

Forest Health and Wildfire

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What is forest health?

Utilitarian perspective

Ecosystem perspective

Utilitarian Perspective

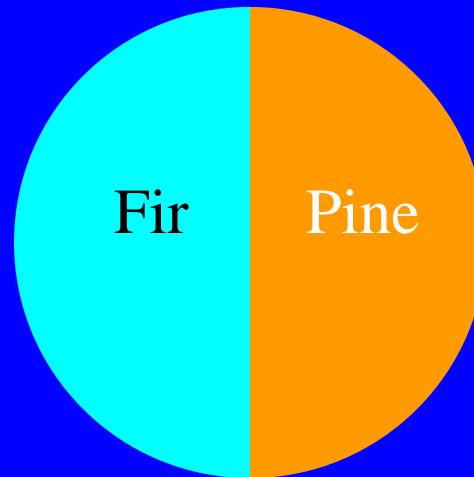
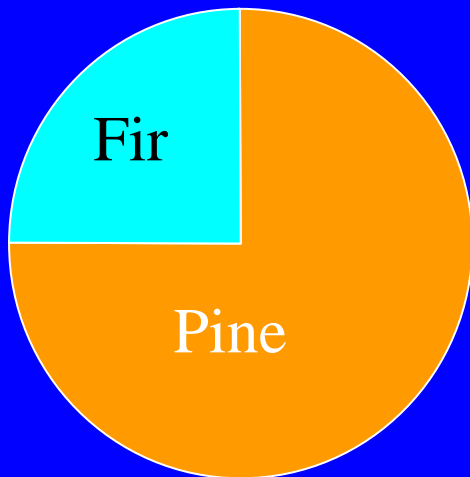
- Timber production
- Dying and dead trees are bad
- Relatively easy to define and measure

Ecosystem Perspective

- Fully functioning community
- Ecosystem in balance
- Resilient to disturbance
- Within the historic range of variability
- Difficult to define and measure

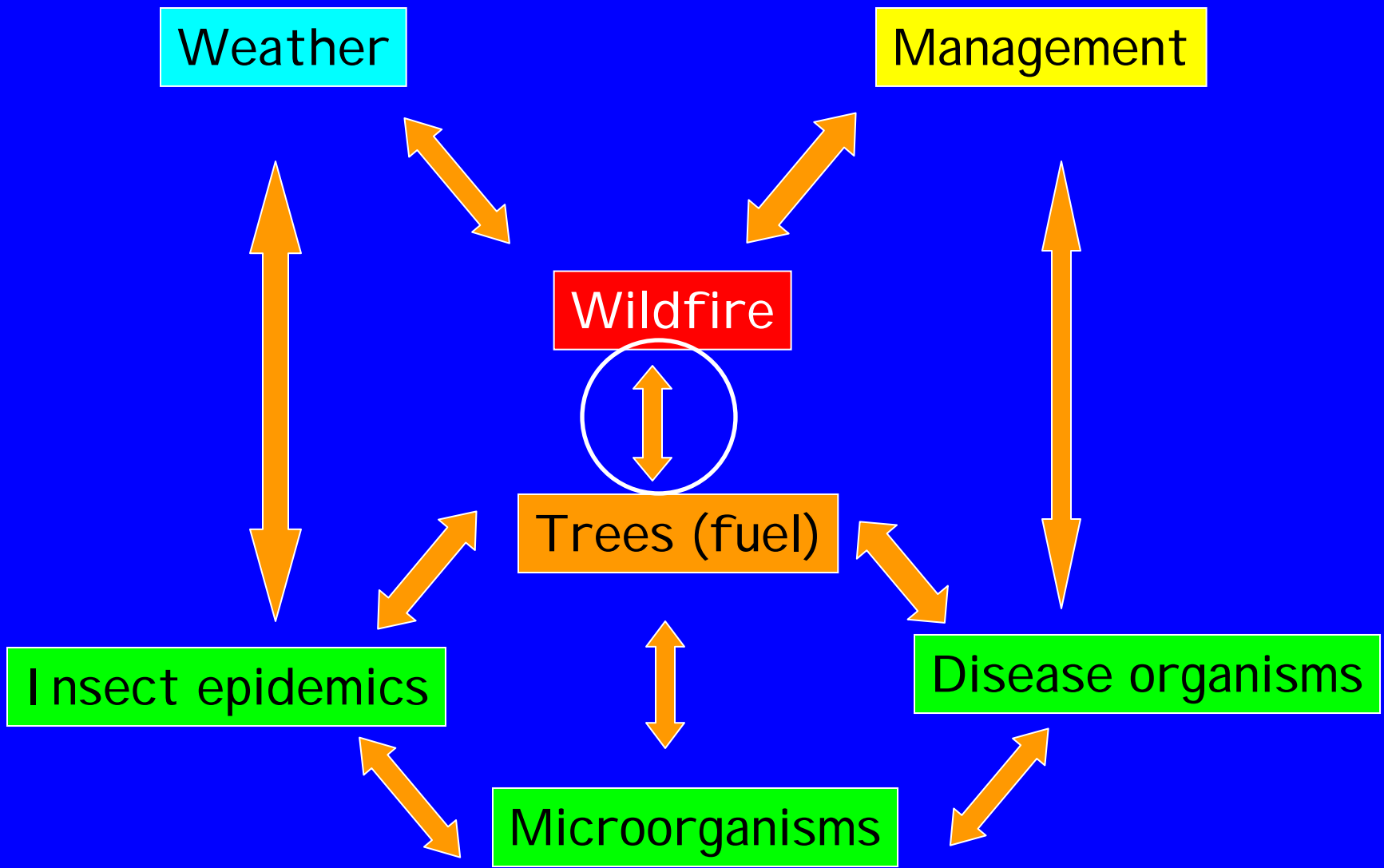
Historical range of variability: species composition

Historical range



Unhealthy





Lack of wildfire



Tree species shifts
High stand densities



Pest epidemics



Changes in stand structure



Root Diseases

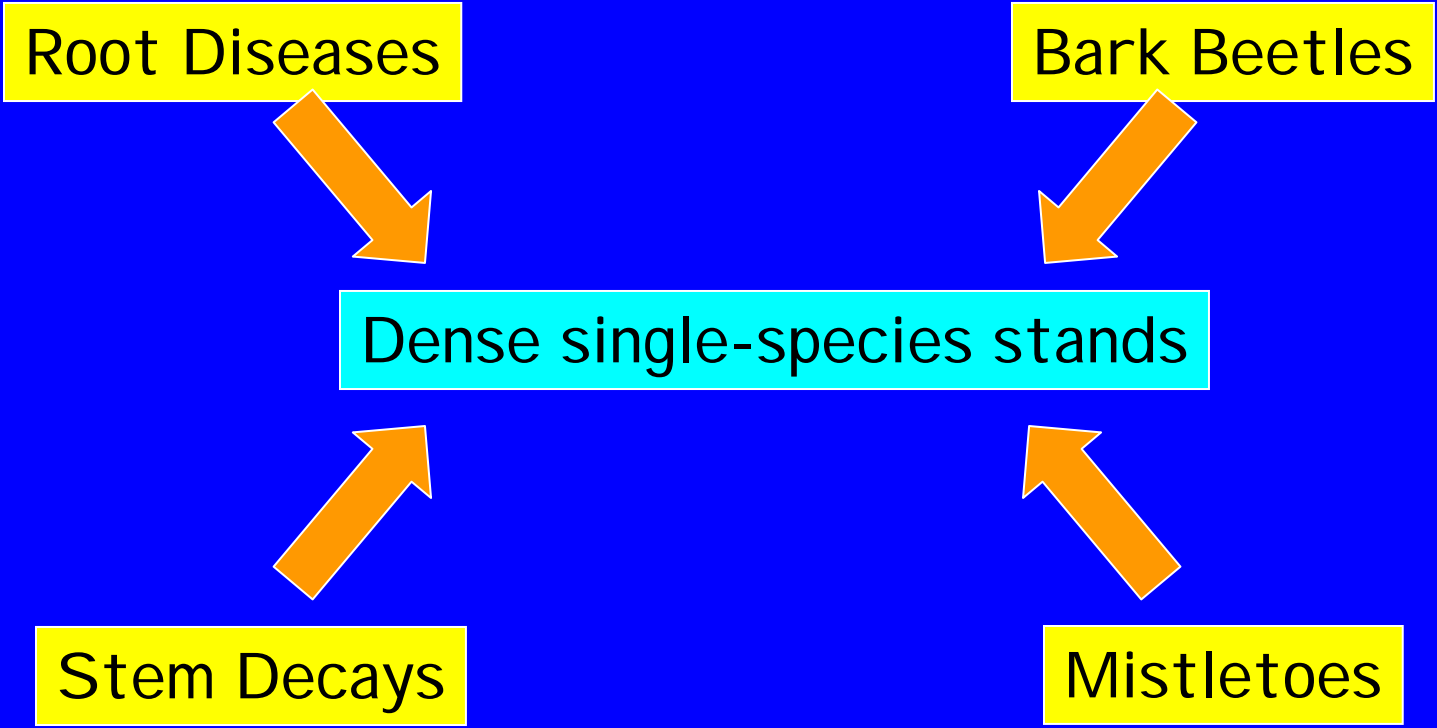
Bark Beetles

Dense single-species stands

Stem Decays

Mistletoes





Root Diseases and Bark Beetles

Effects on Forest Structure

Increases in:

- Windthrow of live trees
- Live stem breakage
- Top killing
- Tree mortality
- Down wood
- Wildlife habitat
- Wildfire increase
- Stand opening and regeneration
- Tree species shifts



Dwarf Mistletoe

Effects on Forest Structure

Increases in:

- Live-crown ratio
- Abnormal branches (witches brooms)
- Dead branches
- Top killing
- Branch and stem breakage
- Tree mortality
- Down wood
- Wildlife habitat
- Wildfire increase



Pine dwarf mistletoe



Stem Decay (Heart Rot) Effects on Forest Structure

- Some tree species are more decay prone (hemlock, true fir)
- Heart rot increases with stand age

Stem decay results in:

- Hollow living stems and branches
- Stem breakage
- Tree mortality – bark beetles
- Down wood (hollow logs)
- Wildlife habitat
- Wildfire increase?





USFS Photos

Root Diseases

Bark Beetles

Wildfire

Stem Decays

Mistletoes



Wildfire

Effects on insects & diseases

- Root diseases – fire removes susceptible hosts; i.e. true firs



Armillaria Root Disease



The Humongous Fungus



Largest living organism ever found

Taking 2,400 years to grow, tree-killing mushroom covers 880 hectares

JEFF BARNARD

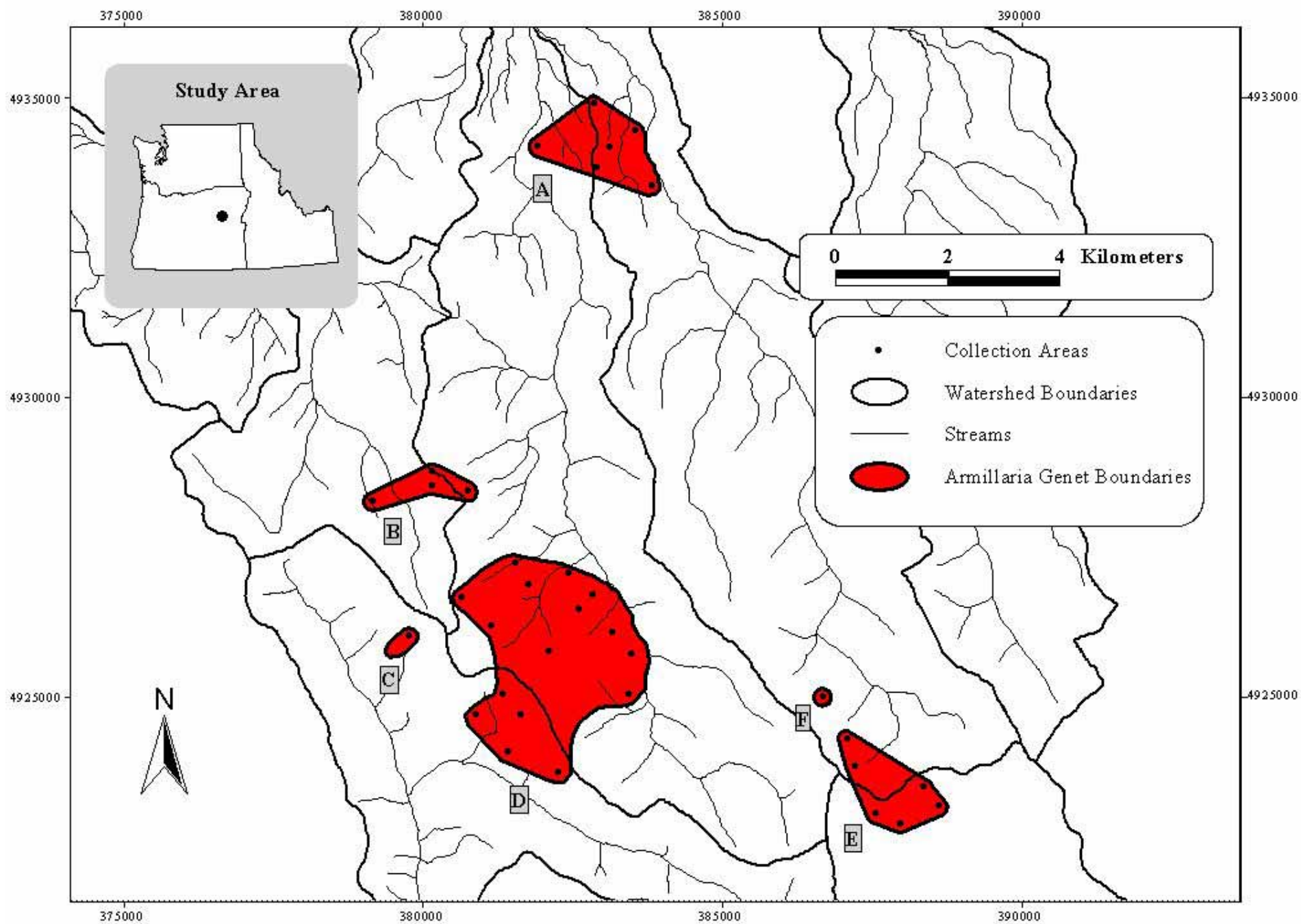
Beneath the soil of the Malheur National Forest in eastern Oregon, a fungus that has been slowly weaving its way through the roots of trees for centuries has become the largest living organism ever found.

The *Armillaria ostoyae*, popularly known as the honey mushroom, started from a single spore too small to see without a microscope and has been spreading its black shoestring filaments called rhizomorphs through the forest for an estimated 2,400 years, killing trees as it grows. It now covers 880 hectares.



Armillaria mushrooms grow at the base of an infected tree. Spores in the

1990s would see honey on the land.



Wildfire

Effects on insects & diseases

- Root diseases – fire removes susceptible hosts; i.e. true firs
- **Stem decays** – fire causes wounds that become infected

Fire-caused
tree wound



Wildfire

Effects on insects & diseases

- Root diseases – fire removes susceptible hosts; i.e. true firs
- Stem decays – fire causes wounds that become infected
- **Bark beetles** – fire causes tree stress and attack

Fire-caused bark beetle attack



Wildfire

Effects on insects & diseases

- Root diseases – fire removes susceptible hosts; i.e. true firs
- Stem decays – fire cause wounds that become infected
- Bark beetles – fire causes tree stress and attack
- **Mistletoes** – fire kills infected lower branches



What management strategies can be used to produce healthy forests???



Fitzgerald photo

To reduce root disease, bark beetles, stem decays, and mistletoes

- Decrease stand densities and increase tree vigor through thinning
- Encourage multiple-species stands
- Avoid multiple stand entries and tree wounding
- Use prescribed fire in some cases

To increase snags and down wood, decayed trees for wildlife, and mistletoe

- Maintain high stand densities
- Maintain single-species stands
- Wound trees
- Fell trees and leave in forest
- Use pheromones to attract bark beetles
- Artificially inoculate trees

Take-home messages!!!

- Wildfire and forest health interact!
- Fire exclusion and selective harvesting lead to increases in insect and diseases, especially Eastside.
- Wildfire affects pests and pests affect wildfire.
- Stand density management and tree species mixtures can both reduce or increase forest insects and diseases.