Diseases of Conifer Regeneration in the Sierra Nevada

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Major Disease Issues of Seedlings and Regeneration in the Sierra Nevada

- Western Gall Rust
- Incense Cedar Rust
- White Pine Blister Rust
- Dwarf Mistletoes
- Others (Needle Diseases, root rots)
- Animal Damage
- Weeds

Characteristics of Rust Diseases

Rust fungi grow only in living plant tissues (Obligate Parasites)

Abundant, colored spores

Complex, multi-year life cycle

Can diagnose western rust diseases on conifers easily by:

- Host species
- Spore stage on host
- Shape of infections

Incense Cedar Rust - *Gymnosporangium libocedri*

Alternate Hosts – Members of the Rose Family including apples, pears and many native plants

Incense Cedar Rust

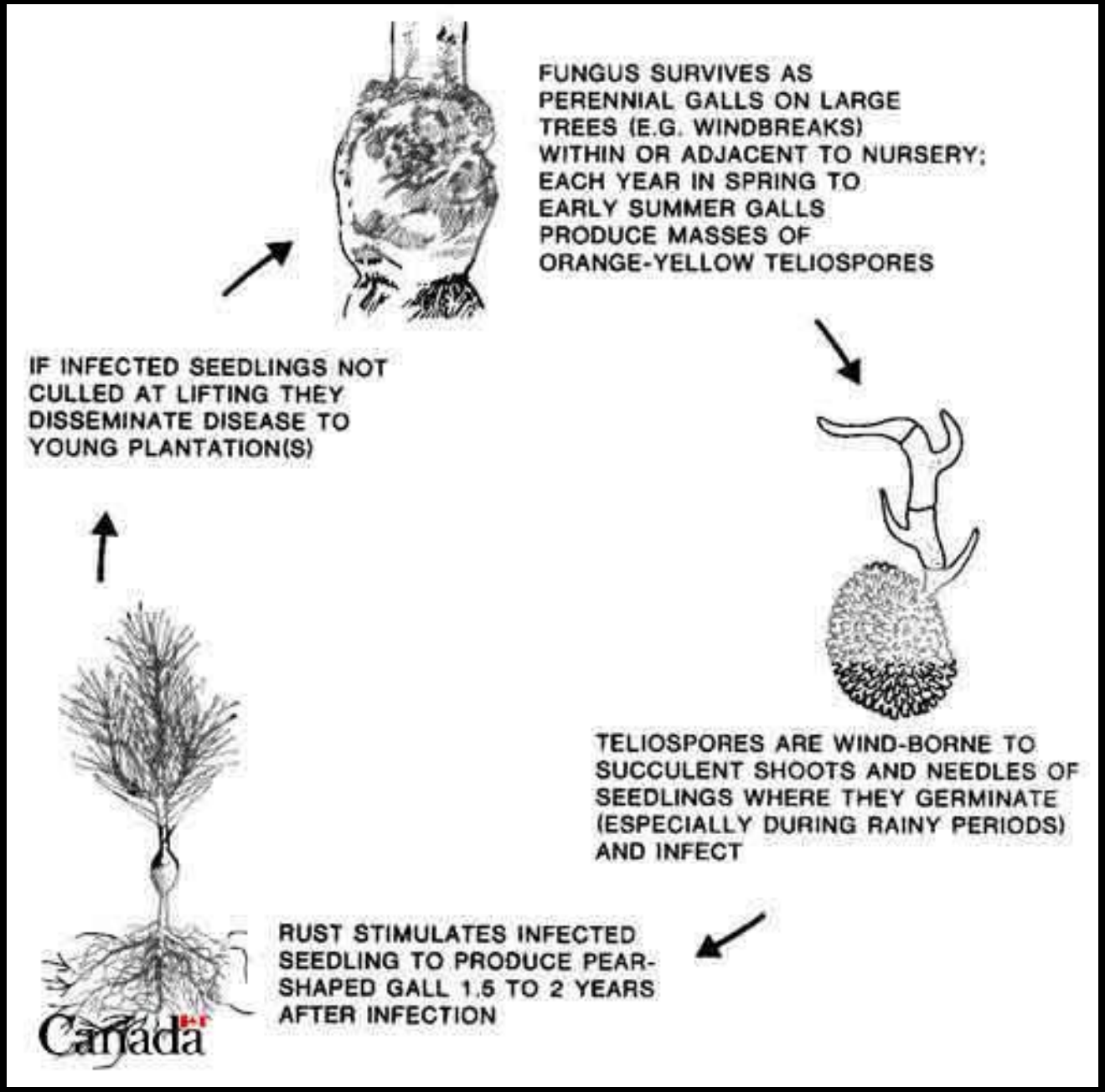
Can kill or damage incense cedar seedlings

Western Gall Rust – *Peridermium harknessii*

Hosts:
All Pine Species

Range:
Wherever pines grow

Western Gall Rust
- Life Cycle



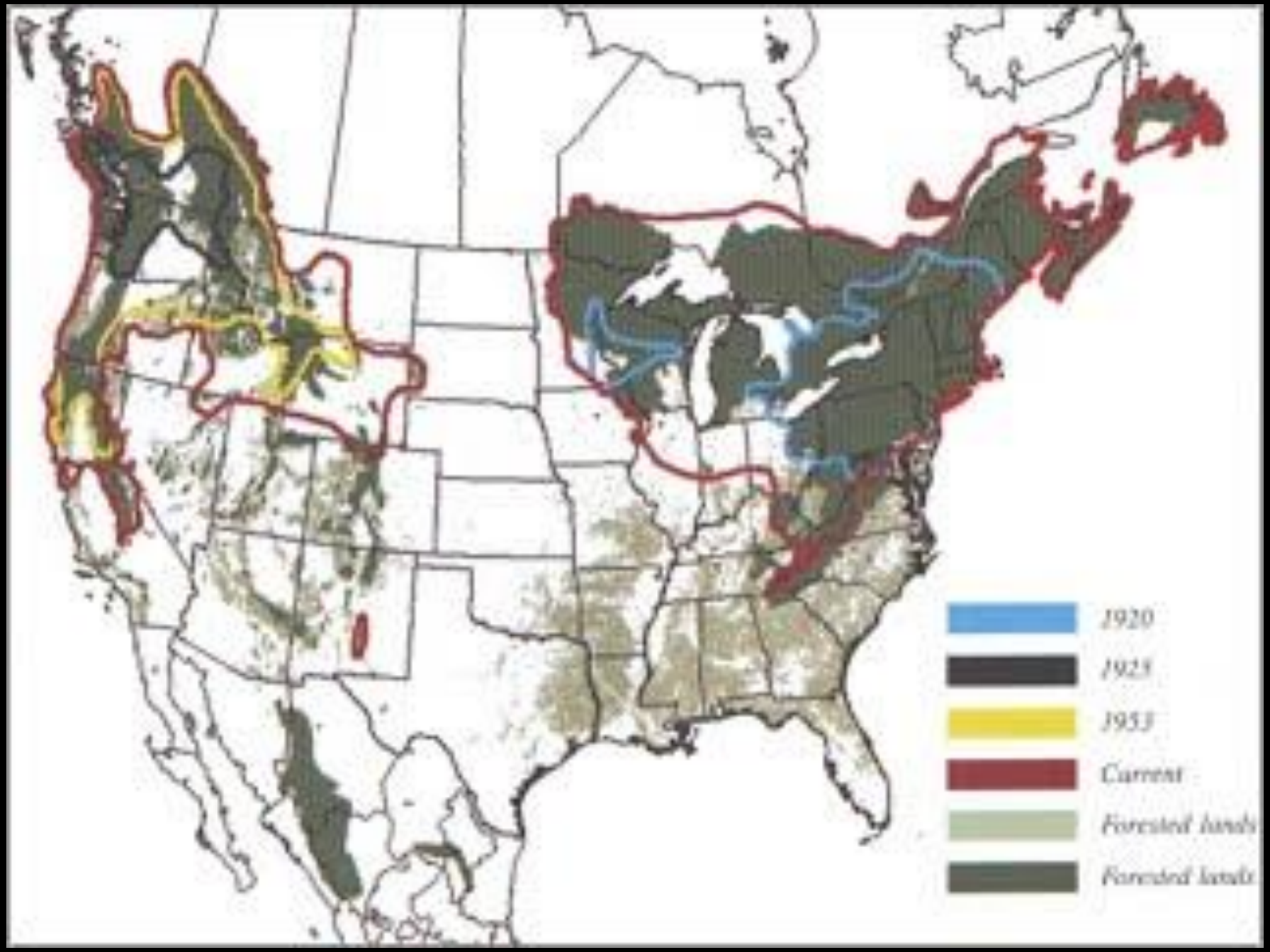
White Pine Blister Rust – *Cronartium ribicola*

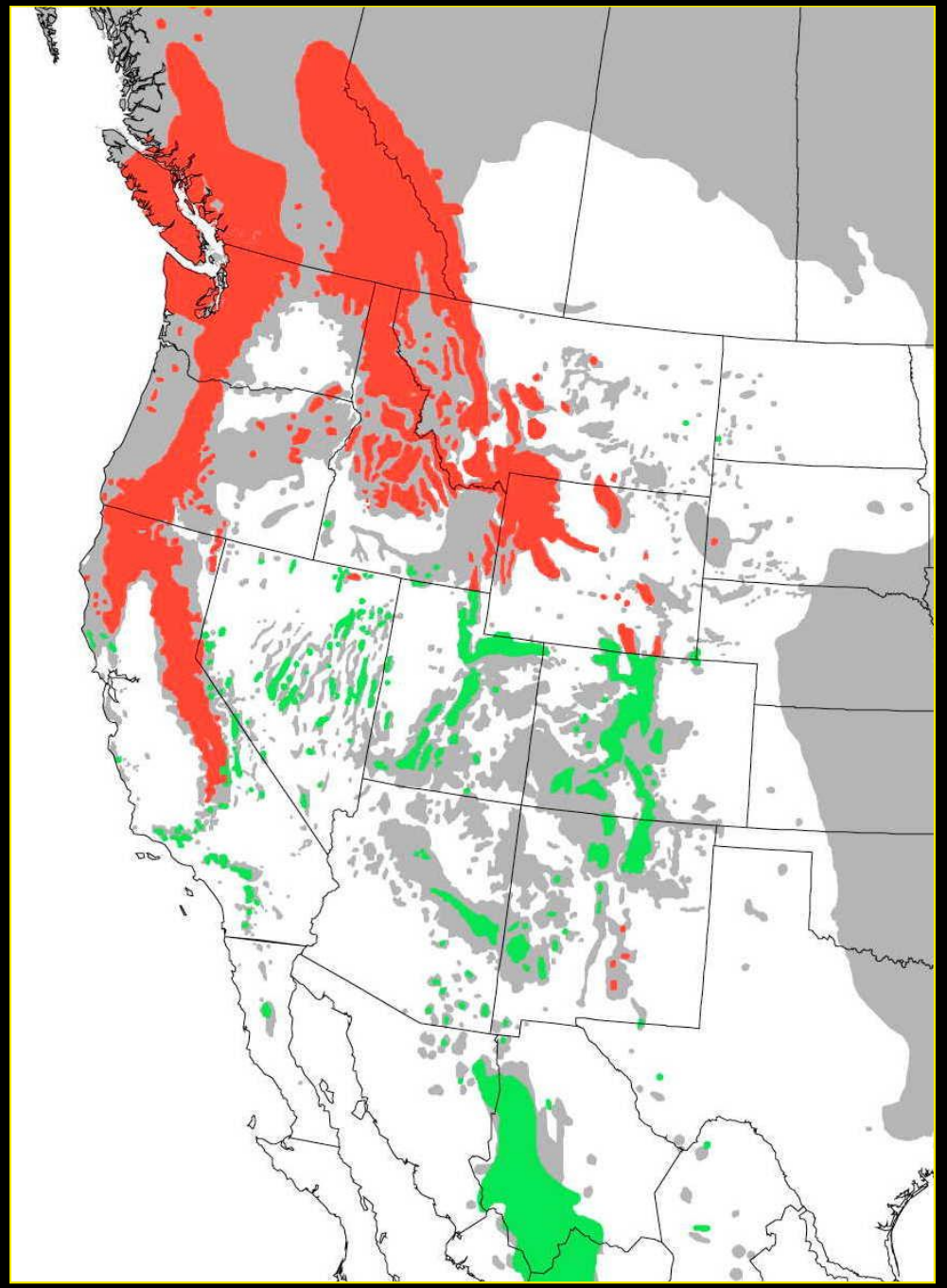
Hosts: Five Needle Pines –

- Sugar Pine
- Limber Pine
- Foxtail Pine
- Western White Pine
- Bristlecone Pine

Alternate Hosts –

- Ribes spp. or Gooseberry
- A few other very minor host species in the western United States

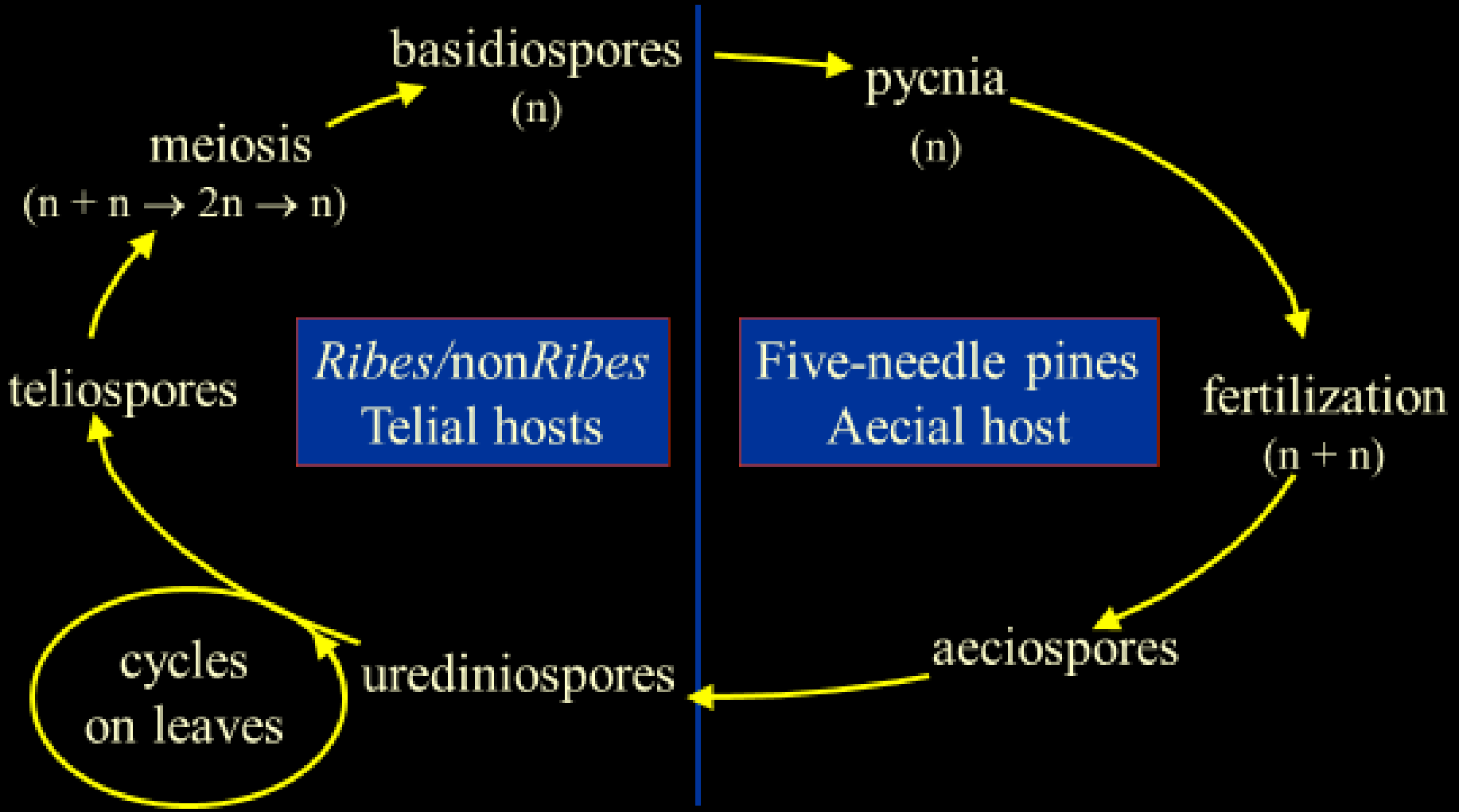

1920
1925
1953
Current
Forested lands
Forested lands



Western north America Spread of White Pine Blister Rust

Symptoms of WPBR on the Two Hosts

Life Cycle of North American *Cronartium ribicola*



WPBR Disease

Found generally on moist sites and near to the alternate host plants

Usually kill branches, tops of trees or seedlings and saplings but can kill entire trees

WPBR in Regeneration

Planting WPBR Disease Resistant Sugar Pine

Plant a mix of major gene resistant sugar pine with other local seed source trees

Pine Major Gene Resistance

- Found in sugar, western white, limber pines
- Single dominant gene in each species
- Virulent strains overcome this resistance in some hosts

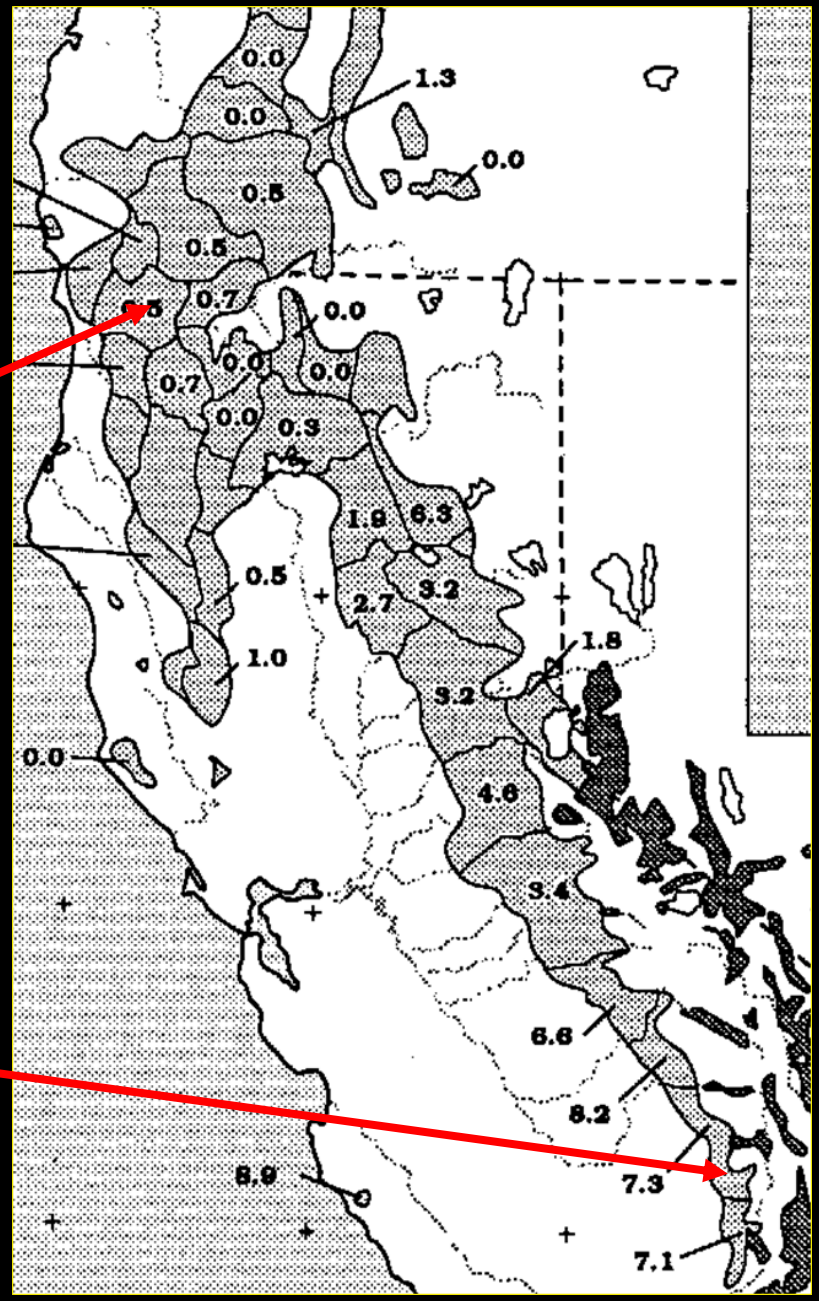
Susceptible

Resistant (MGR)
Cell-Killing Reaction

Sugar Pine MGR Resistance by Seed Zone/ Virulence that Overcomes it

Happy Camp
Out-plant Site
MGR f = 0.005

Mountain Home State
Demonstration Forest
MGR f = 0.08



Multigenic “Slow Rusting” Resistance

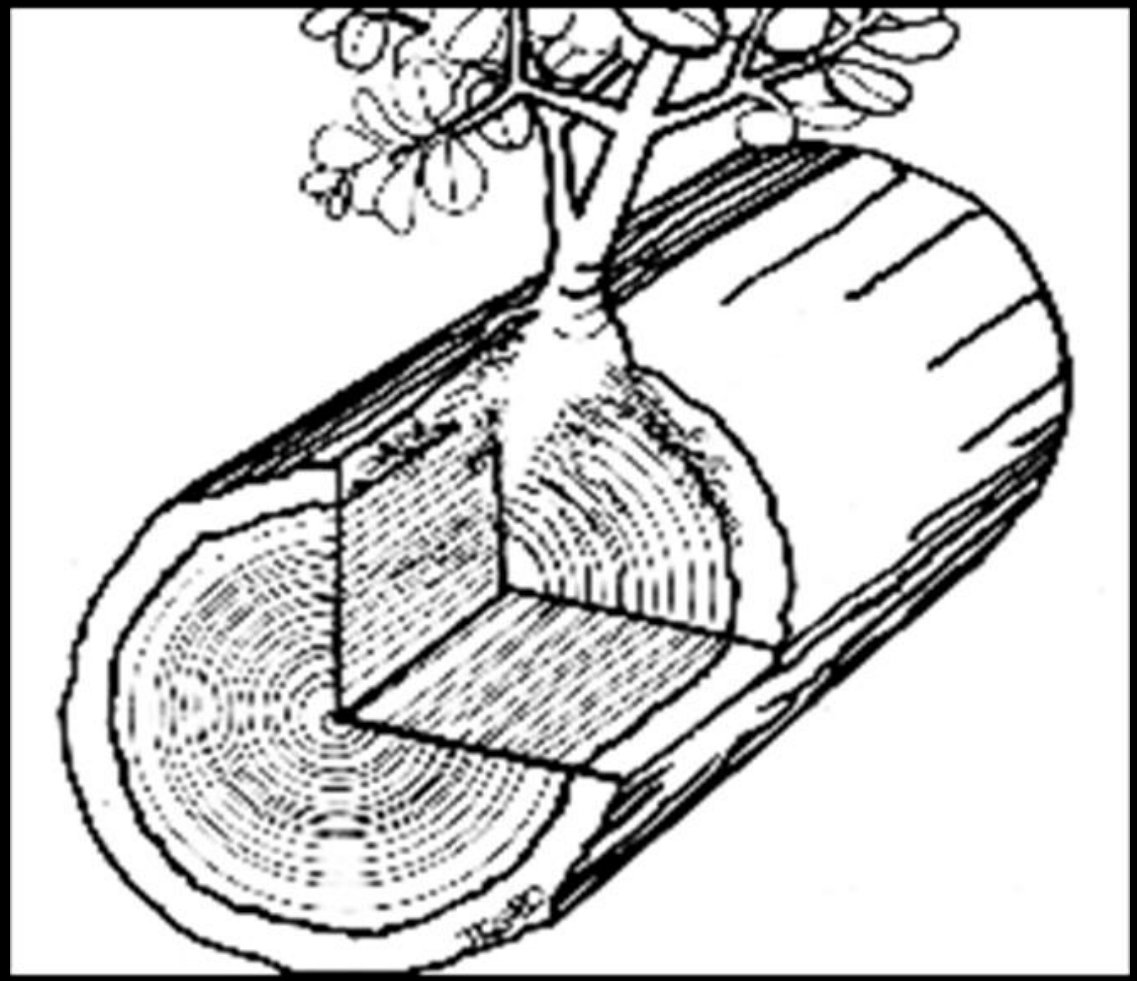
Slow canker growth

Bark reactions

Dwarf Mistletoes – *Arceuthobium spp.*

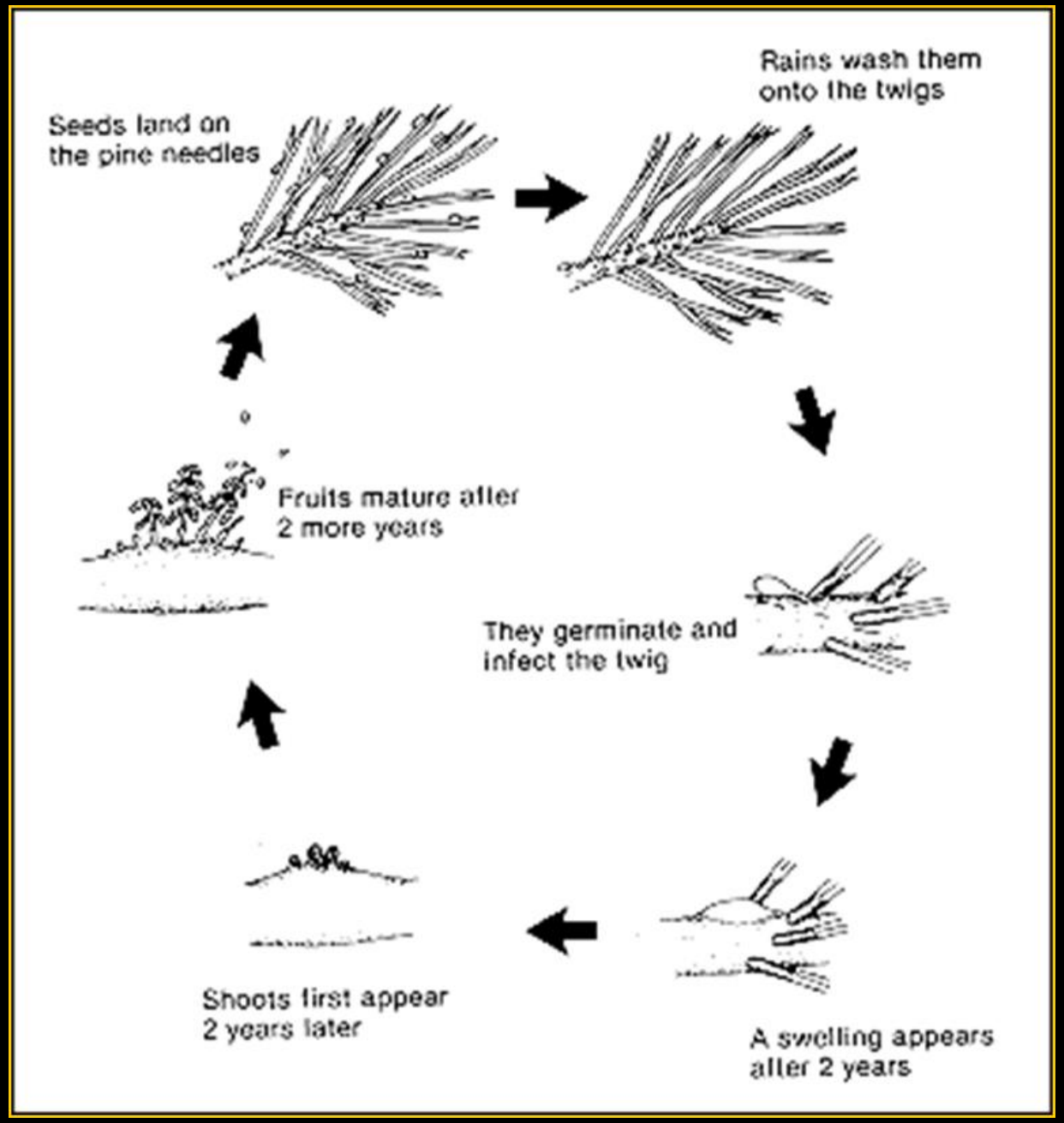
Mistletoe haustoria grow deep into water conducting tissues

- Rootlike structures grow first into xylem and phloem
- Grow slowly-may take a year for shoots to be visible
- Haustoria grow up and down the branch in wood
- If mistletoe leaves and branches are removed, new ones grow from haustoria



Dwarf Mistletoes

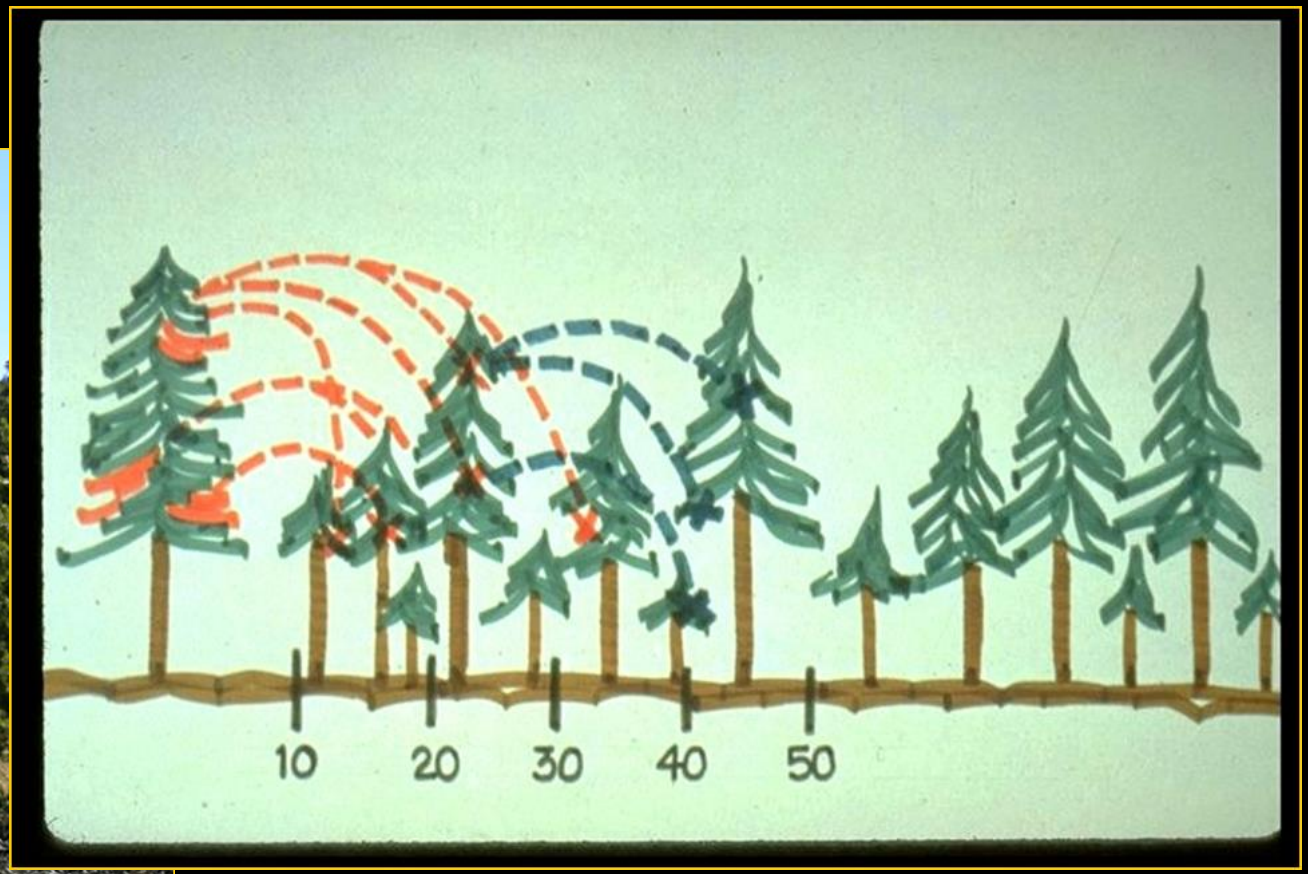
Spread by Explosive Seed Dispersal



Dwarf Mistletoes

- Lifecycle Takes Several Years to Complete
- Obligate Parasites (must live on their tree hosts to survive)

Spread on Regeneration



Spread on Regeneration

Questions?