fishery managers. After almost 6000 research tows and information collected on over 130 different species, the survey has become an important source of information on the relative abundance of the State's natural marine resources. Monitoring the State's fishery resources is essential for assessing stock status and developing management advice to a number of fishery management agencies including the Atlantic States Marine Fisheries Commission (ASMFC), the Rhode Island Marine Fisheries Council (RIMFC) and the New

England Fishery Management Council. Fisheries management has become increasingly reliant on fishery-independent surveys for resource information. Trawl survey results illustrate seasonal and monthly distribution trends, size/age composition, and indications of stock abundances. Conducted over many years, this survey provides trends in relative abundance and predictions of recruitment of many finfish species found throughout Rhode Island waters. After 35 years, not only has there been changes in the fishery dynamics of the coastal waters but the survey have seen its share of technological changes, from advances in electronics and hydraulics to the modernization of the fishing gear. The R/V John H. Chafee was commissioned on June 7, 2004 and became a permanent member of the Marine Fisheries fleet replacing the R/V Thomas J. Wright which was in service for the previous 25 years. After a wave of comparative survey work to calibrate the previous vessel and gear to its new replacement, the Chafee became the Rhode Island Marine Fisheries Coastal Trawl Survey Vessel. The survey to this day remains the backbone of the State's Department of Environmental Management's Marine Fisheries Section and overall mission to ensure the health and sustainability of the fishery resources of the State of Rhode Island for generations to come.

Comparison of Size Structure for Black Sea Bass between the Narragansett Bay Ventless Pot, Multi-species Monitoring and Assessment Program and The RI Monthly and Seasonal Trawl Surveys in Narragansett Bay, Rhode Island

Richard J. Satchwill, Principal Marine Biologist, RI Div of Fish & Wildlife

The RI Div. of Fish and Wildlife began an unvented multi-species monitoring program in Narragansett Bay in response to reports from the ASMFC stock assessment subcommittee and the Northeast Data Poor Stocks Working Group. They asserted that traditional trawl surveys under represented size classes of many species, among them Scup, Black Sea Bass, and Tautog, because they tend to be structure oriented and thus unavailable to traditional trawls for much of the year. These same groups called for alternative survey gear for these species, either pots or hand line. It was estimated that trawl surveys adequately index the abundance of 0-2 year old scup and the new standardized surveys would focus on indexing the abundance of scup >3 years old. A monthly ventless pot survey was conducted in the Narragansett Bay, North of the colregs line from April through October, beginning in 2013. Narragansett Bay was divided into five sampling areas then further subdivided into 0.5 deg. of latitude and longitude blocks and numbered. All stations were selected randomly. Once a month in each area, we set 20 baited scup pots, 2 at each of five areas of structured bottom and 2 at each of five areas of unstructured bottom, and left to fish for 24 hrs. Additionally, we set two five pot trawls of unbaited sea bass pots per area, one trawl on structured bottom and one on unstructured bottom, and left to fish for 96 hrs. In 2013 and 2014, investigators caught 363 and 1022 black sea bass respectively. The percentage of fish <3 years old in 2013 was 48.8% and >3 years old 51.2%. However, in 2014, the percentage of fish <3 years caught changed to 25.5% and >3 years old 74.5%. In comparing these results to the RI trawl survey we noticed that the percentage of fish <3 years old was greater than in the unvented pot survey.

Scup Special Area Provisions Survey, Determining Recreational Angler Catch and Effort

Kevin Smith, Tim Rovinelli —Rhode Island Department of Environmental Management, Division of Fish and Wildlife, Marine Fisheries Section

In the spring of 2013, the RIDEM enacted new special area provisions designed to give recreational anglers a greater ability to harvest scup, *Stenotomus chrysops*, in order to feed themselves and their families. These regulations lowered the size limit for scup from 10 inches to 9 inches, while maintaining the 30 fish possession limit, at three designated shore locations within Narragansett Bay. The main objective of this survey was to characterize the experimental shore mode fishery for scup at each of the three special areas designated by the regulatory scup special area provisions; India Point Park in Providence, RI, Conimicut Point Park in Warwick, RI, and Stone Bridge in Tiverton, RI. Two primary questions were assessed; to what extent does the program affect catch and harvest rates for scup, and

how does the program impact angler behavior and satisfaction. Comprehensive angler surveys at the designated locations were performed from June 16th, 2013 through October 31st, 2013. Various aspects of environmental conditions were recorded and interviews were conducted with individual anglers to determine their fishing catch and effort as well as to determine the influence of the lower size limit on the number of harvested scup. All catches occurred at either the Stone Bridge or Conimicut Point Park locations. The results show that the regulatory provisions are having moderate effects on scup harvest at Stone Bridge, and likely Conimicut Point Park, though no effect at India Point Park.

Information & Education Posters

Information & Education

The New Haven Harbor Watershed Urban Wildlife Refuge Partnership

Georgia Basso, U.S. Fish & Wildlife Service, Coastal Program

The New Haven Harbor Watershed Urban Wildlife Refuge Partnership was one of the first designated U.S. Fish and Wildlife Service Urban Wildlife Refuge Partnerships in the country. Through the initiative, partners are working to connect student with the outdoors, restore wildlife habitat in urban spaces and to inspire the next generation of environmental leaders.

Community members, working alongside partners have increased habitat quality and connectivity at 11 sites across the city, improving conditions for migratory birds and pollinators. Partners train urban students through a Green Jobs program and put them to work restoring riparian corridors and building bioswals to improve both upland habitat and water quality in Long Island Sound. In 2014 the partnership received a grant to develop the city's first habitat restoration site selection tool incorporating social and ecological parameters. Partners are working alongside community members to implement this tool, taking a diverse array of social, environmental and economic factors into consideration to select future habitat restoration sites that will benefit both people and wildlife in urban areas like New Haven Connecticut.

New Haven Urban Wildlife Refuge Partners: include Yale School of Forestry & Environmental Studies, New Haven Urban Resources Initiative, National Audubon Society, EPA Long Island Sound Study, City of New Haven Parks and Recreation, Yale Peabody Museum of Natural History, New Haven Public Schools , Stewart B. McKinney National Wildlife Refuge and Common Ground: High School Urban Farm and Environmental Education Center.

Sure we are making a difference, aren't we?

Mike Beauchene, Tom Bourret, Justin Wiggins — CT DEEP Inland Fisheries Division

Many agree the future of outdoor sporting activities like hunting and fishing are reliant upon today's youth becoming engaged. Education programs, like the Connecticut Aquatic Resources Education (CARE) program are designed for families and youth, focusing upon providing an introductory experience, an awareness of the many benefits fishing has to offer. With the annual contact of 10,000 students annually, it is the assumption, that through our programming, we have instilled the desire to become an angler. Long term tracking surveys can be time consuming and resource intensive. Leaving largely unanswered, "is our programing effective at creating anglers?" To begin long-term tracking of CARE students, the CT Inland Fisheries Division initiated the Youth Fishing passport. The passport is a free product available to anyone 15 years of age or younger via the sportsmen licensing system, the same system used for hunting and fishing license sales. Each passport registrant is assigned a lifetime conservation ID, just as any adult purchasing a sporting license. Over time, we will be able to enumerate people who purchase a fishing license and were a youth fishing passport holder.

Likes and Dislikes: The experience of using Facebook to engage the outdoor community

Mike Beauchene, Justin Wiggins — CT DEEP Inland Fisheries Division; Kathy Herz, CT DEEP Wildlife Division

CT Bureau of Natural Resources (Fisheries, Wildlife, and Forestry) entered the social media world on April 13, 2012. Since that time we have acquired over 8,500 fans. Our posts can be categorized as important/breaking news, general information, contests/trivia, daily fish stocking reports, and sharing user submitted posts. Our most engaging posts, averaging several thousand views, involve popular wildlife like Bobcats, Mountain Lions, Bears and our daily trout stocking reports. Our two greatest posts, each reaching close to 80,000 views, were on the emergence of the periodical cicada and the discovery of a 7 foot long sturgeon (deceased) in the lower Connecticut River. With close to 42% of people accessing social media from their smartphones and 75% of adults using Facebook, social media provides an effective media for promoting and creating awareness of CT's natural resources and possible recruiting new users to the outdoor recreation community. The downside of social media is that it requires constant moderating by staff, fans can be finicky, critical, or curious and keeping them interested and engaged can be challenging.

MARSH! A Volunteering Adventure

Nick Vermeulen – Montezuma National Wildlife Refuge, Seneca Falls NY

The Montezuma National Wildlife Refuge (MNWR) consists of 10,000 acres of interspersed wetland, grassland, and forested habitats. MNWR is part of the Montezuma Wetlands Complex which encompasses 50,000 acres. The mission of the complex is to protect, restore, enhance, and manage wildlife habitat; specifically for migratory birds with an aim at providing quality resting and feeding habitat for birds during spring and fall migration as well as nesting habitat for resident species. Established in 2009, MARSH! is a volunteer program and stands for Montezuma Alliance for the Restoration of Species and Habitat. This is a collaborative effort coordinated by USFWS, NYSDEC, and Montezuma Audubon Center staff which focuses on the restoration of habitats within the Montezuma Wetlands Complex. This program also helps to increase public awareness, while establishing new connections and volunteers. The MARSH! program plays an integral role in helping keep the Montezuma Wetlands Complex healthy.

The program is conducted about once a week April - October and "work" days are ~ 4 hours in length. Restoration activities conducted by the volunteers include invasive plant monitoring and removal, native plantings, native seed collection, and bathymetry mapping. MARSH! volunteers range from grade school to high school and college students to retirees. More than 100 individuals volunteer each year, with total work hours equaling between 756 and 1620. The number of volunteers varies on a weekly basis, averaging just over 10 volunteers per work day. Since the inception of MARSH! > 6000 native trees have been planted on ~100 acres, invasive species monitoring and control has been conducted on > 1700 acres with close to 10,000 lbs. of invasives removed. Almost 300 lbs. of native wetland seed have been collected and used to help restore numerous areas on the Complex.

The work accomplished by MARSH! volunteers helps supplement work by refuge staff that can be limited by time, funding, and personnel; in essence our success on the refuge is greatly enhanced by this volunteer program. The MARSH! volunteer program also gives volunteers behind the gates access to areas that are normally closed to the general public. MARSH! has proven to be an invaluable management, restoration, and outreach tool for MNWR and will continue to provide opportunities in the future for volunteers to help enhance, protect, and restore this natural resource.

Wildlife Posters

Wildlife

Extending the Northeast Terrestrial Habitat Map to Atlantic Canada

Charles Ferree, Mark G. Anderson — The Nature Conservancy

The Northeast US and Atlantic Canada share many of the same types of forests, wetlands, and natural communities, and from a species perspective the region is one contiguous forest. However, resources are classified and mapped differently on the two sides of the border creating challenges for species modeling and ecosystem evaluation. To remedy this, ecologists from The Nature Conservancy collaborated with a committee of scientists from various Canadian institutions to produce the first international map of terrestrial habitats for the region. The project used extensive spatial data on geology, soils, landforms, wetlands, elevation and climate. Additionally, all four provinces contributed spatially comprehensive forest inventory data consisting of millions of polygons depicting the exact tree composition of individual forest stands, and the Atlantic Conservation Data Centre contributed spatial locations of over 16,000 species locations including herbaceous plants, herptiles, mammals and birds. The resulting map will be integrated with US map and released as a single dataset in 2015. This poster reviews the methods and examines some of the interesting findings. This project was jointly funded by the NE CSC and the North Atlantic Landscape Conservation Cooperative.

Floating Habitat Islands for Salt Marsh-Nesting Birds

Bri A. Benvenuti, Adrienne I. Kovach, David M. Burdick — University of New Hampshire; Jonathan B. Cohen, State University of New York – College of Environmental Science and Forestry; Chris S. Elphick, University of Connecticut; Thomas P. Hodgman, Maine Department of Inland Fisheries and Wildlife; Kathleen M. O'Brien, U.S. Fish and Wildlife Service; Brian J. Olsen, University of Maine; W. Gregory Shriver, University of Delaware

Tidal marsh birds are severely threatened by the impacts of rising sea levels on salt marsh ecosystems. Changes in vegetation, loss of nesting habitat, and increased tidal inundation will reduce, if not eliminate, the reproductive ability of marsh-nesting birds, such as the Saltmarsh Sparrow. Conservation actions are needed in the very near-term to identify solutions to mitigate nest flooding and maintain breeding populations until habitat is created in the longer term by accelerated marsh migration or other habitat restoration efforts. In this pilot study, we explored the potential of floating habitat islands to provide Saltmarsh Sparrows with nesting habitat that is free of tidal flooding. A 10 ft x 5 ft floating island raft was constructed from a 2-inch PVC pipe frame, held together by plastic mesh garden fencing, filled with wrack and flotation devices, and planted with vegetated pieces of peat, 4 x 6 inch squares of marsh sod (*Spartina patens*), and bare root *Spartina alterniflora*. The island was deployed on a marsh in the Rachel Carson National Wildlife Refuge in Wells, Maine, in a shallow pool and anchored with cinder blocks, allowing it to rise and fall with the tide but not to flood. We monitored the status of the island for 3 months, confirming that it did not flood during high tides. Preliminary findings suggest floating islands may be a feasible means of providing breeding habitat for salt marsh-nesting birds, and we are making modifications to the design for further trials next year.

Comparing mammal abundance and diversity in two different travel corridors using remote cameras

Leon Burman, Jonah Gula — Unity College

South-central Maine is the second-most populated area of the state and has experienced major changes in land use over the past century and a half. The often fragmented landscape has created an environment in which wildlife must navigate among human-altered habitats. We used remote cameras to compare mammal abundance and diversity in two different corridors in Unity, Maine: along a riparian area and bordering a powerline. Both types of corridors have been shown to be important travel routes for mammals, and differences in diversity have been documented depending on the type of corridor. Travel corridors have been increasingly recognized as important for wildlife to maintain connectivity in such

landscapes. We hypothesized that abundance and diversity would be greatest along the riparian area, which has classically been characterized by a high species diversity due to the interface between ecosystems it provides. We will use any differences in abundance and diversity to determine the importance of each corridor type in the patchy environment that is found in and around Unity.

Prevalence of Ixodes scapularis tick-borne pathogens in the Lehigh Valley region of Pennsylvania

Meaghan Butler, East Stroudsburg University; Louise Bugbee, Penn State Extension; Marten Edwards, Laura Barbalato, Katerina Pham, Amulya Makkapati — Muhlenberg College; Jane Huffman, East Stroudsburg University

The blacklegged tick, *Ixodes scapularis*, is ubiquitous throughout Pennsylvania and much of the Northeastern United States. *Ixodes scapularis* are capable of transmitting numerous human pathogens including *Borrelia burgdorferi* (Lyme disease), *Borrelia miyamotoi* (tick-borne relapsing fever), *Anaplasma phagocytophilum* (human granulocytic anaplasmosis) and *Babesia microti* (human babesiosis), as well as numerous animal pathogens such as *Babesia odocoilei* and specific strains of *A. phagocytophilum*. In recent years the Lehigh Valley region of Pennsylvania, population 821,000, has had an increasing number of reported cases of Lyme disease and three cases of human babesiosis. These pathogens are maintained in the environment as part of the cycle between larval and nymphal blacklegged ticks and the mammalian hosts that they feed upon, predominantly the white-footed mouse (*Peromyscus leucopus*). These rodents and the eastern chipmunk (*Tamias striatus*) and the short-tailed shrew (*Blarina brevicauda*), serve as sentinels and competent reservoirs for Lyme disease and other tick borne pathogens. This study investigated the infection rates of four human pathogens in 460 adult and nymphal black-legged ticks and 100 field caught rodents. DNA was extracted from the ticks, ear biopsies and splenic tissue from the captured rodents and pathogen presence was determined using both traditional and Real-time PCR assays. The prevalence of the four human pathogens was determined in multiple locations in the Lehigh Valley.

Evaluating detection probabilities and associations of a carnivore community in central Wisconsin surveyed using remote cameras.

John Clare, Maine Cooperative Fish and Wildlife Research Unit; Eric M. Anderson, College of Natural Resources, University of Wisconsin - Stevens Point; David M. MacFarland, Bureau of Wildlife Management, Wisconsin Department of Natural Resources

Remote-camera surveys are commonly used to infer the distribution, abundance, and habitat associations of cryptic species such as carnivores. Cameras are a particularly appealing survey method because multiple species can be detected and monitored. However, estimates of status and trend are only useful if sufficient observations are collected to support the estimation. We sought to quantify how fine-scale camera placement and phenological season influenced the detection probability of 12 carnivore species in central Wisconsin, with particular focus on identifying interspecific trade-offs in detectability and factors that ubiquitously increased detection probability. We surveyed 281 camera stations for more than 12,000 total trap-nights, and modeled detection probability using community occupancy models and a Bayesian parameter selection framework. Average ambient temperature (inclusion probability $w = 1.0$), bare trail-substrates ($w = 0.945$), small trail sizes ($w = 0.54$), and placement along linear features or natural funneling features ($w = 0.48$) strongly influenced carnivore detectability, but no single factor had ubiquitous positive or negative influence. This suggests that surveys designed to make community-wide inference should spread camera deployment across a range of local conditions and seasons to provide opportunity to detect all species present.

Comparing waterbird species diversity and composition between a newly created wetland and an established wetland in West Virginia

Hannah L. Clipp, Nick S. Goodman — West Virginia University Environmental Research Center, Morgantown, WV; Mike L. Peters, West Virginia Division of Natural Resources – Wildlife Resources,

South Charleston, WV; James T. Anderson, West Virginia University Environmental Research Center, Morgantown, WV

Wetlands in the United States are protected by both federal and state governments. Permits to degrade wetlands usually require wetland mitigation efforts, and thousands of hectares of wetlands have been created in compensation for wetland destruction and disturbance. However, literature shows that constructed wetlands do not consistently function as ecosystem equivalents of natural wetlands. In addition, information on how wetland restoration affects carrying capacity and waterbird use in this region is limited. Therefore, the objective of this study is to compare waterbird diversity, species composition, abundance, and use between a recently created wetland (2013) and an established wetland (created in 2001) in the Pleasant Creek Wildlife Management Area near Grafton, WV. From September to May of 2013–2014 and 2014–2015, 30-minute visual surveys were conducted from different locations around each wetland 2–4 days per week (half in the morning, half in the evening). Waterbirds were identified to species and sex when possible, and feeding activity was noted for each bird. To date, 12 and 25 species of waterbirds have been observed at the newly created and established wetland, respectively. Certain species, such as solitary sandpipers (*Tringa solitaria*), were more likely to be found in the new wetland, while others, including ring-necked ducks (*Aythya collaris*), were more likely to be found in the established wetland. Data collection is ongoing, but preliminary data reveals that waterbird abundance and species composition appears to vary between the two wetlands, perhaps due to a difference in water surface area and depth.

Accomplishing Regional Conservation

Elizabeth Crisfield, Karen Terwilliger — Northeast Fish and Wildlife Diversity Technical Committee

Since 2007, Northeastern states have contributed 4% of their State Wildlife Grant funding to support a program called the Regional Conservation Needs (RCN) Grant. The Northeast Association of Fish and Wildlife Agency Directors and their subcommittee, the Fish and Wildlife Diversity Technical Committee, directs the program with administrative help from the Wildlife Management Institute. Representatives of each state collaborate to define the focus topics and principal investigators working in government agencies, non-profit organizations, and academic institutions propose projects and provide matching funds to address these topic areas. Projects that best address urgent questions at the regional scale or provide important information for state and regional planning processes are selected. In this poster, we highlight previously funded projects and the regional benefits they provide. With State Wildlife Action Plan revisions nearing completion, we explore potential next steps for the RCN program to serve conservation planning and action through another decade.

Climate change and wildlife conservation – a summary of NEAFWA technical committee white papers

Elizabeth Crisfield, Karen Terwilliger — Northeast Fish and Wildlife Diversity Technical Committee

Over the last two years, the technical committees of the Northeast Association of Fish and Wildlife Agencies (NEAFWA) produced white papers summarizing the impact of climate change on fish and game species including fish, white-tailed deer, fur-bearing animals, birds, and black bears, along with impacts on habitat in general and non-game species. These papers include management recommendations for stewardship of fish and wildlife and the natural resources they depend on. This poster highlights common climate-affected considerations such as diet, disease, habitat, dispersal ability, phenology, and competition and inter-dependence that are relevant to nearly all wildlife species. Associated management actions that could be taken to support wildlife under changing climate conditions are also described. Taken together, the NEAFWA technical committee white papers can provide a foundation for a comprehensive and cohesive regional strategy for dynamic conservation.

Using GPS Tracking Logs to Document Feral Swine Investigations

Tyler DeLisle; Justin Gansowski; and Allen Gosser, USDA APHIS Wildlife Services

USDA Wildlife Services has built a large network of cooperators and stakeholders that report feral swine activity directly to WS or New York State Department of Environmental Conservation (NYSDEC). Wildlife Services Feral Swine Damage Management Program investigates all reports by scouting properties, setting up camera traps, and conducting local interviews. To ensure that scouting efforts are thorough, WS began using GPS tracking logs to record the areas searched by WS personnel. The tracks are then recorded into GIS to document searched areas, and create a visual representation of feral swine activity investigated to ensure that all pertinent areas have been searched. This poster presents feral swine surveillance activities documented in New York State using track logs and GIS.

Post-Hurricane Sandy Tidal Marsh Restoration at Edwin B. Forsythe National Wildlife Refuge

Virginia Rettig, Amy Drohan, Paul Castelli, Mason Sieges, Vincent Turner, William Crouch, Rebecca Reeves, Marc Virgilio — U.S. Fish and Wildlife Service, Edwin B. Forsythe National Wildlife Refuge

A suite of projects designed to mitigate the impacts of Hurricane Sandy and address threats to the integrity and persistence of 47,000 acres of salt marshes and other coastal habitats at Edwin B. Forsythe National Wildlife Refuge (NWR) are underway with a goal to maintain and improve green infrastructure in coastal New Jersey using a combination of natural and engineered features, safeguarding a variety of ecosystem services, including wildlife habitat and protection of shore communities. These projects will enhance or restore tidal marshes that are deficient in sediment deposition, tidal flow, or altered by anthropogenic structures or actions, while others provide opportunities to implement living shoreline engineering techniques. We plan to elevate sediment-starved saltmarshes by depositing dredge material from nearby waterway channels. Tidal flow will be restored to altered sites to enhance salt marsh resilience by replacing undersized culverts and restoring natural creek channels. Nine coastal impoundments will be restored to tidal marsh and/or increasing resilience to meet wildlife habitat management objectives. We will also restore 283 ha of salt marsh habitat on two former ship-to-shore communication sites by removing 900+ telephone poles and associated cabling. Living shorelines may be established as green infrastructure in both estuarine and freshwater habitats. The progress of these habitat restoration efforts and lessons learned will be discussed.

Restoring and Enhancing Saltmarsh Sparrow Nesting Habitat at Sachuest Point National Wildlife Refuge Post-Hurricane Sandy

Nick Ernst, USFWS; Benjamin Gaspar

The Saltmarsh Sparrow (*Ammodramus caudacutus*) is a species of high conservation concern because of its limited breeding range and the loss of coastal habitat associated with human development, sea level rise and climate change. Sachuest Point National Wildlife Refuge supports one of the most concentrated populations of nesting Saltmarsh Sparrows in Rhode Island, however, monitoring data suggests the population has declined recently. The marsh where sparrows nest suffers from restricted tidal flow through an undersized road culvert that drains across nearby Third Beach. This culvert provides the only outlet for the adjacent freshwater Maidford River and the only source of tidal flow for the saltmarsh. During high tides and storm events the outlet frequently becomes blocked with sand and as a result, excess water becomes trapped on the marsh for extended periods of time causing failure of saltmarsh sparrow nests and degradation of marsh vegetation. The Rhode Island National Wildlife Refuge is currently implementing a restoration strategy designed to restore tidal flow, reduce marsh flooding, and raise marsh elevations to support future nesting habitat for saltmarsh sparrows. The restoration project is being funded through Hurricane Sandy disaster relief funds made available by DOI. These efforts will also serve to increase the resilience of the saltmarsh to better withstand impacts from future storms and sea level rise. A preliminary overview of the restoration project is provided.

Trophic Cascade Effects on Invasive Plant Species and Tick-borne Diseases: Management Implications and Future Directions

Megan Floyd, University of Connecticut

Recent work in trophic cascade theory pertaining to the Northeast has revealed that a novel ecosystem may be in effect. The cascade caused by a lack of an apex predator has rippled down to not only positively influence white-tailed deer (*Odocoileus virginianus*) populations, but also white-footed mice (*Peromyscus leucopus*) and blacklegged ticks (*Ixodes scapularis*). Specifically, white-tailed deer have caused native plant species to be reduced and invasive species to prosper due, in part, to a lack of competition. As a result, invasive plant species, specifically Japanese barberry (*Berberis thunbergii*), have caused a new cascade to occur resulting in a constant white-footed mouse population and increased blacklegged tick populations, in areas where barberry is present compared to areas where it is not. The two species are of particular importance as they aid in the life cycle of *Borrelia burgdorferi*, the pathogen that causes Lyme disease in humans and domesticated animals. Therefore, research can now be conducted to further identify and quantify the relationship between vector and reservoir populations correlated with invasive plant species presence or absence. The intent of this research is to provide a plan to potentially lessen the spread of Lyme and other tick-borne diseases as well as provide scientific justification for invasive plant species management, in particular, Japanese barberry.

Applying New Technology to Non-lethal Wildlife Deterrence

Donald Ronning, Lite Enterprises, Nashua, NH; Carol R. Foss, Ph.D., Audubon Society of New Hampshire, Concord, NH

Deterring birds from approaching dangerous or undesirable situations is an on-going challenge for wildlife managers. This poster describes pilot field tests of high-brightness light-emitting diodes (LEDs) of various wavelengths to discourage birds from approaching specific food sources. Tests included Common Eiders at a mussel farm in Casco Bay, Maine; Ospreys at an uncovered trout rearing pond at a New Hampshire fish hatchery, and Red-tailed Hawks at a raptor banding station in Cape May, New Jersey. While these tests were necessarily brief (one to four weeks), each of the target species reacted to the lights and generated statistically significant results. Unlike lasers, LEDs cause no eye damage to humans or other animals, offering opportunities for use in a wide variety of settings. Potential applications include reducing sea duck predation at aquaculture operations, bird strikes at airports, raptor mortality at wind and solar energy facilities, and water bird mortality at toxic tailings ponds and other contaminated sites; and preventing raptor nesting on cell phone towers.

NY eBear: A mobile app for collecting citizen science data on black bears in New York

Jonathan Gomes-Selman, Patrick Finlay, Catherine C. Sun, and Angela K. Fuller

For research projects that span over wide geographic regions or time, citizen science approaches have become an efficient way of collecting scientific information that would otherwise be impossible by an individual research team. We developed a mobile app called NY eBear that provides a user-friendly and accessible way for a wide variety of users to contribute data towards research and management efforts aimed at better understanding the expanding black bear population in New York State. By utilizing the extensive features of mobile applications, NY eBear will foster the creation of a network of citizen scientists collecting data on black bears and contributing to monitoring study sites across the state. Potential users include individuals such as hikers, landowners, and hunters, as well as groups such as student classes, Boy/Girl Scout troops, and nature programs. Users submit spatial information and photographic evidence of bear sightings and signs, including hair, scat, and paw prints, through their email address, which allows for instantaneous feedback and allows users to actively send information from across New York. The app creates user-statistics, interactive maps, and leaderboards based on submitted data to incentivize users to continue contributing observations. This citizen science effort will

be used in conjunction with traditional, systematic sampling efforts to provide data for evaluating population distribution, abundance, and patterns of habitat selection and movements of black bears in New York.

Plant use and preference in the diets of New England cottontail (*Sylvilagus transitionalis*) and eastern cottontail (*S. floridanus*)

Amy Gottfried Mayer, Thomas J. McGreevy, Jr., Mary Sullivan — University of Rhode Island; Brian Tefft, Rhode Island Department of Environmental Management Division of Fish and Wildlife; Thomas P. Husband, University of Rhode Island

The New England cottontail (*Sylvilagus transitionalis*) is a candidate species for listing under the Endangered Species Act. Throughout much of their range they are sympatric with the introduced eastern cottontail (*S. floridanus*). Contributing factors for the decline of the New England cottontail may include competition for resources with the eastern cottontail and habitat change and loss. The objectives of our study were to: 1) identify the plant species that make up the winter diets of New England and eastern cottontails in areas where they are sympatric; 2) compare the diet preference of the two species; 3) and determine if invasive species comprise significant percentages of the diets of both species. Twenty-two fecal pellet samples (New England cottontail n=13; eastern cottontail n=9) collected from eight sites in southern New England and eastern New York were analyzed for diet composition. Browse availability was measured at each site by performing stem counts at 24 random locations within a central plot that corresponded to the collection location of the fecal pellets analyzed. Results of the pellet analysis for each species were compared to determine if the two species were consuming different species at different quantities. Our preliminary results show little differences in the diet of each species. Invasive species were present at each site; however, these plant species did not make-up large portions of either cottontail's diet. Our results will inform management decisions for New England cottontail by providing a better understanding of the potential competition for resources between the two species.

Comparative population structure of vernal pool amphibians in a developing landscape

Jared J. Homola, University of Maine; Michael T. Kinnison, University of Maine; Cynthia S. Loftin, U.S. Geological Survey, Maine Cooperative Fish and Wildlife Research Unit

Environmental alterations that coincide with landscape development (i.e., urbanization) often have disadvantageous consequences for native fauna. For instance, the removal of woodlands and construction of buildings and roadways may present increased mortality risks and decreased interpopulation connectivity, consequently disrupting metapopulation dynamics. Vernal pool amphibians, whose life history includes seasonal migrations and occasional dispersal among ephemeral wetland habitats, are among the species that can be expected to experience deleterious effects of urbanization that inhibits individual movement patterns. We paired information on landscape characteristics of a developmentally diverse region with microsatellite genetic data drawn from two vernal pool amphibian species. Using this landscape genetic approach, natural and anthropogenic features can be evaluated for support in explaining interpopulation structure to identify those landscape characteristics that are most important for influencing the success of individual dispersal among populations. For our analyses, we collected egg or larval stage wood frogs (n = 1190 from 60 sites) and spotted salamanders (n = 1228 from 65 sites) from vernal pools located throughout central and southern Maine. Preliminary results suggest isolation by distance patterns generally dictate genetic structure for the studied populations, with occasional discontinuities in structure coinciding with the presence of large natural features (e.g., rivers). Forthcoming results will provide fine-scale insights into the potential effects of urbanization on the interpopulation connectivity of wood frog and spotted salamander populations. This information will inform amphibian conservation as human communities modify landscape composition and pattern through urbanization.

A Multi-regional Review of Trends in Habitat and Community Associations for at Risk Shrubland Birds: Developing Regional and Landscape-specific Management Practices

Cara J Joos, Dept. of Environmental Conservation, University of Massachusetts-Amherst; David I King, USDA Forest Service, Northern Research Station, Amherst, MA

Bird species associated with shrubland habitats are declining throughout eastern North America. Previous research has identified regional differences in habitat-selection reflecting regional differences in bird communities. Region-specific differences in habitat use by shrubland birds argue for a review that synthesizes regional differences in their landscape ecology and provides guidance to managers that reflects this geographic variation. A review of this nature required developing a list of shrubland birds for the region of interest; however methods used to assemble current species lists included species that do not require shrubland breeding habitat and overlook species that do. Here we present an objective and repeatable approach for generating a species list useful for summary and syntheses. We focused USFS Northern Research Station region, and searched for reviews and syntheses of shrubland birds and habitats within this region and generated a list of shrubland habitats described. We identified species dependent upon these habitats for breeding starting with species detected by the BBS within our region and AOU and BNAS accounts for habitat descriptions, which yielded 23 shrubland habitats and 81 species. This illustrates an approach for conducting a multi-regional review of existing literature to identify 1) species dependent upon shrublands for breeding 2) regional variation in habitat and community associations, and 3) gaps in knowledge and research coverage. Already this project has identified species with no detailed habitat studies representing knowledge gaps and opportunities for future research. We anticipate that these products and the approach will be valuable contributions to future conservation efforts.

Using Distance Sampling to Estimate Density of Newly Metamorphosed Amphibians

Jaron Kolek, Tracy Rittenhouse — Department of Natural Resources and the Environment, University of Connecticut, Wildlife and Fisheries Conservation Center

Amphibian research and conservation tends to focus on aquatic life history and the protection of wetlands. While these areas are essential for reproduction, survival in the terrestrial life stage also affects population dynamics. Population characteristics, such as density and gender ratios, may have large impacts, but these factors are poorly understood and techniques for studying terrestrial life stages are limited. To determine the effectiveness of distance sampling as a means of estimating juvenile wood frog and spring peeper densities, we initiated a study to compare population characteristics from Program DISTANCE to mark-recapture estimates calculated using Schnabel estimator. We used two sampling locations, Industrial Tract and Beaver Pond, within the University of Connecticut forest system and conducted a total of 15 sampling events over the course of 10 weeks resulting in over 5 km of sampling and 315 captures. We calculated a density of 0.0059 frogs/m² at Industrial Tract and 0.0164 frogs/m² at Beaver Pond. Using Schnabel mark recapture analysis, we calculated frog density to be 0.25 frogs/m² at Industrial Tract and 0.66 frogs/m² at Beaver Pond. The density estimates using distance sampling methods were unrealistically low and the estimates of detection probability suggest that only 8.8% of the population was observed at the Industrial Tract, and only 2.6% at Beaver Pond. Our results indicate that distance sampling is not an effective method for estimating densities of juvenile pond breeding amphibians. Additional research is needed to identify an effective protocol for estimating densities of juvenile amphibians.

Genome-wide epigenetic survey of Vermont bobcat (*Lynx rufus*) and fisher (*Martes pennanti*)

Hannah Lachance, Bonnie Cantrell — Department of Animal Science, University of Vermont, Burlington, VT; Rex Yee, Poteet High School, Poteet, TX; Sydney Friedman, Stephanie McKay — Department of Animal Science, University of Vermont, Burlington, VT

Fisher (*Martes pennanti*) and bobcat (*Lynx rufus*) are considered reintroduction success stories in Vermont. However, Vermont Fish and Wildlife have identified the bobcat as an at risk species for increased mortality within the next two to three decades. In order to understand the genetic and environmental factors that have led to the fisher and bobcats' current success and apply that knowledge towards inhibiting further decline, we looked at the global DNA methylation levels within each species to determine how epigenetic attributes influence these factors. Epigenetic modifications are a result of the interaction between genetic and environmental effects. One such epigenetic modification is DNA methylation, which chemically modifies DNA base pairs but does not change the base pair itself. This study examines the percentage of methylation present throughout the species' entire DNA, laying the groundwork for future studies which can determine which specific genes are methylated and how that affects the species' survival. Using the MethylFlash Methylated DNA Quantification Kit (Colorimetric) from Epigentek (Farmingdale, NY), we determined the percent of global DNA methylation within 6 fisher and 7 bobcat liver samples. Bobcat global DNA methylation varied between 2.64% - 5.40% and the Fisher's global methylation varied between 2.30% - 6.56%. The variation of global methylation within each species was statistically significant (fisher $P = 0.001$; bobcat $P < 0.001$). These results confirm that variation is present between individuals within a species, which was expected, and that methylation is present in sufficient quantities to continue with more specific methylation research.

Examining the density and age effects of Connecticut's exurban environment on the presence and abundance of *Desmognathus fuscus* and *Eurycea bislineata*

D. Cristina Macklem, Ecology and Evolutionary Biology, University of Connecticut; Tracy A. G. Rittenhouse, Natural Resources and the Environment, University of Connecticut

Exurban development is defined as 6-25 houses per square kilometer, and has been the fastest growing form of land use since the 1950s. This development perforates intact forests and creates forest edges, which can have profound effects on wildlife. Research has quantified changes along the rural-urban gradient, but the ecological effects of development types within exurban development are much less clear. The physical and chemical composition of headwater streams can be significantly altered by development such that stream-dwelling salamanders, which occupy these discrete, measurable headwater habitats, can serve as biological indicators. Urban streams are known to have reduced salamander abundance and larval retention. Therefore, habitat characteristics linked to increasing exurbanization should be reflected by changes in the presence and abundance of salamanders. *Desmognathus fuscus* and *Eurycea bislineata*, which differ in their size, behavior, and habitat use, were used to examine this relationship. Area-constrained surveys of 15 first-order streams in Coventry and Mansfield, Connecticut, were conducted monthly between May and August 2014. Streams were categorized by age (new: houses built after 1980, old: houses built prior to 1980) and density (low: <15%, high: >15%), as well as control streams (<0.05% development). Individuals were marked using unique visible implant elastomer tags. We marked 27 *D. fuscus* and 406 *E. bislineata* and recaptured 2 *D. fuscus* and 15 *E. bislineata* salamanders. *E. bislineata* were most abundant in the control streams, and *D. fuscus* were absent from streams with high density, old development. Results should be considered in future development planning and protection of first-order streams and their buffer zones.

Preliminary evaluation of unmanned-aerial vehicles to inventory early-successional habitats

Tyler J. Mahard, John A. Litvaitis — University of New Hampshire; Donald Keirstead, Natural Resources Conservation Service; Alena Warren, Matthew Tarr, Matthew Wallhead, Dorn Cox — University of New Hampshire

We are exploring the utility of low-elevation photographs obtained from unmanned-aerial vehicles (UAV) to inventory shrub-dominated habitats as an alternative to ground-based surveys. Initial flights were over habitats managed for New England cottontails (*Sylvilagus transitionalis*) where features of interest included: general composition (ground covered by grasses, shrubs/regenerating forest, and

closed canopy forest), vegetation height, understory stem density, and the prevalence of invasive shrubs. During the leaf-on season, comparisons of photographs and ground surveys indicated that UAV photographs did provide a useful assessment of general composition. Vegetation height and stem density were difficult to obtain with foliage present. Additionally, our ability to identify taxa or categories of regenerating vegetation (native vs invasive) was often hampered by image resolution, blurriness, and brightness that were difficult to control. It was difficult to count understory stems in photographs, and comparing relative stem densities between two plots was hindered by differences in vegetation taxa and structure. At this stage of our evaluation, we suggest that UAV-based photographs can provide up-to-date information on general habitat composition and serve as a valuable tool for communicating management actions to stakeholders. We are continuing our evaluation during the leaf-off season to determine if vegetation height and understory stem density can be obtained when foliage is absent. Identifying plants species using conventional UAV photographs does not seem possible.

Moving wildlife, storing carbon: the Greens-to-Hudson Highlands wildlife linkage project in western Massachusetts

Laura Marx, Jessica Dyson — The Nature Conservancy in Massachusetts

The Staying Connected Initiative is a partnership of state agencies, conservation groups, and communities working to restore and enhance landscape connections (linkages) for the benefit of people and wildlife across the Northern Appalachians. Much of western Massachusetts is within a linkage that connects the Green Mountains in Vermont to New York's Hudson Highlands. In this linkage, The Nature Conservancy, MassDOT, and UMass-Amherst have used the Critical Linkages project to identify places where land protection and transportation improvements will provide the biggest benefit to wildlife movement and habitat connectivity. In these high-leverage locations, TNC and partners are maintaining and restoring the ability of wildlife to move in response to the continuing impacts of climate change. Many of these same actions that improve habitat corridors will also reduce the greenhouse gas emissions that lead to climate change. Conservation of a continuous, natural cover path that winds through large forest cores throughout the linkage will both allow for wildlife movement and ensure the continued storage of carbon within this path. Similarly, transportation infrastructure projects that allow both water and wildlife to move safely under major roads will reduce damage to roads from storms and lessen the economic and carbon costs of repeated re-construction of culverts and road surfaces.

New England Cottontail Captive Breeding and Evaluation of Nomans Land Island NWR as a Potential Reintroduction Site

Cindy Maynard, Suzanne Paton — U.S. Fish and Wildlife Service Coastal Program; Tony Tur, U.S. Fish and Wildlife Service New England Field Office; Eileen McGourty, U.S. Fish and Wildlife Service Eastern Massachusetts NWR Complex

As New England Cottontail (*Sylvilagus transitionalis*; NEC) populations continue to decline across their range, the U.S. Fish and Wildlife Service has been working closely with our partners to explore new strategies for reversing this trend. One such strategy has been the initiation of a captive breeding program at the Roger Williams Park Zoo in 2011. In 2012, pilot releases of captive-bred NEC began on Patience Island, located in Narragansett Bay in Rhode Island, and continue to be conducted and monitored by the RI Department of Environmental Management. With the continued success and growth of this program, we will have the potential to release NEC to additional areas where they have been extirpated or the population is dangerously low. Nomans Land Island National Wildlife Refuge is a priority site for release, and its suitability as an island release site was evaluated in the summer of 2011. While a strategy for translocation of wild individuals is being explored, captive-bred NEC may also be released to Nomans Land Island to establish a self-sustaining population that would have the potential to significantly impact the status of the species at a regional scale. The size, habitat quality, and minimal predator presence on Nomans Land Island are all factors that would contribute to the successful

establishment of a population of NEC, providing a stronghold for the species and a potential source population to reintroduce or supplement NEC at other sites where the population is in need.

Implementation of Habitat Restoration and Enhancement at Roseate Tern Breeding and Staging Sites in Six Northeastern States.

Suzanne Paton, Stephanie Koch, Susi VonOettingen, Kris Vagos, Kate O'Brien, Kate Iaquinto, Ryan Kleinert — U.S. Fish & Wildlife Service; Carolyn Mostello, Massachusetts Division of Fisheries and Wildlife; Helen Hays, Grace Cormons — Great Gull Island Project, American Museum of Natural History; John Kanter, New Hampshire Fish and Game Department; Paula Shannon, National Audubon Society.

The northeast population of roseate tern (*Sterna dougallii*) was listed as federally endangered in 1987 due to range contraction and population declines. Numbers subsequently increased, but by 2012 had again declined to approximately 3,100 breeding pairs, with 91% concentrated on only three major nesting colonies: Great Gull Island, NY and Bird and Ram Islands, MA. Ongoing threats include erosion, habitat degradation, and predation at breeding sites, and human disturbance at post breeding staging areas that may reduce fitness for migration and survival of newly fledged chicks (USFWS, 2010; CT, ME, MA, NH, NY and RI Comprehensive Wildlife Conservation Strategies, 2005). With support from the Service's Cooperative Recovery Initiative, we have undertaken a variety of management actions to expand suitable habitat and enhance productivity on nine existing and historic nesting sites throughout the northeast including: construction of nesting structures, native plantings, vegetation control using prescribed fire and herbicide, and selective predator control to increase productivity. Staging sites on four National Wildlife Refuges and numerous partner-owned beaches have also been managed to minimize disturbance, expand public outreach, and evaluate tern movement and behavior. Monitoring of breeding pairs, productivity, and vegetative response at nesting sites will be conducted annually to evaluate success and inform future habitat management. Long term population responses attributable to this effort may not be apparent until recruitment of juveniles into the breeding population at 3-4 years of age, so longer-term monitoring is essential to judging success.

A Pilot Study on the Use of Nanotags and Automated Telemetry to Track At-Risk Bat Species

Nancy Pau, USFWS; Zara Dowling, UMass Amherst; Katlyn Hojnacki, USFWS; David Yates, Biodiversity Research Institute

Bats are rapidly emerging as a group of conservation concern. As of June 2014, white nose syndrome has killed more than 5.5 billion bats, affecting 7 species in 25 states and 5 Canadian provinces. The Northern long-eared bat was proposed for Federal protection as endangered due to impacts from WNS. Simultaneously, proposed and existing large-scale wind power development threatens bats during migration. These two threats to bat conservation underscore the need for large-scale data on bats, which has been difficult to obtain with traditional research methods. Automated radio-telemetry using coded nanotags has great potential to inform our understanding of large-scale bat movements. Coordinated through Bird Studies Canada and Acadia University, researchers from the Canadian Arctic to Virginia deployed 327 automated radio-telemetry stations in 2014. This network is expected to expand rapidly in the coming years. At Great Bay NWR in Newington, NH, we tested the ability of nanotags and automated radio-telemetry to track local and regional bat movements. In July and September, we tagged 4 northern long eared bats, 3 small-footed myotis, 2 red bats and a big brown bat with nanotags and tracked their movement with 2 towers located on the Refuge. We will present data on activity budget of the bats, detectability of bats during foraging and roosting periods, and compare the benefits and costs of using automated radio-telemetry with a traditional radio-telemetry study conducted in 2012. Data regarding the capability of the regional radiotelemetry network to track bats during migration will also be presented.

A novel parvovirus for wild carnivore populations? A signature sequence of canine parvovirus VP2 capsid gene suspected in VT fisher (*Martes pennanti*).

*Carol A. Shaw PI Green Mountain College, Benjamin Smith (Student, BS Biology candidate, GMC)
Nathaniel Laymon, NRM Candidate GMC*

A novel parvovirus for wild carnivore populations? A signature sequence of canine parvovirus VP2 capsid gene suspected in VT fisher (*Martes pennanti*). Parvoviruses infect many carnivore species, however well characterized parvovirus variants have only been isolated from a few wild host species. Evidence suggests parvoviruses, specifically feline panleukopenia virus (FPV) and canine parvovirus (CPV), have been evolving independently and rapidly during this century and often infect a variety of wild and domestic host species. Parvoviruses appear to move between hosts during predation or scavenging events, which seems to result in genetic modification and transmission within the new host taxon. The objective of this study is to focus on the viral variant present in Vermont's fisher (*Martes pennanti*) population and its impact on conservation and management. Due to its secretive nature and low density, the host species has proven difficult to obtain sufficient samplings to identify and characterize the viral variants present. Therefore, viral DNA was amplified directly from tissue samples obtained from Vermont Fish and Wildlife annual furbearer seasons 2010, 2011, 2012, and 2013. We used primers designed by Pereira et al. (2000) to amplify the 2b variant of the canine parvovirus. The samples which yielded active viral infections will be sequenced and analyzed. Preliminary results indicate that *Martes pennanti* in Vermont will show a signature sequence with variation near residue 300 in the VP2 capsid gene which appears to be particularly responsive to host specific processes. This region is highly variable, exposed to the capsid surface and changes the antigenic structure of the capsid which affects the binding of the transferrin receptor. The novel sequence suggests a sustainable prolonged onward transmission of a viral variant as opposed to spillover transmission via predation or scavenging. Identification of the variants which infect wild carnivores and their modes of transmission will allow better understanding of disease impacts on population dynamics, conservation management strategies and overall health of the current fisher population.

Relationship between acorn abundance and adult tick *Borrelia* infection in Japanese barberry stands in Connecticut

Michael R. Short, Department of Forestry and Horticulture, The Connecticut Agricultural Experiment Station; Scott C. Williams, Department of Forestry and Horticulture, The Connecticut Agricultural Experiment Station; Michael A. Gregonis, Wildlife Division, Connecticut Department of Energy & Environmental Protection

Japanese barberry (*Berberis thunbergii*) has become the dominant understory shrub in many forested areas of Connecticut and provides habitat favorable to blacklegged tick (*Ixodes scapularis*) and white-footed mouse (*Peromyscus leucopus*) survival. Like many tree species, oaks (*Quercus* spp.) have an irregular cycle of seed production, known as masting. Acorns are a primary food source of white-footed mice and other wildlife species, and are known to influence population cycles. White-footed mice are the reservoir host for *Borrelia burgdorferi*; the Lyme disease-causing spirochete. Larval blacklegged ticks feed primarily on mice and can become infected with and retain *B. burgdorferi* throughout their two-year life cycle. We trapped mice at three replicate sites over 8 years in dense barberry infestations. Adult ticks were sampled along 200-m draglines and tested for *B. burgdorferi* presence. Infected tick abundance was 60% higher in intact barberry stands compared to managed stands or areas where no barberry existed. Connecticut Department of Energy and Environmental Protection (DEEP) staff monitored 575 individual oak trees in 12 Deer Management Zones to ascertain annual relative acorn abundance indices. In correlating acorn abundance with mouse capture success and adult tick infection prevalence, we illustrate the effect acorn abundance has on Lyme disease risk. We observed a 1-year lag of increased infected tick abundance and increased mouse capture success after a mast year. In Japanese barberry dominated areas

of Connecticut, it appears that oak mast has a direct influence on mouse abundance and thereby an indirect effect on abundance of ticks infected with *B. burgdorferi*.