

BLM Thinning Workshop
Risk Management:
From the perspective of Forest Protection

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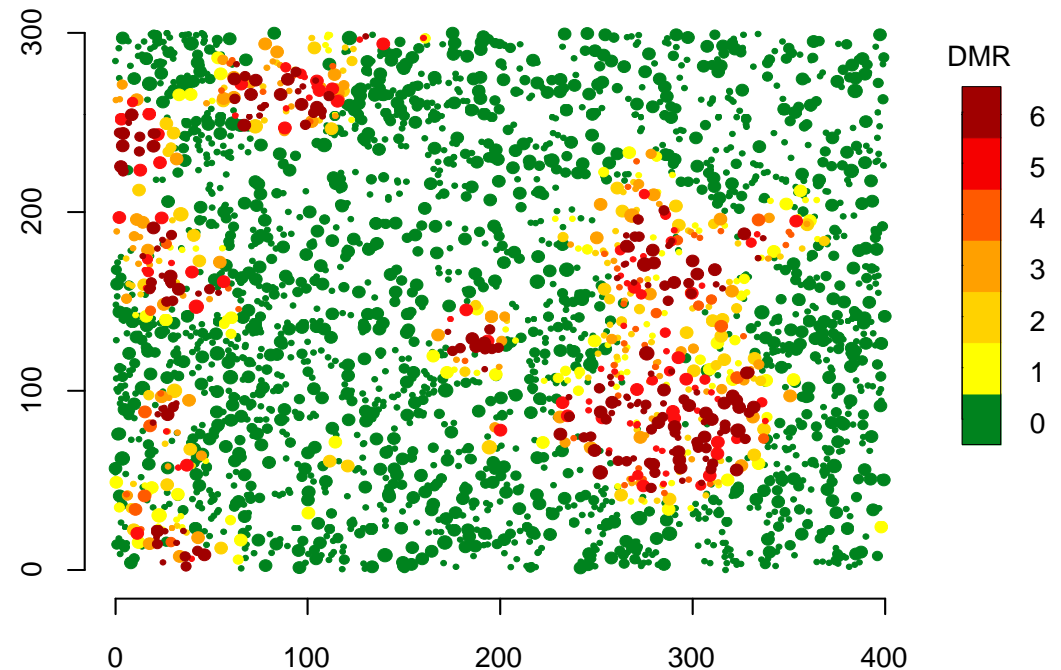
Risk Management Associated with Thinning: Forest Protection

- Abiotic
 - Sunscald
 - Windthrow
- Diseases
 - Root Rots
 - Stem Decays
 - Needle Diseases
 - Cankers and Rusts
 - Dwarf Mistletoes
- Insects:
 - Bark Beetles
 - Defoliators
 - Other Insects



Some considerations

- Thinning can increase or decrease tree diversity.
- Spatial patterns of insect and disease host and non-hosts can impact insect and disease spread and intensification.
- Local scale problems will define the need for spatial diversity.



Distribution of dwarf mistletoe on a 12 ha Old-growth plot. Red heavy, green uninfected Western hemlock trees.

Abiotic Factors: Windthrow

- The effects of wind events are strongly defined by topography and wind direction
- Ht/diameter ratio
 - Small dbh, tall height = vulnerable
- A Classic Scenerio:
 - Heavy thinning in overstocked stands leads to unstable trees.



Photo Glenn Ahrens, Dec 2007 near Astoria

Windthrow

- New Research:
 - Roberts, S.D., C.A. Harrington, and K.R. Buermeyer. 2007. Does variable-density thinning increase wind damage in conifer stands on the Olympic Peninsula? *Western Journal of Applied Forestry* 22(4):285-296.
- Variable retention silviculture did not inherently increase windthrow.
- Cut edges, gaps, skid trails that occurred in topographically vulnerable positions did have increased windthrow.
- Topographically vulnerable = experience higher wind speeds, like ridge-tops



Suncald

- Associated with:
 - Over-thinned stands.
 - Bad timing
 - Thinned during or just before a particularly hot, dry weather event
 - Young-ish bark that has been shaded and then is suddenly exposed to direct sun.
- Avoid heavy thinning during hottest summer months.



- Laminated Root Rot

Trees affected by laminated root rot are very susceptible to windthrow.

Tree most affected:

Doug-fir

Grand fir

Mt. Hemlock



J. PUNCHES photo

Laminated Root Rot

- **Should one avoid Laminated root rot pockets?**
 - The root rot is not necessarily limited to the obvious root rot pocket. Several options:
 - Avoid root rot centers (50 ft buffer), and lightly thin the remaining area (to avoid windthrow)
 - Thin across the entire area, but don't remove too much basal area.
 - If planning to harvest stand within 15 years
 - If windthrow isn't a major issue already
 - Stay out of the area completely until final harvest.
 - Salvage rot centers and buffer (50 ft) around it to prevent spread of disease. This could create large openings that influence windthrow.

Laminated root rot distribution:

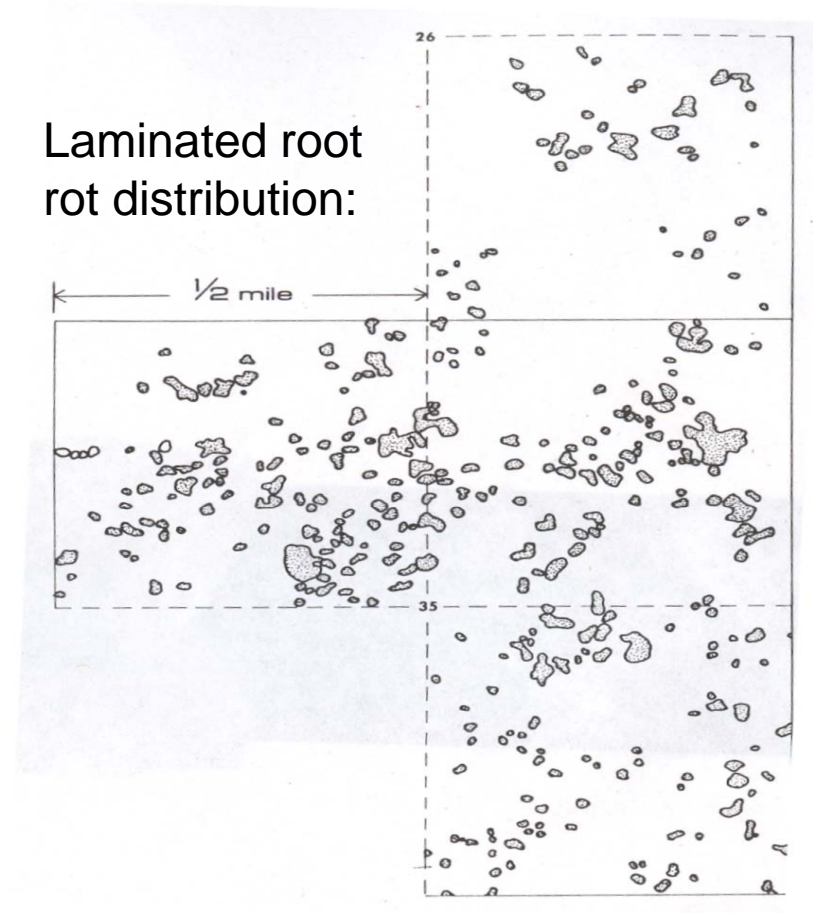


Figure from: T.W.Childs. 1970. USFS Res. Paper PNW-102.

Armillaria Root Rot

- Typically different in east side vs. west side forests.
- West side forests:
 - Disease is associated with poor vigor, improving vigor with thinning is good.
- Eastside forests:
 - Way more complicated, species composition may be key (avoid grand fir).
 - In pine types, thinning may increase tree vigor and improve things.

Preventive management techniques, especially thinning dense stands to maintain tree vigor, is your first defense.



G. Filip photo

Annosus Root Disease

- Westside, most important in hemlock and true fir.
 - Rot increases with stand age and number of entries.
 - Pathological rotation ~120 yrs.
- Eastside, true fir-mixed conifer especially bad.
- Ponderosa pine in S-Central OR and N. Calif.
- Doug fir usually not an issue.



Annosus Risk Management

- Avoid wounding always.
 - Annosus is a famous wound colonizer.
- In high hazard areas:
 - Use stump surface protection.
 - Thin when stumps are small.
 - Thin in hot summer months when spores are minimal.



Borax stump surface protection

Black Stain Root Disease

- Douglas-fir
 - Western and Cascades Oregon
- Ponderosa pine
 - SW Oregon, S Central and N. CA.
- Can form disease centers.
- Associated with stress, compacted soils, roads.
- Spread by root bark beetles and weevils that are attracted to fresh thinning stumps and stressed/wounded trees.



Black stain is vectored by insects

Bark beetle



Weevil



Weevil



Black Stain Management

- Avoid wounding.
- Thin or prune July (August) – December to avoid insect flights and disease spread.
- Favor resistant species during thinning.
- New road construction through young doug fir and p pine plantations should be avoided, esp within 1 mile of known black stain center.
- Rotary blade brush cutting to clear roads should be avoided near plantations.



Stem Decays

- Tree Wounding a major factor.
 - Planned directional felling, skid road placement
 - Bumper trees, removed last
- True Heartrots
 - In true firs, there is some evidence that *Echinodontium tinctorium* (Paint fungus) lays dormant inside the tree and when the tree is stressed or wounded, it is activated and can cause significant decay.
 - Not sure if this is the case for *Phellinus pini* (white speck, conk rot) in Douglas-fir.



**ARMILLARIA entering
through wound**



Stem Decay Management

- **Encourage tree vigor through good silviculture.**
- **Avoid tree wounds that give access to fungal spores and activate dormant infections.**



G.Filip photo

Needle Diseases

- Thinning is thought to improve situation with needle diseases by:
 - Allowing airflow through canopy
 - Drying tree crowns, reducing moisture on foliage
- However, Swiss Needle Cast doesn't seem to behave like other needle diseases in the epidemic area along the coast.



Swiss Needle Cast of Douglas-fir affects the tops more than other needle diseases



Dothistroma needle blight of pines, B.C. Canada

**Bottom-up and
Inside-out**

**Thinning could reduce
Humidity and dry lower
Canopy.**

Cankers and Rusts

- Thinning and pruning are recommended to reduce incidence of white pine blister rust
- Thinning can be used to remove diseased trees and lower inoculum in the stand.
- Thinning may increase the abundance of understory plants, some of which may be alternate hosts of the rust.
 - Bracken fern and grand fir-bracken rust
 - Bastard toadflax and ponderosa pine, commandra blister rust



Western gall rust on pine.
Best to remove heavily infected trees during normal thinning operations.

White Pine Blister Rust

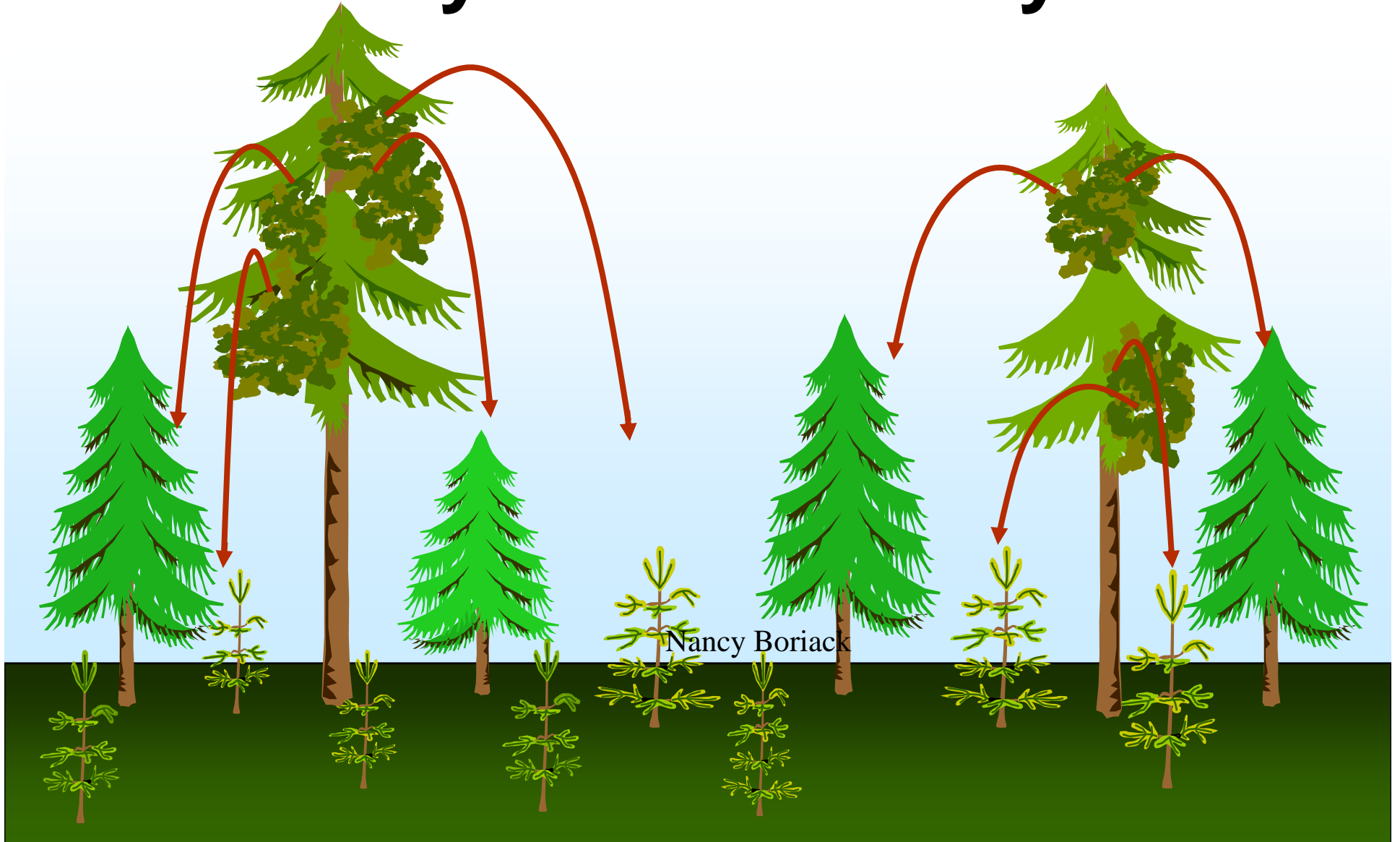
- **Management**
 - Maintain wide spacing
 - Pruning
 - Vegetation management



Managing Dwarf Mistletoe in Commercial Forests: Silviculture

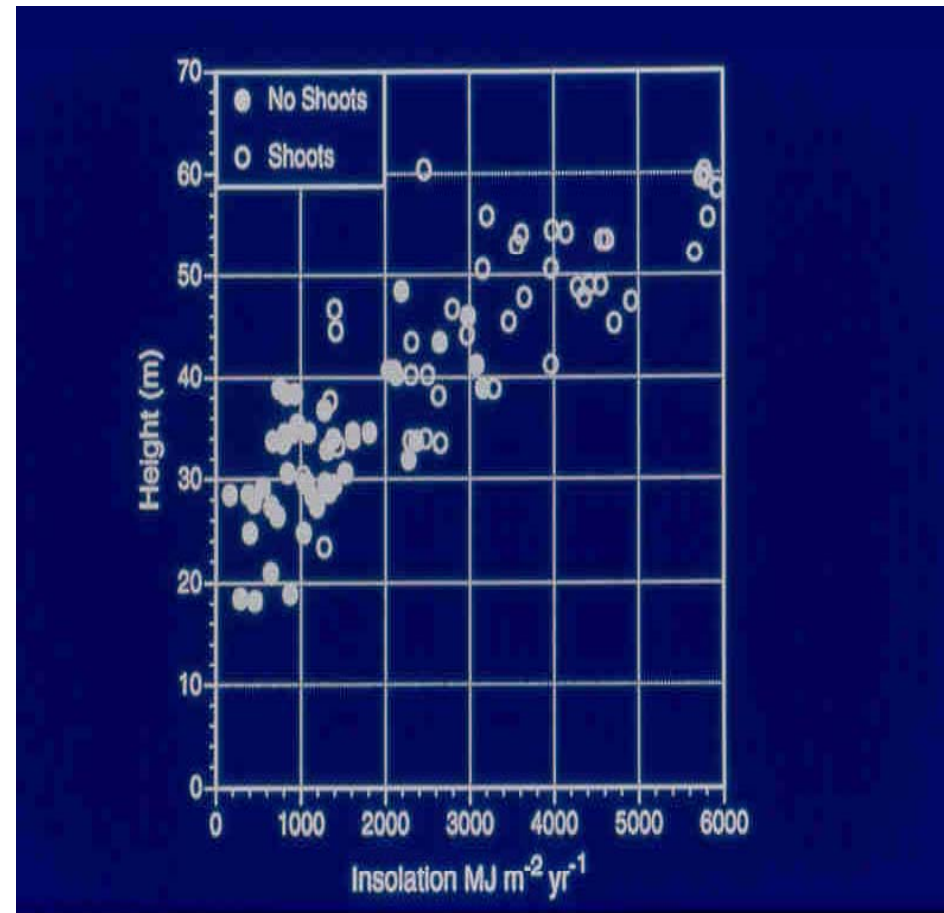
- Key life strategies of dwarf mistletoes which make them amenable to silvicultural treatments:
 - Obligate parasitism (require living host)
 - Host specificity (generally effect one species)
 - Extended life cycles (2-10 yrs)
 - Limited seed dispersal distance (10-50 ft)
 - Slow intensification within tree crowns

Mistletoe Infection from Overstory to Understory Trees



Managing Dwarf Mistletoe in Commercial Forests

- Dwarf Mistletoes require light for aerial shoot production.
- Density and crown management can shade out infections.
- Or, open the stand for dwarf mistletoe spread.
- Thinning can have positive or negative impacts.



Dwarf mistletoe brooms with shoots or no shoots by height and amount of insolation.

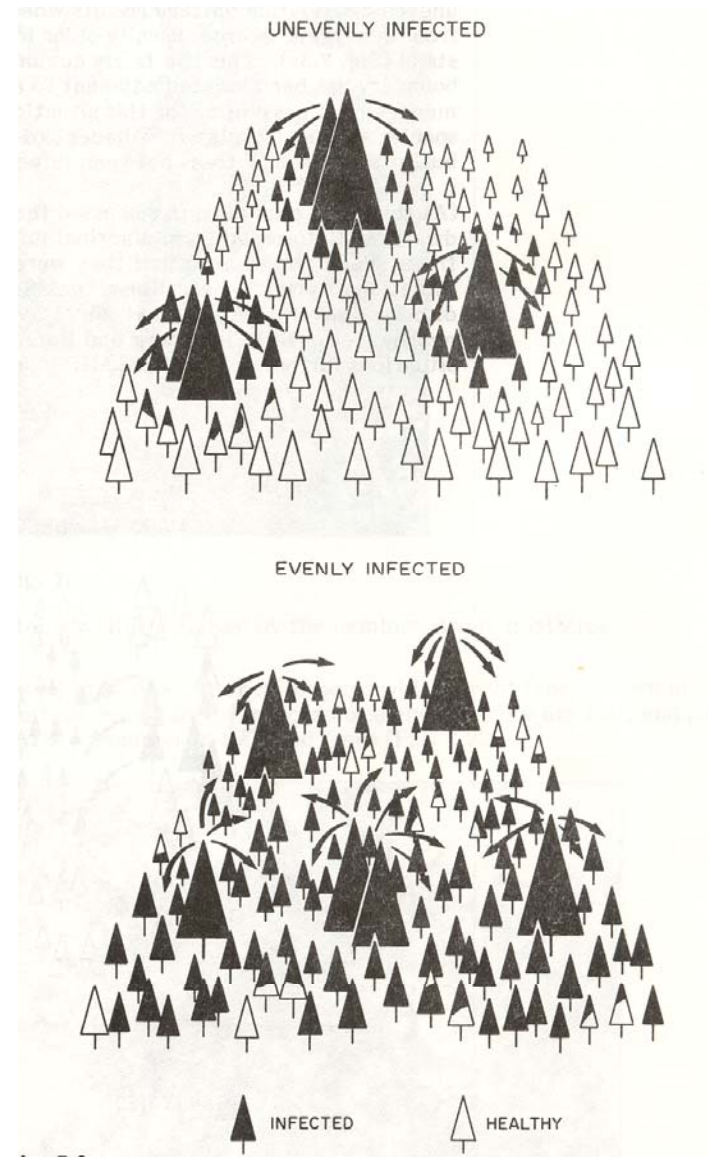
Dwarf Mistletoes

- Even aged management
- During thinning operations, remove heavily infected trees (DMR 4-6).
- During clearcut harvest, remove infected regeneration.
- Manage associated reserves and riparian areas with buffers of non-hosts or with high density of hosts.



Shelterwood

- Remove infected over-story trees within 10 years, or after regeneration reaches 3 ft tall.
- Prune brooms out of overstory trees if you have money to throw away.



Uneven aged management

- Selectively harvest heavily infected trees during routine stand entries.
- Favor non-host in vicinity of infected overstory trees when spacing trees.
- Use mixed species management and concentrate non-host in areas of infected trees.
- Thin bole infected understory trees in routine stand entries.
- Reduce density and maintain wide spacing of understory host trees.



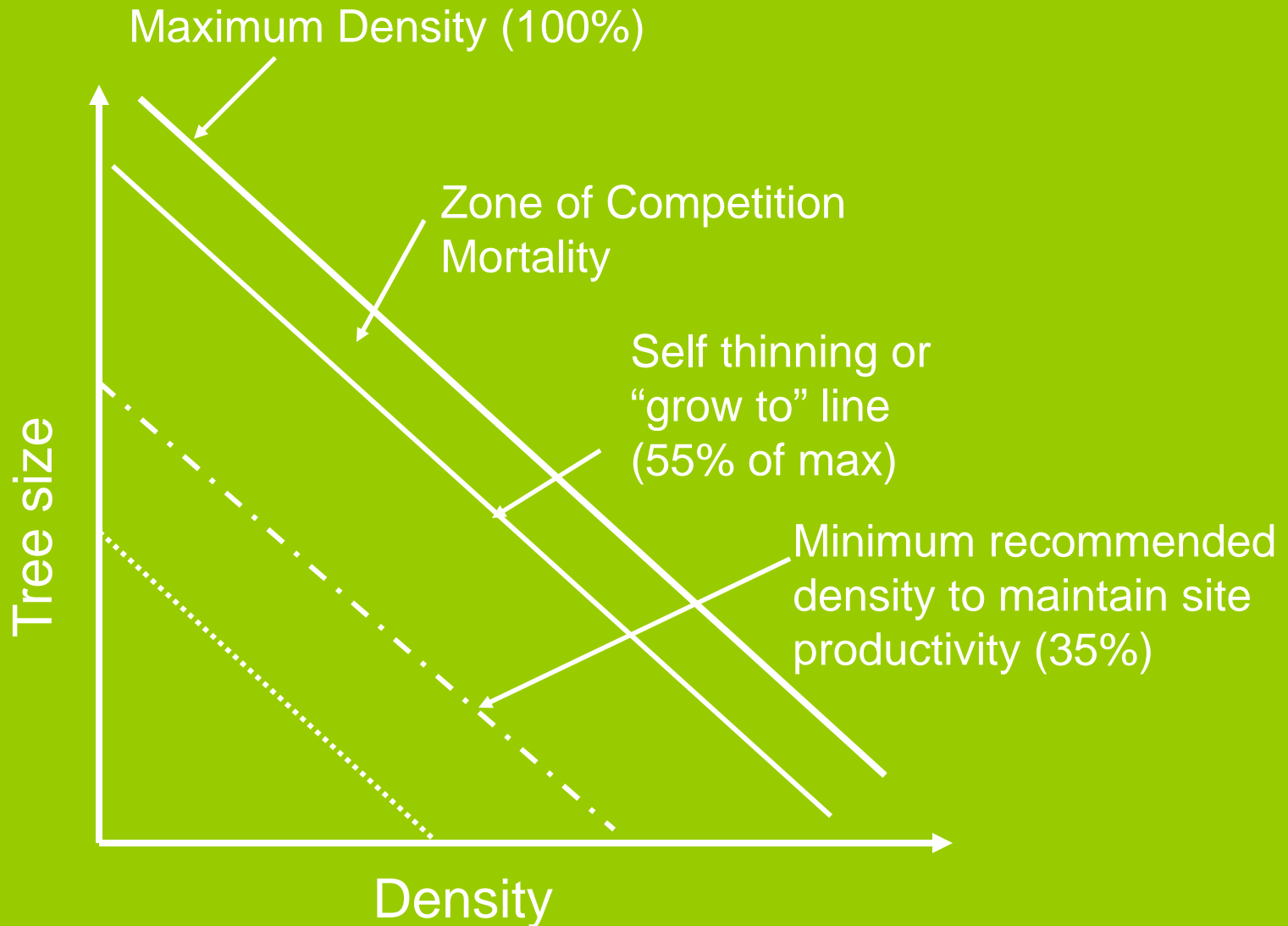
Uneven aged, single species lodgepole pine or Ponderosa pine where no alternative species are available

- Remove the most heavily infected DMR 4-6 trees when possible.
- Maintain wide spacing around heavily infected trees.
- Thin infected regeneration when possible.
- Reduce density and maintain wide spacing of understory host trees.



Bark Beetles

- Thinning is generally thought to improve the condition of a stand so that it is less susceptible to bark beetle attack.
- However, slash may increase beetle activity
 - Pine engraver and > 3 inch dbh slash



Size Matters to Some Beetles...

Species	Tree size requirements
Mt. pine beetle	Pole size to large
Western pine beetle	Large= scattered mortality Small = clumped mortality
Pine engraver	Small to tops of larger trees
Douglas-fir beetle	Pole size to large
Douglas-fir engraver/pole beetle	Small to tops of larger trees
Fir Engraver	Small to large
Spruce beetle	Large

Select “Good” Trees to Leave in Thinnings...



- Don't leave the genetically inferior
- Maintain trees with at least 30-40% crown ratio
- Leave healthy trees without disease or damage

Manage Pine Slash to Prevent Leave Tree Mortality



Defoliators

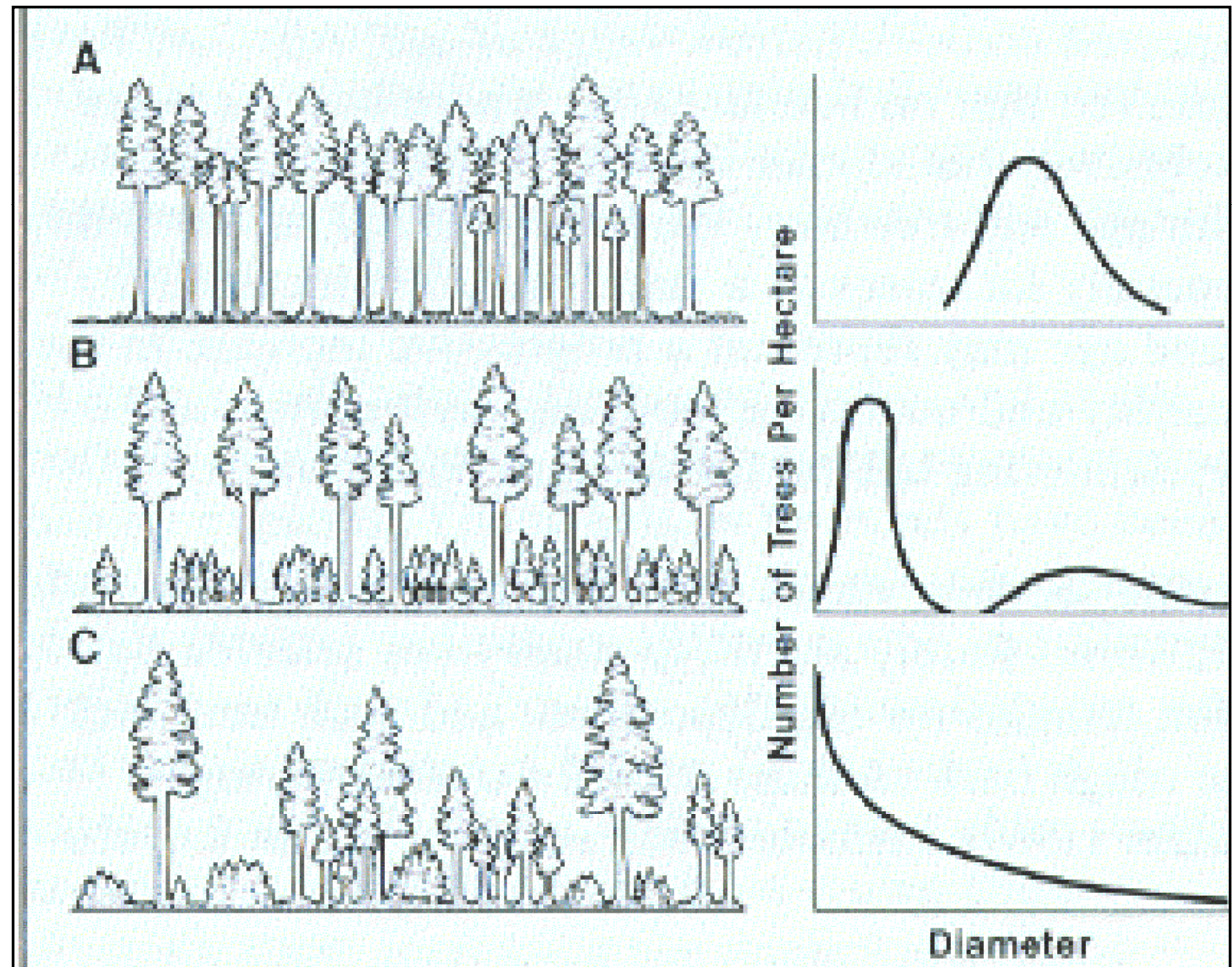
- Thinning can improve the situation
 - Thin from below: w spruce budworm
- Thinning can open crowns to more light, improving the environment for the bug
 - Silver spotted tiger moth



Silver spotted tiger moth webbing and defoliation.

Stand structure influences susceptibility to budworm and tussock moth damage...

Increasing susceptibility



Budworm

- **Most susceptible stands are uneven-age, multistoried stands with shade tolerant firs**
- **Higher damage in understory**
- **High stand density and low diversity favor damage**
- **Simplify structure and keep fir to 40%**



Douglas-fir Tussock Moth

- Understory trees more heavily damaged
- Outbreaks of TM generally more prevalent in Douglas-fir/True fir stands with a high proportion of host species growing on dry sites
- Reduce fir to 40% or less on high risk sites and simplify structure to reduce damage



Other insects

- Thinning (plus veg. management) may enhance height growth and therefore trees with terminal insects can grow out of hazard zone faster.
 - Western pine shoot borer
- Maintaining high density and thinning late is also used.
 - Sitka spruce weevil

RESOURCES

- **USFS Forest Health Protection**
 - <http://www.fs.fed.us/r6/nr/fid/index.shtml>
- **Oregon Department of Forestry, Forest Health Management:**
 - http://egov.oregon.gov/ODF/PRIVATE_FORESTS/fh.shtml
- **Oregon State University, Forestry Extension Service:**
 - <http://www.cof.orst.edu/cof/extended/extserv/>