



Michael Remke Photography

Regulators and Terminators

Disease = A chronic ^{→ persistent} condition

that prevents the affected host

from reaching its maximum genetic

potential (individual)

↳ Fitness (biological) → ability to survive
and reproduce.

→ Tree NOT a stand.

Agents that
cause disease...

Include insects!

Forest entomology



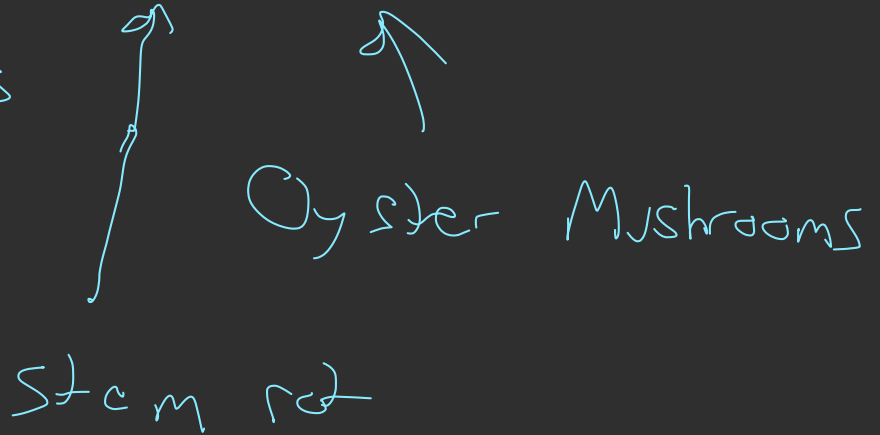
↑
Emerald Ash Borer

Forest Pathology



Pathogens

Fungi, bacteria,
viruses, mistletoes



Abiotic pathogens

- Drought

Fire

Flooding

Salt Stress



How do we recognize disease
in trees?

Pine beetle
↑ caused browning

→ Signs and
Symptoms

Symptoms - Response
of the host to
a disease causing
agent. - Browning
of leaves, etc.



Signs - Evidence of the
actual disease causing agent.
- The insect or the fungus...

Red Jeopardy beetle →



Signs of beetle!



↕ Sign!



↗
Mtn pine beetle

Root Rot

→ Tree

falling?



→ Symptoms of root rot

Sign of

Armillaria

root rot!



The tree death spiral

Predisposing factors

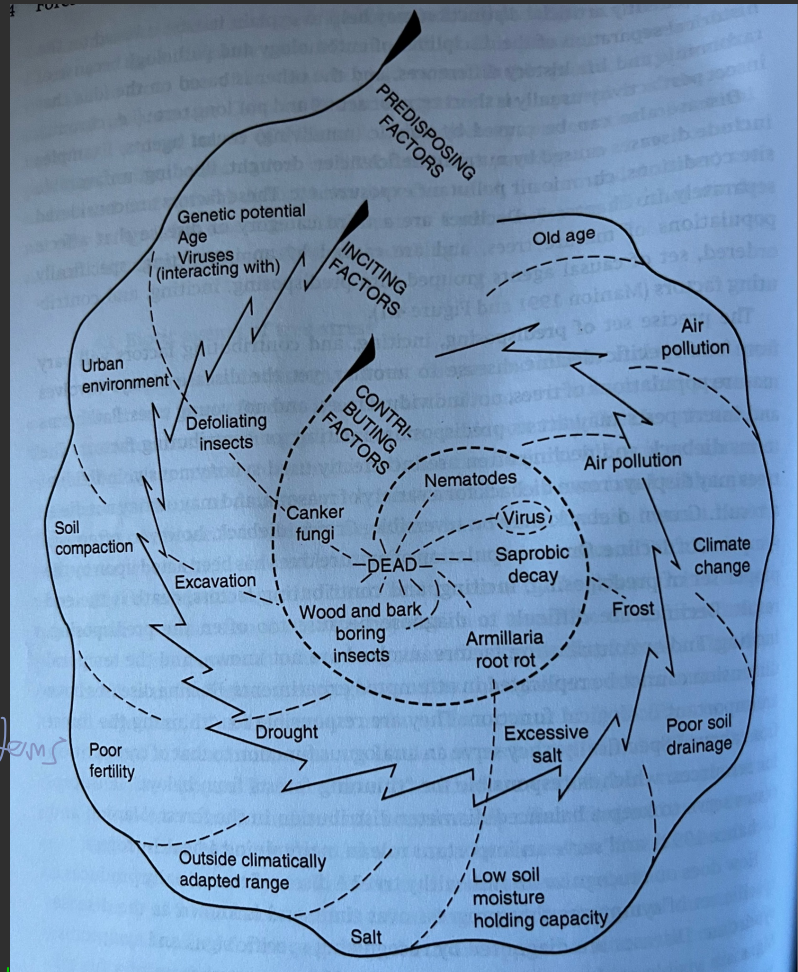
- Grow site conditions
- tree genetics

Inciting Factors

- Factors that weaken the tree. Cause symptoms

Contributing Factors

- Interact with other factors to kill tree



Integrated Pest Management

Goal: Managing all possible factors that may cause undesired mortality in a way that balances

1. Value of the resource
 2. Cost of treatment
 3. Avoid adverse effects of Tx
- Ecological
- Social
Economic

Tools for pest management

- Pesticides

- insects, fungi,

- Natural or introduced predators

- Biological control

→ Habitat manipulation

Habitat manipulation in
forests is called

→ Pyrosilviculture

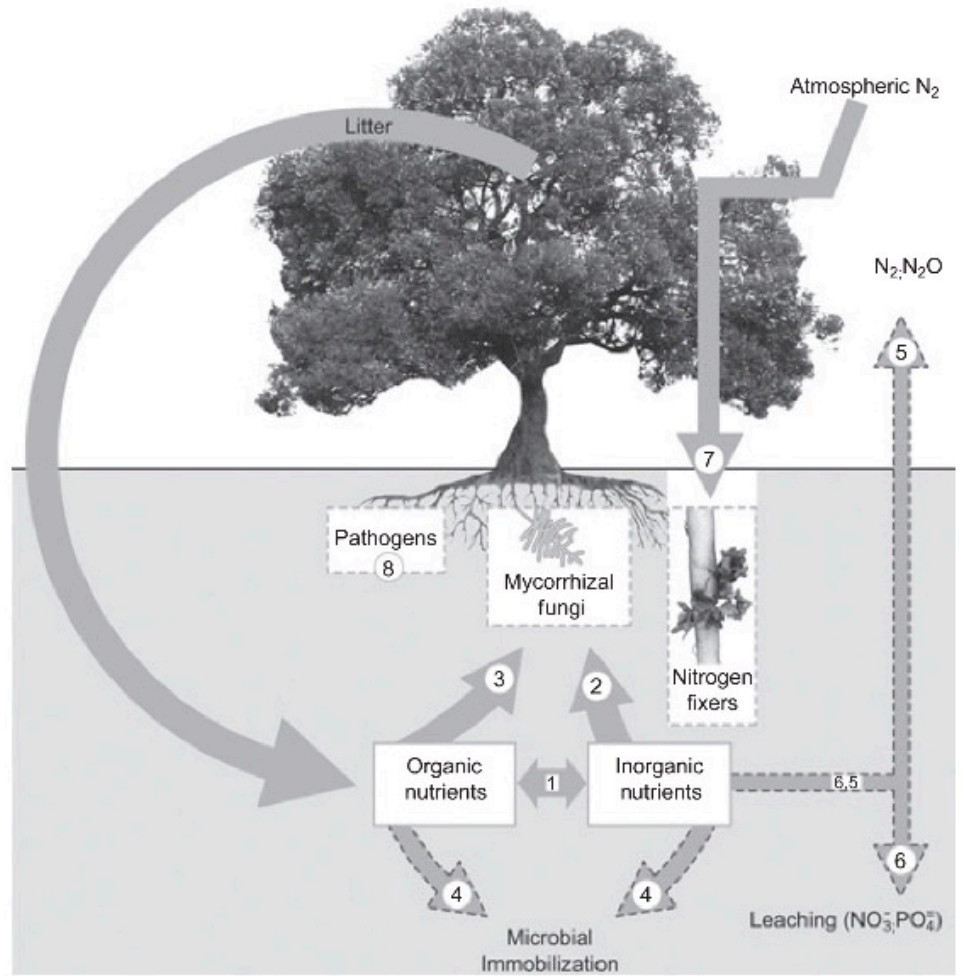
Silviculture!

Primary tool for
forests on Public Land in the
US

Regulators of Tree Growth

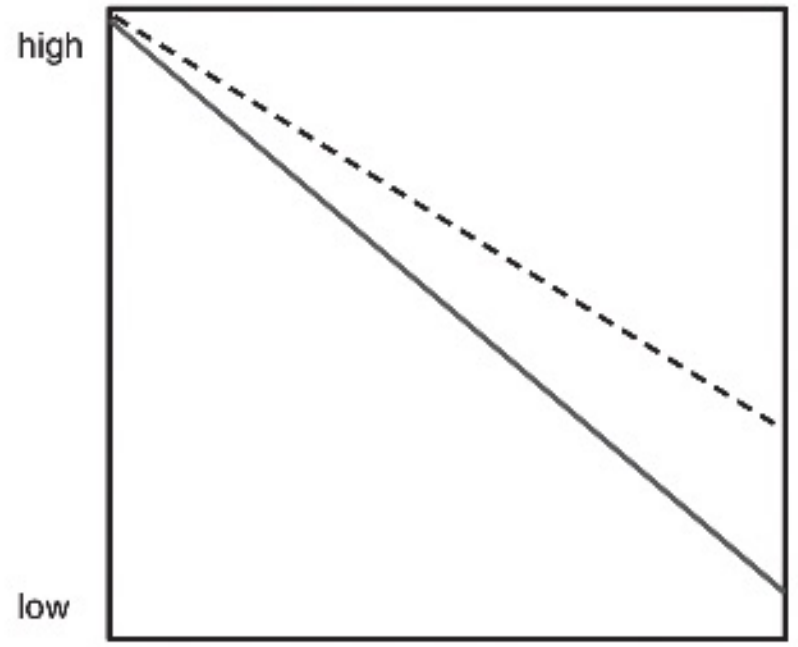
↳ Ensures

"proper function"



Microbes
regulate
tree growth
when soil
nutrient
availability
is low

Microbial diversity (---) and contribution
to plant productivity (—)



NATIVE
In ^ forest

→ can cause disease
insects ... what

naturally regulates populations?