UNIVERSITY OF MINNESOTA
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Sustainable Forests Education Cooperative

2016 Forestry & Wildlife Research Review

A day-long symposium:
Tuesday January 12, 2016
8:45am – 3:45pm
Cloquet Forestry Center in Cloquet, MN

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Agenda

2016 Forestry and Wildlife Research Review

January 12, 2016 from 8:45am – 3:45pm, Cloquet Forestry Center

8:15am	Check-in opens	
8:45am	***Welcome and agenda review***	Eli Sagor, *UMN-SFEC*
9:00am	***Block 1: Silviculture*** - Influence of aggregated overstory retention on regeneration and biodiversity in aspen-dominated forests - Extrapolating 50 years of native plant community sampling to inform forest management planning - The Great Lakes Silviculture Library ⚡ - Thinning reduces vulnerability of red pine growth to drought - Building partnership and resolving conflict: Preliminary analysis of perspectives from USFS tribal relations program managers ⚡	 -Miranda Curzon, *UMN* -David Wilson, *UMN-FR* -Eli Sagor, *UMN-SFEC* -Brian Palik, *USFS-NRS* -Mike Dockry, *USFS-NRS*
10:15am	Break and poster session	
10:45am	***Block 2: Wildlife*** - Superior National Forest's Canada lynx DNA database *and* Summer bat survey, monitoring and research in Minnesota 2013-2015 ⚡ - Understanding the moose decline in northeastern Minnesota - Assessing moose browsing patterns - Recent Research on Minnesota Forest Birds	 -Tim Catton, *USFS – Superior NF* -Glenn DelGiudice, *MN DNR* -Christina Maley, *1854 Treaty Authority* -Jerry Niemi, *UMD-NRRI*
Noon	Lunch and poster session	
1:00pm	***Block 3: Other*** - Post-fire forest floor fire severity index relationships with forest floor and soil carbon, nitrogen & mercury pools ⚡ - Natural resource managers' perceptions of forest land parcelization trends, drivers, and impacts in the Lake States - Biomass dry-down: Fuel benefits and site impacts - Management implications for private forestland when there are multiple owners ⚡ - Identifying and preserving Heritage Forest Stands through tree-ring records	 -Randy Kolka, *USFS-NRS* -Mike Kilgore, *UMN-FR* -Brad Jones, *ICC* -Stephanie Snyder, *USFS-NRS* -Evan Larson, *UW-Platteville*
2:15pm	Break and poster session	
2:45pm	***Block 4: Insects & Invasives*** - Assessing the acarological risk of human exposure to tickborne pathogens in Minnesota - A new research center at the University of Minnesota on terrestrial invasive species - Dispersal capacity of late instar gypsy moth larvae (*Lymantria dispar*) and implications for wood products movement	 -Jenna Bjork, *MDH* -Rob Venette, *UMN* -Rachael Nicoll, *UMN*
3:45pm	Adjourn	

⚡ denotes a Lightning Talk -- visit the poster session to learn more.

Welcome and Overview

Welcome to SFEC's 12th Annual Forestry and Wildlife Research Review!

The Research Review is designed to offer rapid-fire overviews of a broad cross-section of active, current research relevant to Minnesota land managers. This year's topics run from bats to browse, lynx to land parcelization, ticks to terrestrial invasives, leave trees to *Lymantria*, biomass to the Boundary Waters and beyond. We've got a terrific group of speakers and hope you enjoy the program.

Five-minute "Lightning Talks" are designed for poster presenters to briefly discuss their work, enticing you to visit the poster session for the full story. We have taken your suggestions to disperse Lightning Talks throughout the day to allow more opportunities for follow-up during poster sessions. You'll find the posters and their presenters in the Stine Room.

As an educational cooperative, SFEC's job is to deliver programs to help you continually improve the quality of your land management activities. We take your input very seriously. Please use the confidential evaluation form to share your continuing education needs and to make suggestions for next year's Research Review or any other event.

Thank you for being here today. We hope you find this year's Research Review both fun and informative, and we hope to see you at other SFEC events this year.

-Eli Sagor and Julie Hendrickson

Block 1: Silviculture

Influence of aggregated overstory retention on regeneration and biodiversity in aspen-dominated forests

Miranda Curzon*; Anthony W. D'Amato, University of Vermont; Brian J. Palik, USFS Northern Research Station; and Christel C. Kern, USFS Northern Research Station

Variable-retention harvesting and the adaptation of conventional silvicultural systems to include reserved mature trees are increasingly being used to balance productivity objectives with biodiversity conservation. Using two operational-scale studies that include a total of seven sites dominated by quaking aspen, we investigated the influence of retained overstory aggregates (0.25 acres in size per guidelines developed by the Minnesota Forest Resources Council) on regeneration in surrounding areas 2 and 12 years post-harvest. Sites associated with each study were harvested during winter in 2010 and 2000, respectively, and sampling occurred in 2012. Initial (2 year) understory species composition and microenvironment conditions within aggregates were intermediate between intact forest and clearcuts as expected. Aggregates did not reduce initial regeneration densities of quaking aspen or other tree species in immediately surrounding harvested areas (within 16 ft) relative to open conditions. Observations from 12 years post-harvest also suggest aggregates had no negative impact on stem density or total woody biomass whereas intact forest reduced values for both variables up to a distance of 16 ft into harvests. Over all, our results suggest that small, 0.25 acre aggregates achieve some ecological objectives without negatively impacting regeneration.

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Extrapolating 50 years of native plant community sampling to inform forest management planning

David Wilson*; Alan Ek, UMN Dept. of Forest Resources

Interest has grown in the use of fundamental ecological information to guide the development and selection of management options for forested stands and landscapes. The desire to use detailed site description data, ecological classifications, and their inter-relationships in the planning process pre-supposes knowledge of the composition, distribution, and successional state of plant communities comprising the local and bio-regional ecosystems. Unfortunately, such knowledge is not currently available with the level of detail needed to make timely management decisions for harvest scheduling, wildlife habitat, biodiversity, and other values. However, this gap may be resolved by leveraging what we do know about native plant community (NPC) distribution with respect to relevant site characteristics.

The current research focuses on using the physical and biotic conditions defining growing space to systematically identify associations between NPCs and various site characteristics. This process employs techniques similar to those used in the MNDNR native plant sampling program, and is informed by 23,751 NPC observations collected between 1964 and 2013 by MNDNR, combined with forest inventory and additional physiographic data. Unique associations of herbaceous plants are thought to occur in conjunction with specific sets of trees on sites with similar soils, physiography, moisture, and disturbance regimes. It is the joint dependence of trees and herbaceous species on these abiotic factors, and on landscape-scale disturbance regimes, which enables the imputation process developed by the author to function. Methods employed include data mining, multiple correspondence analysis, and hierarchical clustering, as well as techniques developed by the author to identify likely associations.

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The Great Lakes Silviculture Library: Intelligent tinkering, shared

Eli Sagor*

Every silvicultural treatment is an experiment. But too often new insights from this informal research are lost to the larger community when land managers retire, move on, or simply lack a way to share their work.

We have created a new online resource designed to archive the results of innovative and interesting silviculture treatments from across the Lakes States. We invite land managers to contribute cases from their own work or the work of their predecessors, particularly when that work helps to answer questions relevant to other land managers. Published case studies need not include peer-reviewed, replicated research – simply well-documented everyday silviculture.

The Silviculture Library is a free web-based archive of real-world, actual silviculture treatments from Minnesota, Wisconsin, Michigan, and Ontario, contributed by land managers. Each case includes descriptive info about the site, silviculture objective, silviculture prescription, what actually happened during the treatment, and what was learned from it, along with photos. Some have supplemental reports, documents, and links. And, importantly, each case has the author's name and contact information to enable connections with others engaged in similar silviculture work. Published cases can be valuable resources for land managers considering silvicultural options.

The Library is at **http://silvlib.cfans.umn.edu/**

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Thinning reduces vulnerability of red pine growth to drought

Brian Palik*; Alessandra Bottero, University of Minnesota; Anthony D'Amato, University of Vermont; John Bradford, USGS; Shawn Fraver, University of Maine

Reducing tree densities through thinning has been advocated as a strategy for enhancing resistance and resilience of tree growth to drought, yet few empirical evaluations of this approach exist. We examined detailed dendrochronological data from two long-term (50 and 65 years) replicated thinning experiments to determine if density reductions conferred greater resistance and/or resilience to droughts, assessed by the magnitude of stand level growth reductions. Our results suggest that thinning generally enhanced drought resistance and resilience; however, this relationship varied somewhat with stand age. These results confirm the potential of density management to moderate drought impacts on growth, and they highlight the importance of accounting for stand structure when predicting climate-change impacts to forests.

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Building partnership and resolving conflict: Preliminary analysis of perspectives from USFS tribal relations program managers

Michael Dockry*; Sophia GuttermanΨ; and Mae Davenport, University of Minnesota

American Indian tribes have inherent rights to National Forest land and resources originating in treaties, the US constitution, and case law. This includes but is not limited to the use of USFS lands for hunting and gathering, spiritual and religious ceremonies, and access to sacred sites. These rights require government-to-government consultation between each tribe and the USFS to best assess and meet the needs and rights of tribes with regards to USFS managed lands. Along with government mandated consultation, the Forest Service seeks to create opportunities to work in collaboration and partnership with tribal nations to manage land. Despite best efforts to collaborate and communicate, the inherent intricacies of tribal-federal relationships and differences in land management practices can lead to conflict. To minimize conflicts and fulfill their legal responsibilities to tribes, the USFS builds long-term relationships with tribes and employs environmental conflict resolution to reach solutions. This poster uses qualitative research methods to analyze semi-structured interviews with USFS tribal liaisons throughout the Eastern Region to understand their perspectives on their jobs, USFS mandates, and strategies they use to build partnerships and resolve conflicts with American Indian tribes.

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Block 2: Wildlife

Superior National Forest's Canada lynx DNA database

Tim Catton*; Dan Ryan, Superior National Forest; Dave Grosshuesch, Superior National Forest; and Steve Loch, Private Researcher

Snow tracking and other methods used to obtain genetic samples have confirmed presence of Canada lynx (*Lynx canadensis*) across northeastern Minnesota since December 2000. In 2008 the Superior National Forest created, and continues to maintain, a database of genetically confirmed Canada lynx to document their occurrence, persistence and reproduction in Minnesota. The current database contains 1,306 samples that have been submitted to the USDA Forest Service Rocky Mountain Research Station's National Genomics Laboratory for Wildlife and Fish Conservation for DNA testing. Mitochondrial DNA analysis has identified 1,039 of them (79.6%) as lynx. Nuclear DNA analysis has determined 268 unique lynx genotypes, 129 female (47.9%), 138 male (51.3%) and 1 of undeterminable sex. Additionally, the database contains 42 samples that have been identified as F1 lynx-bobcat hybrids. There are 13 unique lynx-bobcat hybrid genotypes, 5 female and 8 male. Since 2011, 21 family groups have been identified producing 50 kittens that survived to the winter following their birth. Of the 236 individuals that were not originally detected as a result of a mortality, 51 (21.6%) are known to have persisted into a second year, the longest over a 6 year period, a female.

Summer bat survey, monitoring and research in Minnesota 2013-2015

Tim Catton*; USDA Forest Service-Chippewa and Superior NFs; Minnesota Dept. of Natural Resources; University of MN-Duluth Natural Resources Research Institute

Bat populations in the eastern United States have been decimated by white-nose syndrome (WNS), a disease caused by the fungus *Pseudogymnoascus destructans (Pd)* that leads to increased winter activity and extremely high mortality rates of hibernating bats. In April 2015, the U.S. Fish and Wildlife Service listed the northern long-eared bat (*Myotis septentrionalis*; MYSE or NLEB) as "threatened" under the federal Endangered Species Act due to the impact of WNS. Obtaining knowledge about northern long-eared bat summer habitat use and distribution before a population decline occurs in Minnesota will be critical information for conservation of the species in the state. Both mobile (driving) and passive (stationary) acoustic surveys have been conducted to help document species presence, distribution, population trends and responses to WNS. Acoustic surveys for bats have been conducted since 2005. Mist-netting and transmitter deployment began in 2013. To date we have captured 370 bats representing 6 of the 7 species of bat that occur in Minnesota. Forty-five transmitters have been deployed on *Myotid* bats (38 NLEBs, 7 little brown bats) and 114 roost structures have been identified. This work has led to the current state-wide research project "Endangered Bats, White-Nose Syndrome and Forest Habitat" which is funded by Minnesota's Environmental and Natural Resources Trust Fund into 2017.

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Understanding the moose decline in northeastern Minnesota

Glenn D. DelGiudice*; Michelle Carstensen, Wildlife Health Program, MN DNR; William J. Severud, Department of Fisheries, Wildlife, and Conservation Biology, UMN

According to the State's 2015 Moose Survey, the northeastern moose population continues to exhibit a consistent declining trend. The point estimate was 3,450 (2,610-4,770 95% CL), which is 61% lower than in 2006 (8,840 moose). Research since 2003 has shown that a low average annual adult survival rate of 80% (20% mortality rate) has had the greatest negative impact. A recent study of GPS-collared adult moose documented survival rates of 81%, 88%, and 91% from 2013 to 2015, respectively, with 39% of the mortality being wolf-related and 61% health-related. Our calf study is showing that significant decreasing calf production (57% since 2006) and annual recruitment also are depressing the population's growth rate. Wolf and black bear predation account for the greatest percentage of total calf mortality, 40% occurring by 30 days of age. Additionally, our winter physiological assessments of moose are showing that severe nutritional restriction is closely tracking the moose decline and the winter and winter-summer mortality rates of the GPS-collared moose. We are now investigating potential relationships of our winter nutritional restriction findings to forest disturbance and other aspects of habitat across the moose range landscape.

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Assessing moose browsing patterns

Christina Maley*

Moose foraging habitat is created by shearing, timber harvest, prescribed burns, windstorms and forest fires. We have measured a combined 229 moose habitat restoration sites in spring (winter browse) and fall (summer browse) since 2013. Browse use and availability were measured at each site. Data was collected on 13 common species eaten by moose in Minnesota. A typical site contained 7 of these 13 species. Aspen (27%), beaked hazel (22%), and paper birch (12%) were the most abundant species available. These species were browsed less than their availability, but they were browsed most heavily in absolute terms and are important forage species. Conversely, maple species, red-osier dogwood and mountain ash are less common, but were browsed at the highest percentages, 22.4%, 16.1%, and 14.5%, respectively.

Suggested forestry management strategies would include gains in regenerating birch, northern hardwoods, such as maple species, and upland brush species at heights less than 3 meters. Although not opposed to aspen regeneration as a management goal that provides timber benefits and moose forage, it is the aspen stands also rich in additional forage species that are most beneficial to moose. Silviculture treatments that achieve an uneven aged stand, greater than 80 acres, with a high species richness would ultimately be advised.

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Recent Research on Minnesota Forest Birds

Gerald 'Jerry' Niemi*; Alexis Grinde, Edmund Zlonis, Annie Bracey, and Josh Bednar, Natural Resources Research Institute, UMN-Duluth

Recently, Minnesota has seen a substantial reduction in logging activity. During this period we have been monitoring breeding bird populations for 74 bird species in two of Minnesota's national forests for 21 years (1995-2015). In these two national forests combined, 7 species have increasing trends while 9 have been decreasing. The majority of species have been stable but many have widely fluctuating populations. Most bird guild analyses have indicated significant increasing trends in each national forest and regionally, but bird species associated with early-successional habitats have not been increasing; a pattern consistent with reductions in harvest levels. The bird monitoring program provide a wealth of data over time to analyze forest-related questions of management interest to birds including the effects of habitat and climate change, interspecific interactions, and landscape influences. We present several examples of multiple effects on several bird species of concern in Minnesota forests such as the Golden-winged, Connecticut, and Canada Warbler.

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Block 3: Other

Post-fire forest floor fire severity index relationships with forest floor and soil carbon, nitrogen and mercury pools: Issues of scale

Randy Kolka*; Brian Sturtevant, USDA Forest Service Northern Research Station; Jessica Miesel, Michigan State University; Phil Townsend, University of Wisconsin; Peter Wolter, Iowa State University; Shawn Fraver, University of Maine; Tom DeSutter, North Dakota State University

Although we know fire leads to combustion of forest floor and mineral soil organic matter and losses of elements, little research has assessed how fire severity influences post-fire pools of those elements. If we can relate fire severity indices with changes in soil elemental pools, fire severity can be used as a surrogate to evaluate C, N and Hg emissions post fire. We used forest floor fire severity indices both aggregated at the plot scale and individual measurements at the subplot scale where soils were sampled, to assess our ability to predict elemental losses following the 2011 Pagami Creek Fire in northern Minnesota. We sampled forest floor and upper mineral soils soon after fire and again after one growing season. During the first sampling we compare fire severity indices and forest floor and mineral soil C, N, and Hg aggregated at the plot scale. During the second sampling we assessed fire severity and measured forest floor and mineral soil C, N, and Hg at the subplot scale. Our results indicate that aggregating at the plot scale does not differentiate among forest floor fire severity categories. Differences in element pools where only found between burned and unburned plots. However, assessing forest floor fire severity at the subplot scale and relating it directly to the forest floor and mineral soil samples taken at that scale explain much more variability in the relationship between forest floor fire severity and post fire element pools.

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Natural resource managers' perceptions of forest land parcelization trends, drivers, and impacts in the Lake States

Michael Kilgore*; Stephanie Snyder, USDA-Forest Service, Northern Research Station

Forest land parcelization is viewed as a potential threat to maintaining the productivity and viability of private forests throughout the United States. Natural resource professionals such as foresters and wildlife managers who work in predominantly forested landscapes have unique, field-based perspectives and insights on forest land parcelization (e.g., parcelization drivers, impacts, trends) that can be important to researchers and policy-makers. Additionally, those working for public resource management organizations can offer distinct perspectives on how private forest land parcelization activity is affecting or may affect the management, use, and protection of public forest lands. Using an internet-based survey, more than 250 field-based public natural resource managers in the Lake States provided information on their familiarity with parcelization, perceived parcelization trends in their work area, perspectives on important drivers of parcelization, potential outcomes associated with a parcelized landscape, parcelization impacts on public land management, and strategies for preventing or slowing the rate of parcelization. They also ranked four unique forest land ownership patterns according to their perceptions of how each ownership pattern impacts three forest resources: timber production, wildlife habitat, and forest recreation. Selected survey results highlighting natural resource manager perspectives on forest land parcelization trends, drivers, and impacts to private and public forests will be discussed.

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Biomass dry-down: Fuel benefits and site impacts

Brad Jones*

Over the past several years, European models for renewable fuel have drawn considerable attention. Sweden, Germany, Austria and Switzerland have made major commitments to become reliant on renewable fuel for the majority of their power and heating needs. For the past 30 years, these countries have been conducting research designed to refine techniques for integrating renewables into the mainstream. This project, funded by the US Department of Agriculture through the Fond du Lac Band of Lake Superior Chippewa, is designed to demonstrate European models for in woods drying of biomass fuels and utilize these fuels as a thermal energy source in modern pellet appliances. The project evaluates the financial and environmental impacts of in-woods drying and will use the results to evaluate tribal and state contracting practices, supply chain logistics and legal barriers, and make recommendations for optimizing value-chain efficiency in the state and region. This presentation will discuss the results of fuel drying and the impact on logging economics, as well as preliminary data on the site impact of long-term storage of woody biomass in the forest.

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Management implications for private forestland when there are multiple owners

Stephanie Snyder*; Mike Kilgore, University of Minnesota Dept. of Forest Resources

When a parcel of forestland is jointly held by multiple owners, is that a barrier to forest management? Previous research has found that when agricultural land is jointly held by multiple co-owners, such lands may often go unmanaged, be abandoned, partitioned, or forced into sale. Multi-person ownership of forested parcels may complicate the ability to undertake activities such as harvesting given that all owners must sign a contract as well as provide proof of ownership. Moreover, forested parcels with large numbers of owners may not qualify for loans or assistance programs due to potential difficulties in getting all owners to agree to the conditions of the program and/or in providing clear title to the land. While anecdotal evidence of such impacts has been offered in the literature, these findings have not been rigorously tested or demonstrated on a broad scale. We undertook a study utilizing a national dataset of information on private forest landowners, the National Woodland Owner Survey, which is administered by the FIA program of the US Forest Service. The NWOS data allowed us to examine whether forest management behaviors and intentions on private forest lands may differ with increasing numbers of owners. We also examined how forest land ownership structures and landowner decision-making networks are related to past practices and future intentions. Contrary to previous findings, our research suggests that having a greater number of owners need not necessarily reduce the likelihood of activities such as harvesting or wildlife habitat improvement.

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Identifying and preserving Heritage Forest Stands through tree-ring records: A case study of fire history and culturally-modified trees in the Boundary Waters Canoe Area Wilderness

Evan Larson*; Kurt F. Kipfmueller, University of Minnesota; Lane B. Johnson, University of Wisconsin-Platteville

We assessed the fire history, age structure, and cultural use of sites across the primary forests of the Boundary Waters Canoe Area Wilderness in order to better understand the role of people in the historical fire regimes of this landscape and how human activities of the past may persist in the forests of today. Our results include over 400 years of detailed fire history, forest inventory data for 31 stands, and the identification of 28 sites where culturally-modified trees provide direct evidence of past land use. Based on these data we propose the concept of Heritage Stands that could be targeted for restoration or special management consideration in order to actively manage culturally-influenced forest sites that embody the essence of wilderness. Our research highlights the value of natural areas as ecological baselines and how research from within wilderness can inform management beyond its borders. The methods we employed are applicable across all forest systems, and though past landuse may have reduced the existence of sites warranting heritage consideration, we present information on landscapes where such sites may still exist. Direct management implications from this work range from the documentation and mapping of these stands to the explicit tailoring of prescribed fire programs to incorporate the unique history of such sites in their management and the potential of active management within wilderness areas. Efforts to identify Heritage Stands throughout the forests of the Upper Midwest could help inform site-specific management activities while preserving the cultural and natural history of the region.

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Block 4: Insects & Invasives

Assessing the acarological risk of human exposure to tickborne pathogens in Minnesota

Jenna Bjork*; David Neitzel, Franny Dorr, and Elizabeth Schiffman, Minnesota Department of Health; Tammi Johnson and Rebecca Eisen, Centers for Disease Control and Prevention; Sonia Kjos, University of Minnesota, Duluth; and Jeanne Minnerath, Saint Mary's University of Minnesota.

Ixodes scapularis, the blacklegged (deer) tick, is the primary vector of several pathogens causing human disease in the United States. Over the last two decades, *I. scapularis*-borne diseases have increased in incidence as well as geographic distribution. Using existing data on blacklegged tick presence previously collected by the Minnesota Department of Health (MDH), the Centers for Disease Control and Prevention (CDC) created a tick distribution model that predicts areas that are ecologically conducive to the survival of *I. scapularis.* The major objectives of this study were to 1) develop an acarological risk model for Minnesota that can be used to identify areas of elevated abundance of host-seeking *I. scapularis* and areas of future expansion and 2) monitor *I. scapularis* populations from April through October at four geographically diverse regions of the state in an effort to better understand the phenology of tick life stages in Minnesota. In total, 80 acarology sites were randomly selected by the model based on suitable habitat and public land classification; these sites were sampled twice in June, during the anticipated peak questing period of blacklegged tick nymphs. An additional four phenology sites were chosen by the researchers to represent various regions of the state; these sites were sampled biweekly from April through November. For all sites, ticks were collected using a distance-based sampling method in which a white cotton cloth was dragged over the ground, covering a total area of 750 m^2 per site. Preliminary results indicate that 5,754 ticks were collected from 80 (95%) of 84 sites visited in 2015. Of all the ticks collected, 4,556 (79%) were identified as *I. scapularis* and at least one *I. scapularis* tick was collected from 73 (87%) of 84 sites. An average of 6.6 (median 3, range 0-77) nymphs were collected on transect per site visit. Data collection from each of the phenology sites indicated that the peak nymphal questing period occurred slightly later than expected in 2015, in late June and early July instead of mid-June. Therefore, while the numbers of nymphs found questing during our study represent a relative degree of risk between sites, absolute tick density is likely underestimated and subject to several limitations. Knowledge of suitable tick habitat, including currently established and potentially emerging areas, as well as tick phenology is important for guiding tickborne disease prevention strategies in Minnesota.

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A new research center at the University of Minnesota on terrestrial invasive species

Robert Venette*

The invasions of new insects, diseases, and plants into Minnesota continue to present difficult challenges to forest managers. The Minnesota Invasive Terrestrial Plants and Pests Center was recently established at the University of Minnesota to research new methods to prevent or minimize these threats to Minnesota forests, prairies, wetlands, and agriculture. Three initial projects focus on concerns in forestry. This brief presentation will introduce the Center, its initial priorities, and progress towards ranking the top 120 invasive species threats to Minnesota lands.

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Dispersal capacity of late instar gypsy moth larvae (*Lymantria dispar*) and implications for wood products movement

Rachael Nicoll*; Scott Myers, USDA APHIS-PPQ; and Brian Aukema, University of Minnesota

The gypsy moth (*Lymantria dispar*) is an invasive forest defoliator of over 300 tree and shrub species, most notably oak and aspen. Its range has expanded throughout the northeastern region of the United States and eastern Canadian provinces to Midwestern and Southeastern states primarily through human transportation. Egg masses, in particular, are readily conveyed on wood products. To mitigate spread via wood products, state and federal quarantine policies restrict movement of regulated articles such as logs and firewood. Wood movement mitigation measures include a 100-foot host vegetation-free buffer zone surrounding log decks to prevent infestation of logs and adjacent forest by crawling gypsy moth larvae. However, no studies exist which evaluate the long-distance dispersal of late instar gypsy moth larvae, the developmental stage with the greatest potential for movement across the ground. The dispersal of late instar larvae may reduce the effectiveness of gypsy moth containment policies as the location of pupation strongly influences the egg-laying site of the flightless female gypsy moth. In summer 2015, we released fourth, fifth, and sixth instar gypsy moth larvae daily for six days at a paper mill lumber yard and visually assessed their dispersal capacity over 12 hours with harmonic radar supplementation. Movement of 20 percent of the larvae surpassed the buffer zone width, and the greatest dispersal distance was 143.7 feet. These results demonstrate a need to evaluate the wood products movement restrictions of the gypsy moth quarantine as well as the effectiveness of alternative containment measures.

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And finally, without your registration and participation, the event would have been significantly less interesting. Thank you for joining us today.

-Eli Sagor and Julie Hendrickson

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