Toward Healthy Forests: Leadership, Vision, and Action

NORTH AMERICAN FOREST INSECT WORK CONFERENCE

May 31 – June 3, 2016 ☆ Washington, D.C.

www.cpe.vt.edu/nafiwc16/
2016 North American Forest Insect Work Conference Organizers

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Nadir Erbilgin – University of Alberta, Edmonton, AB
Stephen Cook – University of Idaho, Moscow, ID
Don Duerr – USDA Forest Service, Atlanta, GA

Posters:
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Darren Blackford – USDA Forest Service, Ogden, UT

Student Poster Competition:
Holly Wantuch – Virginia Tech, Blacksburg, VA

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Bag Insert and Other

Student Poster Reception

THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES
# North American Forest Insect Work Conference Program Overview

## Tuesday, May 31

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<td><strong>Registration and Poster Set-up</strong> (Registration B and Marriott foyer)</td>
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<td>2:00 – 4:00</td>
<td><strong>Forest Health Task Force</strong> (Harding)</td>
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<td>4:00 – 5:00</td>
<td><strong>SFIWC Business Meeting</strong> (Harding)</td>
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<td><strong>WFIWC Business Meeting</strong> (Hoover)</td>
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*Pre-Meeting field trips Tuesday afternoon*

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<th>Time</th>
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<tr>
<td>6:00 – 7:30</td>
<td><strong>Opening Reception</strong> (Wardman East Lawn</td>
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## Wednesday, June 1

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<tr>
<th>Time</th>
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<tr>
<td>7:00 – 12:00</td>
<td><strong>Registration</strong> (Registration B)</td>
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<td>8:00 – 12:00</td>
<td><strong>Poster Set-up</strong> (Marriott Foyer)</td>
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<td>8:15 – 8:30</td>
<td><strong>Welcome Remarks</strong></td>
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<td>8:30 - 10:00</td>
<td><strong>Plenary Session 1</strong> (Thurgood Marshall Northeast)</td>
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|              | 1. Speaker: Jim Hubbard, Deputy Chief, State and Private Forestry, USDA Forest Service  
|              | National Perspectives on Our State and Private Forests   |
|              | 2. Speaker: Monica Lear, Director, Forest Health Protection, USDA Forest Service  
|              | Forest Health Challenges and Approaches                    |
|              | 3. Speaker: Carlton Owen, US Endowment for Forestry and Communities  
|              | Toward Healthy Forests: The Role of Modern Biotechnology |
| 10:00      | **Break** (Marriott Foyer)                                 |
| 10:30 – 12:00 | **Concurrent Session 1** DAVEY                             |
|              | A. Rediscovering Our Urban Forests – Lynne Rieske-Kinney (Hoover)  
|              | sponsored by Davey Tree                                     |
|              | B. Testing an Early Intervention Strategy to Suppress a Spruce Budworm Outbreak.  
|              | David A. MacLean (Coolidge)                                 |
|              | C. Technological Advances in Monitoring Forest Health – Frank Sapio (Thurgood Marshall Northeast)  
|              | D. Open Session 1 – Iral Ragenovich (Harding)               |
| 12:00 – 1:30 | **Lunch** (on own)                                        |
| 1:30 – 3:00 | **Concurrent Session 2**                                  |
|              | A. Responses of Arthropods to Composition of Urban Landscapes – Kamal J.K. Gandhi  
|              | and Dayton Wilde (Hoover)                                   |
|              | B. Douglas-fir Tussock Moth in Western North America: Outbreak Trends, Current Issues,  
|              | and Future Directions in Monitoring, Management, and Resource Protection – Robbie W. Flowers  
|              | and Andrew D. Graves (Coolidge)                             |
|              | C. Landscape Session: Regional Characterization of Forest Susceptibility to Insect Outbreaks and  
|              | their Impacts - J.T. Vogt and Randy Morin (Thurgood Marshall Northeast)  
|              | D. Off-the-shelf Kits for Saving the World’s Forests. Available Now! – Jiri Hulcr and  
|              | Caroline Storer (Harding)                                   |
| 3:00 – 3:30 | **Break** (Marriott Foyer)                                 |
Wednesday, June 1 – continued

3:30 - 5:00 Concurrent Session 3
A. Characterizing Above and Below Ground Changes in Forests Aftermath of Insect Outbreaks – Nadir Erbilgin (Hoover)
B. Sirex and Its Complicated Food Web – Laurel Haavik, Ann Hajek, Jessica Hartshorn, and Fred Stephen (Coolidge)
C. Forest Entomology in a Landscape Context – Robert N. Coulson and Patrick C. Tobin (Thurgood Marshall Northeast)
D. Relevance of Our Forested Lands to the Maintenance of Pollinators and Pollination Ecology in North America – Rob Progar and Justin Runyon (Harding)

5:00 – 6:30 Poster Session and Student Poster Competition – Judging and students at their posters

Mixer Sponsored by Michigan State University and The Ohio State University (Marriott Foyer)

6:30 Adjourn

Wednesday Evening Field trips
Camden Yards (Orioles/Red Sox)
RFK Stadium (DC United vs Seattle Sounders)

Thursday, June 2

8:30 – 10:00 Plenary Session 2 (Thurgood Marshall Northeast)
1. Speaker: Gwen Pearson, Purdue University
   Facts are Not Enough: Stories and Emotion in Science Communication
2. Speaker: Doug Crandall, Legislative Affairs, USDA Forest Service
   Congress and the Forest Service.
3. Keynote: Tom Tidwell, Chief, USDA Forest Service
   Forest Health – Challenges, Restoration, Partnerships and Collaboration.

10:00 – 10:30 Break (Marriott Foyer)

10:30 – 12:00 Concurrent Session 4
B. Bark Beetles and Forest Management: Are Prevention and Suppression Programs Effective? – Steve Clarke, John Nowak and Chris Fettig (Hoover)
C. The Changing Face of Biological Control in Forest Ecosystems – Sandy Smith, Krista Ryall (Coolidge)
D. Getting to the First Step in Forest Restoration - Cone and Seed Insects of North American Conifers – Carl Jorgensen (Harding)

12:00 - 1:30 Lunch (on own)

1:30 - 3:00 Concurrent Session 5
A. Women in Forest Entomology – Jessica Hartshorn (Wilson A/B)
B. Managing for Forest Health and Resilience – Steve Clarke, John Nowak and Chris Fettig (Hoover)
C. Forest Health Extension in North America: Challenges and Opportunities – David Coyle (Coolidge)
D. Potentials for Restoration After Invasions by Exotic Forest Pests: East – Fred Hain (Harding)

3:00 – 3:30 Break (Marriott Foyer)
### Thursday, June 2 – continued

<table>
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<th>Time</th>
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| 3:30 - 5:00 | **Concurrent Session 6**  
A. Open Session 2 – Molly Darr (Wilson A/B)  
B. Applied MPB Ecology During Severe Outbreaks in High Elevation Pine Systems – Joel Egan and Polly Buotte (Hoover)  
C. History of Forest Entomology in North America – Beth Willhite (Coolidge)  
D. Potentials for Restoration After Invasions by Exotic Forest Pests: West – Steve Cook (Harding) |
| 5:00   | Adjourn                                                                 |
| 6:30   | **Banquet** – Rob Nelson, Untamed Science (Thurgood Marshall Northeast) |

### Friday, June 3

<table>
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<th>Time</th>
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<tr>
<td>8:30 - 9:00</td>
<td><strong>Business Meeting and Awards</strong> (Thurgood Marshall Northeast)</td>
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| 9:00 – 10:30 | **Concurrent Session 7**  
A. Invasions by Non-Native Forest Insects and Diseases: Efficient Solutions 1 – Kirsten Prior, Sandy Liebhold, Jiri Hulcr (Thurgood Marshall Northeast)  
B. Open Session 3 – Elizabeth Graham (Hoover)  
C. Assessing the Impact of Populations of Bark Beetles and Woodborers with Expanding Ranges in North America 1 – Tom W. Coleman and Steven J. Seybold (Coolidge)  
D. Arthropogenic Effects: Tree-mediated Interactions Among Forest Insects – Jonathan Cale and Jennifer Klutsch (Harding) |
| 10:30 – 11:00 | Break (Marriott Foyer) |
| 11:00 – 12:30 | **Concurrent Session 8**  
A. Invasions by Non-Native Forest Insects and Diseases: Efficient Solutions 2 – Kirsten Prior, Sandy Liebhold, Jiri Hulcr (Thurgood Marshall Northeast)  
B. Factors Influencing Forest Insects at Range Margins – Barbara Bentz and Brian Aukema (Hoover)  
C. Assessing the Impact of Populations of Bark Beetles and Woodborers with Expanding Ranges in North America 2 – Tom W. Coleman and Steven J. Seybold (Coolidge)  
| 12:30   | Adjourn                                                                 |
North American Forest Insect Work Conference Full Program

Wednesday, June 1

8:15 – 8:30 Welcome Remarks

8:30 – 10:00 Plenary Session 1 (Thurgood Marshall Northeast)

1. Speaker: Jim Hubbard, Deputy Chief, State and Private Forestry, USDA Forest Service
   National Perspectives on Our State and Private Forests.

2. Speaker: Monica Lear, Director, Forest Health Protection, USDA Forest Service
   Forest Health Challenges and Approaches.

3. Speaker: Carlton Owen, US Endowment for Forestry and Communities
   Toward Healthy Forests: The Role of Modern Biotechnology

10:00 – 10:30 Break (Marriott Foyer)

10:30 – 12:00 Concurrent Session 1

1. Rediscovering Our Urban Forests. (Hoover) sponsored by Davey Tree
   a. Moderator: Lynne Rieske-Kinney

   b. Abstract: As urbanization encroaches further into wildland areas our urban canopy is expanding. Recognition of the importance of the urban canopy is increasing as human population centers seek to enhance their vitality to attract and retain new residents. Urban trees create a vibrant aesthetic, make significant contributions to ecosystem services, provide critical habitat for urban wildlife, affect property values and aesthetics, influence social interactions, and contribute to human health and human happiness. Urban trees are exposed to many of the same stressors as their wildland counterparts, but also have insect pest and pathogen problems unique to urban ecosystems. Protecting and engaging in our urban forests is key to enhancing their contributions and ensuring their sustainability.

   c. Speakers will address how urban landscapes are affecting insect biology and host relations, how we can manage our urban landscapes to enhance ecosystem services provided by the landscape itself and by its insect associates, and lastly, how we can take steps to engage the urban population in enhancing and caring for urban forests. Five speakers will present (four of the five have agreed to speak pending acceptance of the session into NAFIWC). Talk length will be dictated by session length. 1 ½ h session: 18 min talks (15+3)

   i. Urbanization alters insect development and behavior. Steve Frank.
   ii. Urban landscapes can provide refugia for an aggressive invader Don Cipollini
   iii. Managing urban landscapes to enhance pollinator populations Mary Gardiner
   iv. Urban landscapes support a lot more than pollinators. Doug Tallamy
   v. Engaging stakeholders to enhance our urban forests. Nic Williamson

2. Testing an Early Intervention Strategy to Suppress a Spruce Budworm Outbreak (Coolidge)
   a. Moderator: David A. MacLean

   b. Abstract: As evidence mounts that Eastern North America is on the cusp of another spruce budworm (SBW) outbreak, jurisdictions must weigh control options. In Québec, defoliation by SBW has increased from <3,000 hectares (ha) in 2003 to more than 4.2 million ha in 2014. SBW is the most damaging insect in North America. Detailed analyses of economic effects of SBW outbreaks in New Brunswick along with assumptions to estimate potential economic losses for forest in other jurisdictions indicated that potential direct and indirect losses of a moderate to severe SBW outbreak in the eastern Canada/US region could be $41.5 billion to $59.0 billion. An option not previously tested is an early intervention strategy to suppress SBW population growth and prevent damage. Recent R&D by the Canadian Forest Service indicates promising results from applying an aggressive early intervention strategy through maintaining low SBW mating success at low population levels. This session will describe progress on a 4-year, $18 million program to develop, test and monitor the effectiveness of an early intervention strategy against SBW. The research involves over 30 scientists from 5 universities and the Canadian Forest Service. An early intervention strategy against SBW involves: i) intensive monitoring and early detection, ii) small area target-specific pesticide application, and iii) tools and techniques to disrupt mating and migration.
The project includes multiple stakeholders, including industry, university, and government. Important research issues being addressed include: What are the early indicators of an infestation? When should treatment be initiated? What new tools and technology need to be developed? Strategies tested include short-term (applied control measures designed to suppress populations), longer-term (inoculating seedlings with endophytic fungi that have insect suppressing qualities), and improving decision support capabilities to facilitate pest management planning. The first step, increased sampling intensity of SBW populations to identify pre-outbreak SBW population increases, commenced with forest industry financing in NB in the fall of 2013. The project involves studies in northern NB and Quebec, with successful Mimic, Btk, and pheromone trials in 2013 and 2014, intensive SBW population ecology and natural enemies research, examination of satellite and airborne hyperspectral sensing of low-level defoliation, radar detection of moth flights, decision support for optimizing spray operations, a citizen science program, and an active public communications program. We will describe progress to date and the rationale and prognosis for SBW outbreak alteration.

c. Speakers:
   i. David A. MacLean
   ii. Jacques Régnière
   iii. Rob Johns
   iv. Patrick James

3. Technological Advances in Monitoring Forest Health (Thurgood Marshall Northeast)

d. Moderator: Frank Sapio

e. Abstract: Disturbances in Forest health cross various spatial and temporal scales. An integrated system is presented that addresses a range of technologies for predicting and monitoring forest disturbances that span these scales. Moderate to high spatial resolution with multi-temporal approaches are discussed in the context of forest disturbance reporting. New technologies for recording pest activity advance our capabilities for monitoring and informing predictions.

f. Speakers:
   i. Frank Krist. The NEXT NIDRM.
   ii. William B. Monahan. Making the Next NIDRM Climate Smart.
   iii. Ryan Hanavan. G-LIGHT.

4. Open Session 1 (Harding)

g. Moderator: Iral Ragenovich

h. Abstract: An Open Session for Submitted Talks on Important Topics.

i. Speakers:
Wednesday, June 1 – continued

12:00 – 1:30  Lunch

1:30 – 3:00  Concurrent Session 2

1. Responses of Arthropods to Composition of Urban Landscapes  (Hoover)
   a. Moderators: Kamal J.K. Gandhi and Dayton Wilde
   b. Abstract: Currently, >80% of the U.S. population lives in urban areas, and the land under urban development is expected to expand with human population growth. Urbanization causes major shifts in habitat structure, composition, and quality due to the introduction and establishment of exotic plant species. Such replacement of native trees and shrubs with exotic species causes changes in biodiversity on multiple trophic levels, especially arthropods with cascading ecological impacts on other taxa. This is of conservation concern because of the current extent of aesthetically managed landscape (30-40 million hectares) embedded in and around forested habitats in the U.S. We propose a symposium to present recent research on the response of arthropods to urban-suburban forested landscapes, the ensuing impact on insect predators, and various landscaping options that may conserve biodiversity. We have invited noted speakers that are experts in this field, and expect to generate discussion about ways to minimize and ameliorate the effects of urbanization using arthropods as a model taxa, along with avenues for future research.
   c. Speakers:
      i. Dayton Wilde. Landscaping plants with ecological function: Challenges of scaling-up.
      ii. Douglas W. Tallamy. Are Non-native plants bad for food webs?
      iii. Matthew H. Greenstone. Plant provenance in urban landscapes: The Influence of native vs. exotic woody plants on natural enemy biodiversity.
      iv. Paula M. Shrewsbury, Douglas W. Tallamy, Michael J. Raupp, Holly M. Martinson, David E. Jennings, and Ellery A. Krause. How do arthropod communities respond to native and exotic urban landscapes?

   a. Moderators: Robbie W. Flowers and Andrew D. Graves
   b. Abstract: The Douglas-fir tussock moth (Orgyia pseudotsugata) (DFTM) is an important defoliator of Douglas-fir, true firs, and spruces in Western North America. Severe outbreaks of DFTM have occurred in British Columbia, the Pacific Northwest, the Pacific Southwest, the Intermountain Region, and the Rocky Mountains. Outbreaks are cyclical with rapid onset and decline, usually attributed to the activity of natural enemies. Defoliation of preferred hosts may cause widespread growth-loss, top-kill, and tree mortality alone or in association with attacks by bark beetles and/or environmental conditions. The history of forest management and fire suppression in the western U.S. and Canada has led to an increase in preferred hosts for DFTM in many areas, and this, coupled with changing climatic conditions, has the potential to impact the initiation, duration, frequency, and location of future outbreaks. Cooperative pheromone trapping is currently used to monitor DFTM population trends, but interpretation has proven difficult and programs are becoming increasingly difficult to sustain. Similarly, while forest management of DFTM outbreaks has traditionally relied on suppression by aerial applications of insecticides, the challenges of timely implementation of spray projects, the decline of staff experience and products associated with these technologies, and the increased scrutiny surrounding these efforts may require new approaches. The objective of this session will be to provide a brief update on DFTM history and trends in each region, and discuss the current approaches and challenges to monitoring, management, and resource protection. The session format will be a panel discussion with representatives from several regions in the western U.S. and Canada.
The session will conclude with large-group discussion of these subjects and/or related topics that were highlighted during the annual meeting of the Western North America Defoliator Working Group (WNADWG).

c. Speakers/panelists:
   i. Gina Davis
   ii. Robert J. Cain
   iii. Andrew D. Graves
   iv. Darren Blackford
   v. Cynthia Snyder
   vi. Robbie W. Flowers
   vii. Lorraine Maclauchlan

3. Regional Characterization of Forest Susceptibility to Insect Outbreaks and their Impacts (Thurgood Marshall Northeast)
   a. Moderators: JT Vogt and Randy Morin
   b. Abstract: Invasive and native forest pests may threaten forest resources over vast land areas. Forest Inventory and Analysis (FIA) plays a central role in pest risk and forest health assessments before and after pest invasions and outbreaks. Due to the national scale and consistent protocols employed the FIA inventory is uniquely positioned to take a broad scale look at pest risk and impacts. In this session we examine routine and novel applications of FIA data to these assessments, and consider advantages and limitations offered by the FIA sampling design.
   c. Speakers:
      v. Frank Koch, J.A. Smith, J.J. Riggins, and M.A. Hughes. FIA Data Show Dramatic Loss of Redbay Due to Laurel Wilt.

   a. Moderators: Jiri Hulcr and Caroline Storer
   b. Abstract: Innovations in genome, transcriptome, and proteome sequencing, known collectively as the “omics”, have already revolutionized human medicine. These technological advancements are also available for forest health protection, but their vast potential remains underused. For example, genetic engineering of trees is increasing our ability to respond to new pest outbreaks or bring threatened trees back from extinction. Gene drive technologies may enable us to eradicate pathogens from the landscape. How can we used these methods, and should we? This session will provide an approachable introduction to forest health “omics” and an engaging discussion of the technological, environmental, and societal trade-offs of adopting these new approaches to forest health.
Wednesday, June 1 – continued

c. Speakers:
   i. Caroline Storer. Can biotechnology save the world's forests?
   ii. Sally L. McCammon. Regulation of genetically engineered organisms.

3:00 – 3:30 Break (Marriott Foyer)

3:30 – 5:00 Concurrent Session 3

1. Characterizing Above and Below Ground Changes in Forests Aftermath of Insect Outbreaks (Hoover)
   a. Moderator: Nadir Erbilgin

   b. Abstract: During the last century, insect outbreaks have caused significant changes at both below and above ground processes of terrestrial ecosystems across the globe. These changes have had serious implications for both altering the integrity (resilience) of ecological systems and affecting economy related to natural resources. The goal of this session is to provide some examples of how outbreaks by native or invasive insects can impact ecosystems properties from different ecosystems. It will focus on both below (e.g. changes in soil chemistry and microbial communities) and above (changes in species composition) ground processes that are temporarily or permanently altered due to sudden changes imposed by insect outbreaks.

   c. Speakers
   ii. Kristen A. Pelz. Understory tree and plant responses to bark beetle outbreaks: lessons from recent forest mortality in North America and beyond.
   iii. Jeffrey A. Hicke. How do insect outbreaks alter biogeochemical and biogeophysical processes?

2. Sirex and Its Complicated FoodWeb (Coolidge)
   a. Moderators: Laurel Haavik, Ann Hajek, Jessica Hartshorn, and Fred Stephen

   b. Abstract: Sirex noctilio occurs in many regions worldwide, and has been a more serious pest in some areas than in others. Its biology involves many complicated, multi-trophic relationships, making it an excellent and important case study in invasion biology, and evolutionary and community ecology. Complex relationships within the Sirex food web in North America and elsewhere have been difficult to decipher. We will devote 20 minutes to each of the four discussion topics, outlined below. For each topic, a speaker will lead off with a brief, < 5-minute summary on the topic, followed by a discussion among attendees, led by the discussion panel.

   c. Speakers
   i. How is S. noctilio likely to affect native pine communities in North America, and what are the potential differences in the southeast vs. the northeast? Summary speaker: Jeremy Allison. Discussion panel: Flora-Krivak Tetley, Kamal Gandhi
   ii. Should we proactively manage or prepare for the arrival of S. noctilio in the southeast? And if yes, then what strategies should we use? Summary speaker: Jim Meeker. Discussion panel: Laurel Haavik, Dave Coyle
   iii. Success and failure of applied biological control with Deladenus? Summary speaker: Ann Hajek. Discussion panel: Fred Stephen, Jessica Hartshorn
   iv. What have we learned and what do we still need to learn from the Sirex system about invasion biology and evolutionary ecology? Summary speaker: Laurel Haavik. Discussion panel: Ann Hajek, Andrew Liebhold
3. **Forest Entomology in a Landscape Context.** (Thurgood Marshall Northeast)
   a. Moderators: Robert N. Coulson and Patrick C. Tobin
   
   c. Abstract: To examine how landscape ecology concepts and associated technologies are being used in forest insect research, monitoring, evaluation of impacts, and invasive species assessments.
   
   c. Speakers:
      i. Variation in the Speed of Invasion: Roles of Weather, Resource Availability, and Landscape Attributes on Gypsy Moth Invasion Dynamics. Patrick Tobin, School of Environmental and Forest Sciences, University of Washington, Seattle, WA; Riley Metz, School of Environmental and Forest Sciences, University of Washington, Seattle, WA; Jon Walter, Dept. of Ecology and Evolutionary Biology and Kansas Biological Survey, University of Kansas, Lawrence, KS; Kristine Grayson, Dept. of Biology, University of Richmond, Richmond, VA; Derek Johnson, Dept. of Biology, Virginia Commonwealth University, Richmond, VA; Kyle Haynes, Dept. of Environmental Sciences, University of Virginia, Charlottesville, VA.
      
      ii. Use of Unmanned Aerial Vehicles (UAVs) in monitoring forest insect damage and their utility for evaluating hemlock woolly adelgid impact. Tuula Kantola, Dept. of Forest Sciences, University of Helsinki, Helsinki, Finland; P. Lytyikäinen-Saarenmaa, Dept. of Forest Sciences, University of Helsinki, Helsinki, Finland; E. Honkavaara, Dept. of Remote Sensing and Photogrammetry, Finnish Geospatial Research Institute, Masala, Finland; M. Holopainen, Dept. of Forest Sciences, University of Helsinki, Helsinki, Finland; R.N. Coulson, Dept. of Entomology, Knowledge Engineering Laboratory, Texas A&M University, College Station, TX.
      
      iii. Spatial Dynamics of Periodical Cicada Broods. Andrew Liebhold, USDA Forest Service, Morgantown, WV; John Machta, Dept. of Physics, University of Massachusetts, Amherst, MA; Alan Hastings, Dept. of Environmental Science and Policy, University of California, Davis, Davis, CA; Julie Blackwood, Dept. of Mathematics & Statistics, Williams College, Williamstown, MA.
      
      iv. Landscape Ecological Interactions Between Introduced Tamarisk Beetles, Invasive Tamarisk and the Endangered Southwestern Willow Flycatcher. J.L. Tracy, Dept. of Entomology, Knowledge Engineering Laboratory, Texas A&M University, College Station; R. N. Coulson, Dept. of Entomology, Knowledge Engineering Laboratory, Texas A&M University, College Station; A.E. Knutson, Texas A&M University, Dept. of Entomology, Dallas, TX
      
      v. Landscape-scale Consequences of Weakly Coevolved Tree Defenses to an Eruptive Bark Beetle. Allan L. Carroll, Dept. of Forest & Conservation Sciences, University of British Columbia, Vancouver, BC, Canada; Anthony P.W. Robinson, Dept. of Forest & Conservation Sciences, University of British Columbia, Vancouver, BC, Canada.
   
4. **Relevance of Our Forested Lands to the Maintenance of Pollinators and Pollination Ecology in North America.** (Harding)
   a. Moderator: Rob Progar and Justin Runyon
   
   b. Abstract: Pollinators are critical components of forest ecosystems where they provide pollination services to many trees, shrubs and herbaceous understory plants. Evidence suggests that pollinators are declining worldwide as a result of changes in land use, fragmentation, agricultural intensification, pesticide use, invasive species, diseases, urbanization, and climate change. What is our extent of knowledge of the role of pollinators in our forest ecosystems?
Wednesday, June 1 – continued

c. Speakers:
   i. Mary Purcell-Miramontes.  What the national pollinator health strategy means for pollination ecology in forest systems.
   ii. Monica Tomosy.  Role of USDA Forest Service Research and Development and efforts by Forest Service scientists to sustain pollinators.
   iii. Andy Moldenke.  Pollination Ecosystem Services: attempting to analyze pollination at the scale of an entire community.
   iv. Scott Horn.  Have changing forest conditions contributed to pollinator decline in the Southeastern United States?
   v. Justin Runyon.  Climate change can alter floral scent and pollinator attraction.

5:00  Student Poster Competition – Judging and students at their posters (Marriott Foyer)

Poster Reception Co-Sponsored by the Departments of Entomology at Michigan State University and The Ohio State University

6:30  Adjourn

Wednesday Evening Field trips
Camden Yards (Orioles/Red Sox)
RFK Stadium (DC United vs Seattle Sounders)

Thursday, June 2

8:30 – 10:00  Plenary Session 2 (Thurgood Marshall Northeast)
   1. Speaker: Gwen Pearson, Purdue University  
      **Facts are Not Enough: Stories and Emotion in Science Communication**
   2. Speaker: Doug Crandall, Legislative Affairs, USDA Forest Service  
      **Congress and the Forest Service.**
   3. Keynote: Tom Tidwell, Chief, USDA Forest Service  
      **Forest Health – Challenges, Restoration, Partnerships and Collaboration.**

10:00 – 10:30  Break (Marriott Foyer)

10:30 – 12:00  Concurrent Session 4

1. **Challenges, Paradigms, and Novel Approaches to the Forest Health Curriculum** (Thurgood Marshall Northeast)
   a. Moderators: Kamal J.K. Gandhi and Robert N. Coulson
   b. Abstract: We propose a symposium to discuss the pedagogy of Forest Health and Protection courses at the 2016 NAFIWC. Currently, Forest Entomology and Forest Pathology are taught either individually or together as Forest Health. During the last few decades, the background and aspirations of students have changed, and much more material is being taught for less credit hours. There is also a greater ease and access to technology, and an ever-changing catalog of current pests because of exotic invasions and climatic changes. Accordingly, we propose to critique the current structure and content of course offerings in Forest Health courses across the forested regions of the North America. The goal of the workshop is to develop a contemporary curriculum for training the next generation of forest health specialists.

   c. Speakers:
      i. Robert N. Coulson, Kamal J.K. Gandhi, and John J. Riggins.  Teaching forest protection – What is relevant: Conclusions from the SFIWC workshop.
      iii. David L. Kulhavy.  Metamorphosis to Dr. Bug: Lessons from the classroom.
2. Bark Beetles and Forest Management: Are Prevention and Suppression Programs Effective? (Hoover)
   a. Moderator: Steve Clarke
   b. Abstract: Abstract: Integrated pest management programs have been developed to mitigate the ecological and economic impacts of bark beetles. These IPM programs rely on active forest management, and their implementation has often been limited by lack of funding and personnel, poor timber markets, public opposition, and other factors. Given these difficulties, do forest managers and entomologists currently have the ability to conduct efficacious bark beetle prevention and suppression programs? Is there a need to reconsider how we address bark beetle outbreaks in the current environment? We will discuss the viability of IPM programs for several important species of bark beetles in North America.
   c. Speakers:
      ii. Steve Clarke. Time for cut and remove or to cut and run: Current status of southern pine beetle suppression.
      iii. Arthur Stock, Robert Hodgkinson, Lorraine Maclauchlan, Ken White and Jodi Axelson. New approaches and lessons learned about bark beetle management in BC.
      v. Discussion

3. The Changing Face of Biological Control in Forest Ecosystems. (Coolidge)
   a. Moderators: Sandy Smith, Chris MacQuarrie, Krista Ryall
   b. Abstract: This symposium will review this history and current practice of biological control in forests in North America. Biological control, in particular of invasive species, has been an important tactic in the management of insect pests in North American forests. The application of biological control has focused mainly on its use against non-native species. However, work in the past and today has addressed the potential uses of biological control against native pests. This symposium will highlight current research against major non-native pests and new invasives, as well as perennial native pest insects. This symposium will examine a variety of cases from different insect-pest systems as well as a historical perspective from Canada and the United States.
   c. Speakers
      i. Sandy Smith. Introduction.
      ii. Sandy Smith, Chris MacQuarrie, Veronique Martel, Lukas Seehausen, Barry Lyons. Biological control programs against forest insects in Canada, with focus on eastern spruce budworm
      iii. Leah Bauer, Jian Duan, Roy Van Driesche, Daniel Kashian, Therese Poland, Juli Gould. Management of emerald ash borer in forested ecosystems using classical biological control.
      iv. Kenneth F Raffa, Adam Krause, Jesse A Pfammatter, Philip A Townsend. Anticipatory biological control of mountain pine beetle in areas of increasing impact and range expansion due to climate change.
      v. Kimberly Wallin, Darrell Ross, Nathan Havill, Bud Mayfield. Preliminary results using silver flies for biological control of hemlock woolly adelgid in the eastern USA.
Thursday, June 2 – continued

4. **Getting to the First Step in Forest Restoration - Cone and Seed Insects of North American Conifers.** (Harding)
   a. **Moderator:** Carl Jorgensen
   b. **Abstract:** Update on the management and research associated with cone and seed insects in conifer seed orchards - an open discussion. Determining if Hedlin et al. 1980 “Cone and Seed Insects of North American Conifers” needs updating, reprinting and/or the process to complete such a task. Work assignments may be discussed.
   c. **Speakers – Open discussion with**
      i. Sandy Kegley
      ii. Alex Mangini
      iii. Danny DePinte
      iv. Others willing to share
      v. Jorgensen – Hedlin Discussion

12:00 – 1:30 **Lunch**
1:30 – 3:00 **Concurrent Session 5**

1. **Women in Forest Entomology** (Wilson A/B)
   a. **Moderator:** Jessica Hartshorn
   b. **Abstract:** Women are well represented at the graduate student level in forest entomology but do not hold as many leadership roles in academia, government, and industry. Reasons for this discrepancy range greatly and opinions about the necessity of diversity in leadership roles can be wide-ranging. I will devote 30 minutes to each discussion topic described below, 20 minutes for small group discussion and 10 minutes for large group discussion. A facilitator will lead small group discussions and give a brief summary, leading to a wider discussion among the entire audience. Topics: Pros and cons to intentionally increasing diversity among forest entomology groups in all divisions (i.e. academia, government, industry). Reasons for choosing alternative career paths; is this a negative? Ways to keep women in leadership positions in all divisions.
   c. **Facilitators (may change as workshop progresses):**
      i. Scott Salom, Virginia Tech
      ii. Fred Stephen, University of Arkansas
      iii. Kamal Gandhi, University of Georgia
      iv. Lynne Rieske-Kinney, University of Kentucky
      v. Laurel Haavik, The Ohio State University
      vi. John Riggins, Mississippi State University

2. **Managing for Forest Health and Resilience** (Hoover)
   a. **Moderator:** Chris Fettig and John Nowak
   b. **Abstract:** Several assessments have concluded that forests are increasingly vulnerable to tree mortality as a result of the direct and indirect effects of climate change (e.g., Fettig et al. 2013), and that the use of sound, ecologically-appropriate management strategies and prioritizing of their application to the landscape is critical. Relatedly, IPPC (2007, p. 543) has concluded that “In the long term, a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual sustained yield of timber, fiber, or energy from the forest, would generate the largest sustained mitigation benefit.” We explore options for increasing resistance and resilience to disturbances exacerbated by climate change. We focus on bark beetles as widespread outbreaks of several species have recently occurred in North America.
Thursday, June 2 – continued

c. Speakers:
   ii. Chris Fettig. Keeping forests as forests through active management.
   iii. Chad Hanson. Redefining healthy forests: Why tree mortality from natural disturbances, and recruitment and protection of snags, are essential to the maintenance of native biodiversity and recovery of imperiled wildlife species.
   v. Discussion

3. Forest Health Extension in North America: Challenges and Opportunities (Coolidge)
   a. Moderator: David Coyle
   b. Abstract: Forest health extension and outreach personnel are challenged with reaching an extremely diverse audience in North America. Forest landowners come from multiple backgrounds, ethnicities, and ages. In part, because of the various demographics of forest landowners, the use of different communication strategies is necessary to impact landowners, and these strategies may have varying levels of efficacy. This session will feature speakers from across North America with expertise in various forest health issues. Topics of discussion will focus on effective methodologies for reaching the diverse forest stakeholders in North America, including successes and failures. The audience is encouraged to discuss these and their own experiences with this distinguished panel.
   c. Speakers:
      ii. Challenges to Extending Forest Health: When Onslaught outpaces, People, Research and Budgets. Mark Megalos, NC State University, Raleigh, NC.
      iii. Transferring Bark Beetle Technology to Central America: Needs, Obstacles and Accomplishments. Ronald F. Billings, Texas A&M Forest Service, College Station, TX.
      iv. Title (Macias) – confirmed, pending funding

4. Potentials for Restoration After Invasions by Exotic Forest Pests: East (Harding)
   a. Moderator: Fred Hain
   b. Abstract: Speakers will focus on the need to conserve the gene pool of trees threatened by invasive pests, the need to quickly regenerate seedlings for restoration, and the current situation of species being threatened in eastern North America.
   c. Speakers:
      v. Marc Hughes, Jason A. Smith, Ben Held, Robert Blanchette, Katherine Smith, Tyler Dreaden and Randy C. Ploetz. Rapid selection and opportunities for restoration of laurel wilt tolerant Persea species.

3:00 – 3:30 Break (Marriott Foyer)
Concurrent Session 6

5. Open Session 2 (Wilson A/B)
   a. Moderator: Molly Darr
   b. Abstract: An open session for submitted talks on important topics.
   c. Speakers:
      i. Jordan Burke, Jorg Bohlmann, and Allan Carroll. Coevolution, climate-change, and the creation of a native invasive species.
      iii. Rabiu Olatinwo and Stephen Fraedrich. Laurel wilt: beyond the redbay (Persea borbinia (L.) Spreng) native range.
      iv. Adrian Polini and E.D. Medina. Management of bark beetle outbreaks in the community forests of Oaxaca, Mexico.

6. Applied MPB Ecology During Severe Outbreaks in High Elevation Pine Systems (Hoover)
   a. Moderator: Joel Egan
   b. Abstract: This workshop will explore recent advances in applied ecology with respect to severe mountain pine beetle (Dendroctonus ponderosae Hopkins) outbreaks that have impacted high-elevation pine systems in recent decades. Experts will present novel research findings and management synopses pertinent to these impacted systems. Specifically, various ecological factors impacting severe and widespread MPB outbreak dynamics will be explored in this workshop with perspectives ranging from broad factors that occur over landscape spatial scales to fine-scale host interactions that occur between individual trees and attacking beetles. This session will be focused with an applied perspective to indicate how this knowledge relates to overall high-elevation pine inter-tree resistance as well as ecosystem resilience when exposed to severe mortality caused by widespread outbreaking MPB populations.
   c. Speakers:
      i. Polly Buotte. A comparison of climate influences on mountain pine beetle outbreaks in lodgepole and whitebark pine forests in the western US.
      ii. Lorraine Maclauchlan. Risk to young pine during severe mountain pine beetle outbreaks: the B.C. story
      iv. Kenneth F. Raffa. Integrated analysis of pine defense systems as a foundation to understand and enhance resilience of conifer ecosystems.
      v. Sandra Kegley. Whitebark pine restoration following MPB outbreaks.

7. History of Forest Entomology in North America. (Coolidge)
   d. Moderator: Beth Willhite
   e. Abstract: It is important to understand the history of forest entomology, yet we are losing many of our entomologists without the chance to collect and preserve their stories, writings, and materials. Though individual regions have committees dedicated to the history of forest entomology, there is no unified approach across North America. NAFIWC provides the perfect opportunity to discuss the need and methods for preserving our history. The objective of the session will be to discuss current efforts, share problems and successful methods, and develop training techniques on history preservation for forest entomologists. The goal is the initiation of a unified effort in North America to protect our knowledge base and retain the experience and wisdom of our forest entomologists.
Thursday, June 2 – continued

f. Speakers:
   i. Julie Johnson. History preservation project example: The history of aerial survey in Oregon and Washington. USFS Forest Health Protection, Portland, OR
   ii. Sally Dunphy. Preserving historical information through the National Forest Service Library. USFS National Forest Service Library, Ft. Collins, CO
   iii. Lisa Stringfield. A new national process for repositing historic insect and disease documents at the National Forest Service Library. USFS Forest Health Protection, Sandy, OR
   iv. Open discussion by participants.

8. Potentials for Restoration After Invasions by Exotic Forest Pests: West (Harding)

   g. Moderator: Steve Cook

   h. Abstract:

   i. Speakers:
      Speakers will focus on the need to conserve the gene pool of trees threatened by invasive pests, the need to quickly regenerate seedlings for restoration, and the current situation of species being threatened in western North America.
      i. White Bark Pine  Jesse Logan
      ii. Balsam Woolly Adelgid Robert Progar
      iii. Monterey Pine  Andrew Storer
      iv. Sudden Oak Death Brice McPherson

5:00 Adjourn


Friday, June 3

8:30 – 9:00 Business meeting and awards (Thurgood Marshall Northeast)

9:00 Concurrent Session 7

1. Invasions by Non-Native Forest Insects and Diseases: Efficient Solutions 1 (Thurgood Marshall Northeast)
   a. Moderators: Kirsten Prior, Sandy Liebhold, Jiri Hulcr

   b. Abstract: Worldwide, the field of forest health is increasingly dominated by problems associated with non-native insects and diseases. Trends of increasing globalization are driving the arrival of these species and as establishments of these pests accumulate, their impacts on forest resources continue to grow. This session will cover the various options that exist for managing the forest pest invasion problem. One tactic involves measures to prevent these species from arriving in the first place, through pre-invasion risk assessments and pathway management. Once a species is introduced, surveillance and rapid-decision making are important for practical eradication programs. Once a species establishes and spreads, implementing a successful eradication becomes increasingly difficult. At these stages management strategies via classical biological control or the development of resistant tree genotypes holds promise for at least partially mitigating the impacts of invading pest populations. In this session, invited speakers will discuss current research on each of these management strategies from scientific and socio-economic perspectives. Advantages and disadvantages of each strategy will be discussed.
Friday, June 3 – continued

c. Speakers:
   Before the arrival
   iii. Sandy Liebhold. Managing Forest Insect Invasion Pathways.

   After the arrival - Surveillance, Eradication and Management

2. Open Session 3 (Hoover)
   a. Moderator: Elizabeth Graham
   b. An Open Session for Submitted Talks on Important Topics.
   c. Speakers:
      ii. Louis-Etienne Robert, Brian R. Sturtevant, Patrick M. A. James, Barry J. Cooke and Dan Kneeshaw. Landscape-scale forest management legacies affect spatial synchrony in insect outbreaks.

3. Assessing the Impact of Populations of Bark Beetles and Woodborers With Expanding Ranges in the USA – Session 1 (Coolidge)
   a. Moderators: Tom W. Coleman and Steven J. Seybold
   b. Abstract: Native and exotic insects with expanding ranges represent significant challenges for forest and other land managers across all ownerships. Interacting factors, such as population establishment and invasion, drought, warmer winter temperatures, increased frequency of wildland fire, and deteriorating forest stand conditions and urban tree stress, have led to range expansions followed by increases in tree injury and mortality from bark beetles and woodborers. The measurement and reporting of the impact of pests in these situations has been largely ignored and potentially undervalued. Determining the extent of the injury and assessing the potential stand- and landscape-level changes caused by these threats to our forests are needed to develop and support management actions; contribute information to risk models; and address future funding allocations. Eight presenters across two workshop sessions will discuss the impacts of selected bark beetles and woodborers with expanding ranges from most regions of the USA. The topics represent emerging forest health threats within each region and speakers will address the history, impact, risk of further expansion, and management outlook for each area. The California fivespined ips, Ips paraconfusus, and southern pine beetle, Dendroctonus frontalis, represent two native bark beetles that have recently caused elevated tree mortality at the northern edge of their ranges. The Douglas-fir beetle, Dendroctonus pseudotsugae; goldspotted oak borer, Agrilus auroguttatus; and walnut twig beetle, Pityophthorus juglandis, represent three examples of indigenous exotic species that have been moved in raw wood products and have caused varying degrees
of impact in the USA. International trade continues to increase the number of exotic insect introductions into North America. In 2012, the exotic polyphagous shot hole borer, Euwallacea sp., was linked to tree injury in southern California, with rather dramatic impacts in urban forests and agroecosystems. Its impact is being quantified in riparian forest corridors in the southern California National Forest System. This ambrosia beetle, and a related species in the Southeast, the redbay ambrosia beetle, Xyloborus glabrus, are accompanied by pathogenic fungi that exacerbate their impacts. Finally, actual and projected impacts will be discussed and contrasted for two long entrenched hardwood woodborers of Asian origin: Asian longhorned beetle, Anoplophora glabripennis, and emerald ash borer, Agrilus planipennis.

c. Speakers:
   ii. Wendy Klooster. Impacts associated with emerald ash borer, Agrilus planipennis, in mixed hardwood forests.
   iv. Andrew D. Graves. Impact of the walnut twig beetle, Pityophthorus juglandis, and the thousand cankers disease pathogen, Geosmithia morbida, in native and potentially naïve walnut stands in the southwestern USA.

4. **Arthropogenic Effects: Tree-mediated Interactions Among Forest Insects.** (Harding)
   a. Moderators: Jonathan Cale and Jennifer Klutsch
   b. Abstract: Like humans, herbivorous insect populations drastically alter the environment in which other organisms develop. From the scale of individual trees to landscapes, tree-mediated interactions among forest insects have significant effects on co- or subsequently-occurring insect species. These interactions can shift in directionality (e.g., from antagonistic to facilitative) due to altered nutritional content or quality of host plant tissue in response to insect feeding. Especially important for forest pests, these chemical ecological changes can be significant determinants of insect population establishment, reproduction, and growth. Multiparte studies are increasingly recognized for allowing researchers to look beyond comparatively simple investigations to interpret and understand insect-tree interactions through a more multifaceted, ecological lens. An understanding of tree-mediated interactions among forest insects is important to developing targeted pest management strategies, for example, in exploiting host physiological changes to mitigate forest loss or predict impacts to insect diversity. The goal of this session will be to highlight mechanisms by which non-native and native forest insects affect, and in turn are affected by, herbivore-induced changes to host condition and chemistry. Further, it will identify how an understanding of tree-mediated interactions can be used in forest pest management.

   c. Speakers:
      i. Evan L. Preisser. Interactions between invasive species in a forest ecosystem: hemlock woolly adelgid, elongate hemlock scale, and eastern hemlock.

10:30 – 11:00 **Break** (Marriott Foyer)
11:00 – 12:30 Concurrent Session 8

1. Invasions by Non-Native Forest Insects and Diseases: Efficient Solutions 2
   (Thurgood Marshall Northeast)
   a. Moderators: Kirsten Prior, Sandy Liebhold, Jiri Hulcr
   b. Abstract: Worldwide, the field of forest health is increasingly dominated by problems associated with non-native insects and diseases. Trends of increasing globalization are driving the arrival of these species and as establishments of these pests accumulate, their impacts on forest resources continue to grow. This session will cover the various options that exist for managing the forest pest invasion problem. One tactic involves measures to prevent these species from arriving in the first place, through pre-invasion risk assessments and pathway management. Once a species is introduced, surveillance and rapid-decision making are important for practical eradication programs. Once a species establishes and spreads, implementing a successful eradication becomes increasingly difficult. At these stages management strategies via classical biological control or the development of resistant tree genotypes holds promise for at least partially mitigating the impacts of invading pest populations. In this session, invited speakers will discuss current research on each of these management strategies from scientific and socio-economic perspectives. Advantages and disadvantages of each strategy will be discussed.

11:30 – 12:30
   c. Speakers:
      After arrival
      i. Patrick Tobin. Learning from the legacy of historical eradication programs: when to pull no punches and when to throw in the towel.
      After the establishment – Population Management
      iii. Enrico Bonello and David Showalter. Tree resistance as a primary tool to respond to established invasions by cryptic, tree killing forest pathogens and insects.

2. Factors Influencing Forest Insects at Range Margins (Hoover)
   a. Moderators: Barbara Bentz and Brian Aukema
   b. Abstract: Forest insects follow the distribution of their host tree species. In many cases, however, the distribution of the host tree species is larger than that of the insect species. Several factors influence restricted insect ranges including climate suitability for persistent population success at range margins, community associates and novel forest habits. For example, phenotypic plasticity in life-history traits can allow for population growth when released from climate restrictions, as has occurred recently with changes in precipitation and temperature patterns across North America. We will discuss factors that influence forest insect populations at range margins, including key life history traits that are being influenced by a changing climate.

c. Speakers
   i. Barbara Bentz. Mountain pine beetle at range margins in the western United States.
   ii. Matt Ayres. Why is the southern pine beetle not so southern anymore?
   iii. Kristine Grayson. Can gypsy moth stand the heat: performance at the southern invasion front.
   iv. Allan Carroll. Beyond the margins: altered dynamics of an eruptive bark beetle in novel habitats.
Friday, June 3 – continued

3. Assessing the Impact of Populations of Bark Beetles and Woodborers With Expanding Ranges in North America – Session 2 (Coolidge)
   a. Moderators: Tom W. Coleman and Steven J. Seybold
   
   b. Abstract: The second sequential 90 minute session will address impacts of other bark beetles and woodborers (like EAB, ALB, tea shot hole borer, redbay ambrosia beetle, soapberry borer, etc.). This will provide even greater regional coverage. The analysis of the impact of these pests with expanding ranges has not been given much attention, but it is very valuable information for decision makers, funders, etc.
   
   c. Speakers:
      i. Kevin J. Dodds. Southern pine beetle, Dendroctonus frontalis, in northeastern pitch pine, Pinus rigida, forests.
      iii. Bud Mayfield. Impacts of the redbay ambrosia beetle, Xyleborus glabratnus, and the laurel wilt pathogen in the southeastern USA.

   
   b. Abstract: As human disturbance and habitat fragmentation become increasingly pervasive, management and stewardship of unique forest ecosystems reaches its highest priority. Given the ubiquity and abundance of insects and other arthropods in forests, consideration of the roles that invertebrates play within these ecosystems is of primary concern. This is particularly true in unique and sensitive ecosystems that are often restricted in their distribution across the continent. The goal of our symposium is to highlight research aimed at understanding the interactions of insects and other arthropods within sensitive forest ecosystems across North America. Our session will attempt to present a widespread perspective of many such forest systems across North America.
   
   c. Speakers:
      i. Boreal systems: Nadir Erbilgin (Univ. Alberta) or Tim Work (Univ. Quebec)
      ii. High elevation systems: Diana Tomback (Univ. CO)
      iii. Coastal forests: Joel Gramling (Citadel) or Matthew Kasson (WVU)
      iv. Environmental extremes: Dave Denlinger (OH State) or Nick Teets (Univ. KY)
      v. Subtropics: Steve Yanoviak (Univ. Louisville)
      vi. Appalachia: Luke Dodd (Eastern KY Univ), Graziosi/Rieske (Univ. KY)
      vii. Southwestern pines: Tom Coleman (USDA Forest Service)

12:30 Adjourn
# NAFIWC 2016 Allen-Abrahamson Student Poster Competition

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<td>Behavioral chemical disruption of the host selection behavior of the walnut twig beetle: a chemical ecological approach</td>
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<td>2</td>
<td>Bodart, Jake University of Arkansas</td>
<td>M.S.</td>
<td>Flight activity and oviposition pit distribution: comparative analysis of southeastern Monocha-mus species</td>
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<td>3</td>
<td>Darr, Molly Virginia Tech</td>
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<td>Dearing, Natalie Mississippi State</td>
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<td>Impacts of laurel wilt disease on insect herbivores of North American Lauraceae</td>
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<td>5</td>
<td>Fahner, Samuel University of Minnesota</td>
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<td>Modeling the spring activity of larch casebearer and eastern larch</td>
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<td>Hefty, Andrea University of Minnesota</td>
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<td>Walnut twig beetle (Coleoptera: Scolytidae) reproduction varies across host species</td>
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<td>Heminger, Ariel Virginia Tech</td>
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<td>8</td>
<td>Howe, Michael University of Wisconsin</td>
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<td>Jagemann, Stephanie University of Wisconsin</td>
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<td>10</td>
<td>Jones, Michael SUNY ESF</td>
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<td>Phenology of emerald ash borer and its introduced larval parasitoids in the northeast</td>
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<td>Nicoll, Rachael University of Minnesota</td>
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<td>The dispersal capacity of late instar gypsy moth larvae (Lymantria dispar) and its implications for wood products movement</td>
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<td>12</td>
<td>Ritger, Haley University of Georgia</td>
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<td>Interactions between subcortical insects and longleaf pine physiology under various prescribed fire regimes</td>
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<td>13</td>
<td>Sumpter, Kenton Virginia Tech</td>
<td>MS</td>
<td>Evaluating a potential area-wide IPM strategy for managing hemlock woolly adelgid in the eastern United States</td>
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<td>14</td>
<td>Thomason, John Mississippi State</td>
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<td>Bloom or bust? An examination of the southern pine beetle (Dendroctonus frontalis) spring trap deployment dates</td>
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<td>15</td>
<td>Wantuch, Holly Virginia Tech</td>
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<td>Phenology of the pine bark adelgid, Pinus strobi, in forests of southwestern Virginia</td>
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<td>Whitney, Thomas University of Georgia</td>
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<td>Link between a scale insect and eastern white pine dieback: overview and future directions</td>
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<td>Peralta-Vazquez G. Haydee University of Calgary</td>
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<td>Hitchhiking with the best ride without a cost: ectosymbiont load does not affect dispersal capacity of mountain pine beetles</td>
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<td>Lachowsky, Leanna University of Calgary</td>
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<td>Development time and synchrony of emergence in individual broods of mountain pine beetles</td>
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| 19        | A meta-analysis of the impact of trap type and design features on survey and detection of bark and woodboring beetles and their associates.  
          Allison, Jeremy D.1 and Richard A Redak2. 1Research Scientist, Canadian Forest Service, Natural Resources Canada. 2Professor and Chair, Department of Entomology, University of California-Riverside. |
| 20        | Exotic ambrosia beetle (Coleoptera: Curculionidae: Scolytinae) establishment factors and hosts for newly detected species in southern Alabama.  
          Bares, Hannah M.1, John J. Riggins1, Richard L. Brown1, Natalie A. Clay2, and Robin M. Verble-Pearson3. 1Department of Biochemistry, Molecular Biology, Entomology, & Plant Pathology, Mississippi State University, 2School of Biological Sciences, Louisiana Tech University, 3Department of Natural Resources Management, Texas Tech University. |
| 21        | Ecological and social factors affecting pine health in the southeastern U.S.  
          Barnes, Brittany F.1, David R. Coyle1, Christiane Helbig1, Gary T. Green1, Kier D. Klepzig2, Frank H. Koch3, Larry A. Morris1, John T. Nowak4, William J. Otrosina5, William D. Smith3, and Kamal J.K. Gandhi1. 1University of Georgia, D.B. Warnell School of Forestry and Natural Resources, Athens, GA, USA; 2USDA Forest Service, Forest Health Protection, Asheville, NC, USA; 3USDA Forest Service, Southern Research Station, Research Triangle Park, NC, USA; 4USDA Forest Service, Forest Health Protection, Asheville, NC, USA; 5USDA Forest Service, Southern Research Station, Athens, GA, USA. |
| 22        | The forest pest management cooperative: Celebrating twenty years of applied research in forest health protection.  
          Billings, Ronald F. (Texas A&M Forest Service), Donald M. Grosman (Arborjet, Inc.), and Melissa J. Fischer (Washington Department of Natural Resources). |
| 23        | Cold tolerance and seasonality in mountain pine beetle: implications for the spread of a native invasive insect in Canada.  
          Bleiker K. and G. Smith. Canadian Forest Service, Natural Resources Canada |
| 24        | Cerceris fumipennis foraging for general buprestid survey in New England.  
          Bohne, Michael, Rebecca Lilja, and Kevin Dodds. US Forest Service, Forest Health, Durham NH. |
| 25        | Rearing survey of wood inhabiting insects in Boston and New York arboreta.  
          Bohne, Michael1, Kevin Dodds1, Marc DiGirolomo1, Andrew Gapinski2, Arnold Arboretum2, and Joseph Charap3. 1US Forest Service, Forest Health, Durham NH; 2Harvard University; 3Green-Wood Cemetery. |
| 26        | Elevated light levels reduce HWA infestation and improve carbon balance in eastern hemlock seedlings.  
          Brantley, Steven T.1*, Albert E. Mayfield III2, Robert M. Jetton 3**, Chelcy F. Miniatt1, David R. Zietlow1, Cindi Brown1, and James R. Rhea4. 1USDA Forest Service, Southern Research Station, Coweeta Hydrologic Lab, Otto, NC; 2USDA Forest Service, Southern Research Station, Asheville, NC; 3Camcore, Department of Forestry and Environmental Resources, North Carolina State University, Raleigh, NC; 4USDA Forest Service, Forest Health Protection, Asheville, NC; *Present address: Joseph W. Jones Ecological Research Center, Newton, GA; **Presenter. |
| 27        | Fungal volatiles mediate interspecific interactions among mountain pine beetle’s (Dendroctonus ponderosae) fungal symbionts.  
          Cale, Jonathan A1, R. Maxwell Collignon2, Jennifer G. Klutsch1, Sanat Kanekar1, Altaf Hussain1, and Nadir Erbilgin1. 1Department of Renewable Resources, 4-42 Earth Sciences Building, University of Alberta, Edmonton, Alberta T6G 2E3, Canada; 2Department of Entomology, Entomology Building, University of California, Riverside, CA 92521, USA. |
| 28        | Silent springtails: effects of vehicular pollution on arboreal collembolan.  
          Callahan, Sean, Amanda Bidwell, Thomas DeLuca, and Patrick Tobin. School of Environmental and Forest Sciences, University of Washington. |
| 29        | Walnut twig beetle mortality and reduced brood production following exposure to commercial strains of entomopathogenic fungi Beauveria bassiana and Metarhizium brunneum.  
          Castello, Louel1, John Vandenberg2, Michael Griggs2, Robert Camp3, Adam Taylor3, Bryan Mudder4 and Albert Mayfield4. 1Department of Entomology, Cornell University, Ithaca, NY 14853; 2USDA ARS, Robert W. Holley Center for Agriculture & Health, Ithaca, NY 14853; 3Department of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, TN 37966; 4USDA Forest Service, Southern Research Station, Asheville, NC 28804. |
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<td>Reducing firewood movement by the public: effective combination of regulation, education and persuasion. Diss-Torrance, Andrea1 and Kim Peterson2. 1Wisconsin Department of Natural Resources; 2Forest Management, Alpha Tech Group.</td>
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<td>Drought and tree mortality: An example from the southern Sierra Nevada. Fettig, Christopher J.1, Leif A. Mortenson2, Patra B. Foulk3,3, and Beverly M. Bulaon4. 1Pacific Southwest Research Station, USDA Forest Service, Davis, CA 95618, 2Pacific Southwest Research Station, USDA Forest Service, Placerville, CA 95667; 3Volunteer; 4Forest Health Protection, USDA Forest Service, Sonora, CA 95370.</td>
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<td>Distribution of balsam woolly adelgid in western North America. Gannon, Amy1, Leland Humble2, Gabriella Zilahi-Balogh, PhD3, Laura Lowry4, Gina Davis, PhD5, and Lia Spiegel6. 1Montana Department of Natural Resources and Conservation; 2Natural Resources Canada; 3Canadian Food Inspection Agency; 4USFS Forest Health Protection, Boise Field Office; 5USFS Forest Health Protection, Couer d’Alene Field Office; 6USFS Forest Health Protection, La Grande Field Office.</td>
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<td>Pheromone divergence among populations of western pine beetle (Dendroctonus brevicomis LeConte) across its range in the western United States. Grady, Amanda1, Richard Hofstetter2, Deepa Pureswaran3 and Brian Sullivan4. 1USDA Forest Service, Forest Health Protection, Flagstaff, AZ 86001, USA; 2Northern AZ University, School of Forestry, Flagstaff, AZ 86001, USA; 3Canadian Forest Service, Laurentian Forestry Center, Quebec City, QC G1V 4C7, Canada; 4USDA Forest Service, Southern Research Station, Pineville, LA 71360, USA.</td>
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<td>Evaluation of systemic insecticide and fungicide for protection of sycamore from polyphagous shot hole borer / fusarium dieback. Grosman, Donald1, Aki Eskalen2 and David Cox3. 1Arborjet Inc., 99 Blueberry Hill Road, Woburn, MA 01801; 2University of California - Riverside, Department of Plant Pathology and Microbiology, 3401 Watkins Ave., Fawcett Lab. #232,Riverside, CA 92521; 3Syngenta Crop Protection LLC, 14446 Huntington Road, Madera, CA 93636.</td>
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<td>Chemical defenses mediate interactions among native biotic disturbances and mountain pine beetle in the novel host, jack pine, in Canada. Klutsch, Jennifer G.1, Ahmed Najar1, Patrick Sherwood2, Enrico Bonello2, Jonathan A. Cale1, and Nadir Erbilgin1. 1Department of Renewable Resources, University of Alberta, Edmonton, AB T6G 2E3, Canada; 2Department of Plant Pathology, The Ohio State University, Columbus, OH 43210, USA.</td>
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<td>A forest insect alphabet fine arts presentation. Kulhavy, David1 and Charles Jones2. 1Arthur Temple College of Forestry and Agriculture; 2La Nana Creek Press Stephen F. Austin State University Nacogdoches, TX 75962.</td>
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<td>Knowledge gaps and management needs for the balsam woolly adelgid in the interior west. Lowrey, Laura1 and Gina Davis2. 1US Forest Service, Region 4 Forest Health Protection, Boise, ID; 2US Forest Service, Region 1 Forest Health Protection, Coeur d’Alene, ID.</td>
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<td>Invasive forest insects in southcentral Alaska: Past and present. Moan, Jason E. and John E. Lundquist. Alaska Division of Forestry, 550 W. 7th Ave, Suite 1450, Anchorage, AK 99501, USDA Forest Service, Forest Health Protection, 161 E 1st Avenue, Door 8, Anchorage, AK 99501.</td>
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| 62        | Objective prioritization of exotic pests: Development of a new model for PPQ.  
Neeley, Alison1, Byejoong Kim2, Leslie Newton3, and Ernie Hain2, Godshen Pallipparambil2. 1United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ), Science and Technology (S&T), Center for Plant Health and Science Technology (CPHST), Plant Epidemiology and Risk Analysis Laboratory (PERAL); 2North Carolina State University, Center for Integrated Pest Management (NCSU-CIPM); 3United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Plant Protection and Quarantine (PPQ), Science and Technology (S&T), Center for Plant Health and Science Technology (CPHST). |
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| 66        | Naturalization of a native pine beetle in novel pine habitats.  
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| 67        | Impact of severe drought and bark beetle-caused tree mortality in the pine forests of southern California.  
Poloni, Adrian1, Tom W. Coleman2, and Steven J. Seybold3. 1Department of Entomology and Nematology, University of California, Davis; 2USDA Forest Service, Forest Health Protection, San Bernardino, CA; 3USDA Forest Service, Pacific Southwest Research Station, Davis, California. |
| 68        | Signal convergence and divergence for sympatric populations of western (Dendroctonus brevicomis LeConte) and southern (D. frontalis Zimmermann) pine beetle in Arizona.  
Pureswaran, Deepa1, Richard Hofstetter2, Brian Sullivan3, Amanda Grady4 and Kristen Potter5. 1Canadian Forest Service, Laurentian Forestry Center, Quebec City, QC G1V 4C7, Canada; 2Northern AZ University, School of Forestry, Flagstaff, AZ 86001, USA; 3USDA Forest Service, Southern Research Station, Pineville, LA 71360, USA; 4USDA Forest Service, Forest Health Protection, Flagstaff, AZ 86011, USA; 5Northern AZ University, School of Forestry, Flagstaff, AZ 86001, USA. |
| 69        | Isolation and identification of a male-produced attractant pheromone for the invasive velvet longhorned beetle, Trichoferus campestris (Cerambycinae: Hesperophanini).  
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| 70        | Overview of biological control programs for invasive insects and plants for protection of forested ecosystems in the US.  
Reardon, Richard and Carol Bell Randall. USDA Forest Service, Forest Health Technology Enterprise Team, Morgantown , WV; USDA Forest Service, Forest Health Protection, Coeur d’ Alene, ID. |
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Reardon, Richard, Entomologist; Yun Wu, Pathologist; and Denise Binion, IT Specialist. Forest Health Technology Enterprise Team 180 Canfield St Morgantown , WV 26505. |
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Rosenberger, Derek W.1, Robert C. Venette2, and Brian H. Aukema1. 1Department of Entomology, University of Minnesota, St. Paul, Minnesota, U.S.A.; 2United States Department of Agriculture - Forest Service, Northern Research Station, St. Paul, Minnesota, U.S.A. |
| 73        | The non-native emerald ash borer alters forest structure and the associated arthropod community. 
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| 74        | A "primary" wood borer of low elevation Douglas-fir in southwest Oregon. 
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| 76        | Coarse woody debris accumulation in emerald ash borer invaded forests supports a rich and abundant community of Scolytinae. 
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| 80        | Efficacy of detecting bark- and wood boring beetles (Cerambycidae, Buprestidae, Scolytinae) is improved by using a mix of trap colors and trap placements. 
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| 81        | A burning question: User attitudes and firewood as a vector of non-native wood borers in Mississippi parks. 
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| 82        | Are insects (and/or pathogens) contributing to sugarberry mortality in Georgia and South Carolina? 
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