Emerald Ash Borer
Threats to California and Oregon Native Ash

Wyatt Williams
Invasive Species Specialist

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Invasive Species Specialist

• Created during 2011 Legislative session
• Goal: Prevent, detect and control invasive species in Oregon’s non-federal forests
• All taxa (weeds, insects, disease)
Emerald Ash Borer adult and larvae

*Agrilus planipennis* Fairmaire

Coleoptera: Buprestidae

15,000 known species and 450 genera in the family!

*Agrilus*

3,000 known species in this genus alone!

D. Cappaert, Michigan State U.
Origins of EAB

We now know Russia far east is also in native range.
EAB in North America

- First identified in U.S., 2002
- Infestation started ~1992-1993
- Now in 22 states, 2 provinces
- Spread via firewood

Likely introduced via infested wood packing material
EAB sampling design for the U.S.

= 2013 new state detections: CO, NH, NC, GA
Some effects of EAB

D. Herms
Some effects of EAB

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Some effects of EAB
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Some effects of EAB

Pictures of natural areas & native ash in the Midwest. Note dead crowns.
Signs/symptoms of EAB

“Serpentine” larval galleries

Classic, D-shaped exit holes of emerging adults.

Epicormic shoots and dead canopies.
Treatments – Eradication/Suppression

Delimitation surveys = Hard work!

Eradication = Expensive, ineffective.
Treatments - Chemical

- Tree injections
- Systemic insecticides
  - Imidacloprid
  - Emamectin benzoate
- Costly ($100-$500 per tree)
- Repeat applications – every 1-2 years.
- Not feasible on large scale
Treatments - Biological Control

- *Tetrastichus planipennisi*
- Released in 2007-2008 in Michigan
- 21% parasitism rate
- Not enough?
- Rates still rising?

Duan et al. 2013
Costs of EAB

• **Economic:** Tree removal & replacement, property value losses, timber value losses, survey, research,…

• **Ecological:** changes in water quality, species composition, …
## Costs of EAB

<table>
<thead>
<tr>
<th></th>
<th>Federal government Expenditures</th>
<th>Local government Expenditures</th>
<th>Household Expenditures</th>
<th>Residential Property Value Loss</th>
<th>Timber Loss</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>To date</td>
<td>$92M</td>
<td>$1.7B</td>
<td>$760M</td>
<td>$830M</td>
<td>$130M</td>
<td>$3.5B</td>
</tr>
</tbody>
</table>


“*Emerald ash borers have become the most destructive and costly forest insect to ever invade North America.*”

– Deborah McCullough  
Michigan State University
Costs of EAB in Western States

Removal: $435 M ($290/tree)  Replacement: $580 M ($387/tree)
New EAB invasion in Boulder, CO could cost Denver metro area ~$1 billion!

City of Portland
Street Tree Inventory

4.8% or 72,000 public ash
$21M removal
$28M replacement
$49M total cost to PDX
## Host trees in CA and OR

<table>
<thead>
<tr>
<th>Name</th>
<th>Common</th>
<th>OR</th>
<th>CA</th>
<th>Urban</th>
<th>Origin</th>
<th>Susceptible</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Fraxinus latifolia</em></td>
<td>Oregon ash</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>OR, WA, CA</td>
<td>Yes</td>
</tr>
<tr>
<td><em>Fraxinus velutina</em></td>
<td>Velvet ash</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>CA, NV, AZ...</td>
<td>Yes?</td>
</tr>
<tr>
<td><em>Fraxinus dipetala</em></td>
<td>California ash</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>CA, NV, AZ...</td>
<td>Yes?</td>
</tr>
<tr>
<td><em>Fraxinus anomala</em></td>
<td>Singleleaf ash</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>CA, NV, AZ...</td>
<td>Yes?</td>
</tr>
<tr>
<td><em>Fraxinus americana</em></td>
<td>White ash</td>
<td>Yes</td>
<td></td>
<td></td>
<td>Eastern U.S.</td>
<td>Yes</td>
</tr>
<tr>
<td><em>Fraxinus pennsylvanica</em></td>
<td>Green ash</td>
<td>Yes</td>
<td></td>
<td></td>
<td>Eastern U.S.</td>
<td>Yes</td>
</tr>
<tr>
<td><em>Fraxinus nigra</em></td>
<td>Black ash</td>
<td>?</td>
<td></td>
<td></td>
<td>Eastern U.S.</td>
<td>Yes</td>
</tr>
<tr>
<td><em>Fraxinus quadrangulata</em></td>
<td>Blue ash</td>
<td>?</td>
<td></td>
<td></td>
<td>Eastern U.S.</td>
<td>Moderate</td>
</tr>
<tr>
<td><em>Fraxinus angustifolia</em></td>
<td>Narrow-leafed ash</td>
<td>Yes</td>
<td></td>
<td></td>
<td>Eurasia</td>
<td>Yes</td>
</tr>
<tr>
<td><em>Fraxinus uhdei</em></td>
<td>Tropical ash</td>
<td>Yes</td>
<td></td>
<td></td>
<td>Mexico</td>
<td>Yes?</td>
</tr>
<tr>
<td><em>Fraxinus excelsior</em></td>
<td>European ash</td>
<td>Yes</td>
<td></td>
<td></td>
<td>Europe</td>
<td>Yes</td>
</tr>
<tr>
<td><em>Fraxinus mandshurica</em></td>
<td>Manchurian ash</td>
<td>?</td>
<td></td>
<td></td>
<td>East Asia</td>
<td>No</td>
</tr>
<tr>
<td><em>Fraxinus chinensis</em></td>
<td>Chinese ash</td>
<td>?</td>
<td></td>
<td></td>
<td>East Asia</td>
<td>No</td>
</tr>
</tbody>
</table>
Emerald Ash Borer (EAB) Risk 2014 for Oregon and Washington

Emerald Ash Borer (EAB) Risk 2014
EAB risk is a function of EAB detection likelihood, detection uncertainty, and potential introduction locations. Potential introduction locations include campgrounds, rest areas, and other locations identified by state cooperators. Introduction sites were given a high risk value and then combined with the 2014 EAB detection likelihood composite model. Risk values are classified into: Low, Moderate, Moderate High, and High classes.
Oregon Ash – a widespread and common tree in Oregon, California, and Washington.
Standard APHIS protocol for sampling EAB:

- 3-sided, sticky purple prism trap baited with 2 plant volatiles
- 3-10 m in ash tree for 16 weeks
- ODF is the state cooperator in Oregon

W. Williams
Oregon Dept. of Forestry
EAB and select Buprestid beetles native to W Oregon

EAB
* Agrilus planipennis
3/8 – 1/2 “
10-13 mm

Exotic
Bronze birch borer
* Agrilus anxius
AGAN
6-13 mm
Agrilus vittaticollis
AGVI
8-10 mm
Agrilus politus
AGPO
5-9 mm

Anthaxia deleta
* Chrysophana placida
* Cypriacis aurulenta
Cypriacis langii
ANDE
CHPL
CYAU
CYLA
4-6 mm
6-11 mm
13-22 mm
13-21 mm

Not actual size but all images are to scale.
*Caught on ODF purple traps during 2013-2014 survey seasons.
Other native and exotic Buprestid beetles

**Exotic**

- **GSOB**
  - *Agrilus auroguttatus*
  - 10 mm

- Oak splendor beetle
  - *Agrilus biguttatus*
  - 8-13 mm

- **Chrysobothris sp.**
  - *C. viridicyanea*
  - 5-20 mm

- **Melanophila sp.**
  - *M. acuminata*
  - 6-13 mm

- **Phaenops sp.**
  - *P. drummondii*
  - Flatheaded fir borer
  - 3-8 mm

- **Anthaxia sp.**
  - *P. gentilis*
  - 5-12 mm

- **Xenomelanophila sp.**
  - *X. miranda*
  - 8-12 mm

- **Chalcophora angulicollis**
  - 19-32 mm

- **Buprestis sp.**
  - *B. laeviventris*
  - 9-28 mm

- **B. longi** – male
- **B. longi** – female

- **B. subornata**
- **B. lyrata**
- **B. adjecta**

*Not actual size but all images are to scale.*
After careful screening of on 196 traps...

• 22 beetle families
• 30+ species identified
• 5 Buprestid species
• Only 1 specimen for *Agrilus* (*A. politus*)
EAB – recent 1\textsuperscript{st} detections in 2013

<table>
<thead>
<tr>
<th>Date</th>
<th>State</th>
<th>Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2013</td>
<td>WI</td>
<td>Infested tree, Contract arborist</td>
</tr>
<tr>
<td>Fall 2013</td>
<td>IN</td>
<td>Infested tree, Forester</td>
</tr>
<tr>
<td>Fall 2013</td>
<td>IL</td>
<td>Infested tree, Ag staff</td>
</tr>
<tr>
<td>Fall 2013</td>
<td>CO</td>
<td>Infested tree, Forester</td>
</tr>
<tr>
<td>Summer 2013</td>
<td>VA</td>
<td>EAB trap</td>
</tr>
<tr>
<td>Summer 2013</td>
<td>WI</td>
<td>Infested tree, City workers</td>
</tr>
<tr>
<td>Summer 2013</td>
<td>NC</td>
<td>Infested tree, Forester</td>
</tr>
</tbody>
</table>

In 2013, 86 new county-level detections across entire U.S.

50/86 or 58\% were found by professionals looking in trees

=Official EAB traps are not great!
White fringe tree

- *Chionanthus virginicus*
- 3 sites in OH with EAB
- Oleaceae
- 2 species native to SE U.S.
- 150 spp. native to SE Asia
- Ornamental species

Smithsonian Institute
Forest Pest Detector Project

Goal: Train tree care professionals to recognize and report exotic wood borers

Components:
• Training modules
• Reporting infrastructure
• Develop ‘Invasive Wood Borer Preparedness Plan’

Asian longhorned beetle  Emerald ash borer

Lots of coordination is required!
Oregon ash – important riparian plant?

A common scene in western Oregon. Stand of 100% Oregon ash surrounded by grass seed fields and vineyards.

What kind of wildlife rely upon these islands of habitat?
How important is Oregon ash in hydromorphology?
What would be the fuel loading for wildfires?
What will replace Oregon ash if it disappears?

No one knows because it hasn’t been studied!!!
What happens if EAB reaches the West Coast?

“APHIS will only continue to fund surveys, enforcement of quarantine, and biocontrol research. At this time, we will not fund eradication of EAB but will listen to a State’s request on a case-by-case situation.”

Phillip Baldauf
Acting SPHD, APHIS-PPQ, Oregon
Sometimes it feels like...

VS.

O VS. UCLA Bruins S

Oregon State Trojans SC Cal
But it should be like…

VS.

PSHB, G. Arakelian
ALB

GSOB, UC Riverside
SOD

EAB
Let’s Collaborate. Thank you!

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I thank the U.S. Forest Service for a travel grant to attend this meeting.