Today's Program

- Bark beetles
- Conifer defoliators
- Broadleaf defoliators
- Sucking insects
- Dwarf Mistletoes
- Aspen decline
- Emphasis – how to recognize pest agent and its damage

Forest Health Issues

William M. Ciesla
Forest Health Management International
Fort Collins, CO

2013 Tri River Area Pest Management Workshop
February 19-20, 2013
Two Rivers Convention Center
Grand Junction CO

Bark beetles (Coleoptera:Curculionidae:Scolytinae)

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific name</th>
<th>Host tree(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mountain pine beetle</td>
<td>Dendroctonus ponderosae</td>
<td>Limber, lodgepole, ponderosa pines</td>
</tr>
<tr>
<td>Spruce beetle</td>
<td>D. engelmanni</td>
<td>Engelmann spruce</td>
</tr>
<tr>
<td>Douglas-fir beetle</td>
<td>D. pseudotsugae</td>
<td>Douglas-fir</td>
</tr>
<tr>
<td>Western pine beetle</td>
<td>D. brevicomis</td>
<td>Ponderosa pine</td>
</tr>
<tr>
<td>Pinyon ips</td>
<td>Ips confusus</td>
<td>Pinyon pine</td>
</tr>
<tr>
<td>Fir engraver</td>
<td>Scolytus ventrolis</td>
<td>White fir</td>
</tr>
<tr>
<td>Western balsam bark</td>
<td>Dryocoetes confusus</td>
<td>Subalpine fir</td>
</tr>
</tbody>
</table>

Major bark beetle pests of Colorado's forests

Mass attack

Bark beetle galleries are distinct
Blue stain fungi introduced by bark beetles

Mountain pine beetle, *Dendroctonus ponderosae*

All native pines except pinyon are hosts of MPB

Lodgepole pine

Ponderosa pine

Limber pine

MPB damage in ponderosa and lodgepole pines

Colorado MPB outbreak 1996-2011

Aftermath of a mountain pine beetle outbreak
Mountain pine beetle management

Preventative sprays
Anti-attractants
Brood destruction
Forest Management

Spruce Beetle, *Dendroctonus rufipennis*

Eggs
Pupa
Immature adults
Adult

Windthrow – Sangre de Cristo Range

Spruce beetle “faders”

Spruce Beetle Activity in Colorado: 1996 - 2012 and 2012 Blowdown Damage

*Douglas-fir beetle, Dendroctonus pseudotsugae*

Aerial view of damage

Galleries
Western pine beetle, *Dendroctonus brevicomis*

Pinyon Ips, *Ips confusus*

Fir engraver beetle, *Scolytus ventralis*

Western spruce budworm, *Choristoneura occidentalis*

Defoliators of Aspen
Western tent caterpillar, *Malacosoma californicum*

Western tent caterpillar, Life stages

Egg Larva Pupa Adult

Other host plants of western tent caterpillar

- Mountain mahogany
- Wild currant
- Bitterbrush
- Choke cherry
- Gambel oak
- Other woody plants

Large aspen tortrix, *Choristoneura conflictata*

Larva Rolled leaf
Pupa Adult

Defoliators of Gambel oak and other woody plants

Fall cankerworm, *Alsophila pometaria*, life stages

Egg Larva
Adult - male Adult - female
Defoliation of Gambel oak by fall cankerworm

Linden looper

Erratis tiliara

Pinyon needle scale – Matsucoccus acaleyptus

Dwarf mistletoes, Arceuthobium spp.

Dwarf mistletoes, Arceuthobium spp.

- Parasitic plants
- Infest conifers
- 42 species – mostly in western NA
- Effects
  - Growth loss
  - Deformity
  - Eventual tree death
- Seeds are dispersed by pressure

Dwarf mistletoes in Colorado

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Species</th>
<th>Host(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ponderosa pine</td>
<td>A. vaginatum spp. cryptopodium</td>
<td>Ponderosa pine</td>
</tr>
<tr>
<td>Lodgepole pine</td>
<td>A. americanum</td>
<td>Lodgepole pine</td>
</tr>
<tr>
<td>Limber pine</td>
<td>A. cyanocarpum</td>
<td>Limber pine, other</td>
</tr>
<tr>
<td>Pinyon</td>
<td>A. divaricatum</td>
<td>Pinyon pines</td>
</tr>
<tr>
<td>Douglas-fir</td>
<td>A. douglasi</td>
<td>Douglas-fir</td>
</tr>
</tbody>
</table>
Sudden aspen decline

Ponderosa pine
dmt

Lodgepole pine
dmt

Limber pine
dmt

Douglas-fir
dmt

Pinyon dmt

Witches brooms –
Douglas-fir

Witches brooms –
lodgepole pine

Tree death –
Douglas-fir

Declines or diebacks

- Complex diseases – caused by several interacting biotic and abiotic factors.
- Causes are often difficult to diagnose
- Secondary insects or pathogens are often erroneously blamed for the cause.
- Declines/diebacks have occurred worldwide
- Symptoms often similar, regardless of cause(s).

Causes of decline

- Predisposing factors
  - Root disease (e.g. Armillaria sp.)
  - Pollutants
  - Mature or overmature forests
- Inciting factors
  - Climatic anomalies (drought, excess precipitation, sudden cold)
  - Defoliation (insects, wind, frost)
  - Acute episodes of air pollution
- Contributing factors
  - Secondary insects (wood borers, bark beetles)
  - Weak pathogens (fungi, parasitic plants)

Symptoms of decline

- Smaller than normal foliage
- Thin crowns
- Reduced growth
- Early fall coloring of broadleaf species
- Unusually heavy seed crops (stress crops)
- Branch dieback
- Tree mortality
- Symptoms often develop over a period of several years and are progressive
- In some cases trees may not die but recover when stress(es) are alleviated
Aerial view of aspen decline

Cause(s) of sudden aspen decline

- **Predisposing factors**
  - Pure, even age aspen climax stands at lower elevation limits of tree growth
  - Stands are old > age 100

- **Inciting factors**
  - Long term drought
  - Late spring frost, leaf scorch, other defoliation events

- **Contributing factors**
  - *Cytospora*
  - Cambium boring beetles

Galleries of bronze poplar borer *Agrilus liragus* in a declining aspen (Contributing factor)

Release of aspen regeneration following death of overstory

Questions, comments?

The End

Thank you for your attention

Gracias para su atención