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Flash Talk and Poster Abstracts

Flash Talk Abstracts (presentation sequence)

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5. Dube, Morgan and Donald Chandler: **The prey and foraging range of the predatory wasp *Cerceris fumipennis* and its use for biosurveillance of the Emerald Ash Borer** (*also poster*)
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8. Lane, Erin D., Nicholas Skowronski, Inga La Puma, and Amanda Mahaffey: **The North Atlantic Fire Science Consortium: Connecting Researchers and Managers** (*also poster*)
9. Silver, Emily J., Jessica E. Leahy, Aaron R. Weiskittel, Caroline L. Noblet ,and David Kittredge: **Risk perception and relevance of timber harvesting for bioenergy production: A qualitative examination of private woodland owners**

The Potential for New England's Forests

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The virtues of improved forest management and enhanced local forest product markets are widely extolled, but what might that look like on the ground? How could enhanced forest management help to meet New England's wood and fiber needs, improve local and regional economies, and provide the greatest social and environmental benefits? Recognizing that increased forest management and wood production parallel the movement towards sustainable, renewable food and energy sources, how can we bring together an environmentally minded public and regional policy makers to chart a future course for regional sustainability?

This project seeks to document the existing value and the *future potential* of New England's working forestlands. Given greater forestry resources and innovation, how could we advance forest-based business opportunities, jobs, and income—as well as wildlife habitat, recreational opportunities, and ecosystem services?

New England's forests have unrealized potential in each of these areas. In addition to the opportunities to improve quantity and quality of wood, wildlife populations for a wide variety of species could be enhanced in New England's forests with forest management. Local wood markets could be expanded to meet the regional demand for wood products while contributing to local economies.

The purpose of this project is to document that potential by analyzing what we know about how improved silviculture can enhance wildlife habitat, recreational opportunities, environmental quality and wood production. The best available data from the US Forest Service, state forestry agencies, and universities will be used to characterize this potential. We are not charting a course for *how* to achieve these goals; instead we are painting a picture of the potential not yet captured, in order to better understand what we might strive for.

This report by the New England Forestry Foundation, due for release June 2014, is intended to complement other efforts to conserve New England's forests and enhance its agriculture and fisheries.

Successful Small Hardwood Sawmill Marketing Strategies

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Many owners of small hardwood sawmills start their businesses as portable and part-time operations with one helper. These mills typically cut no more than one to two thousand board feet per day of wood intended for onsite use as barn patterns, barn siding, fencing, etc. – low value undried products that earn the sawyer a low return on his investment and his time. This talk will describe how two saw owners in Kentucky have changed their business models to become stationary, full-time operations. Small dehumidification dry kilns, marketing development and onsite retail sales have been key to making these operations successful to the point where they are exporting lumber beyond the state boundaries and even to Canada and Florida!

STORMWISE: An initiative to mitigate storm damage to electrical infrastructure by increasing the storm resilience of trees

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The growth response of trees to average winds is a well-known phenomenon illustrated by open grown and many edge trees. However, tree and forest management intended to enhance the wind resilience of trees is rarely done in New England. In this talk I will highlight the basic science of how trees adjust their growth to wind forces and how this knowledge is being used to design silvicultural prescriptions intended to enhance tree wind-firmness along power line (distribution) corridors in Connecticut. These deep edge treatments involve the integration of arboricultural and silvicultural techniques intended to create an edge less prone to storm failure. This understanding is fundamental to the STORMWISE initiative which seeks to integrate outreach, education, research and entrepreneurship to provide solutions for tree failure mitigation which are acceptable by the public, economically viable, and biologically effective.

Changes in deciduous tree sway dynamics along a forested edge following a thinning

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Damage caused by wind induced tree failure is a major problem in the highly forested and developed state of Connecticut where 90% of power outages are due to tree or branch failure. Very little information is currently available regarding deciduous tree sway dynamics, especially along forested edges. The objective of this experiment is to monitor the changes in tree sway dynamics and stability along a deciduous forest edge following a thinning. Within an existing edge in the UConn Forest, 13 trees were equipped with clinometers which continuously record each tree's sway movement. Two meteorological towers monitor the wind speed and direction within the forest and aloft. Data collection began in September 2012 and continued until the thinning took place in September 2013. Post-thinning data collection started in November 2013. The goal of the thinning was to increase wind forces experienced by remaining trees as well as to decrease competition for light and space, facilitating the growth of stronger trees with more symmetrical crowns. Analysis of the sway data indicates changes in all trees fundamental frequency during leaf-on and leaf-off conditions: showing higher frequencies during bare months, but the magnitude of change is not equal for all species. Following the thinning, with wind speeds inside the forest edge increased, trees are swaying further, but frequencies remain unchanged. Over time, increased wind loading should lead to adaptive growth strategies that result in more stable trees. A better understanding of the mechanical stability of deciduous edge trees could introduce new management strategies based on the science of tree sway dynamics. Managing to increase tree stability could have long-term social, ecological, and economic benefits.

The prey and foraging range of the predatory wasp *Cerceris fumipennis* and its use for biosurveillance of the Emerald Ash Borer

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Ash trees are a prominent feature and resource in New England forests and are important to our forest biodiversity and economy. The destruction of large populations of this species can have severe ecosystem-level consequences. Currently, the greatest threat to ash trees comes from extensive and serious infestations of the Emerald Ash Borer (EAB, *Agrilus planipennis*). Fortunately, *Cerceris fumipennis* (or the "smoky-winged beetle bandit" [SWBB]), a predatory wasp, is recognized as presenting an extremely effective technique for locating and parasitizing adults of this serious pest that was recently introduced to New Hampshire (2013). The NH Dept. of Agriculture Markets and Foods and Division of Forests and Lands regard an understanding of the biology of this wasp as being critical in development of their plans to detect low density populations of EAB.

My project was to monitor two large colonies of SWBB, Boscawen State Forest Nursery and Epsom American Legion parking lot in New Hampshire. Incoming female SWBB with prey were captured and their prey were collected and documented. Emergence of SWBB appears to be nearly synchronous with 200 females emerging within 15 days of each other. Closer monitoring of this time period is necessary to obtain a more accurate

estimate of first prey preferences. SWBB continues to forage for beetle prey after Aug 22nd but the wasps become unproductive by the 31st. Thirty different prey species were produced and seasonality was documented for ten of the most commonly taken species. During the field season of 2013 there were no EAB observed at either site. Monitoring for EAB is a key step in keeping the forests of New England and New York healthy and intact. Effective management in New England forests can be implemented early with the help of *C. fumipennis* in the detection of low density populations of EAB.

Comparison of Pre-Harvest and Post-Harvest Water Quality Results from a Harvested Stream within Forest land owned by the Springfield Water and Sewer Commission a Supplier of Drinking Water in Western Massachusetts

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The Springfield Water and Sewer Commission Watershed division developed a forest management plan for the removal of timber on land it owns within its drinking water supply protection area. Two important criteria established in the plan included designating "variable width filter zones" along streams and specifying within those zones a tree basal area removal of no more than *25%*. To determine the effects these criteria might have on stream water quality samples were collected from a perennial stream within the harvest area. Simultaneously samples were also collected from a control stream outside of the harvest area. Water samples from both streams were collected simultaneously once a month. A total of twenty three (23) samples were collected pre-harvest and twenty-two (22) samples collected post-harvest. Sample collection was started two (2) years before the harvest took place and continued two (2) years after the harvest was completed. The suite of water quality constituents analyzed were: UV-254 (organics), turbidity, pH, apparent color, nitrate, aluminum, iron, and temperature. In addition forest soil samples were collected from near the harvested stream and submitted for analysis. Historical research indicates that forest harvesting can cause large changes in the rates of chemical cycling and the export of nutrients and base cations from soils into watershed streams. However, the 4-year study conducted by the Commission did not indicate significant changes in water quality between pre and post-harvest conditions although minor changes were noted for: pH, turbidity, and temperature. Overall the results suggests that using a combination of low tree basal area removal in variable width stream buffer zones coupled with careful logging practices will not significantly alter existing watershed stream chemistry.

Interactions among Climate Change, Carbon Cycling and Land Use in a Mixed Agricultural, Residential and Forested Landscape

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Policy initiatives aimed at offsetting climate change through land management typically focus on enhanced carbon storage. For example, practices such as no-till agriculture can sequester carbon in soils, and forest preservation can maximize standing biomass in trees. Often not considered is that these practices bear climate consequences through other mechanisms. Soil carbon storage can result in higher emissions of greenhouse gases like methane and nitrous oxide. Forest preservation results in lower albedo forest canopies as compared

to agriculture fields and residential lawns. The objective of this study is to examine how forested, agricultural, and residential land cover influence climate through a combination of carbon storage, greenhouse gas emissions, albedo, and surface heat flux. The research takes place in a 12 × 12 km, multiple land use landscape surrounding Durham, NH. It combines field measurements, remote sensing imagery, and process based modeling to make spatially continuous estimates of carbon pools, greenhouse gas emissions, shortwave surface albedo, and surface heat flux. Each of these variables is then converted into a common unit, radiative forcing (W m^{-2}), to determine how agricultural, residential, and forested land cover influences climate. The results of this research will highlight tradeoffs among multiple land management strategies in terms of their net climate effect. Considering the climate impact of different land cover types is a critical first step in deciding how to develop the landscape with climate change mitigation as a goal.

The north Atlantic fire science consortium: connecting researchers and managers.

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The misconception surrounding wildland fire science and management in the Northeastern United States and Southeastern Canada is that wildland fire is an insignificant disturbance in these ecosystems. The challenge in the region is to perform scientifically informed forest management activities in the most densely populated areas of the US and Canada while disentangling a web of land ownerships, management organizations, political boundaries, fragmented forests and regulations. The North Atlantic Fire Science Consortium (NAFSC) has been preliminarily funded to join a national network of Joint Fire Science Program Knowledge Exchange Consortia.

The NAFSC was created with the vision to:
1. ***Catalyze***: Catalyze collaboration between scientists and land managers, emphasizing the interactive roles that both play in developing and applying sound science to achieve positive management outcomes.
2. ***Innovate***: Collaboratively determine innovative solutions focused on the region's unique science and management challenges.
3. ***Synthesize***: Consolidate existing research for land managers through the internet, workshops, training sessions, and other outlets. Adapt science from other geographic areas that has applicability in the NAFSC region.
4. ***Communicate***: Become the cohesive outlet for regional fire science communication and delivery, facilitating the flow of information on science and management needs.

The Consortium seeks stakeholder advice for an initial fire science needs assessment. We will present the current status of the consortium and solicit ideas for networking and delivery in preparation for full implementation of the consortium.

Keywords: Fire Science Consortia, knowledge exchange, network, science delivery, technology transfer

Risk perception and relevance of timber harvesting for bioenergy production: A qualitative examination of private woodland owners

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Predicting and understanding timber supply is one central component to the viability of the bioenergy industry. Available timber supply from private woodland owners is difficult to estimate because complex behavioral theory informs the owner's decision to harvest. The decision-making environment consists of exogenous market factors, internal cognitive processes, and social interactions. This study seeks to understand the cognitive and social factors influencing the decision to harvest timber. Two specific cognitive mechanisms, risk perception and relevance, are more thoroughly investigated. Thirty semi-structured interviews were conducted with private woodland owners, who had previously harvested timber, had never harvested timber, and had harvested timber for woody biomass markets. Owners were also asked to build a cognitive map or timeline of their decision-making process. Results indicate that owners frame risk in terms of concerns for their woodlot in four broad categories: economic, aesthetic, environmental, and social. Importantly, economic concerns are typically considered at the very end of the decision-making process. Some owners expressed a willingness to supply timber for biomass, but all expressed unfamiliarity with biomass markets. Many owners had concerns about biomass harvesting, including nutrient removal, economic efficiency, and impact on statewide harvesting levels. Finally, timber harvesting was cited as less relevant to daily life than other land management decisions, and therefore may not be an area to apply traditional social psychological theories of intention and behavior. These results help provide insight to available timber supply for the bioenergy industry. Furthermore, the incorporation of risk and relevance in the study of private woodland owners contributes new information on decision-making and associated land use impacts.

Key Words: biomass, grounded theory, private woodland owner, relevance, risk perception, timber supply

Poster Abstracts

1. Allen, Bruce P., Ingeborg V. Seaboyer, and Kenneth M. Desmarais: **Diameter and volume growth at Caroline A. Fox Research and Demonstration Forest in Hillsborough, New Hampshire**
2. Balch, Si: **Brooks Mills Crop Tree Growth Results**
3. Barsky, Joseph P., Jeffrey S. Ward, and Thomas E. Worthley**: Integrating forest and roadside management objectives to create storm resilient forests**
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6. Dube, Morgan and Donald Chandler: **The prey and foraging range of the predatory wasp *Cerceris fumipennis* and its use for biosurveillance of the Emerald Ash Borer** (*also flashtalk*)
7. Ducey, Mark J., Kenneth M. Johnson, and Daolan Zheng: **Demographic Variables Predict Forest Cover Change in the Northeastern United States**
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9. Hatch, Felicia L. and Mark J. Ducey: **Estimating Canopy Cover with Automated Image Processing**
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17. Walberg, Eric, John Hagan, and Si Balch: **The Climate-Smart Landowner Network**
18. Weimer, Jen, Isabel A Munck, Kerik Cox, Sara Villani, and Philippe Tanguay: **Occurrence of White Pine Blister Rust on Cultivated Resistant and Immune Varieties of *Ribes* Species in New Hampshire and the Impact to Local White Pine Resources**
19. Worthley, Thomas E., Mark Rudnicki, and Jeffrey Ward: **Introducing "StormWise", A Project Overview**

Diameter and volume growth at Caroline A. Fox Research and Demonstration Forest in Hillsborough, New Hampshire

Bruce P. Allen[1], Ingeborg V. Seaboyer[1], and Kenneth M. Desmarais[2]

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Tree growth was assessed on 45 Continuous Forest Inventory (CFI) plots and 22 Silvicultural Demonstration Plots (Biorama) at the Caroline A. Fox Research and Demonstration Forest, in Hillsborough, New Hampshire. Long-term data from the CFI plots provide a record of forest level changes from 1955 to 2011. Tree growth patterns at Fox demonstrate the effects of forest management, competition and stocking on forest productivity through time. Diameter growth on CFI Plots slowed from 1955-65 to 2001-2011 for most of major species with the exception of red oak. This reflects the shift in stocking from 50% in 1955 to over 100% stocking in 2001 for most stands. There were limited management activities between 1989 and 2011 at CFI plot locations. The Biorama plots, established in 2004, provide an opportunity to compare recently managed stands with the forest as a whole. Diameter growth shows an increase on surviving trees for most species in recently managed stands. Assuming that the CFI plots are representative of the forest stands at Fox, the CFI data supports the assertion that diameter growth slows as forests age, however, the Biorama plots demonstrate the positive effects of recent forest management activities on diameter growth, even in a maturing forest. Volume growth on CFI plots declined from 1.435 cord/acre/year from 1984-2001 to 1.137cords/acre/year from 2001-11 with white pines showing the largest drop (more than 30%). Despite the drop, overall volume growth at Fox Forest remained higher than the average for southern NH 2005-2010 of 0.547 cords/acre/year (Horton 2012) based on FIA data. Per acre volume growth on the Biorama plots (2004-2011) was 0.89 cords/acre/yr. However, volume growth on a per tree basis in Biorama plots surpassed CFI 1984-2001 rates for some species. This suggests that maintaining volume growth requires regular management activities which reduce stocking levels and reopen crowns.

Brooks Mills Crop Tree Growth Results

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Brooks Mills, a forester, stock broker and interesting person, owned lots in the Holden and Eddington. He grew good trees on good soils. Starting 1983 he installed five separate crop tree studies with 1084 trees. John Mills, his son, is also a forester and allowed me to try to analyze the data.

- He measured only DBH.
- He re-measured on a frequent but haphazard schedule until 2011, shortly before his death.
- Many trees were dropped through the study, so there are different growth periods.

Lessons for taking measurements

1. Measure on a consistent system, but not every year.
2. Analyze your data, rather than just taking measurements. Choose a few species, with enough trees and measurements for meaningful analysis. Only 3 species had enough trees: 1.) Red oak, 2.) White Ash, 3.) Sugar maple

Findings from study

1. There is huge variability among trees even though Brooks chose only good candidate crop trees. Keep refining your choices through time.
2. DBH growth was very consistent whether a tree was measured over 4 years or 17 years, thus more trees could be included.
3. Average annual DBH growth

a. Red Oak is the most consistent regardless of size, and had the highest growth.
b. Sugar maple's best growth is on 12 to 15 inch trees.
c. White ash's best growth is on 10.5 to 12 inch trees.

4. Average annual basal area growth
    a. Red Oak is the most consistent regardless of size, and had the highest growth
    b. Sugar maple's best growth is on 12 to 15 inch trees.
    c. White ash's best growth is on 10.5 to 12 inch trees.
5. ON SUITABLE SITES, CHOOSE RED OAK AND SUGAR MAPLE. WHITE PINE IS A GOOD OPTION, BUT THERE WERE NOT ENOUGH TO ANALYZE IN THIS STUDY.

Integrating forest and roadside management objectives to create storm resilient forests

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Residents throughout the region have been affected by recent storms which have significantly impacted both the transportation and utility infrastructures through prolonged outages and impassable roads. Hanging, fallen, and/or broken trees contributed to many outages. Following one particular storm that occurred in 2011, nearly 900,000 people in Connecticut (and upwards of 3 million throughout the region) were without power for an extended period. It was estimated that economic losses to the region from that storm exceeded $1 Billion.

In response, The **State Vegetation Management Task Force** recommended that roadside forests be managed to increase utility reliability while also maintaining their aesthetic appeal by integrating silvicultural and arboricultural practices. A collaborative project is underway in Connecticut with the goal of integrating these management objectives, and seeks to find:

1. Methods for fostering storm-resilient forests alongside roadside corridors, and
2. Science-based recommendations for long-term management of roadside corridors

Collaborators on this project include: The Connecticut Agricultural Experiment Station, The University of Connecticut, Audubon Connecticut, Connecticut Light and Power Co., Connecticut Dept. of Energy and Environmental Protection, and several forest landowners.

This poster highlights some preliminary vegetation management work of the project, and how this approach can be utilized throughout the region.

Life Cycle Assessment of Exported Torrefied Wood Pellets (TOP) from Maine to the European Union

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Torrefied wood pellets are an energy source that has the potential to partially displace coal use in coal power plants, reducing the global warming impact of electricity produced from coal. Torrefied wood is produced by heating wood for a short period of time (10 - 30 minutes) without oxygen at high temperatures (200 - 300 °C). The final product is hydrophobic, not subject to biological degradation, has an energy density close to that of coal, and can be ground up easily. These properties allow for high co-firing rates with coal without the need to retrofit existing plants to adjust to a new fuel source.

The life cycle emissions of torrefied wood pellets (TOP) produced in a case study plant in Maine and shipped to the European Union (EU) for combustion were accounted for using the LCI modeling software package SimaPro 7.3.3. Environmental impacts were assessed based on the global warming potential (GWP) of carbon dioxide equivalents (CO_2eq) over 100 years.

Results indicate that the highest impact on GWP is produced by the transportation of TOP from Maine to the EU. Other aspects are the source of electricity at the torrefying and pelletizing facility and whether emissions from burning biomass are included in the calculation. On average, depending on system boundaries and scenarios, 40 - 80% net savings of CO_2eq of pure TOP compared to pure coal were found.

The Northeastern States Research Cooperative (NSRC): Science to support management of the Northern Forest

Bowden, Breck (UVM), Bill McDowell (UNH), Robert Wager (UMaine), David Newman (SUNY-ESF), and John Brissette (USFS)

The Northeastern States Research Cooperative (NSRC) is a competitive grant program supporting cross-disciplinary, collaborative research in the Northern Forest – a 26-million acre working landscape that is home to over a million residents and stretches from eastern Maine through New Hampshire and Vermont and into northern New York.
The NSRC addresses the importance of the Northern Forest to society and the need for research activities to benefit the people who live within its boundaries, work with its resources, use its products, visit it, and care about it. Between 2001 and 2013, the NSRC awarded over 250 grants, totaling over $18 million, to researchers throughout the region.

The prey and foraging range of the predatory wasp Cerceris fumipennis and its use for biosurveillance of the Emerald Ash Borer

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Collaborators: Jen Weimer, Forest Health Specialist, N.H. DRED Division of Forest and Lands
Submitted as a poster and flash talk—see flash talk abstracts

Demographic Variables Predict Forest Cover Change in the Northeastern United States

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Kenneth M. Johnson, Carsey Institue and Dept. of Sociology, UNH
Daolan Zheng, Dept. of Natural Resources and the Environment, UNH

We analyzed demographic and forest cover change in New England and New York to provide a regional context for an analysis of demographic, forest cover and biomass change in New Hampshire. We combined 2001 and 2006 National Land Cover Data (NLCD) with demographic data from the 2000 and 2010 Decennial Censuses to examine the relationship between demographic and forest cover change at the county level. The region experienced modest population change during the period and a mixed pattern of forest cover change influenced both by urban sprawl and by harvesting patterns in the northern forests. Population growth was greatest in recreational counties and least in manufacturing counties (including those in the timber industry). Housing growth was modest and varied, but forests remain widespread even at higher housing densities, and the intermix of forests and population is extensive. Nonetheless, the region as a whole experienced net loss of forest cover in 2001-2006. Most changes in forest cover were associated with conversion to shrub/scrub cover types (including temporary change due to forest harvesting and reversion back to forest), and to development (which had no reverse flow). The patterns of both types of change were uneven through the region, and both types of change were strongly predicted by demographic and housing variables. Our work demonstrates the importance of coupling demographic and remote sensing data in the modeling of forest change.

Changes in structure and carbon content of late successional and old growth stands in northern Maine

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Restoration of old-growth forest structure is an emerging silvicultural goal in New England. However, longitudinal studies of old-growth dynamics that can inform silvicultural recommendations are sparse. From 1995 to 2002, 65 10m by 50m permanent plots were measured to evaluate forest structure (standing live and dead trees, and down coarse woody material) in late-successional and old growth (LSOG) stands across northern Maine. We remeasured these plots in 2011 to assess carbon sequestration trends and changes in forest structure. LSOG aboveground live carbon (C) stocks were very high relative to regional mean C stocks (2.0-2.5 times the mean). LS plots were accumulating aboveground live C at a positive rate (0.27 tons ac^{-1} $year^{-1}$), while C stocks on OG plots showed a decline (-0.24 tons ac^{-1} $year^{-1}$). This change is driven by mortality in larger diameter American beech (*Fagus grandifolia*) trees due to beech bark fungus (*Nectria* sp.). Diameter distributions conformed poorly to a classic exponential distribution, and were not converging toward such a distribution at the plot scale. Restoration of old-growth structure would imply broad targets of basal area around 130-150 ft^2/ac, with a QMD around 10" for trees over 3" DBH. A combination of at least 16 live and dead trees/ac over 16" DBH (and perhaps at least 4 over 20") and several large downed logs per acre is also characteristic of these stands. Meeting these targets could pose challenges in stands that are also managed for timber production, but they can serve as benchmarks where restoration is a goal.

Estimating Canopy Cover with Automated Image Processing

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Forest canopy cover is a key variable for forest health assessment, predicting regeneration, and mapping forest areas consistent with international definitions. However, measuring forest canopy cover is time consuming and expensive. Taking a simple picture could be the answer. We studied the use of conventional digital photographs for canopy cover measurement, and its sensitivity to thresholding, resolution, and postprocessing. Photos of canopies were captured from the ground in the field then an automated MATLAB script was written which used Otsu's method and an edge detection method for automatic thresholding into sky (light) and vegetation (dark). We used the raw images as well as morphological opening and closing with three disk sizes to eliminate within-crown gaps. Otsu's method thresholded the images faster than the edge detection but edge detection proved to be far superior than Ostu's, especially in difficult lighting situations. When the images were resized for faster processing, it occasionally altered the image and delivered less than adequate results. Photographic methods allow for faster field collection than traditional methods, but more importantly, can give us consistent ecological information. Photographic approaches are also amenable to volunteer data collection and crowdsourcing. Automatic thresholding techniques are currently the limiting factor and we are focusing additional effort on improved methods.

The effects of recreation and disturbance on the invasibility of forest interiors

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While forest interiors exhibit resistance to colonization by invasive plants, many conserved forests in the Northeast are densely intersected by recreational trails and areas of historical clearing. The resistance of forest interiors to invasion has not been well quantified in New England in relation to these forms of disturbance. Using detection-based distance sampling, patches of invasive plants were surveyed along trails in conservation areas in Coastal New Hampshire and Maine to determine the impacts of trail use, past disturbance, and important stand features including canopy closure, basal area, and canopy and understory composition, on invasive plant detectability and abundance. Detection models for invasive plant patches showed that stand features and patch size altered detectability. Stand features and past disturbance also altered invasive plant density. Invasive plant abundance declined with distance from trails, but also declined sharply with distance along trails, indicating that trails may be partially facilitating invasion into forest interiors. Invasive plant abundance was most strongly related to housing density around trailheads and conservation area size. These results indicate that while ecological factors, current and historical disturbances, and recreational use facilitate invasion, forest interiors exhibit some ability to buffer invasions. Results are important for consideration in land conservation planning and invasive plant management. Recreational use and disturbance may act as important vectors for the invasion of forest interiors, but the potential for management of invasive plants will be strongly mediated by population pressure and land use patterns. Further research is needed to determine if critical thresholds for disturbance, conservation area size, and population density exist, and whether small patches of invasive plants in forest interiors will contribute to more widespread invasion of forest interiors over time.

The north Atlantic fire science consortium: connecting researchers and managers.

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Submitted as a poster and flash talk—see flash talk abstracts

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SMART - Stewardship Mapping and Reporting Tool

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On November 30, 2012, the USFS Stewardship Program released the new Stewardship Mapping and Reporting Tool (SMART), signaling a new era in Stewardship accomplishment reporting capability and responsibility. SMART fills the need for a national Stewardship geospatial data repository that supports consistent and accurate reporting of accomplishments across the landscape. And for states that need it, SMART is a user-friendly, feature-rich Plan creation and management tool available on the web, with a supplemental desktop tool. Though built with a geospatial backbone, SMART allows field foresters, working with private landowners, to prepare Forest Stewardship Management Plans, record contact and other attribute information of the plan property, track plan implementation accomplishments, and spatially display and analyze plan locations and associated activities, without the need for desktop GIS software or GIS expertise. SMART accomplishment data for the 20 states in the Northeastern Area was completed and officially submitted to the US Forest Service for the first time in November, 2013. New stewardship data will be compiled and submitted annually from this point forward. These data will be analyzed and used strategically to show the impact of the Forest Stewardship Program in the NA states.

Spatial accomplishment tracking is a fundamental requirement for a redesigned State & Private Forestry (S&PF) program, because it allows us to relate on-the-ground accomplishments to priorities identified in the State Forest Action Plans, as well as consistently report on the core set of S&PF performance measures. SMART was developed by the Timmons Group through a contract with the US Forest Service, working in association with state forestry agencies.

Asian Longhorned Beetle (ALB) *Anoplophora Glabripennis* Eradication Program (as of 12/14/2013)

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Asian longhorned beetle, *Anoplophora glabripennis*, (ALB) initial detections in the United States include Brooklyn, NY (August 1996), Chicago, IL (July 1998), Jersey City, NJ (October 2002), Worcester, MA (August 2008), and Bethel, OH, (June 2011). ALB has the potential to be one of the most destructive and costly invasive species to enter the United States. Some of the industries at risk include timber export, saw logs, fuel wood, nursery stock, lumber, maple syrup, and fall foliage tourism. ALB also has the potential to cause significant ecological and environmental impacts. The goal of the ALB program is to eradicate this pestiferous beetle in the United States to protect forest products industries, U.S. hardwood forests and park lands, and the quality of the urban environment. To achieve this goal, the ALB program has developed and implemented area-wide, science-based eradication protocols. The eradication strategy is based on a combination of tactics, including: 1) exclusion; 2) visual survey of host trees; 3) tree removal; 4) chemical treatment; 5) regulatory activities to prevent the pest's spread; 6) replanting to mitigate the effects of trees lost to ALB; 7) outreach efforts; 8) quality assurance to ensure survey, removals, and treatments are conducted correctly to maintain effectiveness; and 9) methods development to improve program efficacy and delivery. The program has declared eradications of infestations in Illinois (2008), Islip, NY (2011), New Jersey (2013), Manhattan and Staten Island, NY (2013). The program continues efforts to eradicate ALB in New York, Massachusetts and Ohio.

New Ways to Share Forest Research: The Hubbard Brook Research Foundation's education and policy programs make cutting-edge forest science relevant to schools, decision makers, and stakeholder groups

David Sleeper, Hubbard Brook Research Foundation

The Hubbard Brook Research Foundation is an education, policy, and support organization whose mission is to support the work of the Hubbard Brook Ecosystem Study and the USDA Forest Service's Hubbard Brook Experimental Forest in Woodstock, NH. HBRF's Environmental Literacy Program (ELP) comprises three key educational components: curriculum development, teacher-professional development, and long-term partnerships with local schools. Each ELP component relies on authentic, long-term data from Hubbard Brook, including measurements of atmospheric conditions and precipitation, soil and water biogeochemistry, hydrological conditions of streams, and long-term data from bird and other animal studies. A Research Experience with Teachers (RET) program pairs educators with scientist mentors, enabling teachers to perform their own forest research projects. HBRF's policy work is characterized by "boundary spanning" activities that put working scientists together with state and federal policymakers, public land managers, business leaders, NGO representatives, and citizen stakeholders including foresters, maple sugar makers, snowmobilers, ski area operators, hikers, and other recreational users of the Northern Forest. HBRF operates two key policy programs. Its Science Links Program brings teams of scientists together to focus on specific policy-relevant issues relating to larger issues such as acid rain, nitrogen pollution, mercury pollution, and carbon mitigation. HBRF's Hubbard Brook Roundtable Program convenes groups of scientists, land managers, and community stakeholders, in confidential settings, for deep dialogues about current environmental issues including winter climate change, forest carbon accounting, biomass energy, and monetization of ecosystem services. HBRF has also been instrumental in founding the Science Policy Exchange, a collaborative of six world-class research institutions and four associated National Science Foundation LTER sites all dedicated to increasing the impact of science on environmental policy, conservation, and natural resource management.

The Stewardship Network: New England is a new effort to connect, equip, and mobilize people and organizations to study and care for lands and water in their communities.

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Malin Clyde, Program Manager, The Stewardship Network: New England and UNH Cooperative Extension

Our goal is to:

- Connect more citizens to the outdoors through meaningful, well-organized land stewardship and environmental research volunteer projects
- Increase the capacity of partner organizations and agencies to work with volunteers
- Keep volunteers engaged and energized in stewardship and science work by designing fun, educational, and inspiring projects and trainings
- Increase the sense of community and stewardship around conservation lands across New England

We will do this by,

- Providing an online portal for linking citizen volunteers and conservation partners and as a clearinghouse for trainings, workdays, stewardship events, and other resources
- Training, developing, and supporting a vibrant group of conservation leaders—both volunteer and professional—as the foundation for local, collaborative land stewardship across our region
- Developing and supporting educational, hands-on trainings and workdays on a variety of topics for volunteers, landowners, and professional land managers
- Assisting with design and implementation of stewardship projects and regional initiatives that result in positive collective impact to communities and the environment

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Mapping forest structure and disturbance using fused radar and optical remote sensing

Nathan Torbick, Applied Geosolutions, LLC
Mark J. Ducey, University of New Hampshire
Peter Ingraham, Applied Geosolutions, LLC
William Salas, Applied Geosolutions, LLC

Disturbance from natural and anthropogenic processes is a frequent occurrence in northeastern forest ecosystems. Timely and accurate assessment of disturbance events is critical for land managers to respond effectively and appropriately. In addition, assessing the severity of disturbance is useful for broad-scale management and understanding impacts on ecosystem functioning. Fusion of satellite remote sensing tools such as Phased Array Synthetic Aperture Radar (PALSAR) and Landsat hold the potential to operationally identify disturbances and quantify impacts on vegetative structural attributes. We conducted a regional analysis supported by field measurements of forest structure, volume, biomass, and canopy attributes. Fused PALSAR and Landsat data provided reasonable predictions of traditional inventory variables such as volume and biomass, as well as canopy cover, but other crown structure variables remain challenging. Project results, including a regional wall-to-wall map of forest biomass, are being made available through a web interface. A key result is the development of a framework and process for a disturbance monitoring tool, which we hope to operationalize in concert with partners to support forest assessment and monitoring.

Climate-Smart Landowner Network: A program of the Manomet Center for Conservation Science

Eric Walberg, John Hagan and Si Balch all from the Manomet Center for Conservation Science with offices in Manomet, MA and Brunswick, ME

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1. The Climate-Smart Landowner Network is a new program under development at Manomet. It is now in the pilot phase and will soon be fully launched. Network members will be part of a voluntary, nationwide program to assist landowners in making their land measurable more resilient to climate change. The goal is to have 30 million acres within five years.
   - It is not a certification system.
   - It is an information sharing system to help CSLN members.

   In the face of the climate and weather uncertainty related to historically high CO2 levels, Manomet believes that it is prudent for landowners to take steps to make their forests and lands less vulnerable. It is also time to identify opportunities that will emerge.

2. Manomet staff provides information and advice that can help landowners prepare for climate change. This includes
   - Analytic service to review current and emerging climate data;
   - An "answer service" for questions you might have;
   - A catalog of lessons learned and actions taken by other network members;

3. To join the network an applicant must successfully complete a checklist reviewing current climate knowledge and interest in managing land for increased resiliency.
   - Copies of an abbreviated checklist will be provided for SAF members so they can see how it is setup and the type of information sought.

4. Education is key part of the program and to accomplish this Manomet has developed at Climate Science 101 presentation that is shared with all CSLN candidates.
   - The poster will include some of the key slides from the presentation.

Occurrence of White Pine Blister Rust on Cultivated Resistant and Immune Varieties of *Ribes* Species in New Hampshire and the Impact to Local White Pine Resources

Jen Weimer[1], Isabel A Munck[2], Kerik Cox[3], Sara Villani[3], Philippe Tanguay[4]

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White Pine Blister Rust (WPBR) caused by the fungus *Cronartium ribicola* was the most significant forest damage causing agent in New Hampshire for more than 60 years. Introduced to North America from Europe in the 1890s, thousands of foresters and laborers spent millions of hours destroying gooseberries and currant plants throughout NH from 1917 to 1986 to protect the white pine timber industry. This monumental effort was

designed to break the disease cycle and by the mid 1990s the occurrence of WPBR damage in the northeast was relatively rare. White pine is still the most economically important timber species in NH.

Requests by growers to plant *Ribes* species in NH became more abundant as resistant cultivars were being developed. As a result a permit was developed to allow the planting of select resistant and immune varieties in NH. The permit included information on the cultivar purchased and where it was being planted. In 2011 scientists in Connecticut documented the occurrence of *Cronartium* infected *Ribes nigrum* cv. *Titania*, one of the immune cultivars approved for planting in the NH. A preliminary survey in 2012 indicated the presence of rust disease on this and other varieties planted in NH. In 2013 an intensive survey of *Ribes* plantings was done to evaluate the breakdown in immunity and led to the removal of immune black currants from the varieties approved for planting in NH.

Introducing "StormWise", a Project Overview

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Dr. Mark Rudnicki, University of Connecticut, Storrs, CT
Dr. Jeffrey Ward**,** Connecticut Agricultural Experiment Station, Hamden, CT

"StormWise" is an innovative and multi-faceted forest management and public education initiative with the goal of reducing the risk of power outages and other damage caused by wind-related tree failure at the forest and power-infrastructure interface. Recent catastrophic storm events in Connecticut illustrate how daily lives can be disrupted by tree failure. A significant proportion of power outages during recent storms were caused by partial and whole-tree failure along wooded roadsides and distribution lines. Over-reaction in some localities can result in excessive tree trimming and removal leading to a loss of forest benefits and negative public reaction to tree pruning. Growing and maintaining storm-adapted trees and forests can increase the resilience of the power supply while maintaining public forest benefits. An examination of the many questions about how to reduce tree related power outages has resulted in **StormWise**, an innovative initiative combining traditional management of individual trees (arboriculture) with the science of managing forests (silviculture) at the forest/power-infrastructure interface. Supported by the local electric utilities and a grant from the US Forest Service, **StormWise** is a multi-partner, statewide initiative encompassing several distinct but integrated research and outreach efforts, including:

- Vegetation management strategies for growing stronger, more wind firm trees and tree communities, being led by the Connecticut Agricultural Experiment Station. (details on accompanying poster)
- Research on tree biomechanics and acclimation to wind.
- Vegetation analysis for validation of LiDAR data used in storm-damage risk modelling.
- Development of protocols for integrating arboricultural and silvicultural techniques.
- Guidance for incorporating **StormWise** recommendations into forest stewardship plans as appropriate.
- Information and curricula development for landowner education, community outreach and work-force training.
- Strategies for value recovery from local wood production and utilization.
- Examination of public official, landowner and forest practitioner reaction, recognition and adoption of **StormWise** principles and techniques