Adaptive Silviculture for Climate Change: Examining strategies for adapting northern forests to global change

Presentation Track: Forests and Climate

Presenting Author: Peter Clark

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Anthony D'Amato, UVM, Rubenstein School for Environment and Natural Resources

Chris Woodall, USDA Forest Service Northern Research Station

Abstract:

Forests managers, scientists, and policy makers must respond to the need for climate-adaptive strategies in the face global change. While strategies to mitigate impacts from climate change and increase forest resilience have been broadly proposed, there are nascent formal empirical evaluations that indicate what locally-calibrated adaptation measures might be most effective in preparing forest ecosystems to deal with climate change. The Adaptive Silviculture for Climate Change (ASCC) project is a national, replicated, operational-scale experiment co-designed with managers to test ecosystem-specific climate change adaptation treatments across a gradient of adaptive approaches. Here we present on the first-year results from the New England ASCC installation at the Second College Grant in northern New Hampshire, highlighting the Transitional approach which actively accommodates change primarily by facilitating species range expansion. In this experiment, over 7,000 seedlings from nine “future-adapted” tree species were planted across harvest intensities. We examine seedling response to treatments as a means to promote compositional shifts in species and functional diversity.

Vermont Agency of Natural Resources Guidelines for Implementing Assisted Migration of Plants on Agency Lands

Presentation Track: Forests and Climate

Presenting Author: Robert Popp

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Abstract:

In 2015, the Agency of Natural Resources Lands Team appointed a small group to review information on the climate change adaptation strategy known as assisted migration and present recommendations for implementation on lands owned and managed by the Agency of Natural Resources. Assisted migration is typically defined as the human assisted movement of species beyond their historic ranges. However, these guidelines are broader in scope and also encompass assisted migration and augmentation of populations. The committee sought to attain two goals: maintaining functional ecosystem services and rescuing species from extinction. The guidelines present five tiered options from most passive to most active depending on the resource involved and the long term goal.

Cold hardiness of American elm crosses bred for Dutch elm disease tolerance

Presentation Track: Forests and Climate

Presenting Author: Paul Schaberg

Presenting Author Affiliation: USDA Forest Service Northern Research Station

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Abstract:

Dutch elm disease (DED) is the primary threat to American elm (Ulmus americana L.) populations in North America. However, shoot freezing injury may also limit elm productivity and survival in the north. We assessed shoot cold tolerance and field winter injury for the current-year shoots of American elm crosses bred for DED tolerance planted in a restoration planting in Lemington, VT. We tested for differences in cold tolerance associated with season (fall, winter and spring), maternal DED tolerance source (R18-2 and Valley Forge), paternal sources from three USDA Plant Hardiness Zones (5a, 6a and 6b), and the interactions of main effects. Cold tolerance was greatest in the winter, followed by fall and then spring. Cold tolerance never differed between maternal sources of DED tolerance. However, during winter cold tolerance did differ among paternal sources from different hardiness zones; crosses with paternal sources from the coldest zone 5a were significantly more cold tolerant than sources from zone 6b, and sources from zone 6a were intermediate in cold tolerance. The difference between zone 5a and zone 6a cold tolerance means was about 7.4 C, which is within 1 C of the average difference in winter low temperature experienced in these zones over the last 30 years. Freezing injury in the field confirmed that shoots were only marginally cold tolerant relative to ambient temperature lows. Future breeding efforts should target sources from temperature zones as low as 3a (the coldest zone in the native range of American elm) to better assure adequate local adaption for restoration in the north.

Examining the future forest through tree seedling experiments

Presentation Track: Forests and Climate

Presenting Author: Nick Fisichelli

Presenting Author Affiliation: Schoodic Institute, Acadia National Park

Abstract:

Ongoing and future climate change challenges land managers to foster both current and future forest ecosystems. The magnitude of potential forest change is matched by the uncertainties in future conditions and how trees will respond to these conditions. On-the-ground research experiments are needed to understand which tree species will thrive and which will struggle under emerging conditions and to help guide forest management responses to climate change. This talk will highlight distributed networks of common garden seedling experiments contributing to the expanding toolbox of climate adaptation approaches.

Quantifying the relative projected impacts of climate change and urban growth on the capability of the northeast to support wildlife

Presentation Track: Wildlife and Climate

Presenting Author: William V. DeLuca

Presenting Author Affiliation: University of Massachusetts, Northeast Climate Adaptation Science Center

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W. Scott Schwenk, U.S. Fish and Wildlife Service

Kevin McGarigal, University of Massachusetts

Abstract:

Climate change and urban growth are projected to be major drivers of environmental change over the next century and wildlife species distributions are likely to shift to reflect these changes. Therefore, understanding the relative importance of each of these drivers is vitally important for developing effective conservation strategies. As part of a landscape conservation design for the northeastern U.S., Nature's Network, we developed landscape capability models for 30 representative species and applied them to a custom built urban growth model and climate change projections for the northeast. We then quantified the relative importance of climate and land use change for shifts to the future distribution of each species. We found that, in general, the future distribution of the 30 representative species will be substantially more sensitive to climate change than urban growth. When considering only negative impacts of both drivers of change on species distributions, climate change also had a substantially greater impact than urban growth. This work will provide users with information that identifies the primary mechanism by which future species distributions will be influenced. Management strategies can then be customized for surrogate species and the systems they represent with an understanding of whether climate or urban growth are likely to drive distribution shifts.

Distribution dynamics of mesocarnivore populations along trailing and leading edges in the northeastern U.S.

Presentation Track: Wildlife and Climate

Presenting Author: Alexej P. K. Siren

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Jillian Kilborn, New Hampshire Fish and Game Department

Toni Lyn Morelli, DOI Northeast Climate Adaptation Science Center, U.S. Geological Survey

Abstract:

The boreal-temperate ecotone of the northeastern U.S., ecologically important due to cool climate and spruce (Picea spp.)-fir (Abies balsamea) forests, defines distributional edges for carnivores such as American marten (Martes americana) and Canada lynx (Lynx canadensis). However, predicted declines in snowpack and loss of boreal forest habitat due to climate change may fundamentally alter community dynamics. We established 250 remote cameras, programmed to collect local climate data, along elevational (188-1,917 m) and latitudinal (42.8-45.3 N) gradients to evaluate the influence of snowpack and vegetative characteristics on carnivore species' distributions for 5 winters. We used data to estimate occupancy for lynx, marten, fishers (Pekani pennanti), bobcats (Lynx rufus), coyotes (Canis latrans), and red fox (Vulpes fulva). Snow depth was the best predictor of occupancy for most species, with forest type/age also acting as an important predictor. Martens and lynx were positively associated with sites that contained deep snow whereas fishers, bobcats, and coyotes were primarily detected at low elevations with shallow snowpack during winter. However, as snowpack receded during spring, these generalist carnivores were more frequently detected at high elevations. Our results highlight that changes in snowpack characteristics are reverberating through wildlife communities across elevational and latitudinal gradients and that dramatic shifts can occur within a few years. To gain a mechanistic understanding of factors influencing range shifts, we are currently evaluating the extent at which climate mediates biotic interactions (e.g., competition) and biotic factors ameliorate harsh climate conditions along distributional edges.

A Slow Loss of Northern Forest Icons: Dynamics of Boreal Birds at the Edge of their Range in the Adirondack Park

Presentation Track: Wildlife and Climate

Presenting Author: Michale Glennon

Presenting Author Affiliation: Adirondack Watershed Institute, Paul Smith's College

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Michale Glennon, Adirondack Watershed Institute, Paul Smith's College

Steve Langdon, Shingle Shanty Preserve and Research Station

Abstract:

The Adirondack Park is in the southern edge of the range for several species of boreal forest birds within eastern North America. The habitats of these boreal specialists are thought to be particularly vulnerable to climate change. Effects may include encroachment by trees into open bog landscapes, increased competition with southern plant and animal species expanding northward, and altered timing of annual events like insect emergence upon which these birds depend for food. Passerine and piciform birds have been monitored in low elevation boreal habitats in the Adirondacks for more than a decade and most focal species are exhibiting a pattern of decline. For some, like the boreal chickadee and Lincoln's sparrow, declines are modest. For others--such as the rusty blackbird, yellow-bellied flycatcher, olive-sided flycatcher, and black-backed woodpecker--the declines are more troubling. Of the boreal birds, only the palm warbler appears to be increasing in our landscape. Initial analysis of these data demonstrated that boreal birds in the Adirondacks exhibit metapopulation dynamics, are more likely to persist in large, connected wetlands with low human footprint, and may be moving northward or upslope in response to climate change. More recent analyses have explored the influence of temperature and precipitation patterns on dynamic rates in order to understand the potential role of climate change in shaping the future for these species and in an effort to identify potential refugia. These species appear to be influenced strongly by precipitation patterns in the breeding season and by temperature characteristics during the non-breeding. Habitat structure appears to mediate bird response to a number of factors, and the largest open peatland habitats in the park have lower local extinction rates for boreal species than boreal upland forest and swamp habitats. Examining changes in these habitats and in the broader bird community within them is helping us to understand the future of boreal birds in the Adirondacks and the sites which may be serving as refugia.

The cost of reproduction in a greening world

Presentation Track: Wildlife and Climate

Presenting Author: Michael T. Hallworth

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Abstract:

Life history theory postulates that individuals balance current reproductive investment with future reproductive potential. Previous work has demonstrated that reproductive investment varies between sexes, age classes and along habitat quality gradients. Reproductive strategies likely differ in the amount of effort required, as such their influence on survival may differ. Furthermore, environmental conditions experienced at the start of the breeding season contribute to the investment in reproduction. At Hubbard Brook, the start of the breeding season is closely tied to spring leaf-out. During years with warm springs individuals are more likely to double brood and produce more young. Therefore, reproductive investment is higher in years with warm spring temperatures and early leaf expansion. Here, using long-term demographic data of breeding Black-throated blue warblers we address the following questions 1) is there a cost of reproductive effort on survival? and 2) does the environment mediate the cost of reproduction? We found that female survival was negatively associated with the timing of leaf-out and length of the green period regardless of age but positively associated with the number of eggs laid for experienced females. Male survival was negatively associated with within-pair young and duration of the green period. Our results support previous findings that the cost of reproduction differs between sexes and age classes. In addition, they suggest that environmental change resulting in earlier springs and an extended green period negatively influences survival of Black-throated blue warblers. Further research is needed to determine where within the annual-cycle the cost of reproduction is occurring.

Climate change effects on water quantity and quality in the Northern Forest

Presentation Track: Water and Climate

Presenting Author: Jamie Shanley

Presenting Author Affiliation: US Geological Survey

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Jamie Shanley, US Geological Survey

Abstract:

Through the 21st century, both air temperature and precipitation are projected to increase in the northeastern USA. Warmer temperatures will increase the length of the growing season. A longer growing season will increase annual evapotranspiration by an amount greater than the projected increase in precipitation, thus reducing streamflow. Lower snowpack and earlier snowmelt combined with higher evapotranspiration will cause lower water availability in the summer low-flow period, increasing the incidence and severity of drought. Water quality will also shift with the changing climate. Reduced snow cover will increase the incidence of frozen ground, which has been found to liberate carbon and nitrogen from soils to streams. Increased organic matter decomposition from warming may play a role in the observed widespread increases in dissolved organic carbon (DOC). We will explore potential climate effects based on research at Sleepers River in Vermont and at other small instrumented watersheds in the northeastern USA.

Tracking trajectories and sensitivities in forest water use

Presentation Track: Water and Climate

Presenting Author: Mark Green

Presenting Author Affiliation: Plymouth State University and U.S. Forest Service

Full Author List:

Mark Green, Plymouth State University

Abstract:

Forest water use via transpiration is a major way that forests control hydrology in the northeastern U.S. Understanding long-term changes in transpiration is of strategic importance to predicting future flooding risk, forest regulation of climate, and sub-canopy microclimate, just to name a few. Recently quantified trends in evapotranspiration suggest increases in the coldest parts of the northeastern U.S. region and decreases in the warmest. The drivers behind these patterns are not well understood. Direct measurement of evapotranspiration with eddy covariance towers provide opportunities to understand the controlling mechanisms. In particular, these measurements are allowing new insight into forest water use sensitivities to climate change.

Effects of extreme high flow events on macroinvertebrate communities in Vermont streams

Presentation Track: Water and Climate

Presenting Author: Jen Stamp

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Abstract:

In August 2011, parts of Vermont experienced major flooding from Tropical Storm (TS) Irene. Here we present results from an evaluation of stream macroinvertebrate data from nine reference quality sites in Vermont affected to varying degrees by flooding from TS Irene. Macroinvertebrate data collected the year of the event were compared to samples collected two years prior and two years after. In addition, effects on substrate composition and periphyton cover were assessed based on pebble count and rapid periphyton assessment data. Macroinvertebrate density showed a significant association with TS Irene, with reduced densities the year of the event. The density reduction was most evident at small to medium-sized, higher gradient streams, which, on average, received the greatest amount of rainfall. Densities rebounded the year after TS Irene. No significant patterns related to TS Irene were found in the pebble count and periphyton cover data, although the percent of substrates with no moss or periphyton cover increased the year of the event, most noticeably at medium-sized, high gradient streams. These types of data take on added importance as extreme high flow events occur with greater frequency and magnitude in many areas.

A simulation modeling approach to investigate hydrologic regime transformations following Eastern hemlock mortality

Presentation Track: Water and Climate

Presenting Author: Kanishka Singh

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Abstract:

Eastern hemlock (Tsuga canadensis) is a foundation tree species present throughout much of eastern North America that exerts considerable control over local hydrologic budget by sustaining year-round transpiration and consistent spatial patterns of throughfall, thereby potentially modulating soil moisture, groundwater recharge, baseflow regime, and stream discharge patterns and volumes. Forest communities dependent on Eastern hemlock-regulated microclimatic conditions are threatened by the hemlock woolly adelgid (Adelges tsugae), an invasive sap-feeding insect. As Eastern hemlock serves an important function with regards to hydrologic cycling as the preponderant contributor to leaf-off season transpiration, loss of this species, or a vitiation of its hydraulic properties, is projected to cause significant declines in the actual evapotranspiration component of the local water budget. This research applies a simple streamflow and overland flow simulation model to investigate the potential water balance, soil moisture, and streamflow regime consequences of hemlock woolly adelgid invasion across 76 USGS gauging stations categorized by Eastern hemlock health and hemlock woolly adelgid presence, calibrating key parameters that determine hydrologic conditions to each site with a global optimization algorithm, and investigating relationships between optimal parameter value outputs and gauge station categories.

Forest health monitoring in northeastern National Parks

Presentation Track: Forest Health

Presenting Author: Aaron Weed

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Aaron Weed, National Park Service, Northeast Temperate Inventory and Monitoring Network, Woodstock, VT

Abstract:

The Northeast Temperate Network (NETN) of the National Park Service has been monitoring forest health in a network of permanent forest health plots spanning eight northeastern national parks since 2006. The overall goal of the NETN forest monitoring program is to monitor status and trends in the structure, function, and composition of NETN forested ecosystems, and to use this information to guide park management decisions. Plots are sampled on a 4-year rotating panel, with one-quarter of plots sampled every year, and each plot is sampled every 4 years. Currently each plot has been sampled at least 3 times. In addition to presenting preliminary analyses of the trends we are observing in forest structure and invasive plant abundance across these park units, results from additional analyses of our monitoring data will be presented. In general, across nearly all parks and all scales, invasive shrubs/vines have consistently increased in abundance since 2006 and these trends were especially strong in parks with chronic overabundant deer populations. In addition, national parks in the eastern United States harbor important older forest structure and protect greater tree species diversity compared with unprotected, matrix forests. These results, combined with additional monitoring conducted by NETN (e.g., water quality and forest birds), are being integrated into park planning and management decisions to fulfill the National Park Service's mission.

Partnering with land managers to guide the search for EAB-resistant ash

Presentation Track: Forest Health

Presenting Author: Jonathan Rosenthal

Presenting Author Affiliation: Ecological Research Institute

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Abstract:

The U.S. Forest Service's EAB Resistance Breeding Program has shown that a small percentage of native ash trees have heritable resistance to emerald ash borer and can be used for propagation of resistant trees for eventual ash restoration. The Ecological Research Institute's Monitoring and Managing Ash (MaMA) program MonitoringAsh.org) for ash conservation and EAB mitigation, developed in collaboration with Dr. Jennifer Koch and Dr. Kathleen Knight of the USFS, includes four citizen-science/land manager projects that facilitate the search for likely EAB-resistant “lingering ash”. These are native, chemically untreated trees that persist in healthy condition significantly after the overwhelming majority of nearby ash have died from EAB infestation - such trees form the basis for EAB-resistance breeding. To ensure the widespread restoration of native ash, it is necessary to find locally adapted lingering ash across the species' ranges.

One particular project of the of the Monitoring and Managing Ash (MaMA) program, the rapidly growing MaMA Monitoring Plots Network, relies upon land manager participation to set aside appropriate trees for monitoring ash mortality to determine when particular EAB-induced mortality thresholds have been met in an area. This determination is crucial, because lingering ash can only be reliably identified within particular time-windows after these thresholds have been reached. MaMA Monitoring Plots Network's plot requirements and data recording and reporting protocols were designed by the Ecological Research Institute (ERI) to be user-friendly while being sufficiently scientifically rigorous to enable reliable detection of actual lingering ash. Its plots form the only such network designed specifically to detect when crucial EAB-induced mortality thresholds have been reached.

This talk presents an overview of the scientific basis for the MaMA Monitoring Plot Network, how it fits into MaMA's overall ash conservation framework, and how partners can participate in it, highlighting in particular the ongoing role of the Vermont Land Trust in establishing and monitoring such plots at several locations in this state. For more information on the Monitoring and Managing Ash (MaMA) program for ash conservation and EAB mitigation, please see MonitoringAsh.org.

Beaver Foraging Preferences and Impacts on Forest Structure in New York's Adirondack Mountains

Presentation Track: Forest Health

Presenting Author: Michael J Mahoney

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Abstract:

Beavers (Castor canadensis) are ecosystem engineers, causing changes at the landscape scale due to a combination of their damming and foraging behaviors. While these behaviors - and the impacts they have on riparian communities - have been well studied in several forest regions, they are poorly understood within the forests of northeastern North America. Field surveys at 19 beaver locations throughout New York's Adirondack State Park assessed beaver foraging preferences and the impacts of beaver activity on forest structure and composition. Forest canopy closure decreased with proximity to beaver impoundments, and forest structure and composition also varied along this gradient. Beavers preferentially harvested stems between 2 and 10 cm diameter, with the 2 to 5 cm size class most generally preferred. Deciduous species were also preferentially harvested, with typically disfavored species such as American beech (Fagus grandifolia) harvested at higher rates than in studies from other regions. Logistic regression models showed clear foraging preferences for stems closer to the impoundment of intermediate sizes for all modeled groupings and species. Understanding the impacts beavers will have on riparian forests in the Northeast is critical as beaver continue to recolonize their historic range, creating new management challenges and opportunities in years to come.

Managing invasive species in light of climate change

Presentation Track: Forest Health

Presenting Author: Carrie Brown-Lima

Presenting Author Affiliation: NY Invasive Species Research Institute

Full Author List:

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Abstract:

The amendment to the Executive Order on invasive species issued on December 5, 2016 ordered that agencies should "consider the impacts of climate change when working on issues relevant to the prevention, eradication, and control of invasive species, including in research and monitoring efforts…" however how to do this isn't clear to many invasive species managers and policy makers. This talk will outline some of the ways that climate change has been shown to influence invasive species spread and impact and will provide an overview of the efforts of the Northeast Regional Invasive Species and Climate Change (NE RISCC) Management Network to address the gaps in knowledge and translate existing knowledge into management and policy actions.

Forest Management on New York Wildlife Management Areas

Presentation Track: Year of the Bird 1

Presenting Author: Katherine Yard

Presenting Author Affiliation: New York State Department of Environmental Conservation

Full Author List:

Katherine Yard, New York State Department of Environmental Conservation

Abstract:

New York State Department of Environmental Conservation manages over 120,000 acres of forest throughout the Wildlife Management Area system. Currently, one of our top forest management priorities is restoring young forest to improve habitat for wildlife from game species to Species of Greatest Conservation Need. To address that priority, the goal of our Young Forest Initiative is to create, enhance, and maintain 10% of the forested acreage as young forest. To date, we have developed over 40 habitat management plans and created over 600 acres of young forest using even-aged management and target species Best Management Practices. We monitor project areas to document baseline conditions, avoid impacts to sensitive species, and evaluate the effectiveness of habitat management. Bird surveys may include target species (woodcock, grouse, turkey, whip-poor-will, golden-winged warbler), woodland raptor surveys, and/or avian point counts. Preliminary results indicate that whip-poor-wills, golden-wings, and numerous songbirds have responded to management. Moving forward, plans are currently in place to manage an additional 2,500 acres, advancing towards our long-term goal of creating a more diverse forested landscape in the WMA system and contributing to a collaboration of partners working to restore young forest on public and private lands throughout the Northeast.

What do Woodland Owners in the Northeast Think of Bird Conservation?

Presentation Track: Year of the Bird 1

Presenting Author: Elizabeth Varanas

Presenting Author Affiliation: American Forest Foundation

Full Author List:

Abstract:

How do we best engage family and individual woodland owners in the Northeast in active forest management with birds in mind? This presentation will highlight our findings about some of the major motivations and challenges related to active forest management for woodland owners – and how the challenges to active management may shift along levels of engagement. We will also discuss lessons learned from our Woods, Wildlife and Warblers project – a partnership with American Forest Foundation, Audubon Vermont, Vermont Tree Farm and Vermont Woodlands Association – which has the goal of equipping Vermont's woodland owners with the tools and resources they need to manage their forest with birds and other wildlife in mind.

A New Paradigm for Forest Bird Conservation: A holistic approach to managing for multiple species guilds

Presentation Track: Year of the Bird 1

Presenting Author: Steve Hagenbuch

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Abstract:

Historically forest bird conservation has focused on single species, particularly those which have exhibited widespread population declines and/or those that utilize a specific forest seral stage. While often successful these efforts may not prove as broadly effective or efficient as taking a landscape-level approach that recognizes a wider range of bird species guilds. Additionally programs that address species not currently “at risk” may require fewer resources and serve as a form of proactive conservation. Examples from Audubon programs throughout the northeast will be used as case studies for a holistic approach to forest bird habitat management.

Forest bird conservation at Mass Audubon: the role of sanctuaries and private lands

Presentation Track: Year of the Bird 1

Presenting Author: Jeff Ritterson

Presenting Author Affiliation: Mass Audubon

Full Author List:

Abstract:

Mass Audubon is a well-recognized leader among the conservation community and general public of Massachusetts, with almost 100 sanctuaries distributed evenly across the state. Currently comprising over 15,000 hectares, continued land protection and management initiatives are prioritized to maximize conservation value. Meanwhile, approximately 65% of Massachusetts forests are in nonindustrial private ownership, and scaling up conservation efforts requires work on these lands. A unique take on the Foresters for the Birds model has successfully promoted forests with diverse vertical structure and interspersed canopy gaps to broadly meet nesting and post-fledging habitat needs of forest birds. However, challenges and questions arise during implementation, mostly surrounding 1) demographic and land ownership patterns and 2) the ecological implications of creating young forest. Ideas for potential solutions will be shared, including the introduction of an online decision support tool for the creation and prioritization of young forest habitat projects. Overcoming these and other challenges will better inform management decisions on and off of Mass Audubon sanctuaries, and improve our collective ability to shape landscape-scale habitat conditions.

Importance of woody debris dynamics in understanding the forest carbon cycle

Presentation Track: Forest Ecology

Presenting Author: Shawn Fraver

Presenting Author Affiliation: University of Maine

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Chris Woodall, U.S. Forest Service, Northern Research Station

Anthony D'Amato, University of Vermont

Jodi Forrester, N.C. State University

Abstract:

Coarse woody debris (here downed trees > 10 cm diameter) plays a crucial role in forest ecosystems, where it influences biological diversity, nutrient cycling, and soil development. The current amount of woody debris on a site represents a balance between additions (forest disturbance) and depletions (wood decay). Recent interest the forest carbon cycle, in the context of global climate change, has highlighted the need to better understand woody debris dynamics, particularly the controls of decay rates. One particular knowledge gap concerns the effect of woody debris 'burial' by colonizing mosses (a common occurrence in our northern conifer forests), which is thought to slow decay rates. We present here a set of ongoing experimental studies, as well as results from our recent empirical studies, that characterize woody debris dynamics following forest disturbance. Our empirical work in old-growth red spruce forests demonstrates dramatic fluctuations in woody debris mass, with amounts fluctuating between ca. 15 and 45 Mg / ha over a 100-year period, as the balance shifted between additions from disturbance and depletions from decay. A related study - using uniform-sized, fabricated 'decay stakes' - reveals higher decay rates under experimental forest canopy gaps when compared to those under intact forest canopies, presumably the result of altered microclimates. An additional, ongoing study using decay stakes, some of which are placed below moss cover, is designed to test the influence of moss 'burial' on wood decay rates. Taken together, these studies are shedding light on the woody debris dynamics and clarifying an important and under-studied part of the forest carbon cycle.

Major species of the Northern Hardwood forest: evaluating trends and environmental drivers of growth in the state of Vermont

Presentation Track: Forest Ecology

Presenting Author: Rebecca L. Stern

Presenting Author Affiliation: Rubenstein School of Environment and Natural Resources, University of Vermont

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Abstract:

Vermont is known for the Northern Hardwood Forest's iconic species: sugar maple (*Acer saccharum Marsh*.), yellow birch (*Betula alleghaniensis Britton*), and American beech (*Fagus grandifolia Ehrh.*). With a changing climate, understanding the future of these forests is dependent on our knowledge of how tree species have responded to anthropogenic factors such as climate change and pollution inputs in the past. Experimental evidence indicates that these factors can significantly alter the health and productivity of some tree species. We are examining the three major species of the Northern Hardwood Forest, as well as red maple (*Acer rubrum L.*), a species whose abundance has increased in this region over the past few decades.

Long-term monitoring reveals forest community change driven by atmospheric deposition and contemporary climate change

Presentation Track: Forest Ecology

Presenting Author: Brittany Verrico

Presenting Author Affiliation: University of Vermont

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Stephen Keller, University of Vermont

Abstract:

Temperature and atmospheric pollution have been shown to influence forest community composition, as well as the productivity and distributions of individual tree species. Empirical studies however, demonstrate conflicting individualistic and community level responses regarding elevational range shifts and often ascertain the importance of environmental drivers for individual species. In this study, we seek to investigate patterns of biodiversity along environmental gradients by modelling community turnover, or the rate of change in beta diversity, which can be quantified using pairwise changes in species composition (e.g. dissimilarity). We couple Generalized Dissimilarity Modelling (GDM) with a long-term forest tree inventory (years 1965-2015) on Camels Hump, VT to (1) characterize how the elevational gradient in forest community composition has shifted over a 50-year period, both in terms of beta diversity and the relative distribution of individual species, and (2) determine the relative importance of atmospheric pollution and climate change as drivers of temporal shifts in forest communities. The rate of compositional turnover along the elevational gradient was highest between 800-900m elevation, the area encompassing the boreal-deciduous ecotone, and decreased in lower and higher elevations. While the pattern of turnover was consistent over time, the total magnitude of community change was significantly reduced in the last census, consistent with a more homogeneous forest community. Notably, mid-elevation forests have shifted from high diversity with few dominant species to lower diversity dominated by red spruce, Balsam fir, and American beech. At low elevations, red spruce first contracted then expanded its range in 2015, and sugar maple has been in decline. We provide evidence to support realized niche expansion of red spruce in low elevations, possibly as a result of competitive release due to sugar maple decline. Temporal models showed S deposition and mean annual temperature are significant drivers of temporal changes in forest communities, which corroborates previous findings of the climate effects on northeastern forests, as well as the role of recovery from acid deposition.

Ecosystem services and biodiversity as outputs of forest stand development in the American Northeast

Presentation Track: Forest Ecology

Presenting Author: Dominik Thom

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William Keeton, University of Vermont

Abstract:

The composition and structure of forest ecosystems shift across successional stages. These shifts drive changes in the provision of ecosystem services and habitat conditions for forest-dwelling species. Anecdotal evidence suggests that not all ecosystem services and species respond similarly to forest succession, thus creating potential trade-offs between management objectives. The impacts of climate change on these relationships are also expected to be heterogeneous, leading to emerging challenges to manage ecosystem services and biodiversity. To address these challenges, we (i) quantify ecosystem services and biodiversity along a stand development gradient, (ii) identify trade-offs and synergies related to forest succession, and (iii) assess sensitivities of ecosystem service and biodiversity indicators to climate.

We complied a dataset of 18,643 individual forest plots from forest survey databases and peer-reviewed literature, and gathered additional information about site conditions from various data sources. Our dataset comprised five carbon storage indicators, one growth indicator, and three biodiversity indicators. We used Bayesian generalized linear models to assess the effects of environmental conditions and forest vegetation on each of these indicators. In particular, we derived the partial effects of dominant forest age as indicator for stand development.

The combined performance of carbon storage, forest growth, and biodiversity was lowest in young and highest in old forests. In particular, carbon storage increased over stand development while growth rate peaked at an early mature stage, followed by a decrease and a subsequent increase of growth in old forests. Biodiversity did not change markedly with stand age but was highest in mature

forests. The response of carbon storage, growth, and biodiversity to increasing temperature and precipitation were highly variable.

Indicator performance differed markedly, implying multiple trade-offs and synergies related to stand development. However, the results have clear implications for sustainable forest management. The low performance of all indicators in young stands suggests that forest management should avoid resetting forest development to early successional stages on a large scale. Conversely, the high performance of late development stages indicates old growth forest should be prioritized in management schemes to maximize ecosystem performance. These implications are particularly important for some indicators to maintain high performance under climate change.

What have we Learned from Monitoring Maine's Ecological Reserves?

Presentation Track: Forest Monitoring

Presenting Author: Andy Cutko

Presenting Author Affiliation: The Nature Conservancy in Maine

Full Author List:

Nancy Sferra, The Nature Conservancy

Justin Schlawin, Maine Natural Areas Program

Christain Kuehne, University of Maine

Don Cameron, Maine Natural Areas Program

Aaron Weiskittel, University of Maine

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Abstract:

Approximately 50 locations totaling 175,000 acres make up Maine's Ecological Reserve System. Maine Ecological Reserves were established in 2000 as benchmarks for monitoring change over time, and they encompass some of the most ecologically important places in Maine, extending from the Southern Maine coast to the boreal forest and from sea level to over 4,000 feet in elevation. As of 2017, plots in 20 Reserves were remeasured 10 years after initial inventory, which allowed for the first analysis of changes over time. Furthermore, this initial assessment of Ecological Reserve Monitoring data quantified differences in forest structure and composition between Reserves and Maine's managed forests.

Stand metrics analyzed at the plot level included live tree basal area, very large live trees per acre, standing dead trees, large standing dead trees per acre, total and large downed woody debris volume, and various growth and yield metrics. US Forest Service Forest Analysis and Inventory (FIA) data from managed forests across Maine were used to calculate the same metrics. Mixed effects modeling was used to evaluate the influence of program (i.e., Ecological Reserve Monitoring or FIA) and time (inventory round 1 or 2 for Ecological Reserve Monitoring plots) on the studied metrics.

Multiple metrics suggested greater stand complexity on Ecological Reserves than managed forestland in Maine. This result was most evident in two attributes: very large live trees per acre and large standing dead trees per acre. The means of these two metrics were nearly twice as high on Ecological Reserve plots compared to FIA plots on managed forestland. Ecological Reserves plots also had significantly greater mean live basal area and downed woody debris. These results confirm findings of other studies that have shown the abundance of ecologically valuable structural forest attributes is commonly greater in unmanaged than in managed forests. More specifically, The Nature Conservancy's Big Reed Forest in northern Maine is one of the Northeast's largest tracts of old growth forest. Using results from 25 Ecological Reserve plots of Big Reed for comparison, much greater structural complexity can be expected in old forests with no history of harvest. In particular,

very large live trees per acre, large snag density, and total downed woody debris volume were all considerably higher on Big Reed Forest.

Our assessment of ten-year changes indicated that Ecological Reserves are still accumulating volume, partially reflecting the past harvesting history of many sites prior to their formal establishment as Ecological Reserves. Longer term sampling data will be needed to verify trends over time. The latitudinal and elevation gradients covered by the Reserves, coupled with the variety of habitats encompassed, suggest that the Reserve system will be an ideal outdoor laboratory for observing long term forest changes in the Northeast.

Trends (?) in Exchangeable Cations after Fifteen Years into a 150-Year Soil Monitoring Study

Presentation Track: Forest Monitoring

Presenting Author: Don Ross

Presenting Author Affiliation: Plant & Soil Science, UVM

Full Author List:

Scott Bailey, USDA Forest Service

Angie Quintana, USDA Forest Service

Thom Villars, USDA NRCS

Sandy Wilmot, VT Forests Parks and Recreation

Jim Duncan, FEMC

Abstract:

Continued monitoring of forest soils is crucial for detecting, predicting and addressing environmental change. In cooperation with the FEMC, we have established a long-term soil monitoring study on five plots in Vermont. Three are around Mt. Mansfield and two are in southwestern Vermont in the Lye Brook Wilderness Area. Elevation ranges from 590 to 1140 m with forest type varying from typical northern hardwood (Acer saccharum, Betula alleghaniensis and Fagus grandifolia) to high-elevation spruce-fir (Picea rubens and Abies balsamea). Each 50 x 50 m plot contains 100 5 x 5 m subplots with sampling date assigned randomly (10 per date). The initial sampling of these plots took place in the summer of 2002, and resampling occurred in 2007, 2012, and 2017. Following intensive understory and overstory vegetation inventories, small pits were dug in the center of each plot and the soils were sampled both by genetic horizon and depth increments. All B horizon samples have been analyzed for exchangeable cations and we will discuss temporal trends, or lack thereof, in exchangeable calcium, aluminum, magnesium and potassium. Analysis of mercury, carbon and nitrogen is in progress. Methodological challenges include the intrinsic variability within and among subplots, which affects our ability to detect temporal changes. One plot on Mt. Mansfield presents thought-provoking spatial differences in exchangeable calcium pools. Ongoing challenges of the monitoring study include sustainable funding, robust long-term storage of samples, and continuity of sampling efforts. Continued sampling will allow detection of soil change in response to a changing climate, shifting abiotic stressors, and transitions in vegetation, providing an assessment of impacts independent of land management.

Forest disturbance: there is more of it than you think

Presentation Track: Forest Monitoring

Presenting Author: Jarlath O'Neil-Dunne

Presenting Author Affiliation: University of Vermont

Abstract:

Forest fragmentation in the Northeast is challenging to map, monitor, and measure. It often occurs at very fine scales and for most of our history the remote sensing technologies available to us either lack the spatial resolution or were too costly for us to carry out detailed forest disturbance mapping. The availability of statewide high-resolution imagery and LiDAR has changed this in Vermont. This presentation will discuss how these technologies are being used to quantify not only the fragmentation but identify its causes. Spoiler alert: there is a lot more forest fragmentation than you think.

Tracking Parcelization Over Time to Inform Planning and Policy

Presentation Track: Forest Monitoring

Presenting Author: Jamey Fidel

Presenting Author Affiliation: Vermont Natural Resources Council

Full Author List:

Jamey Fidel, Vermont Natural Resources Council

Kate McCarthy, Vermont Natural Resources Council

Brian Voigt, Rubenstein School of Evironment and Natural Resources, UVM

Abstract:

Parcelization, or the breaking up of land into smaller and smaller parcels, typically occurs through subdivision. Subdivision, and subsequent land conversion and development, can negatively affect plant and animal species, wildlife habitat, water quality, recreational access, and the ability of forests to sequester and store carbon. Increasing parcelization and subdivision can also affect the contiguous ownership, management, and viability of forest parcels, and reduce their contribution to the working lands economy.

The phenomenon of parcelization is gaining momentum, and subsequent development is causing forest cover to decline in Vermont. According to the U.S. Forest Service, Vermont may have lost 102,000 acres of forestland from 2012 to 2017 (Morin et al., 2017). To minimize forest loss and fragmentation, it is necessary to understand where parcelization and subdivision are occurring, and the rate at which they are occurring; however, to date there has been no systematic way to track trends in Vermont to inform planning and resource management.

A recent project was designed to track and analyze parcelization trends on private land in Vermont by utilizing Grand List (tax) data, as well as Use Value Appraisal Program data, from 2004 to 2016. As part of the project, project partners developed a database of parcels in the state, compiled by size class and various other metrics, with a focus on large parcels and forestland, In addition, project partners developed a website with “data explorer tools” to examine parcelization trends at the town, county, regional planning commission, and state level.

This presentation will examine key parcelization trend findings (see below), provide a brief tutorial on the parcelization website, and identify priority policy and research recommendations.

Key Findings:

- Both the amount of land in parcels 50 acres and larger, and the number of parcels 50 acres and larger are decreasing, while both acreage, and the number of parcels under 50 acres, is increasing.

- The number of acres in the “residential” category is increasing, while “farm” and “woodland” acreage is decreasing. “Woodland,” which represents undeveloped forestland parcel acreage, decreased the fastest.
- Across the state, the per-acre value of land in Vermont nearly doubled during the study period, though increases varied greatly depending on location.
- Most dwellings are built on smaller parcels compared to larger parcels.
- The Use Value Appraisal Program is playing a role in protecting large woodland parcels.
- Morin et al (2017). Forests of Vermont, 2016. Resource Update FS-119. Department of Agriculture, Forest Service, Northern Research Station. Available at https://www.fs.fed.us/nrs/pubs/ru/ru_fs119.pdf

Progress Report: Aligning the Northeastern States Research Cooperative and Forest Ecosystem Monitoring Cooperative

Presentation Track: Planning, Implementation, and Stakeholder Engagement

Presenting Author: Elissa Schuett

Presenting Author Affiliation: University of Vermont

Full Author List:

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Anthea Lavallee, Hubbard Brook Research Foundation

William McDowell, University of New Hampshire

David Newman, SUNY ESF

Aaron Weiskittel, University of Maine

Christopher Woodall, USDA Forest Service

Abstract:

Northeastern States Research Cooperative (NSRC) has long served as source of research funding for the Northern Forest region having awarded more than 300 grants totaling nearly $24 million to more than 50 institutions and agencies over the past 17 years. At the last Forest Ecosystem Monitoring Cooperative (FEMC) annual meeting, a vision was outlined for aligning NSRC and FEMC while recruiting stakeholder engagement to embolden greater regional impact. In the past year, efforts to further this vision have been pursued and will be presented in brief here. A business report highlighting achievements of NSRC over the past 17 years was released, a regional stakeholder meeting conducted, and potential partnership with the Northern Borders Regional Commission explored. As an outcome of these efforts, current concerns and future priority research areas were identified. The primary concerns included: (1) understanding environmental change effects on local ecological and economic systems and (2) better connecting science to the public via outreach and communications. Key priority research areas were: (1) rural and forest-based socioeconomics; (2) invasive species; (3) effective science linkages to policy; (4) sustainable forest management; (5) regional patterns in land use and effects of fragmentation; and (5) ecosystems services, particularly energy and carbon. These have helped guide a future organizational structure of NSRC and clearly showcases the need to maintain a strong partnership with FEMC. These outcomes and future vision will be more fully showcased in the presentation.

Young and Old Forest Targets for an Ecologically Functional Landscape

Presentation Track: Planning, Implementation, and Stakeholder Engagement

Presenting Author: Bob Zaino

Presenting Author Affiliation: Vermont Fish & Wildlife Department

Full Author List:

Bob Zaino, Vermont Fish & Wildlife Department

Abstract:

Young and old forests are critical to long-term ecological function and climate resilience. The majority of the Vermont's native plants and animals are adapted to the forest conditions that preceded European settlement. Today, although Vermont is rich in forests, the composition and structure of the forest is very different than the conditions in which these species evolved. In much of the state, young forest is less abundant today than it was before European settlement, and many wildlife species that depend on young forest are in decline. Old forests, with complex structures and diverse habitats, are essentially absent. Vermont Conservation Design--a science-based vision for an ecologically functional landscape--proposes creating and maintaining a balance in the state's forests, with between 3 and 5 percent as young forest and 10 percent as old forest. Young forests can be created through active management, and their locations can shift over time. Old forests will need long-term conservation, and must be thoughtfully distributed across the landscape. When these targets are achieved as part of a larger vision for sustaining Vermont's well-managed forests, they help maintain all the social and ecological benefits that forests provide.

Flower Brook Watershed Phosphorus Mitigation: Landscape Assessment and Project Implementation

Presentation Track: Planning, Implementation, and Stakeholder Engagement

Presenting Author: Hilary Solomon and Kathy Doyle

Presenting Author Affiliation: Poultney Mettowee Natural Resrouces Conservation District; Doyle Ecological Services/Middlebury College

Full Author List:

Hilary Solomon, Poultney-Mettowee NRCD

Kathleen Doyle, Doyle Ecological Services/Middlebury College

Abstract:

The Poultney Mettowee Natural Resources Conservation District (PMNRCD) and Doyle Ecological Services (DES) partnered to create a landscape-scale assessment of a geomorphically unstable, forested, headwater watershed. The aim of the assessment was to identify conservation and restoration projects to mitigate or attenuate phosphorus sources and to enhance or conserve phosphorus sinks within the Flower Brook basin, a subwatershed of southern Lake Champlain.

The project had four main steps: mapping the watershed characteristics, field truthing the maps, identifying and prioritizing restoration and conservation projects, and implementing at least one of the identified projects. The assessment involved examining GIS data layers and manipulating them to show areas with specific overlapping features that could be used to identify landscape areas that were either sources or sinks of phosphorus. The landscape assessment was completed in tandem with other ongoing assessments in an effort to add to the inventory of projects in the watershed with a focus on attenuating phosphorus and conserving or enhancing phosphorus sinks.

Doyle Ecological Services used the raster calculator to weigh and combine GIS data layers to create numerical gradations encompassing multiple characteristics related to phosphorus stability on the landscape. The Brynn and Underwood paper, Enhancing Flood Resiliency on Vermont State Lands, and Vermont Conservation Design mapping served as important cornerstone studies influencing this work. Four maps were created: Vulnerable Areas- Most Likely to Contribute Phosphorus, Phosphorus Attenuation- High Priority Areas, Restoration and Conservation Priorities, and High Priority Riparian Areas,

The Conservation District used these maps to identify project opportunities, reach out to landowners, and implement a gully stabilization project on a tributary to Flower Brook. The District will use the information from the mapping exercise to implement a variety of projects and is monitoring the Flower Brook Watershed closely to determine the effectiveness of their conservation work. The watershed is also the focus of a High Meadows Fund Flood Resiliency Grant and several other studies that all work to decrease flood and climate vulnerabilities and implement high-priority restoration projects.

The two maps, Restoration and Conservation Priorities, and High Priority Riparian Areas, were created by DES to inform conservation work by the District. Among other combinations of features, these maps show highly productive lands with no forest cover, including areas within riparian and wetland buffers. The District can use these maps to target specific landowners and can update the maps to show changes over time with respect to conservation or forested status within high priority segments and can document cumulative changes on the landscape due to conservation practices that they and partners implement.

Bringing Vermont Conservation Design to Private Landowners in the VT Coverts Cooperator Network: Strategies, Challenges, and Areas of Opportunity

Presentation Track: Planning, Implementation, and Stakeholder Engagement

Presenting Author: Carolyn D. Loeb

Presenting Author Affiliation: University of Vermont

Full Author List:

Carolyn Loeb, University of Vermont

Abstract:

Vermont Conservation Design is a new statewide vision for an ecologically functional future. But how do we translate this conservation roadmap into on-the-ground action, especially given that much of Vermont is privately owned and increasingly parcelized? Join UVM Field Naturalist graduate student Carolyn Loeb as she shares her experiences, results, and lessons learned from a summer pilot project for Vermont Fish & Wildlife and Vermont Coverts during which she introduced the new design to twelve private landowners in the Coverts Cooperator Network. Her findings--though preliminary--suggest that there are reasons to be optimistic when working with this demographic.

Staying relevant: a cooperatively-designed online database to house natural resource survey data collected by citizen scientists

Presentation Track: Wildlife Monitoring

Presenting Author: Jason Hill

Presenting Author Affiliation: Vermont Center for Ecostudies

Full Author List:

Mike Finnegan, FEMC

Jim Duncan, FEMC

Abstract:

Citizen science has emerged as a global phenomenon and tool to conduct ecological research at unprecedented scales, and citizen scientist projects have correspondingly grown in scope and geographic scale. For example, the popular iNaturalist program grew out of a Master's project in California in 2008 and now includes more than 750,000 observers around the world. As the popularity of citizen science projects grows, so too does the challenge to efficiently collect, store, and retrieve those data. Furthermore, competition for attracting and retaining citizen scientists has also increased. In a recent study of volunteer interaction with online tools, volunteers identified “format” and “professional appearance” of the tools as having the greatest effect on their decision to use them. With these ideas in mind, the Vermont Center for Ecostudies and the Forest Monitoring Cooperative recently developed an online data entry portal and database for the citizen science project, Mountain Birdwatch. This project is an initiative by the Vermont Center for Ecosystems to engage wildlife enthusiasts, and to harness the power of the public to conduct wildlife monitoring across northern New England and eastern New York. Until 2017, Mountain Birdwatch had used the same online database (with few structural or cosmetic changes) for more than a decade, and the outdated appearance and limited functionality of the database likely stymied citizen scientist participation and lowered volunteer retention rates. At the same time, the volume of data resulting from >20,000 bird surveys since 2010, necessitated finding technological solutions to collect and manage and automate error checking of this growing mountain of data. In our talk, we will outline our collaborative design process and showcase the resulting online data entry portal and database that are now used by Mountain Birdwatch citizen scientists.

Establishing Baseline Distribution Data on Vermont's Reptiles and Amphibians: The 2018 Maps and Species to Watch

Presentation Track: Wildlife Monitoring

Presenting Author: Jim Andrews

Presenting Author Affiliation: Vermont Reptile and Amphibian Atlas

Abstract:

The Vermont Reptile and Amphibian Atlas has just finished updating its maps showing the current distribution of reptiles and amphibians in Vermont. Establishing current baselines of distribution will allow us (and others) to monitor changes in distribution as a result of climate change, habitat loss, habitat fragmentation, and habitat degradation. Eastern Milksnake distribution very closely matches current hardiness zone 4B and would be expected to track its movement in coming years provided it is able to safely colonize appropriate habitat further north and east. Other lowland species such as DeKay's Brownsnake and Gray Treefrog may also extend their ranges into higher elevations and further north and east and anecdotal reports suggest this is happening. Mink Frogs are a northern species whose range extends into northeastern Vermont. It is a species that might be expected to disappear from Vermont in coming decades as the climate warms. Boreal Chorus Frog, another northern species, appears to have already been extirpated from Vermont. We do not know if this extirpation was climate change related or not. We will explore some of the new maps and how species ranges might change in the future if habitat and movement conditions allow.

Using remote-triggered camera traps to describe patterns of mammal species richness and abundance in relation to anthropogenic and ecological factors

Presentation Track: Wildlife Monitoring

Presenting Author: Alyssa Valentyn

Presenting Author Affiliation: Saint Michael's College

Full Author List:

Declan McCabe, Saint Michael's College

Jade Jarvis, Saint Michael's College

Olivia Richardson, Saint Michael's College

Schyler Schewe, Saint Michael's College

Ethan Brookner, Saint Michael's College

Abstract:

The Saint Michael's College Natural Area in Colchester, Vermont is a fragmented agricultural floodplain which will soon undergo land-use changes, including floodplain restoration and increased trail use. In a series of study periods from May 2017 through July 2018, we set camera traps to describe the distribution of mammals in suburban Vermont in relation to the following anthropogenic and ecological factors: 1) human presence, 2) level of development, 3) presence of compost, 4) forest availability, and 5) wetland habitat availability. Among anthropogenic factors, we found a lower abundance of species at regularly visited cameras and the opposite trend at compost sites; and off-campus species richness was significantly greater than on-campus. Among ecological factors, we found more species in wooded habitats than in open habitats; and no difference between wetland and upland species richness. Because anthropogenic factors tended to decrease animal richness but increase abundance, we conclude that restoration to a more natural state may be beneficial to the area's biodiversity.

Monitoring the Effects of Prescribed Burns on Common Nighthawk Populations in New Hampshire's Ossipee Pine Barrens

Presentation Track: Wildlife Monitoring

Presenting Author: Jason Mazurowski

Presenting Author Affiliation: University of Vermont, Field Naturalist Program, Department of Plant Biology

Full Author List:

Jason Mazurowski, University of Vermont, Field Naturalist Program, Department of Plant Biology

Abstract:

Common nighthawks (Chordeiles minor), once widespread throughout the Northeast, have been in rapid decline since the 1980s. A decline in insect diversity, combined with a lack of early successional habitat, are thought to be major contributors. The Ossipee Pine Barrens Preserve, owned and managed by The Nature Conservancy, represents one of the only locations in New Hampshire supporting breeding populations in their natural environment. Beginning in 2007, The Nature Conservancy has treated over 1,000 acres within the preserve - combining prescribed burns, small-scale timber harvests, and regular mowing to maintain and regenerate pitch pine-scrub oak woodland communities. Partnering with New Hampshire Audubon and the New Hampshire chapter of The Nature Conservancy, 2018's monitoring project yielded updated estimates on distribution and abundance of nighthawk populations. A quantitative analysis of vegetation characteristics at 8 confirmed nighthawk nest sites, combined with extensive observations of nesting behavior throughout the breeding season suggest that a small but stable breeding population has persisted in the pine barrens, and has responded positively to management regimes.

From keystone initiatives to landscape programs: a decade of investing in forest conservation for birds – outputs, outcomes and lessons learned

Presentation Track: Year of the Bird 2

Presenting Author: Scott Hall

Presenting Author Affiliation: National Fish and Wildlife Foundation

Abstract:

The National Fish and Wildlife Foundation's early successional forest (ESF) keystone initiative business plan was focused on creating habitat for dependent bird species across a multi-state region. Time lags to implementation, initial implementation capacity, coordination gaps and ambitious 10-year funding, habitat and species goals contributed to program under-performance. However, increased implementation capacity, extensive outreach and key lessons resulting from ESF program investments combined with emerging science on bird habitat use of multiple forest seral stages during the breeding period are shaping current performance based landscape programs at NFWF. Current landscape efforts are focused on improving age interspersion and structural diversity within forest blocks (5,000 acre minimums); golden-winged warbler, wood thrush and cerulean warbler are serving as indicator species of forest seral stages with goals for each derived from minimum territory sizes multiplied by expected acres under improved management. Performance monitoring will be grounded in point count estimates and scaled using modeled data for occupancy, distribution and count estimates.

Bird Conservation on Commercial Forests in the Northern Forest

Presentation Track: Year of the Bird 2

Presenting Author: Henning Stabins

Presenting Author Affiliation: Weyerhaeuser Inc.

Full Author List:

Abstract:

Bird conservation on commercial forests involves multiple approaches at different scales. Here we highlight stand-scale habitat feature management, species-specific efforts, and coarse-scale landscape shifting habitat mosaic outcomes, along with continued involvement in research and monitoring through collaboration with state and federal agencies and non-governmental organizations. Sustainable forestry certification also includes standards that address bird conservation – examples include conservation of habitat features and listed species, attention to invasive species and healthy forests, contributions to research, and alignment with state wildlife action plans.

What remote sensing tells us about the regions changing forests

Presentation Track: Year of the Bird 2

Presenting Author: Alison Adams

Presenting Author Affiliation: Gund Graduate Fellow, Rubenstein School of Environment and Natural Resources

Full Author List:

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Jennifer Pontius, UVM and USFS NRS

David Gudex-Cross, , UVM RSENR

Abstract:

Improvements in both sensor and computing technologies has allowed researchers to more closely examine historical changes in forest structure and function across the forested landscape and use this information to model future scenarios. Here we highlight the findings of recent papers that build off a 30+ year archive of satellite imagery to quantify the extent and pattern of changes in forest cover, species abundance and fragmentation patterns across the forested landscape. Remote sensing products like these are essential to understand the potential drivers of change in the region's forests, identify locations or forest types particularly at risk, and inform the sustainable management of this critical resource at a time of rapid environmental change.

Using citizen science data in integrated population models to inform conservation

Presentation Track: Year of the Bird 2

Presenting Author: Orin Robertson

Presenting Author Affiliation: Cornell Lab of Ornithology

Abstract:

Coming soon