

Forest Health: Tree Vigor, Forest Ecology and Stand Dynamics

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WASHINGTON STATE DEPARTMENT OF
NATURAL RESOURCES

Forest Entomology and Pathology

Organisms or events that:

- **Kill trees**
- **Slow tree growth**
- **Damage wood products**



“Forest Health”

Greater attention to:

- Forest ecosystem processes
- Forests resilient and resistant to pests
- Landowner objectives



Fir engraver beetle
(*Scolytus ventralis*) gallery in grand fir

Forest Ecosystem Processes:

Insects and diseases
cause structural
and functional
changes



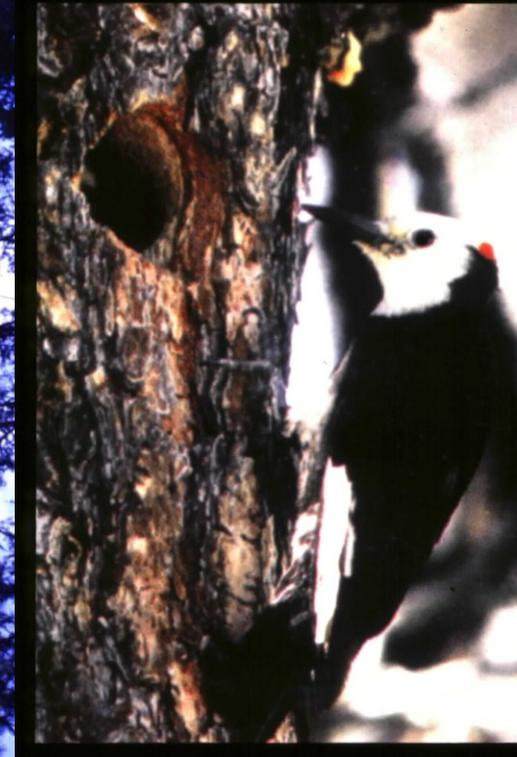
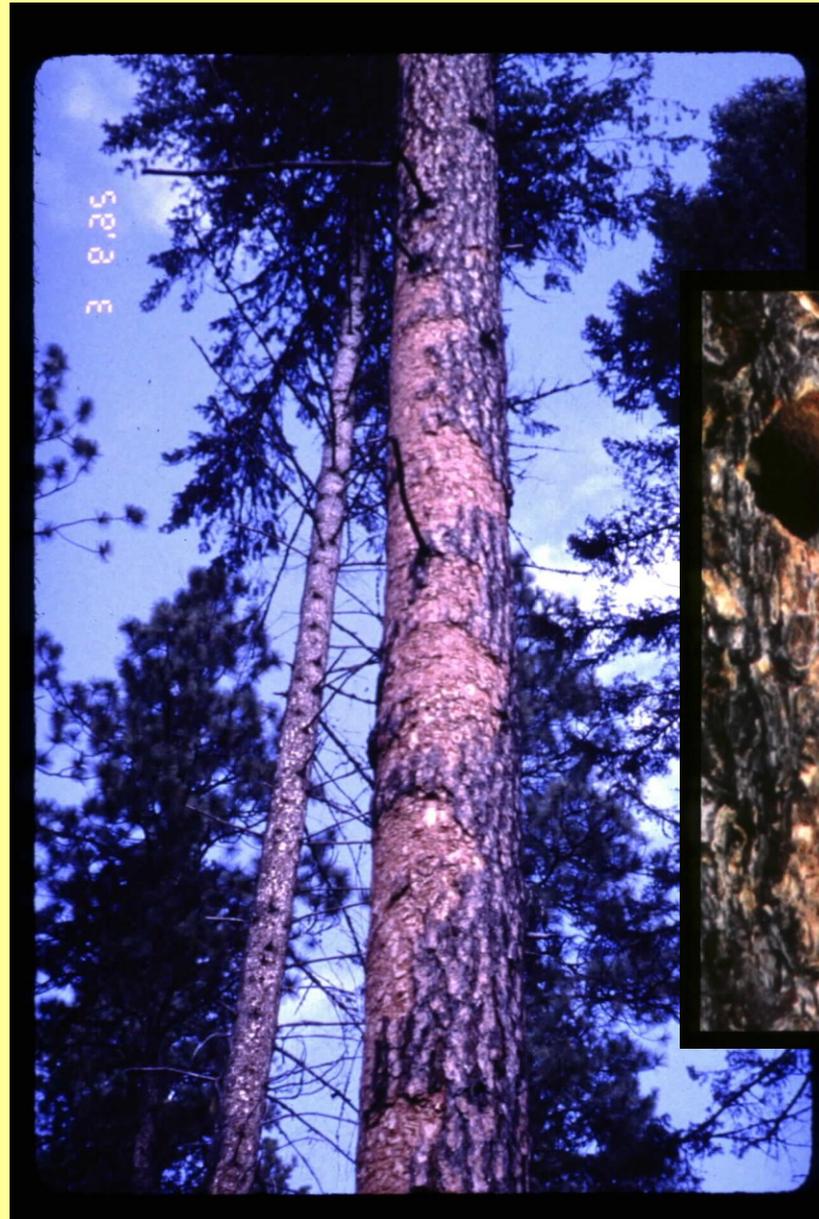
Lodgepole pine killed by
mountain pine beetle
Dendroctonus ponderosae

“Pocket” of laminated root rot *Phellinus sulphurascens*

Forest Ecosystem Processes

**Mortality and
decadence
produce
important
habitats**

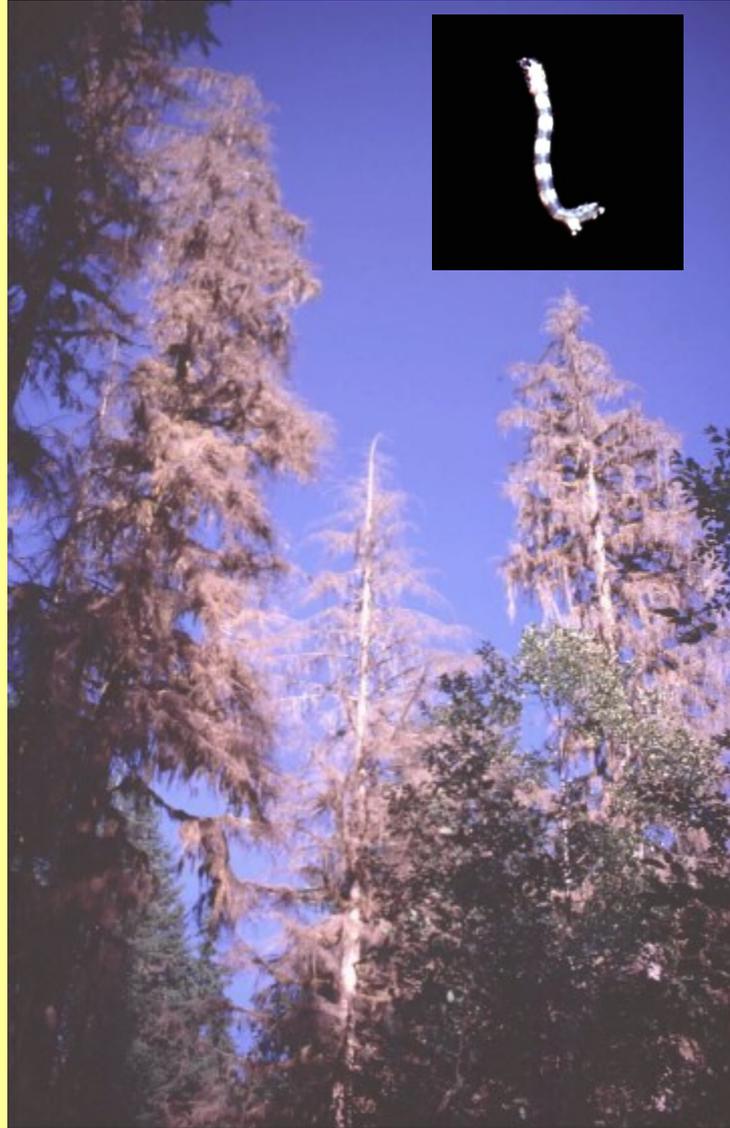
**Western pine beetle
Dendroctonus brevicomis
killed ponderosa pine**



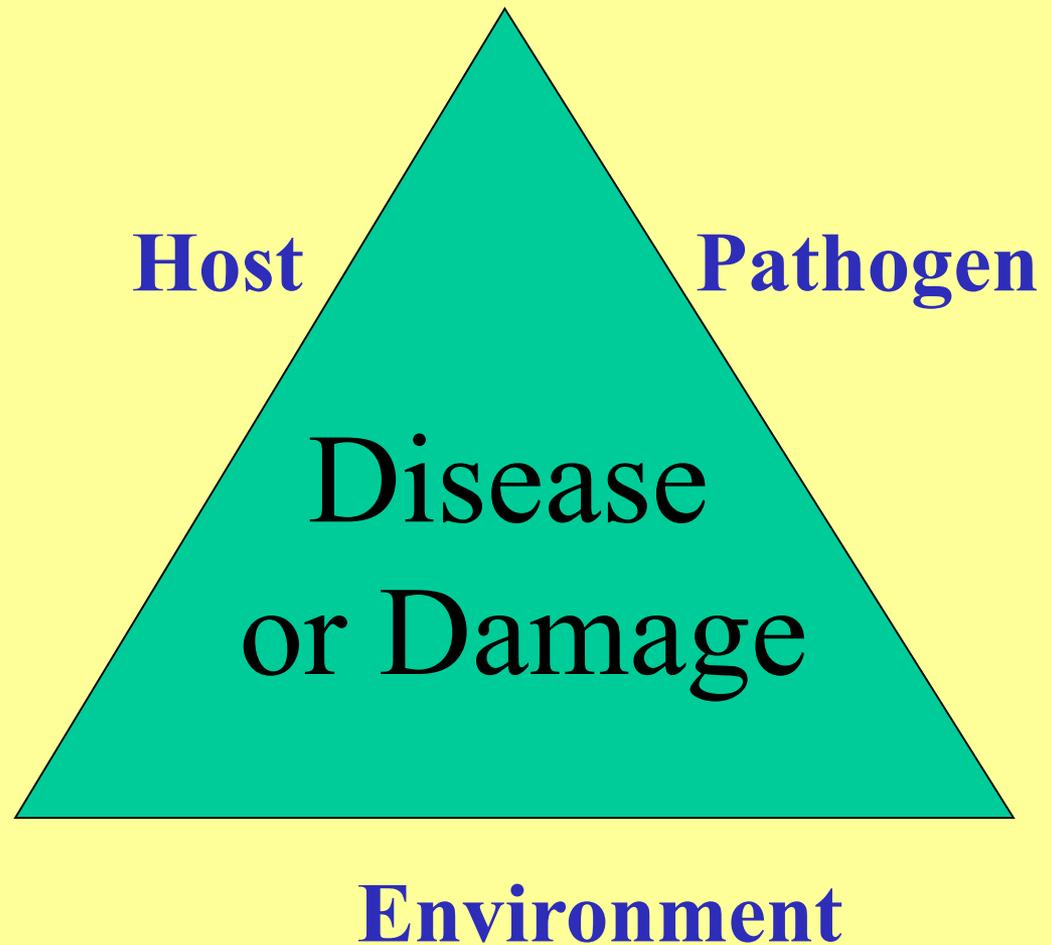
Forest Ecosystem Processes:

Some structures are highly vulnerable to change:

- Overstocked stands
- Older stands
- Stands with multiple layers of host canopy



**Forests
resistant and
resilient to
insects and
pathogens**



Host



Pathogen

**Disease
or Damage**

Environment



Host



Pathogen

**Disease
or Damage**

Environment



Exotic Pests are BAD



Emerald ash borer



Defoliation by Gypsy moth



White pine blister rust canker

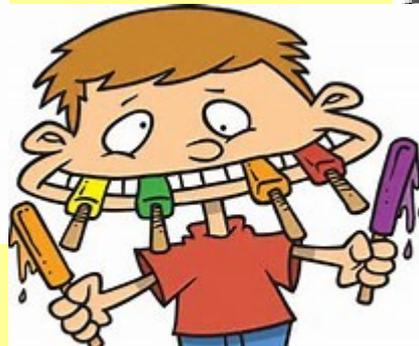
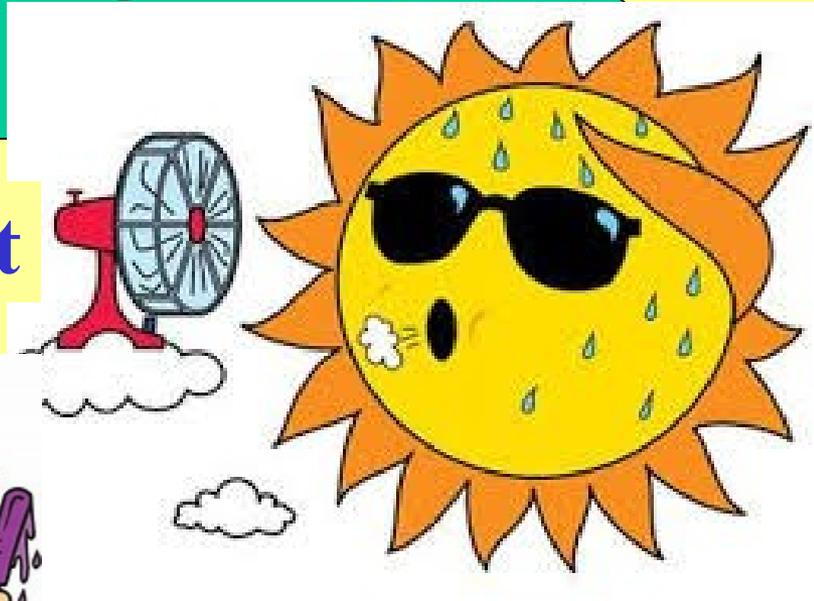
Host

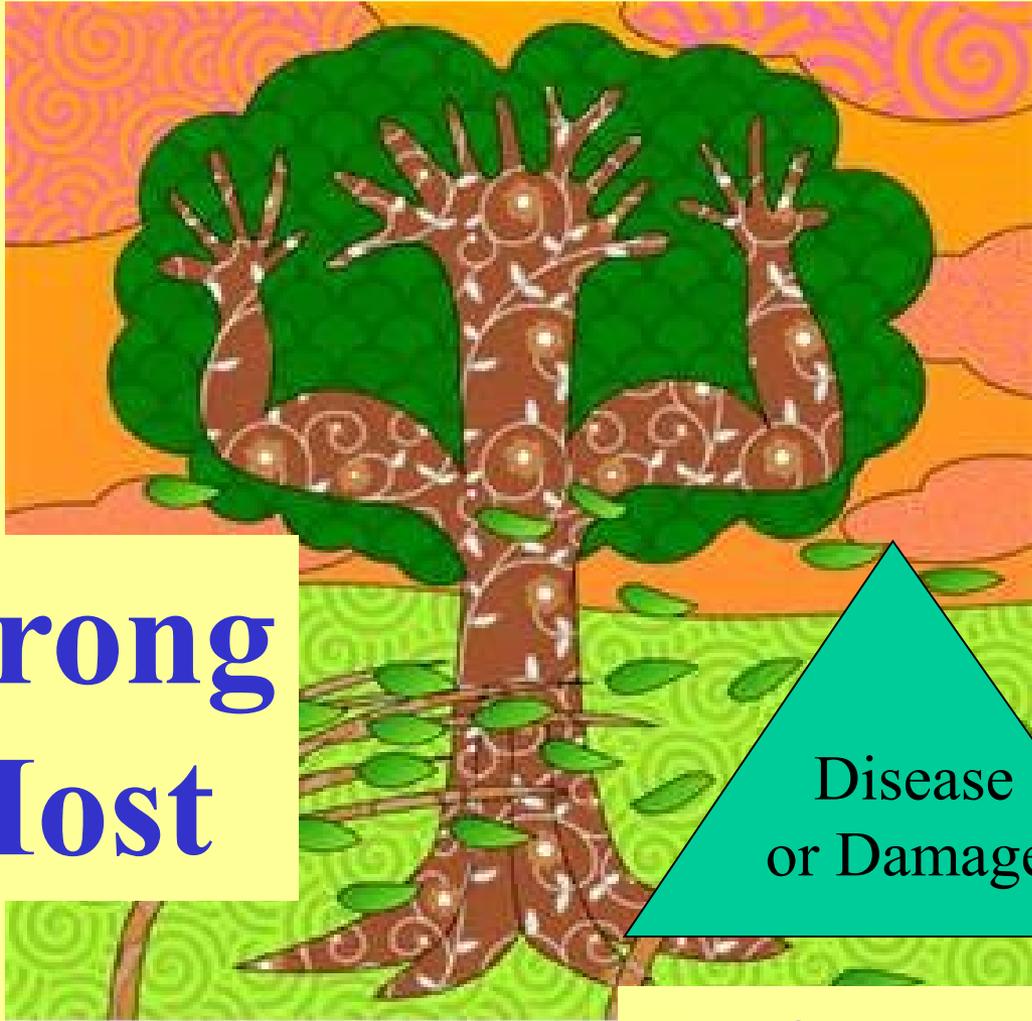


Pathogen

**Disease
or Damage**

Environment





**Strong
Host**



Disease
or Damage



Pathogen

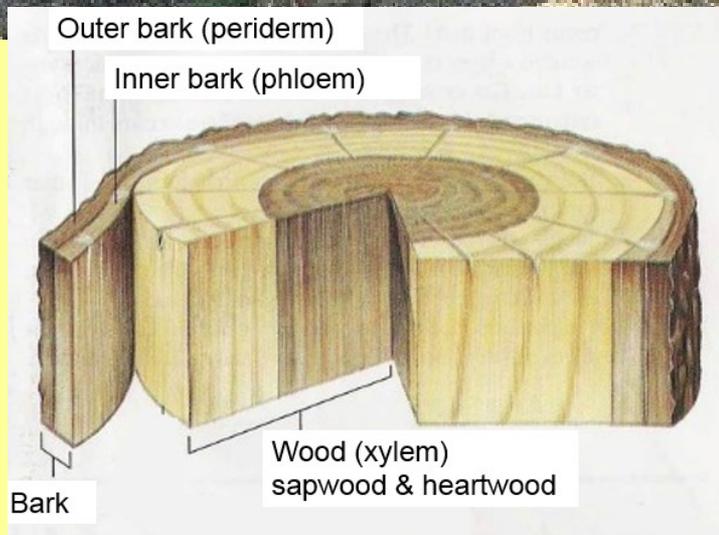
Environment



Priorities for tree growth:



1. Living tissue
2. Fine root and leaf production
3. Flower and seed production
4. Height, branch, root growth. Scar tissue.
5. Diameter growth and resistance to insects and diseases
6. Storage



Vigorous trees can resist insects and pathogens

Pitch tubes



Caterpillar feet



Vigorous trees can recover from damage or disease

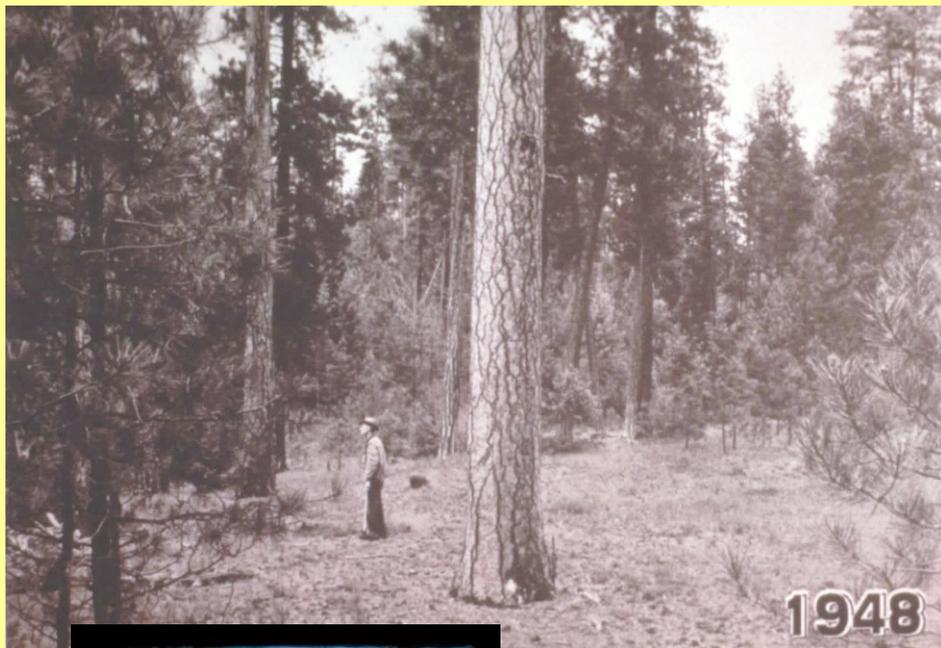


Wound sealing

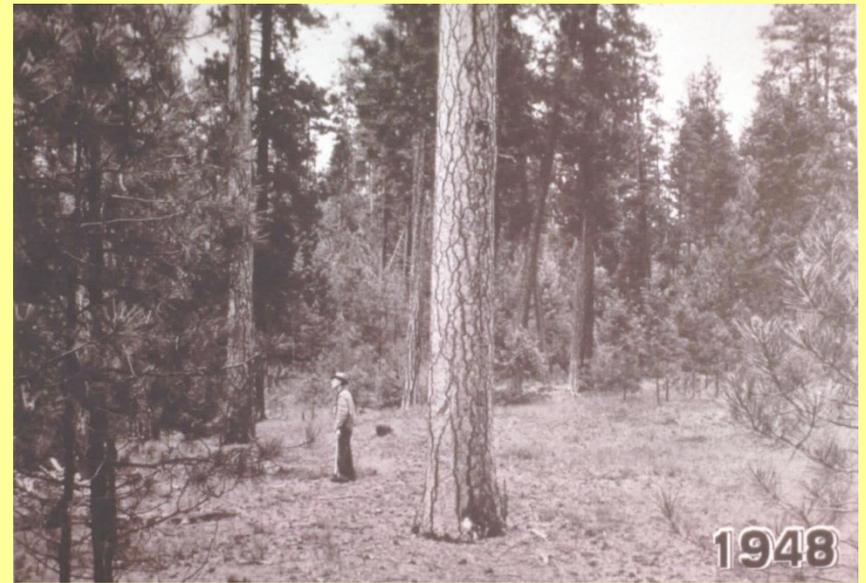
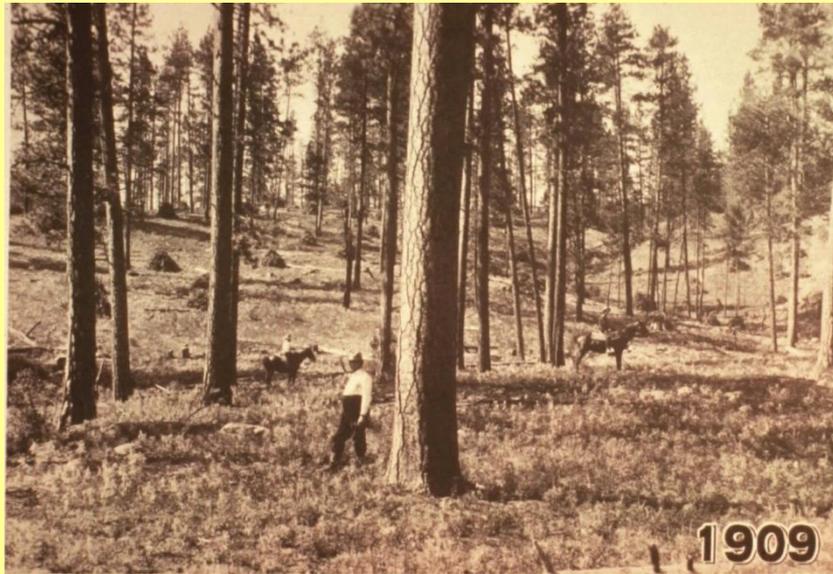


Fire scorched ponderosa pine

Stand Dynamics in Dry Forests



Stand Dynamics in Dry Forests





- # **Forest Changes:**
- **Structure**
 - **Species
Composition**
 - **Tree Density**
 - **Tree Vigor**

Fuel Changes:

- Fuel ladders**
- Continuity of dense fuels**
- Increased accumulation of rotting wood**

Fires more difficult to control



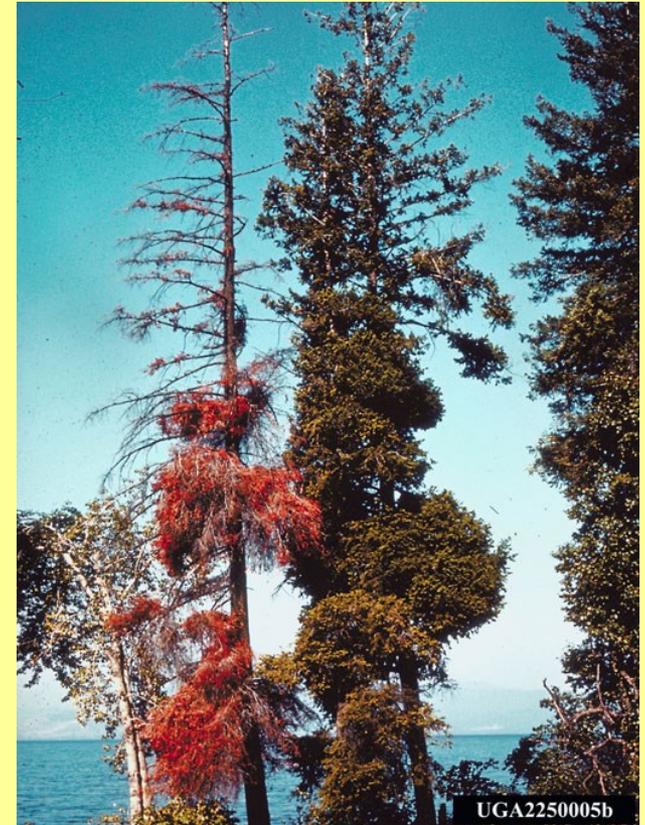
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Forest Changes: Increases in Insect and Disease Levels



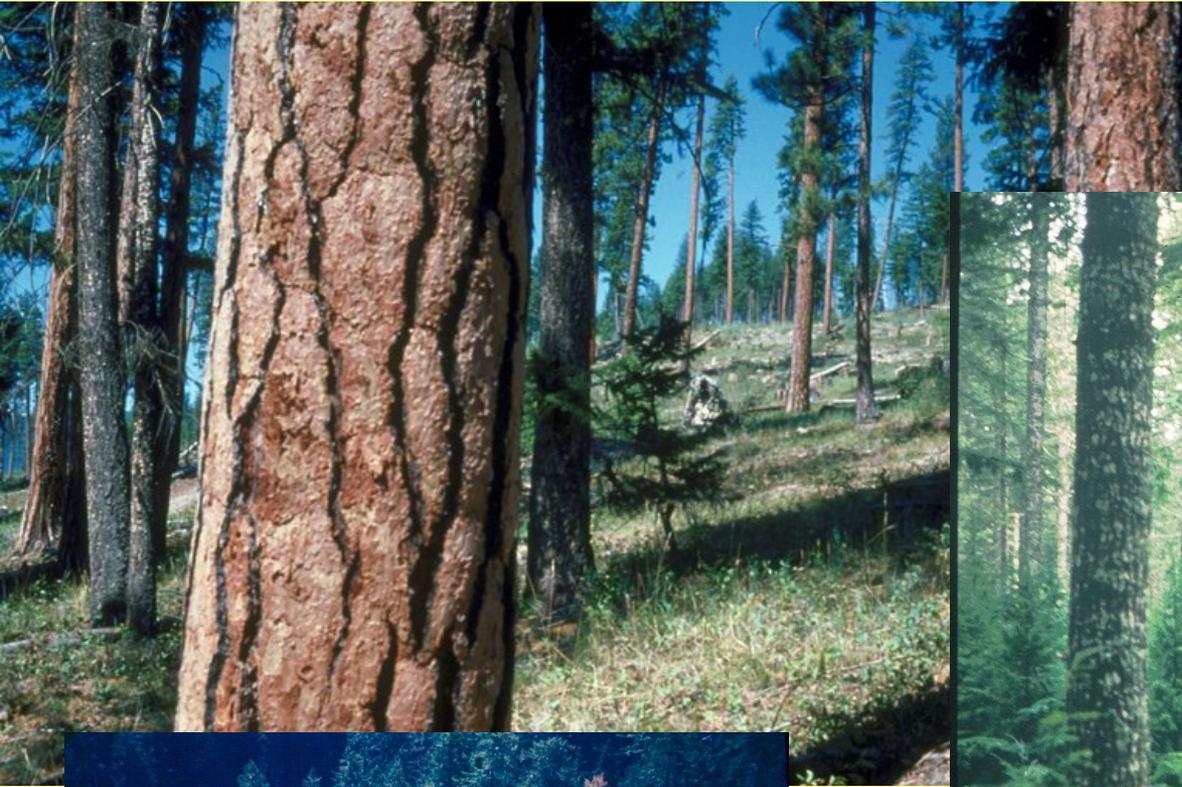
Bark beetles killing dense pine stands

Dwarf mistletoe infection
in Douglas-fir



Western spruce budworm
defoliates fir, but not pine

Landowner Objectives



Landowner Objectives:

Successful Regeneration

- Seedlings are vulnerable
- Failure is expensive
- Mistakes have long term consequences



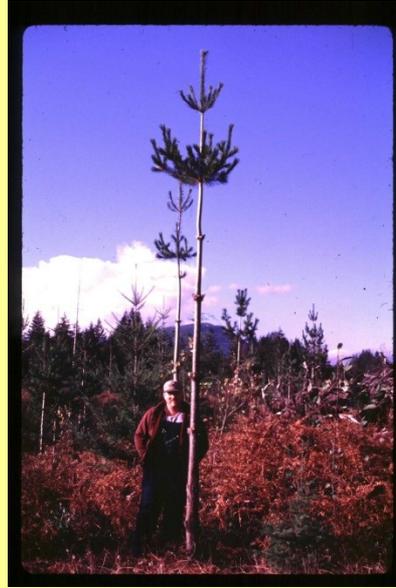
Landowner Objectives: Prevent Losses

- Improved stands represent more investment
- Critical habitats
- New tools are available

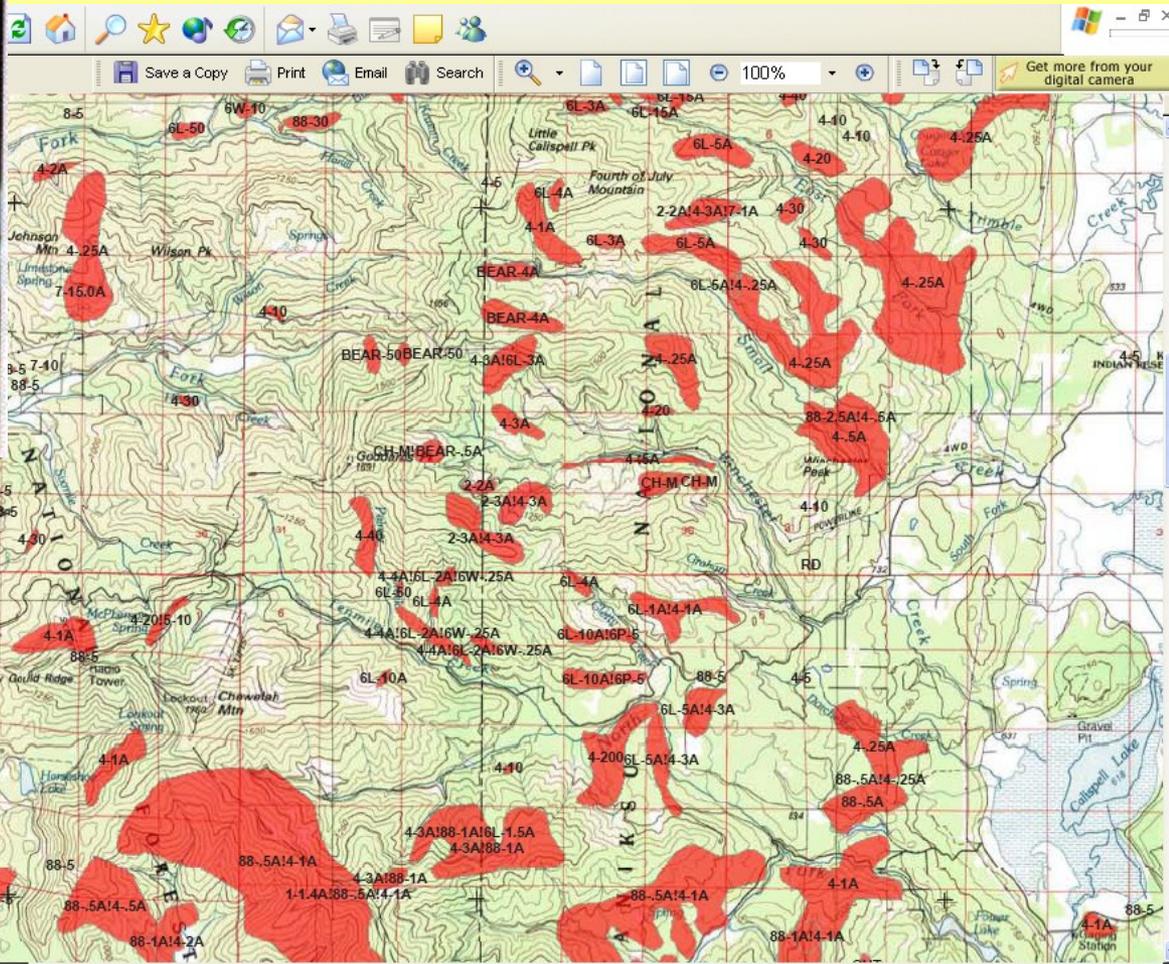


Landowner Objectives: Intensive Management

- Critical needs
- Responsible profits
- New pests



Monitor damage level and insect populations in order to have time ...



**Pheromone-baited
defoliator trap**

Aerial survey insect/disease detection map

Conclusions:

- Vigorous trees are **GOOD**
- Exotic Pests are **BAD**



Recognize important insects and diseases

- Signs and symptoms
- Potential impact to landowner objectives
- High risk habitats
- Management techniques



Thank you for participating



Forest Health Highlights Reports:

www.fs.usda.gov/goto/r6/fhp/highlights