MFRC-Supported Research

Overview of Select Projects

MFRC has supported many research efforts related to sustainable forestry

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NRC Research Press
ARTICLE

Water table response to harvesting and simulated emerald ash borer mortality in black ash wetlands in Minnesota, USA

Robert A. Slesak, Christian F. Lenhart, Kenneth N. Brooks, Anthony W. D'Amato, and Brian J. Palik

Abstract: Black ash wetlands are seriously threatened because of the invasive emerald ash borer (EAB). Wetland hydrology is likely to be modified following ash mortality, but the magnitude of hydrological impact following loss via EAB and alternative mitigation harvests is not clear. Our objective was to assess the water table response to simulated EAB and harvesting to determine if management actions will be needed to maintain ecosystem functions following EAB infestation. We applied four replicated treatments to 1.6 ha plots as follows: (1) control, (2) girdling of all black ash trees to simulate loss via EAB mortality, (3) group selection harvests (20% of stand in 0.04 ha gaps), and (4) clear-cut harvest. Water table (WT) elevations were monitored for 1 year pre-treatment and two years post-treatment. Clear-cutting delayed WT drawdown in both years of the study, and the WT was significantly higher than the control treatment, predominantly when WT depth was below 30 cm. The effect of the group selection treatment on WT response was muted compared to clear-cutting and also limited to periods when the WT depth was below 30 cm. These responses were attributed to establishment of shallow-

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NRC Research Press
ARTICLE

Using lidar to assess impacts of forest harvest landings on vegetation height by harvest season and the potential for recovery over time

Robert A. Slesak and Tyler Kaebisch

Abstract: Tree regeneration and growth is generally reduced at forest harvest landing areas because of significant soil compaction, but it is commonly believed that harvesting in winter can reduce these impacts and that recovery occurs naturally with time. We used lidar data to assess differences in vegetation height between landing and general harvest areas across 79 sites in northern Minnesota, United States, that had been harvested in either summer/fall or winter and between 2 and 175 months since harvest. Vegetation height was significantly lower at landing areas compared with general harvest areas; however, there was no effect of harvest season on the difference ($p = 0.50$), indicating that impacts occur during all seasons. There was a significant ($p < 0.01$) positive relationship between the difference in vegetation height and time, regardless the harvest season, providing evidence that recovery occurs across a wide range of conditions within our time period of assessment. Sites with three landings

Contents lists available at ScienceDirect
Forest Ecology and Management
journal homepage: www.elsevier.com/locate/foreco
ELSEVIER

Changes in soil physical and chemical properties following organic matter removal and compaction: 20-year response of the aspen Lake-States Long Term Soil Productivity installations

Robert A. Slesak [a,*], Brian J. Palik [b], Anthony W. D'Amato [c], Valerie J. Kurth [d]

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[b] USDA Forest Service, Northern Research Station, Grand Rapids, MN 55744, USA
[c] University of Vermont, Rubenstein School of Environment and Natural Resources, Burlington, VT 05095, USA
[d] Flathead Conservation District, Kalispell, MT 59901, USA

Forest Ecology and Management 328 (2014) 342–352
Contents lists available at ScienceDirect
Forest Ecology and Management
journal homepage: www.elsevier.com/locate/foreco
ELSEVIER

Initial soil respiration response to biomass harvesting and green-tree retention in aspen-dominated forests of the Great Lakes region

Valerie J. Kurth [a,*], John B. Bradford [b], Robert A. Slesak [c], Anthony W. D'Amato [a]

[a] Department of Forest Resources, University of Minnesota, 1530 Cleveland Ave. N., St. Paul, MN 55108, USA
[b] US Geological Survey, Southwest Biological Science Center, Flagstaff, AZ 86001, USA
[c] Minnesota Forest Resources Council, 1530 Cleveland Ave. N., St. Paul, MN 55108, USA

ARTICLE INFO ABSTRACT

Forest, Range & Wildland Soils

Soil Temperature following Logging-Debris Manipulation and Aspen Regrowth in Minnesota: Implications for Sampling Depth and Alteration of Soil Processes

Robert A. Slesak*
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St. Paul, MN 55108

Soil temperature is a fundamental controller of processes influencing the transformation and flux of soil C and nutrients following forest harvest. Soil temperature response to harvesting is influenced by the amount of logging debris (biomass) removal that occurs, but the duration, magnitude, and depth of influence is unclear. Logging debris manipulations (none, moderate, and heavy amounts) were applied following clearcut harvesting at four aspen-dominated (*Populus tremuloides* Michx.) sites in northeastern Minnesota, and temperature was measured at 10-, 30-, and 50-cm depths for two growing seasons. Across sites, soil temperature was significantly greater at all sample depths relative to uncut forest in some periods of each year, but the increase was reduced with increasing logging-debris retention. When logging debris was removed compared to when it was retained in the first growing season, mean growing season soil temperatures were 0.9, 1.0, and 0.8°C greater at 10-, 30-, and 50-cm depths, respectively. These patterns were also observed

The support continues

New / ongoing work:

- Historic forest disturbance patterns
- Leave tree effectiveness
- Erosion control effectiveness and risk factors
- Effects of climate on soil operability
- Jack pine survival and growth
- Wildlife dependent on black ash wetlands
- Impacts of EAB on soil and water

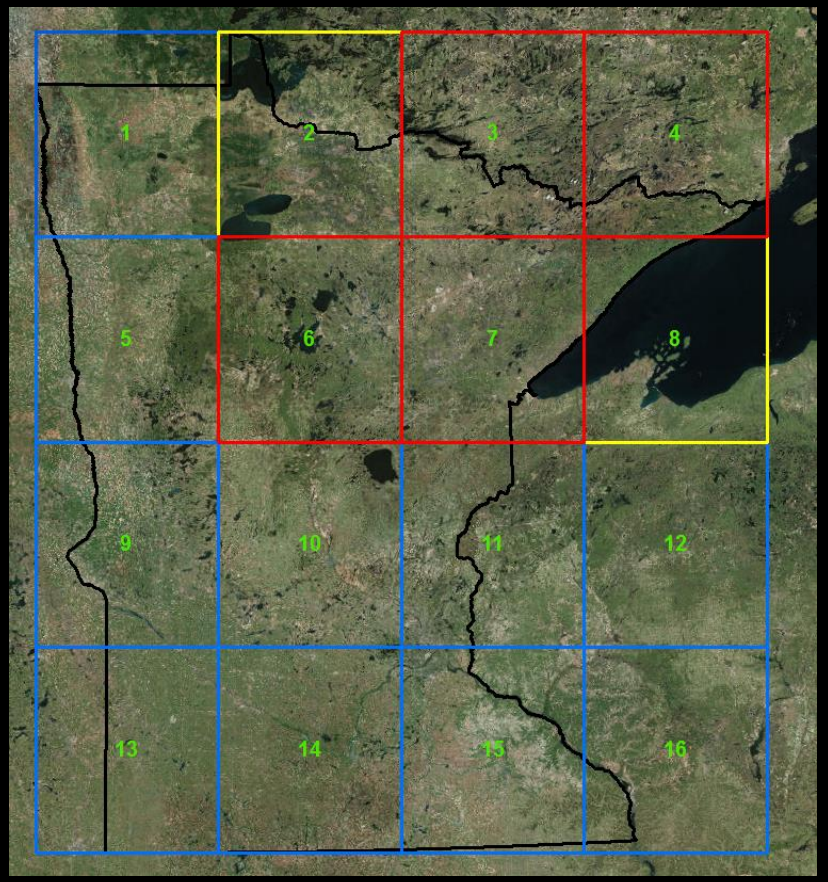
Forest disturbance

Objective: map historic forest disturbance

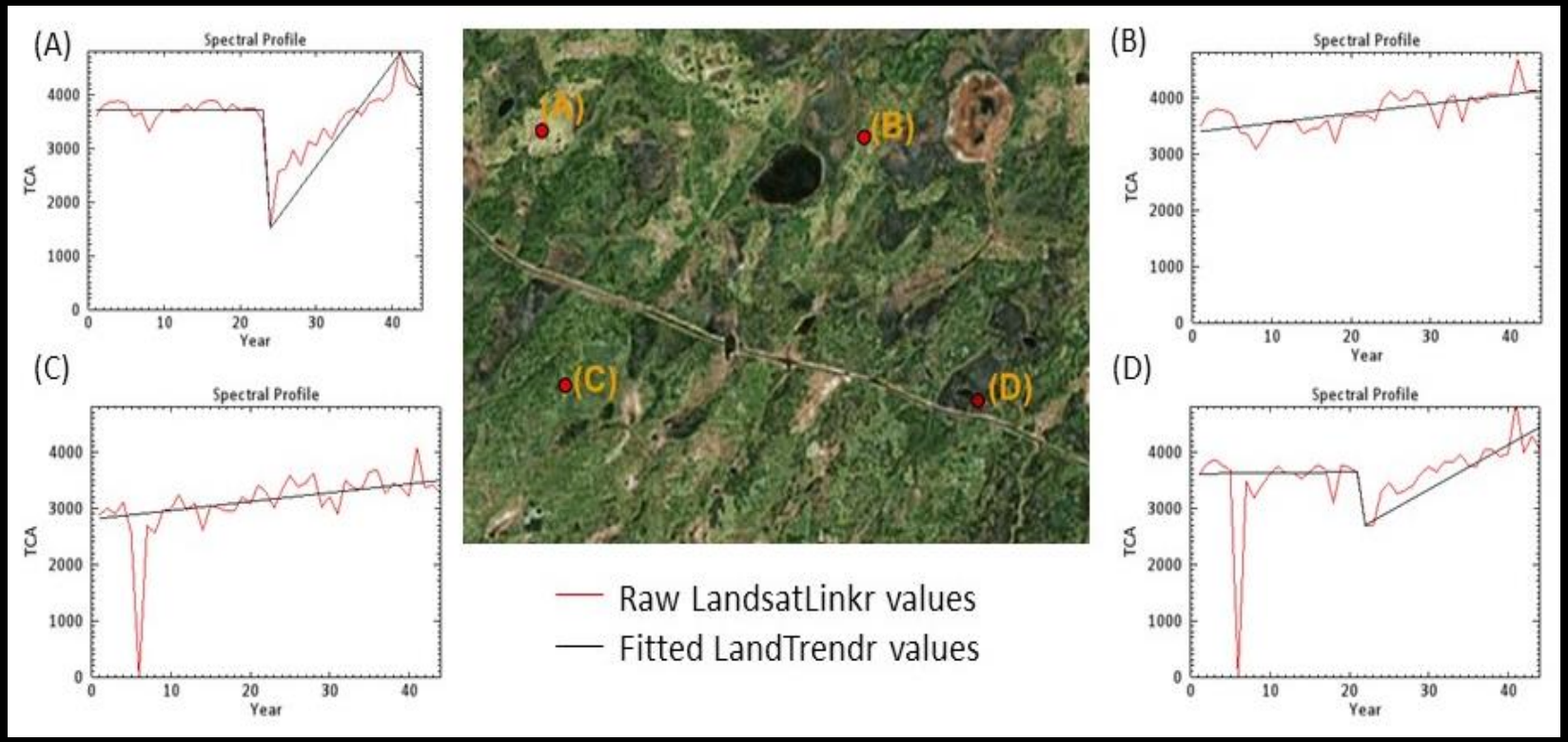
- Team: Mike Falkowski, Jody Vogeler, R. Slesak
- Funds: LCCMR, MFRC, DNR
- Duration: 2015-2018

Approach:

- Time series stacks of archived Landsat imagery
- Time period = 1972-current
- Utilize LandTrendr for analysis / interpretation

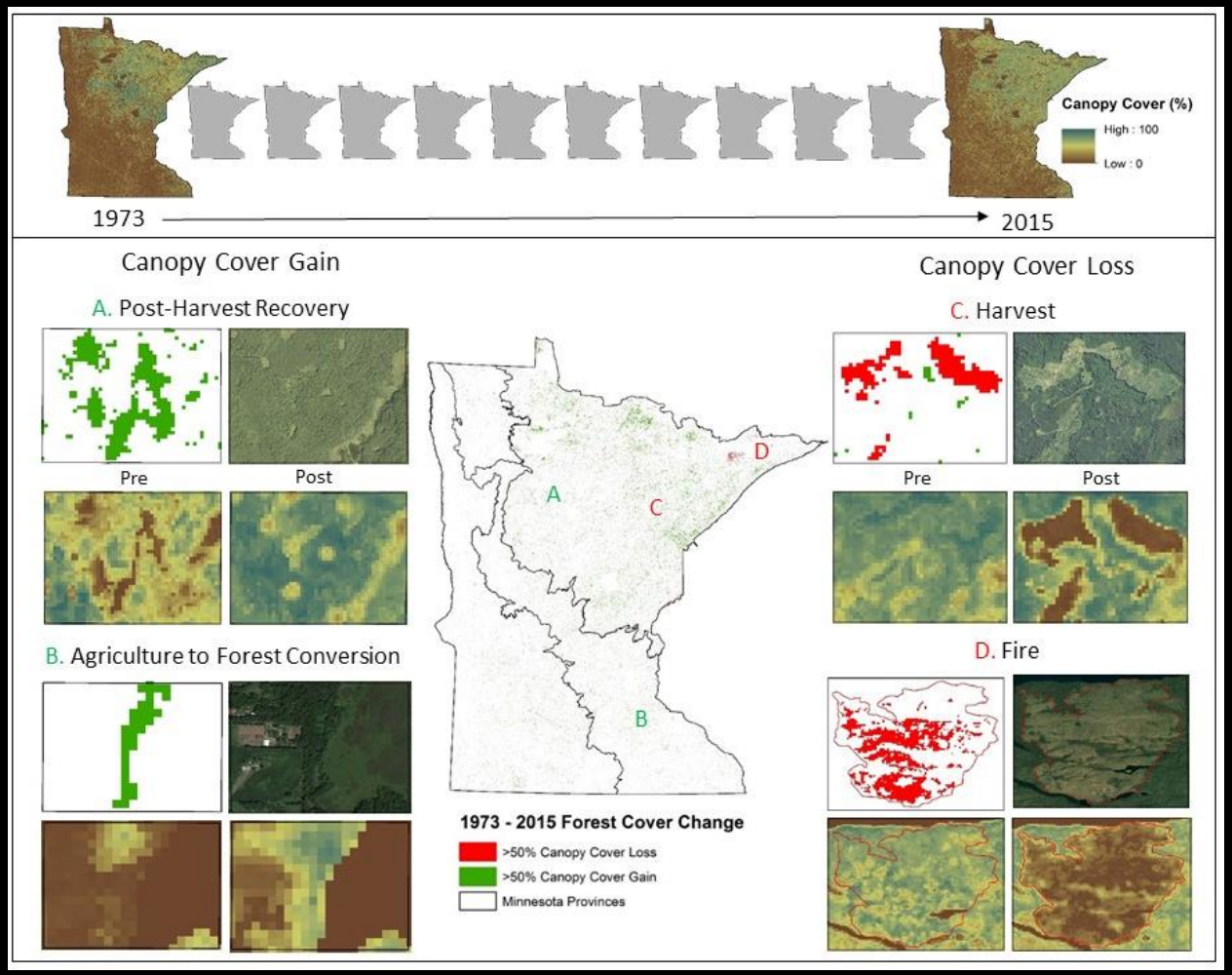


Identifying forest disturbance



- Temporal trends help to classify disturbance type
- A= clearcut, B and C = no disturbance, D= thinning

Classifying Forest Disturbance



Canopy ~ forested

Generally patterns of canopy gain

"Gain" =
Harvest recovery
Afforestation

"Loss" =
Harvest
Fire

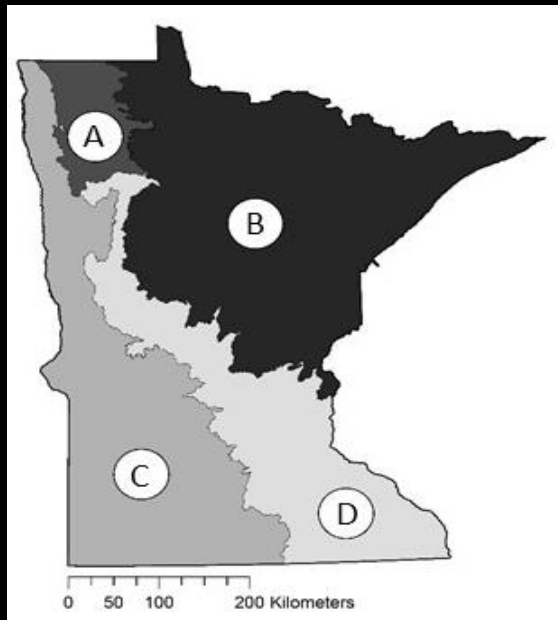
Vogeler et al., in review

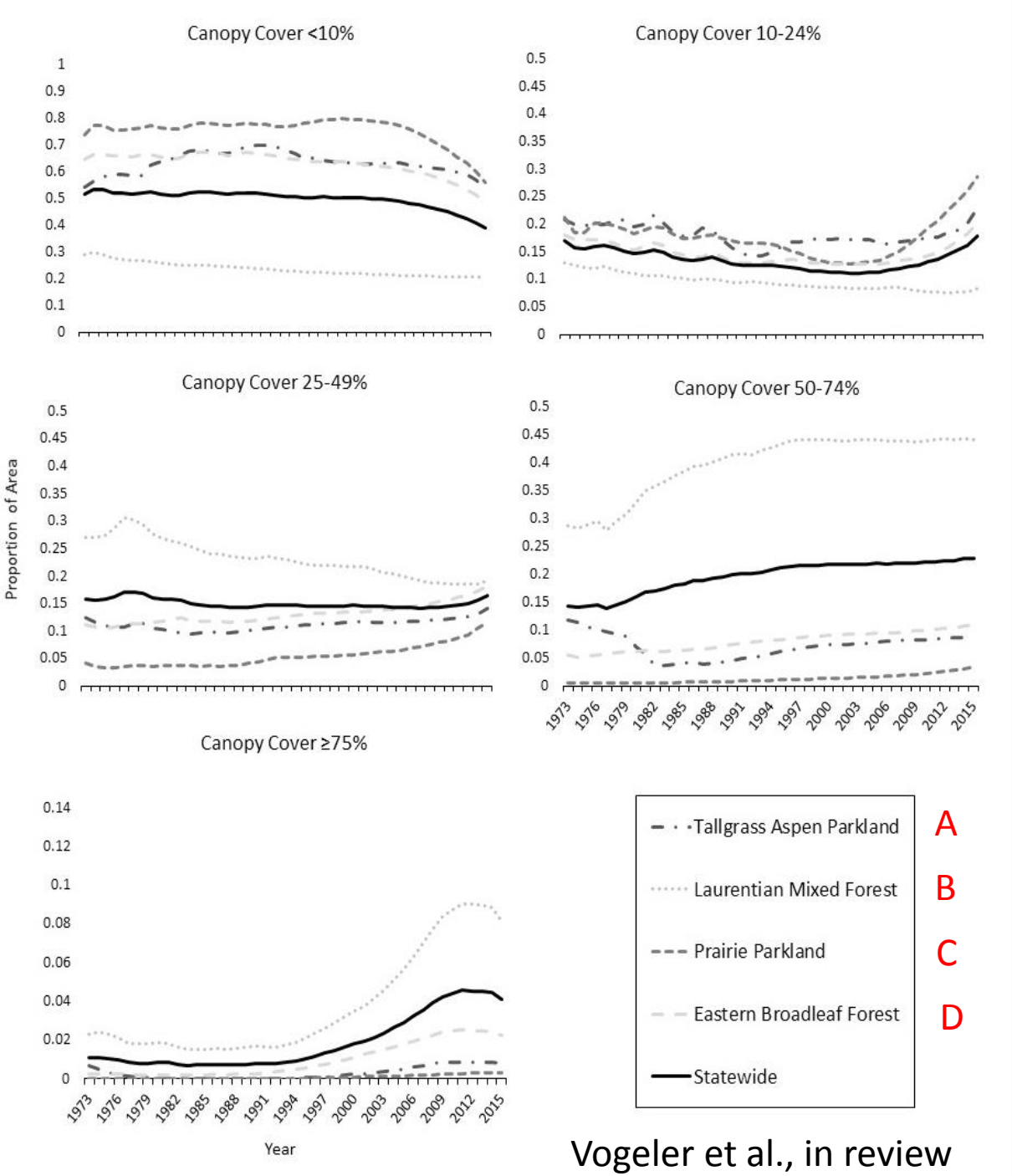
Forest Cover 1973-2015

Low cover decreasing

High cover increasing

Laurentian province has greatest gains



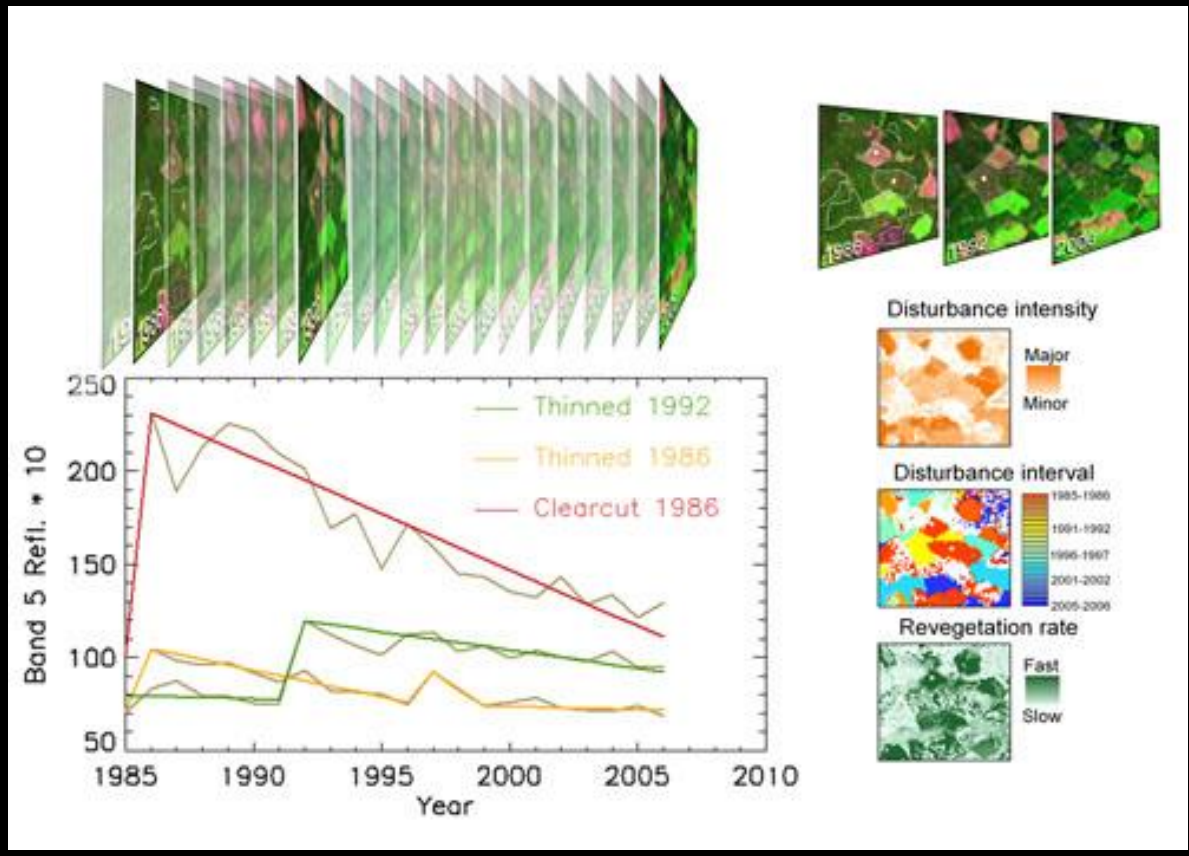


Vogeler et al., in review

Forest Disturbance – Application

Potential applications of the dataset are large

- Age / covertype mapping
- Wildlife population modeling
- Forest health applications
- Land use change (e.g., net forest loss / gain)
- Many, many more



Leave tree effectiveness

- Collaboration with NRRI (A. Grinde, J. Niemi)
- Funded by LCCMR / MFRC
- Utilize previously monitored sites
- Utilize D'Amato biomass study
- Inference at aspen cover, statewide

Products

Leave tree effects on wildlife (birds, small mammals, amphibians) over time

Refined recommendations for configurations

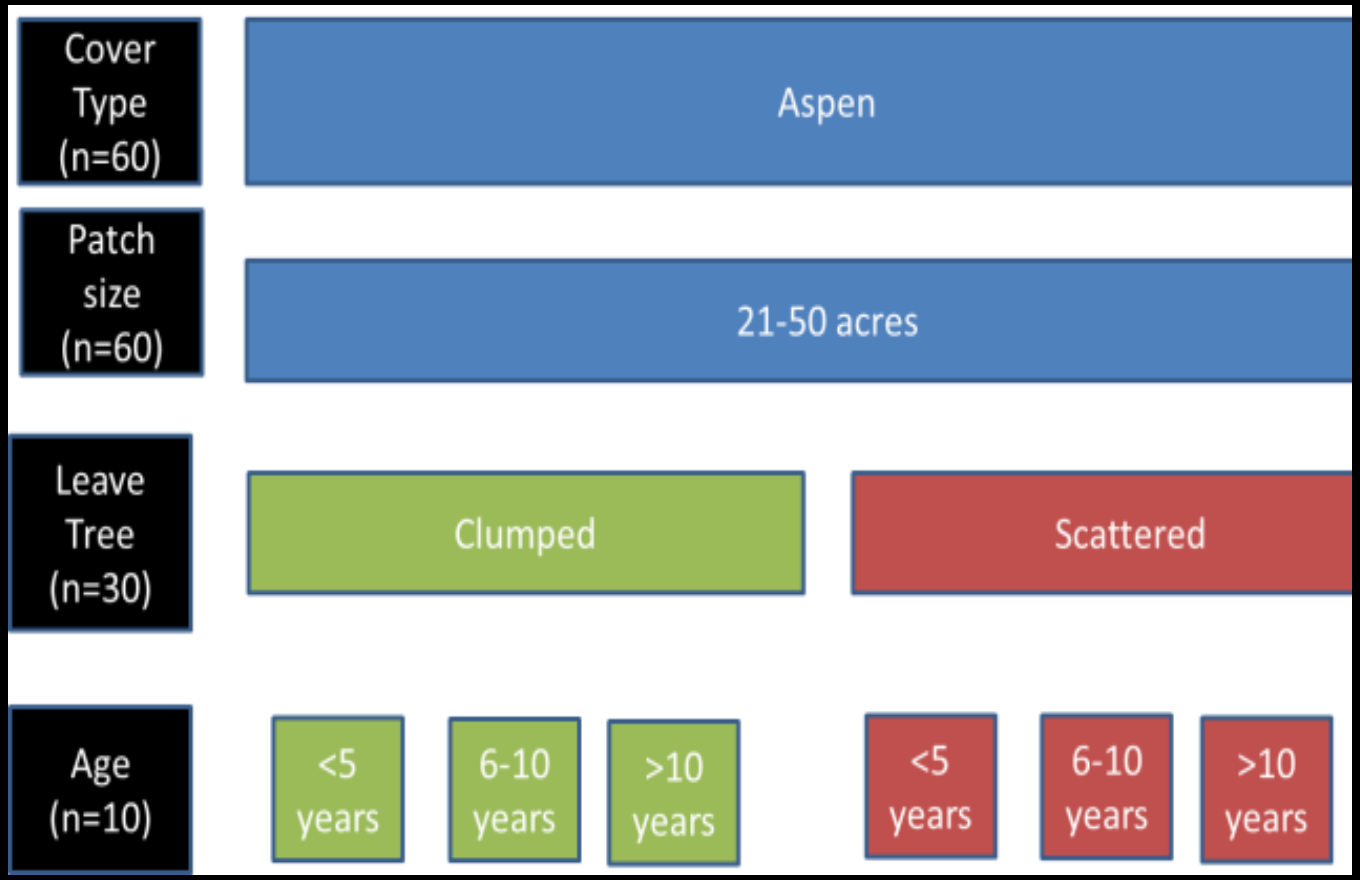
Leave tree – Design 1

Observational comparisons

60 sites total

Contrast clumps and scattered

0 to ~15 years post harvest



Leave tree – Design 2

Experimental comparisons at 4 sites
(D'Amato biomass study)

Established winter 2009

Scattered vs. clumps vs. none

Work and timeline

Project period 2016-2019

- Sites selected and initially being sampled
- Resampled in 2018

Measurements

- Variety of survey techniques (cameras, audio recorders, point counts, etc)
- Vegetation / woody debris
- Forest structure with Lidar

Point cloud profile from Lidar

Outcomes

- Evaluation of effectiveness
- Recommendations for configurations

Erosion Control

- Collaboration with UMN (D. Karwan)
- Funded by MFRC and UMN
- Utilize archived monitoring data on when erosion was observed
- Inference at site scale with statewide application

Products

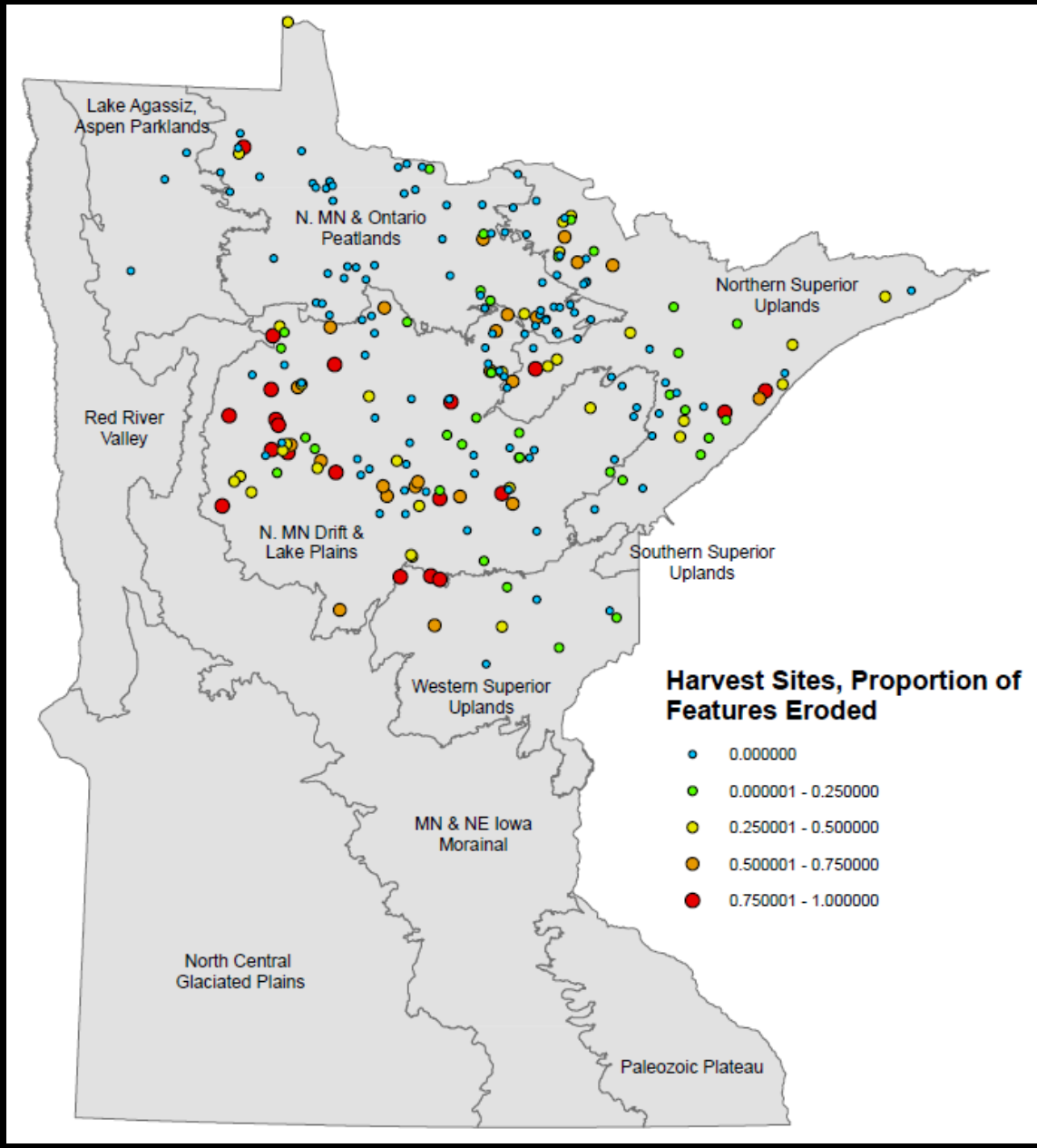
- Determine factors controlling when erosion occurs
- Development of a risk model for site-scale application
- Evaluate utility of existing guidelines

Statewide patterns

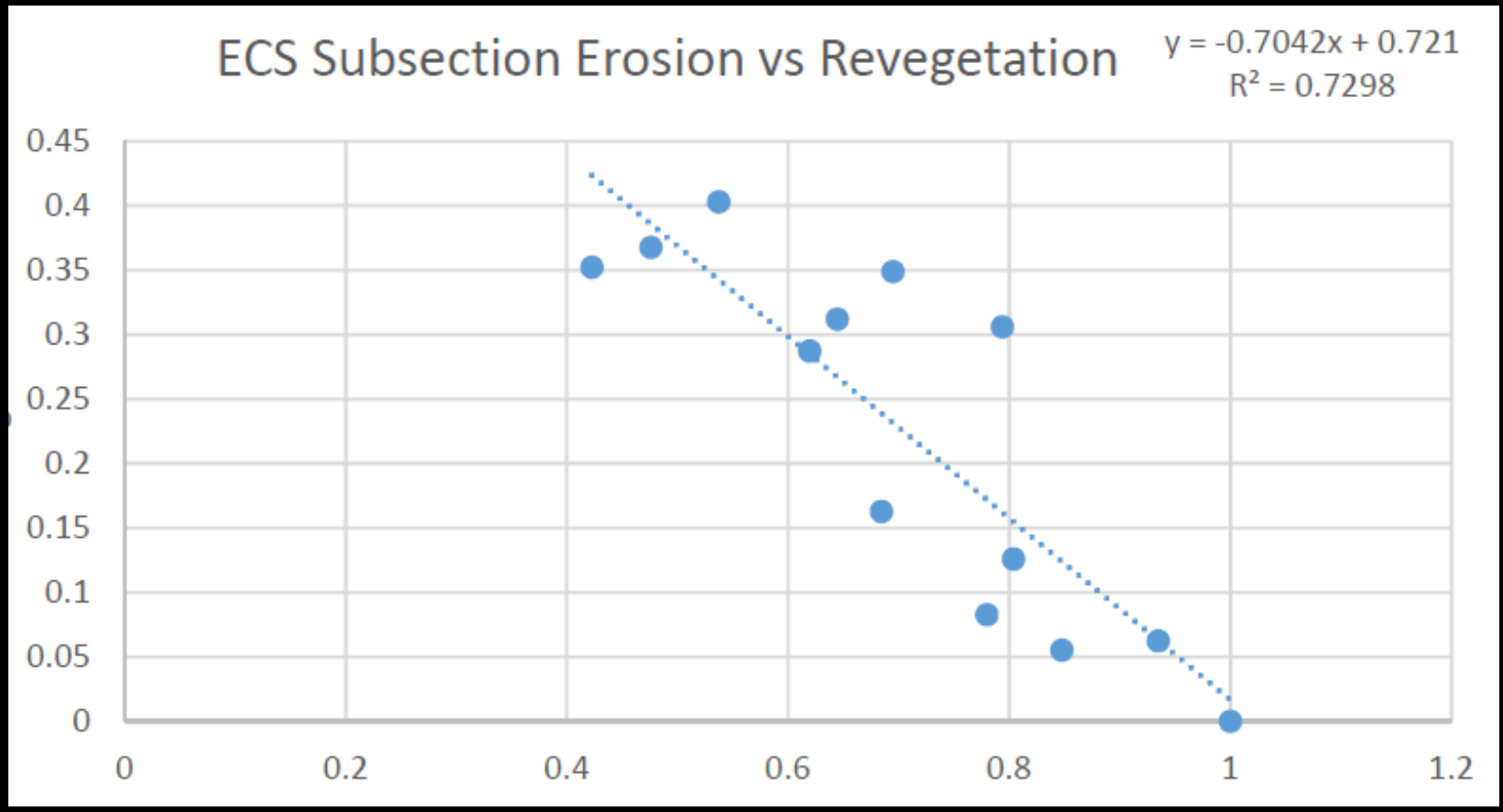
Monitoring data from 2000-2016

Many sites with no erosion occurring

High proportion of features eroding in central MN



Key factor = vegetation



Next work / outcomes

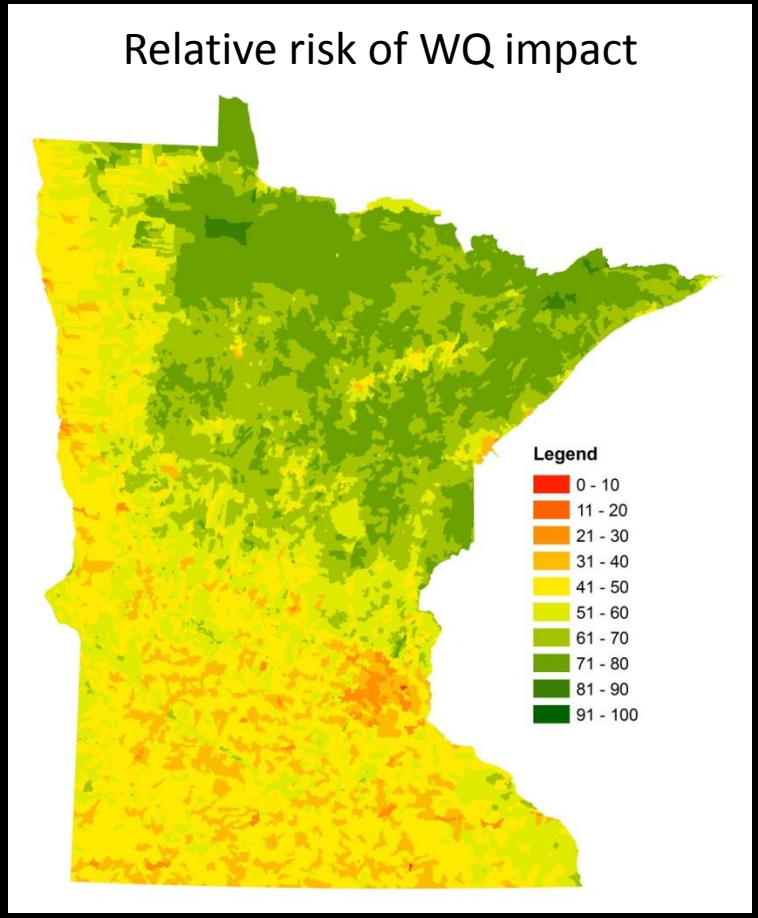
Project period from 2016-2018 (initially)

Objective 1: Factors influencing erosion / statewide patterns

Objective 2: Decision support tool

- Build on J. Corcoran's work
- Incorporate weather patterns
- Incorporate vegetation establishment

Potential for more products (e.g., review paper of Lake States erosion factors)



EAB / black ash

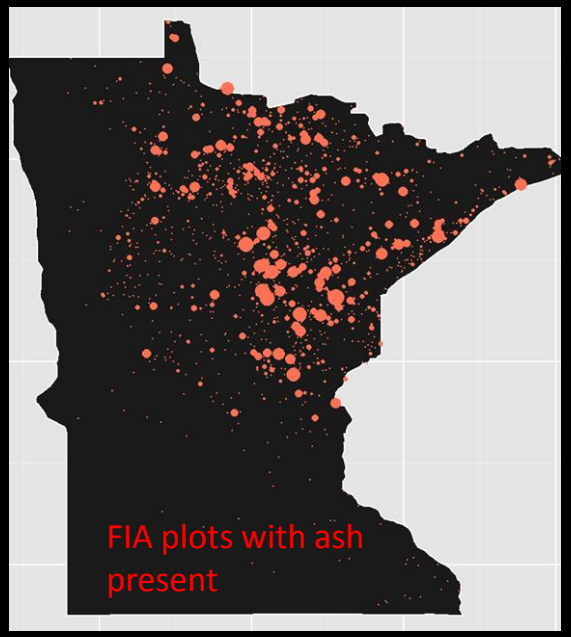
Overriding objective: keep the forested wetlands forested

Alternative strategies: do nothing, manipulate stand composition

What are the impacts?

Are there certain site conditions most susceptible?

Key product = management guidelines



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Water table response to harvesting and simula
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elevations were monitored for 1 year pre-treatment and two years post-treatment. Cl
both years of the study, and the WT was significantly higher than the control treatm

Wetlands
DOI 10.1007/s13157-017-0908-2

REVIEW ARTICLE

Potential Effects of Foundation Species Loss on Wetland Communities: A Case Study of Black Ash Wetlands Threatened by Emerald Ash Borer

Melissa B. Youngquist[1,2] · Sue L. Eggert[2] ·
Anthony W. D'Amato[3] · Brian J. Palik[2] · Robert A. Slesak[1,4]

Contents lists available a

Forest Ecology and

journal homepage: www.elsev

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Research Press

Overstory treatment and planting season affect survival of replacement tree species in emerald ash borer threatened *Fraxinus nigra* forests in Minnesota, USA

Christopher E. Looney, Anthony W. D'Amato, Brian J. Palik, and Robert A. Slesak

The response of *Fraxinus nigra* forest ground-layer vegetation to emulated emerald ash borer mortality and northern Minnesota, USA

Christopher E. Looney [a,*], Anthony W. D'Amato [b], Brian
[a] University of Minnesota, Department of Forest Resources, St. Paul, MN 55108, USA
[b] University of Vermont, Rubenstein School of Environment and Natural Resources, Burlingt
[c] USDA Forest Service, Northern Research Station, Grand Rapids, MN 55744, USA
[d] Minnesota Forest Resources Council, St. Paul, MN 51088, USA

Sap flow of black ash in wetland forests of nortl
Hydrologic implications of tree mortality due to

Andrew C. Telander [a,1], Robert A. Slesak [a,b,*], Anthony W. D'A
Kenneth N. Brooks [a], Christian F. Lenhart [d]
[a] University of Minnesota, Department of Forest Resources, St. Paul, MN 55108, United States
[b] Minnesota Forest Resources Council, St. Paul, MN 55108, United States
[c] Northern Research Station, USDA Forest Service, Grand Rapids, MN 55744, United States
[d] University of Minnesota, Department of Bioproducts and Biosystems Engineering, St. Paul, MN 55108, U

REVIEW ARTICLE

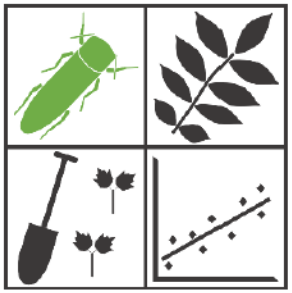
J. For. ●(●):000–000
http://dx.doi.org/10.5849/jof.2016-034R1

forest ecology

The Precarious State of a Cultural Keystone Species: Tribal and Biological Assessments of the Role and Future of Black Ash

Kara K.L. Costanza, William H. Livingston, Daniel M. Kashian,
Robert A. Slesak, Jacques C. Tardif, Jeffrey P. Dech,
Allaire K. Diamond, John J. Daigle, Darren J. Ranco,
Jennifer S. Neptune, Les Benedict, Shawn R. Fraver,
Michael Reinikainen, and Nathan W. Siegert

See you in Duluth!



Science and Management of Ash Forests after Emerald Ash Borer

A workshop on the future of post-EAB ash forests

The workshop will consist of field tours, presentations, posters, and opportunities to network with other affected managers, land owners, and researchers. Topics will include silviculture, hydrology, species transition, biogeochemistry, and more!

When: July 25-27, 2017

Where: Duluth, MN

Registration: Opens January 1, 2017

Abstract Deadline: February 28, 2017

More Info: ashworkshop.org

Organizers:

Nam Jin Noh (nnoh@mtu.edu), Nicholas Bolton, Randall Kolka, Thomas Pypker, Joseph Shannon, Joseph Wagenbrenner, Anthony D'Amato, Brian Palik, Robert Slesak, Shon Schooler, Shannon Kesner, Christian Nelson, Stacey Cotey