Forest insect and disease management: Implications for biomass production

Jana Albers, DNR

Outline
- Landscape-level opportunities
  - Historic or mappable agents
  - Invasive pests on the horizon
- Site-level opportunities
  - By species/covertype
  - Avoid creating future problems today
  - Choose materials for retention
  - Prevent wounding of residuals

Landscape-level biomass opportunities

Average annual mortality of growing-stock on timberland as a percent of volume for 12 most abundant species from 1990-2002.

Jack pine forests are periodically defoliated by budworms.

Typical JBW impact

1. Kills 10% of dom/codom trees. (Ranges 2 to 40%)
2. Kills most regen and suppressed trees (90%) and some intermediates within mature stands.
3. Growth reductions follow heavy defoliation; year 1 = 50%, year 2 and year 3 = 100%.
4. Pollen cone production ceases for 3 years following an outbreak.
5. Stems dry down if top-killed or tree died.
**Current JPBW outbreak:**
- 2002: 400 ac
- 2003: 18,500 ac
- 2004: 47,000 ac

**Historic JPBW outbreaks:**
- West-central counties
- 3 to 6 years
- Up to 120,000 acres in peak year.
- Opportunities for biomass are salvage harvests and slash piles.

**Spruce budworm**
- Native defoliator
- BF and WS susceptible at age 40 to 45 years.
- Prolonged defol in an area
- Doesn’t kill regen
- “Budworm begets budworm”

**Spruce budworm in Minnesota from 1954 to 2005**

**White spruce**

**Balsam fir**
Spruce budworm outbreaks 1954 to present:

- Average 100,000 acres per year of defoliation.
- 28,000 cu ft of dead wood created per year.
- 5 counties in historic area.
- Biomass opportunities:
  
  Pre-salvage as BF reaches aspen canopy.
  
  Salvage BW-killed trees.
*Ips* bark beetles on pines

- Native.
- Habitat = phloem.
- 2 or 3 generations per year.
- Require freshly cut, killed or stressed trees or slash to complete life cycle and build populations.

Biomass opportunities: During fall, winter and spring
- Removal of fresh/recent log piles and log decks.
- Removal of fresh slash from thinning or harvested area.

Biomass opportunities: During late spring and summer.
- Operators must have flexibility to respond.
- Removal of infestation pockets
- Hot logging of pine materials > 3’ diam.
- Slash and slash pile removal
Eastern larch beetle
- Native
- 1 generation per year
- Over-winters in tree
- Host is tamarack
- Outbreak since late 1990’s
- Associated with larch casebearer defoliation

Forest tent caterpillar
- Native defoliator
- Cyclic outbreaks
- Aspen and hardwoods

Larch beetle 2005
11,000 ac

Larch mortality 2002 to 2004
32,580 acres

2005 = 11,000 acres
FTC outbreaks are cyclic in Minnesota

1933-1938
1948-1956
1964-1971
1977-1983
1987-1992
1998-2003

Forest Tent Caterpillar 1998-2003

Trace  Light  Moderate  Heavy

1998 1999 2000
2001 2002 2003

Two-lined chestnut borer

- Native; phloem borer.
- Opportunistic on stressed oaks.
- Localized, intense outbreaks associated with drought and defoliation.

Forest tent caterpillar and its aftermath

Abiotic = dieback, small foliage

Current defoliation

410,500 ac

9,800 ac

2005
Invasive pests on the horizon that have potential for creating biomass opportunities:

- Buckthorn
- Oak wilt
- Red pine pocket mortality
- *Fomes* root rot
- *Sirex* wood wasp
- Emerald ash borer

Wind damage

- Varies greatly from year to year.
- Some acres are found during aerial survey.

Oak wilt

- Invasive fungal disease
  - Treat the oak wilt pocket by root graft disruption, then salvage oaks inside the pocket.
  - Do not build roads, harvest, skid, haul, prune or otherwise wound oaks between April 1 and July 15 within 1 mile.
  - If removing oak from active infection pockets, process, chip or debark all wood by April 1.
Red pine pocket mortality
- Caused by insects and fungi working together.
- Common in western Wisc.
- Two dozen locations in Sherburne Co.
- Not known anywhere else in MN.
- Control is unknown.

Fomes annosus root rot
- **NOT** known to be in MN.
- Fungus native to Rocky Mts.
- Transported in wood, debris and soil.
- Prevented by stump treatment

Sirex noctilio – European wood wasp
- Hosts – pine, spruce, fir, larch
- Native to Europe and Asia.
- Established in S. America, S Africa, Australia, New Zealand.

Emerald ash borer
- Habitat = phloem.
- Found in Detroit in 2002.
- Particularly nasty insect, kills all ashes in its path.
- Federal quarantines are in place.

Not found in
Minnesota Wisconsin
Current practice for EAB:
Locate, cut and dispose of every ash tree within a $\frac{1}{2}$ mile radius of an EAB infested tree.

Site level biomass opportunities:

- All species: too much decay/defect to sell as timber, “high risk stands” on CSA.
- Aspen: to advance successional stage, create openings, select clones for removal.
- Hardwoods: selective/patch thinnings to remove stems with poor form, cracks, decay, and dead trees.

Site level opportunities - continued:

Red pine: bark beetle build-up.
Balsam fir: stand sanitation prior to stems reaching maturity so they won’t be attractive to spruce budworm.
White spruce: in underplantings & plantations, to release saplings from aspen competition about age 20.
Black spruce: dwarf mistletoe control along edges and buffers, and in stands at harvest or post-harvest.
Dwarf mistletoe

Even-aged, healthy, green, growing.

Uneven-aged, infected, stagnating, lots of ladder fuels.

- Parasitic seed plant
- Seeds are dispersed up to 50 feet away.
- Obligate parasite = to eradicate disease, must kill all infected black spruce on a site.
- Slash is not infective.
- From 8 infected trees, 40 acres are infected after 90 years.

Dmt control = eradication of all living black spruces.

- To be effective, both harvest and biomass operations must kill all black spruce on infected sites.
- Lots of acres.

Post-harvest scenario

- cross-section of a black spruce clearcut with mistletoe infected residual trees

Slash dmt pocket adjacent infected stand
Avoid creating future problems:

• Seriously consider ecologic benefits of legacy patches, snags and coarse woody debris.
• Map out and preserve all the desired advanced regeneration on the site. If it is cut or damaged, you lose both the next crop and the genetic potential (local adaptations) found on that site.
• Avoid damaging soils/soil structure.
• Avoid wounding advanced regeneration and residuals because wounds are ultimately expressed as decay and cracks in your crop trees.

On all sites, there are benefits and drawbacks to thinning for timber or biomass purposes:

• Improves stand vigor and productivity.
• Creates stem and root collar wounds.
• May cause soil compaction.

Biomass activities should

• benefit stand productivity,
• benefit ecologic values,
• prevent pest-caused losses.