

Management of western pine beetle (*Dendroctonus brevicomis*) in old-growth ponderosa pine forests of the West





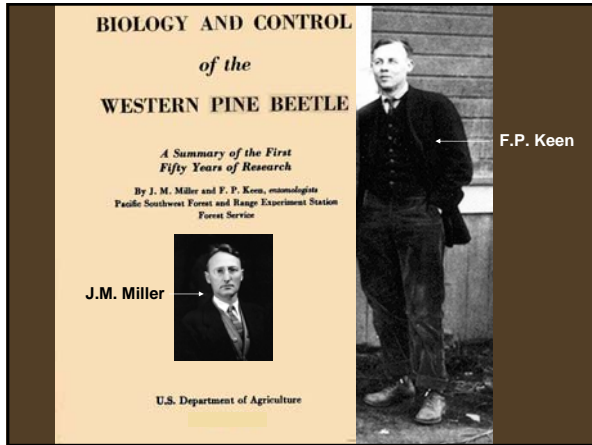
In 1920's old-growth ponderosa pine were common in the West.
As many of these trees reached senescence, the WPB recycled them.

Infested trees during 1910-20's period were cut, debarked and the direct sunlight then killed the WPB brood.





WPB-infested trees were also cut and sprayed with oil sprays. The oil penetrated the bark and killed the brood



Studies on relationships between fire and WPB infestations

TABLE 9.—Studies of bark beetle conditions following fires in ponderosa pine type

WESTERN PINE BEETLE INFESTATIONS

Burn	Date and location	Acres	Type of burn and special conditions	Volume of beetle-caused loss following fire compared with loss for year preceding		
				1st year	2d year	3d year
Chinquapin.....	September 1915, Ashland, Oreg.	220	Hot ground fire with medium crown injury.	+475 percent.	Decrease.....	Increase.
Mistletoe.....	October 1917, Ashland, Oreg.	800	Mixed ground and crown fire with varying degrees of defoliation.	+1,150 percent.	+326 percent.	+122 percent.
Siskiyou.....	August 1918, Ashland, Oreg.	200do.....	+1,700 percent.	+2,680 percent.	+1,210 percent.
Northfork.....	June 1924, Sierra, N.F.	5,460	Mixed ground and crown fire with high percent of defoliated trees.	+843 percent.	+4,680 percent.	+482 percent.
Aspen Lake.....	July 1926, Klamath Falls, Oreg.	8,000	Mixed ground and crown fire, defoliated trees salvaged within year after fire.	Slight increase.	Normal.....	Normal
Sugar Hill.....	July 1929, Modoc, N.F.	5,000	Mostly severe crown fire with about half of stand fire-killed; severe cambium injury in surviving trees.	+326 percent.	+340 percent.	+49 percent.

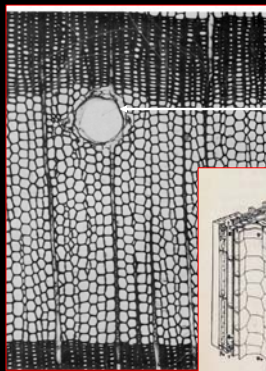
Keen set up experimental plots at Pringle Falls, Oregon



A look at what's going on with ponderosa pine and its interaction with the western pine beetle:

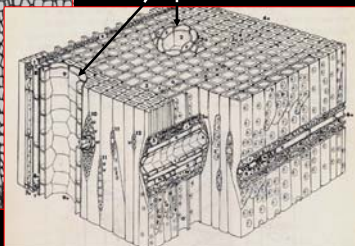
- ❖ Defense of the tree by means of its resin system.
- ❖ The life history of the WPB

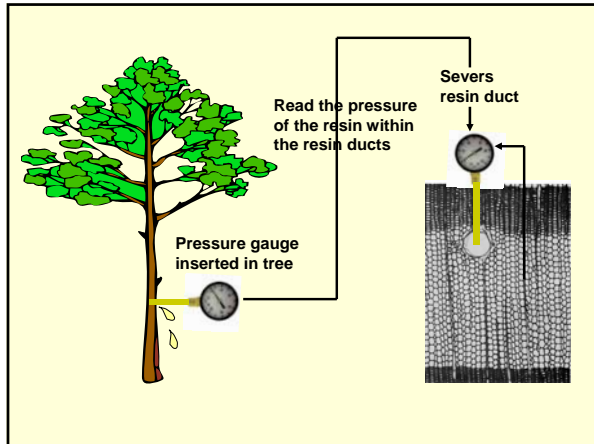


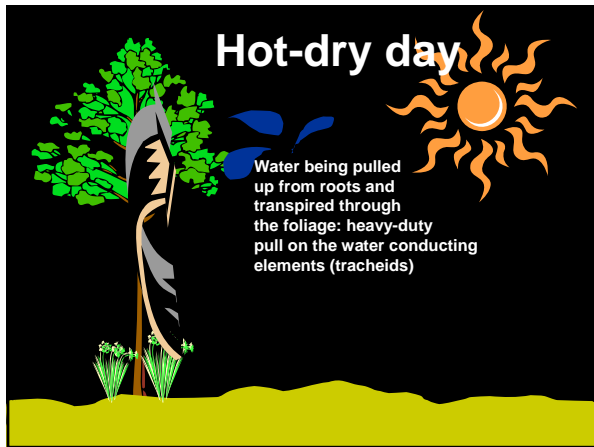


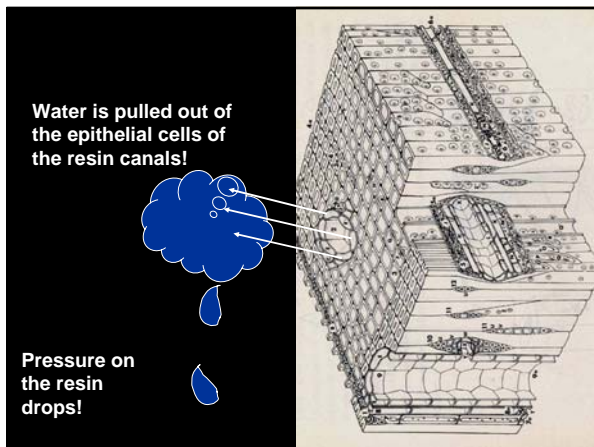
Ponderosa pine has Pre-formed resin canals

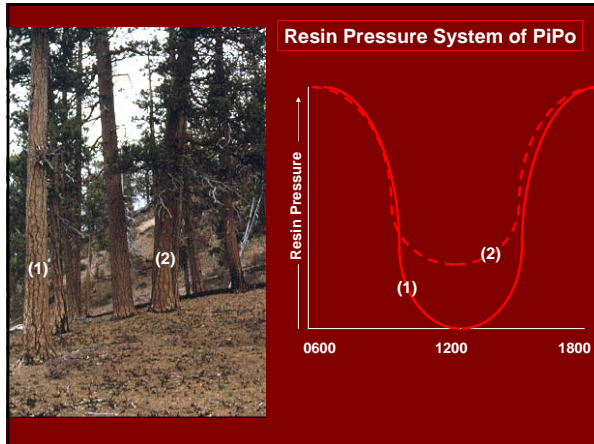
Epithelial cells that surround the resin canals

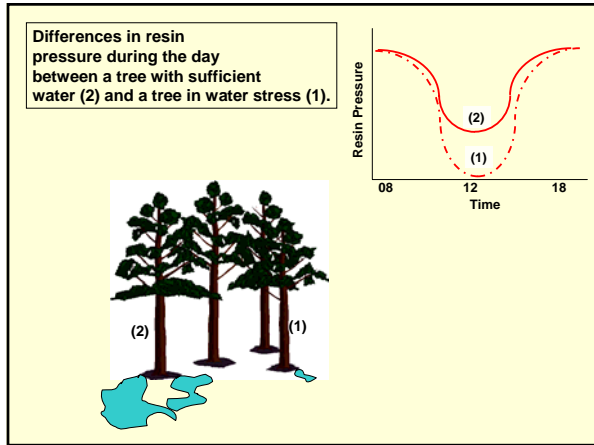


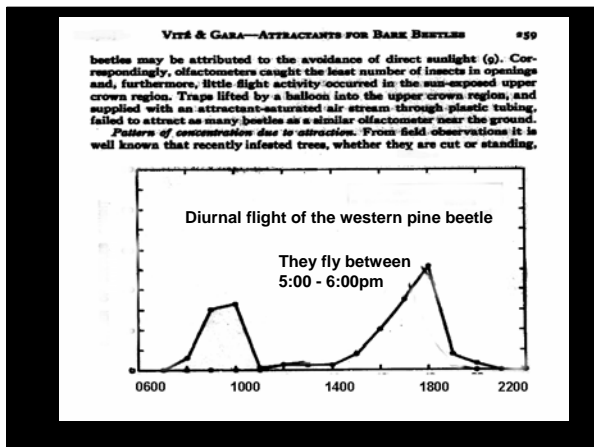


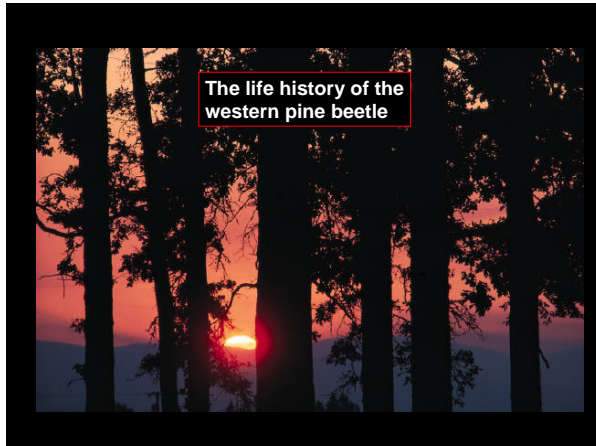




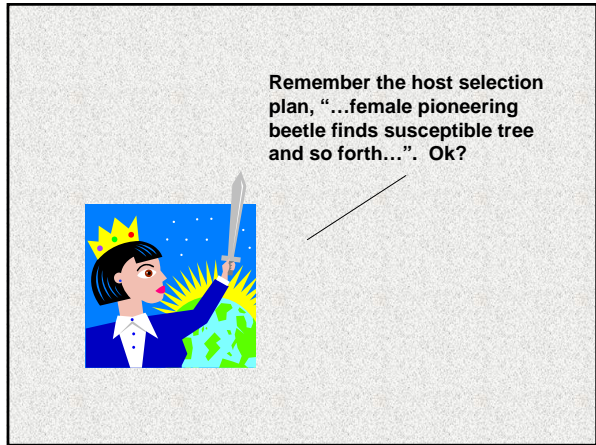




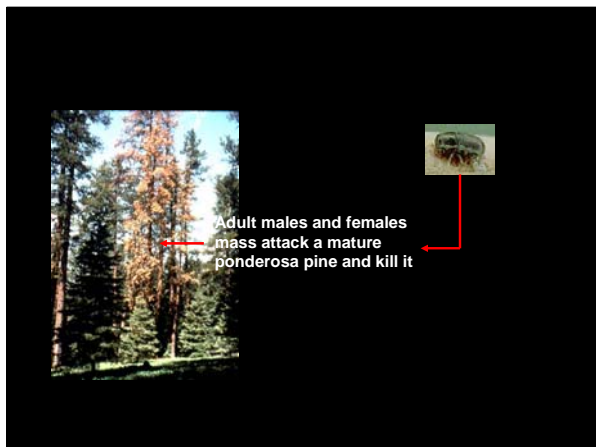




The life history of the western pine beetle

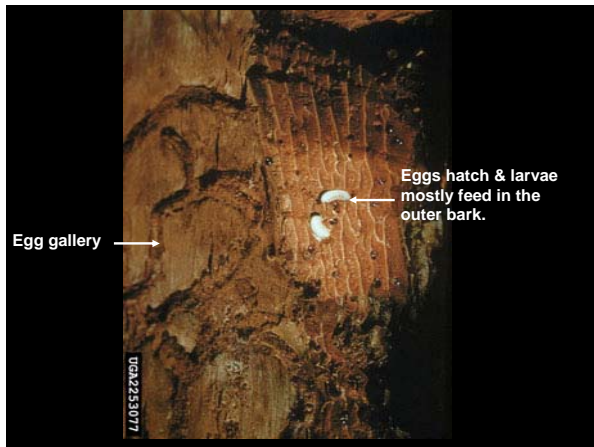


Remember the host selection plan, "...female pioneering beetle finds susceptible tree and so forth...". Ok?



Adult males and females mass attack a mature ponderosa pine and kill it







In June the new adults fly off in a new host selection flight.





F.P. Keen was a great (keen) observer

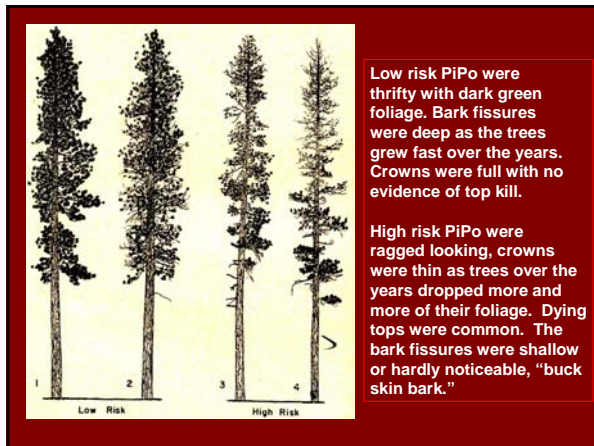
Keen noticed that certain kind of ponderosa pines were attacked by the WPB

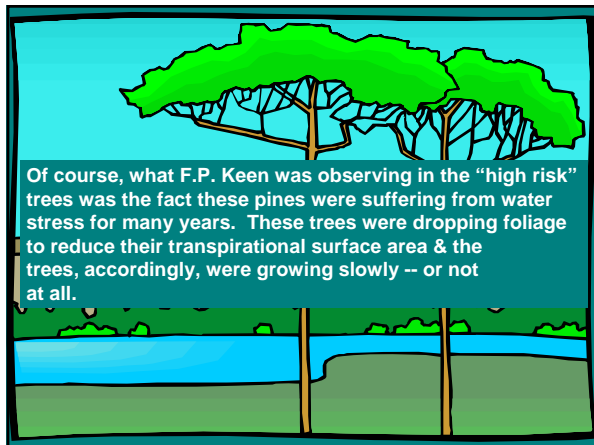
These kinds!

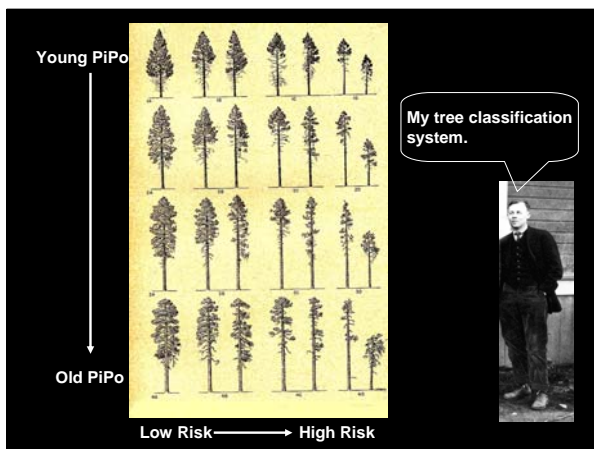


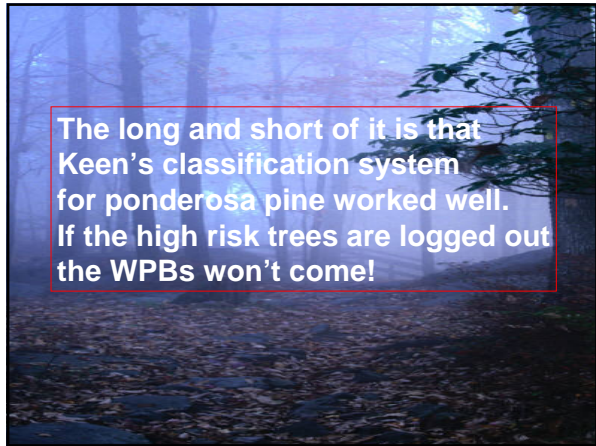
Keen classified PiPo into those of "Low Risk" and those of "High Risk": trees susceptible to WPB attack.

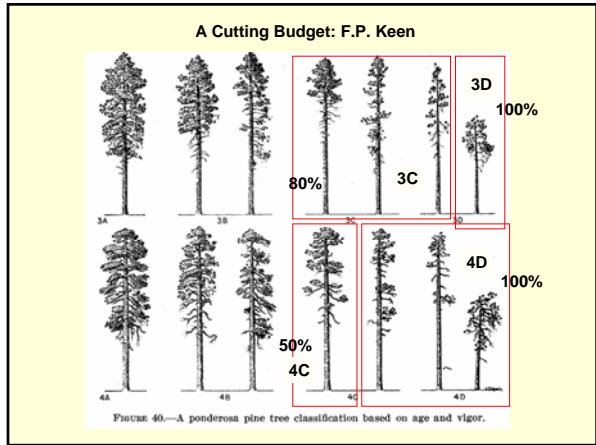
Risk rating	Symptoms
Risk I—Low risk.....	Full-foliaged, healthy-appearing crowns. Foliage of healthy appearance, needles usually long and coarse, color good dark green. Practically all twigs with normal foliage complement. No weakened parts of crown.
Risk II—Moderate risk.	Fair to moderately healthy crowns, imperfect in spots. Foliage mostly healthy, needle length average or better, color fair to good. Some twigs or branches may lack foliage, but such injury should not be localized to form definite "weak" spots in crown.
Risk III—High risk...	Crowns of fair to poor health, somewhat ragged or thin in parts of crown. Foliage in parts of crown thin, bunchy, or unhealthy, needles average to shorter than average in length, color fair to poor. Some to many twigs or branches lacking foliage, some to many twigs or branches fading or dead. Small localized weakened parts of crown usually present.
Risk IV—Very high risk.	Crowns in poor condition, ragged or thin, often showing evidence of active insect infestations in upper parts. Foliage thin or bunchy, needles short or sparse, color poor. Twigs and branches dead or dying, parts of crown definitely weakened. Active top-killing or partial infestations often present.















On federal lands today and in the future:

- Rotations will be long
- Large areas will be in ecological preserves
- The western pine beetle will be back on the scene!
- A tree salvage system based on Keen's classification will once more serve as a silvicultural system to mitigate WPB damage
