

Bark Beetles in California: Are your trees susceptible?

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Bark Beetles vs. Wood Boring Beetles



Bark beetles

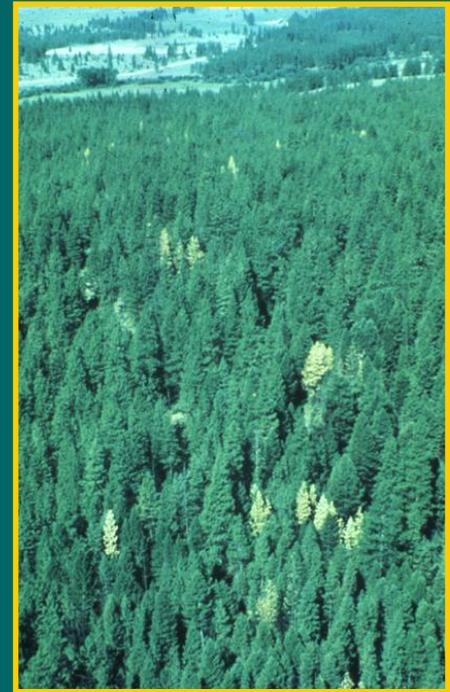


- The most important group of forest insects in the western U. S. (600 N. American species)
- Under certain circumstances, they are capable of being *primary tree killers*
- They shape the way forest succession occurs
- They alter forest stand structure and species composition
- They can cause great aesthetic and financial damage to your wildland/urban landscape



Bark beetles – Common attributes

- Bark beetles are ***opportunistic***, infesting trees weakened by other agents or factors
 - Disease infection
 - Infestation by other insects
 - Mechanical damage, including fire
 - **Drought**
 - High stand densities
 - Soil compaction (high use sites or construction)
 - Air pollution





UNSUCCESSFUL ATTACK



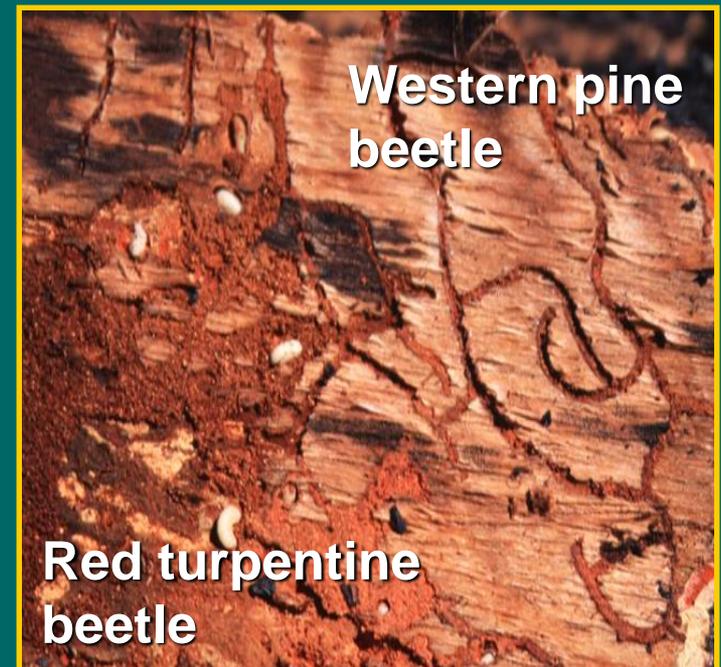
SUCCESSFUL ATTACK



Bark beetles



- Bark beetles live beneath the bark of host trees in ***galleries*** that are unique for each species



Bark beetles – Common attributes

- Bark beetles produce **aggregating attractants** that insure mass attack of suitable host material



These attractants (*pheromones*) also lead to group-killing of trees



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Bark beetles – Common attributes

- Bark beetles carry *staining fungi* that help reduce tree defenses and make the host material more palatable and nutritious for developing larvae



Bark beetles – Common attributes

- A ***high reproductive potential*** allows bark beetles to multiply rapidly when conditions are favorable

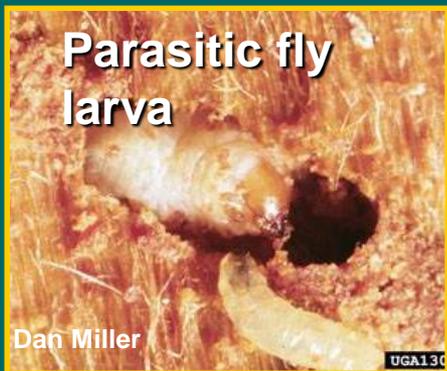


Bark beetles – Common attributes

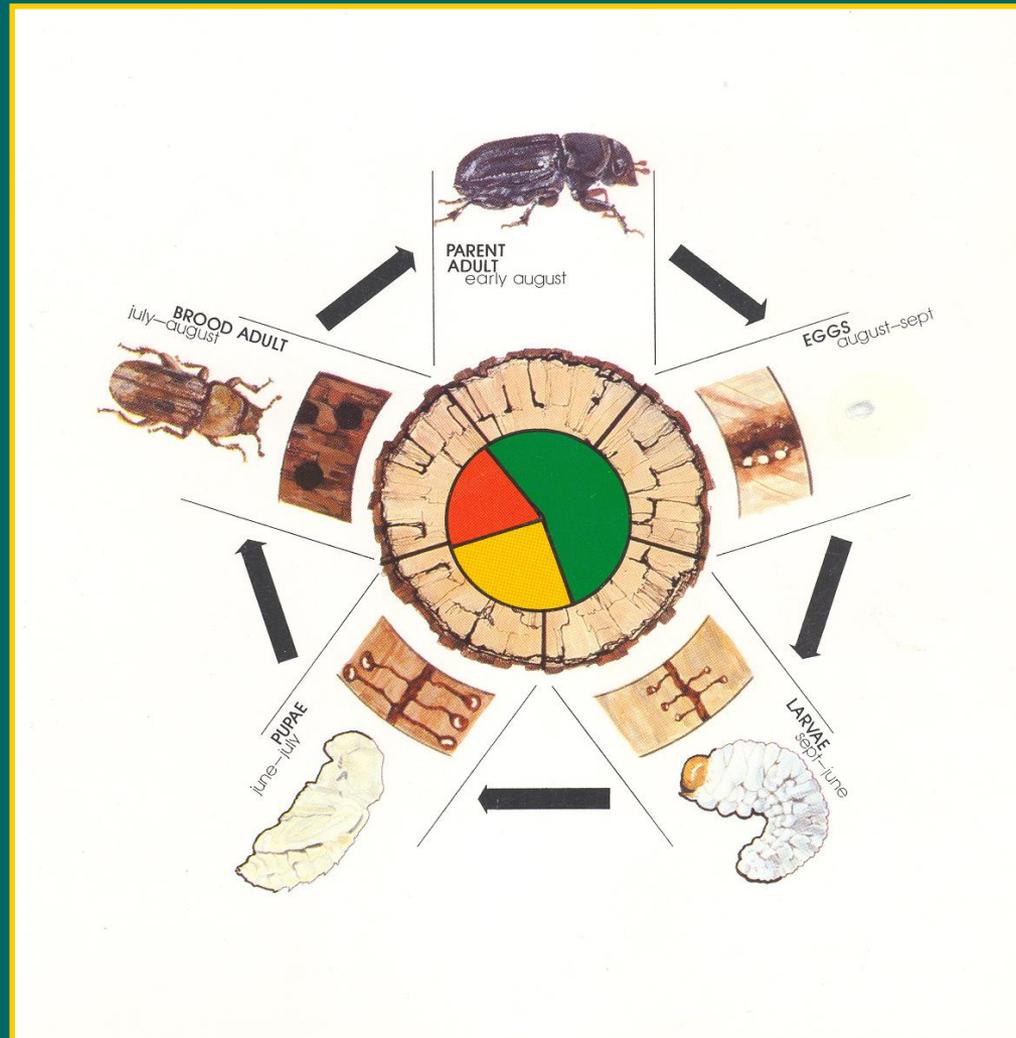
- Beetle populations are ultimately controlled by ***available food source*** (habitat)



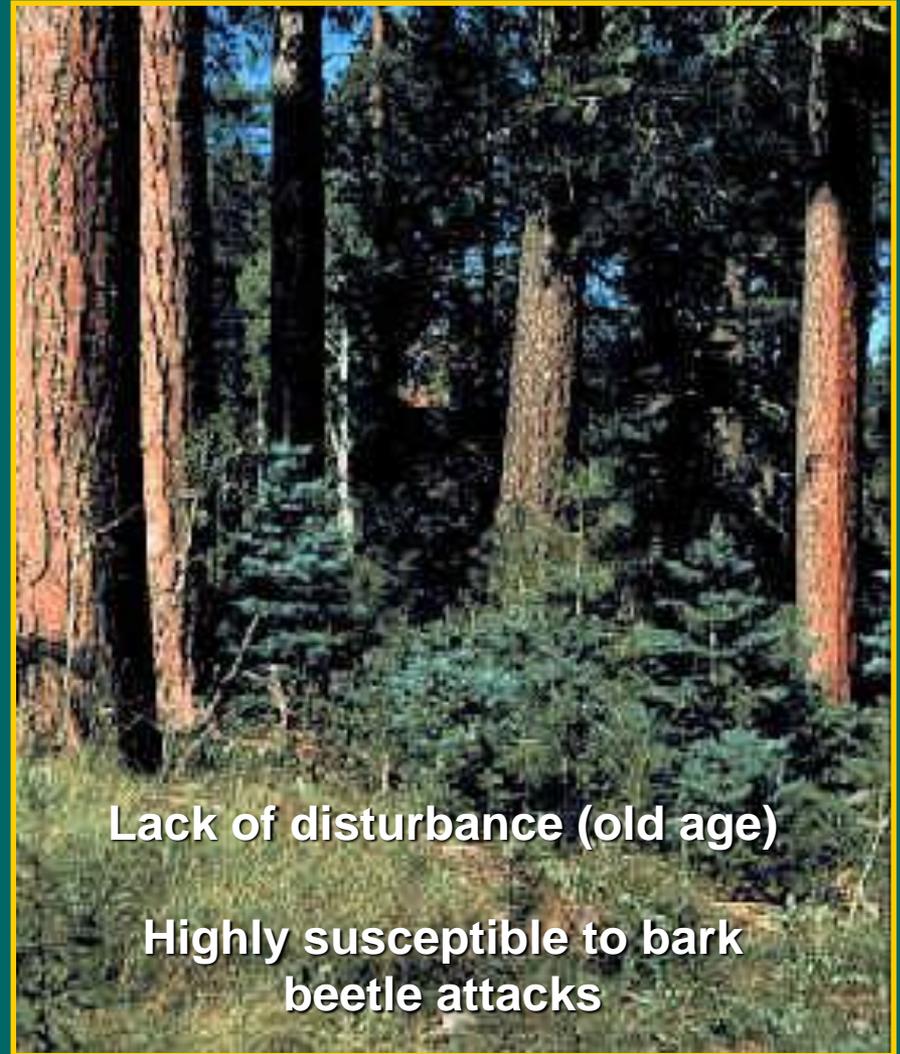
Natural enemies of bark beetles



Typical life cycle



Stand Density, Age, & Composition

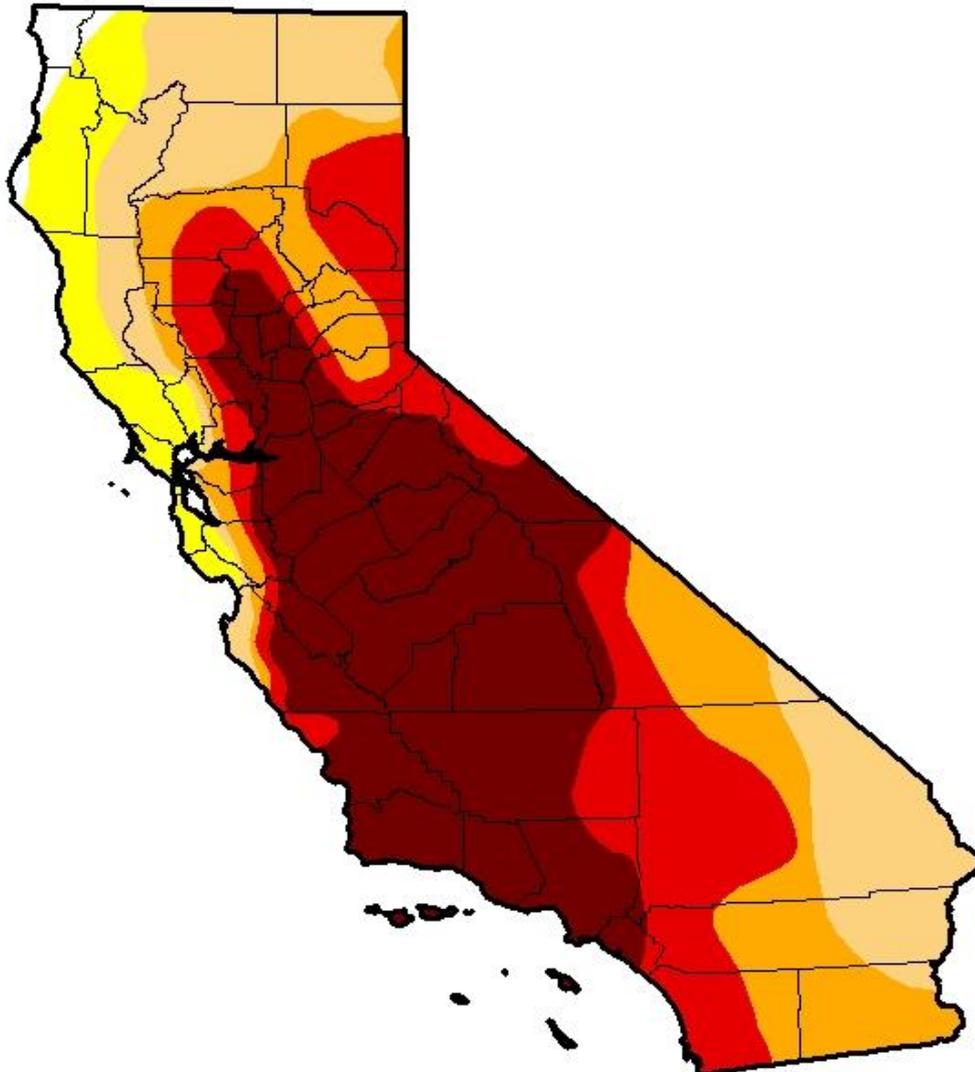


Urban impacts to native forests



U.S. Drought Monitor California

March 22, 2016
(Released Thursday, Mar. 24, 2016)
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	1.16	98.84	91.55	72.86	55.31	34.74
Last Week <i>3/15/2016</i>	0.43	99.57	93.28	73.64	55.31	34.74
3 Months Ago <i>12/22/2015</i>	0.00	100.00	97.33	90.63	69.09	44.84
Start of Calendar Year <i>12/29/2015</i>	0.00	100.00	97.33	87.55	69.07	44.84
Start of Water Year <i>9/29/2015</i>	0.14	99.86	97.33	92.36	71.08	46.00
One Year Ago <i>3/24/2015</i>	0.15	99.85	98.11	93.44	66.60	41.41

Intensity:



The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

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Important bark beetle species of California

Dendroctonus jeffreyi, Jeffrey pine beetle (JP)

Dendroctonus brevicomis, Western pine beetle (CP, PP)

Dendroctonus ponderosae, Mountain pine beetle (LPP, PP, WWP, SP, KP, WBP)

Dendroctonus pseudotsugae, Douglas-fir beetle (DF)

Dendroctonus valens, Red turpentine beetle (all pines)

Ips pini, Pine engraver (all pines)

Ips paraconfusus, California five-spined ips (all pines)

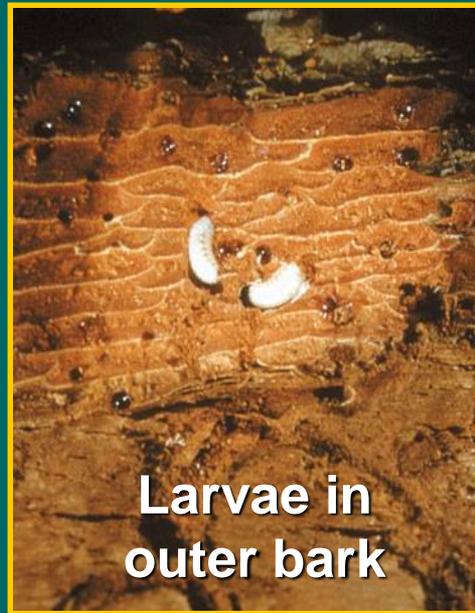
Ips confusus, Pinyon ips (pinyon pine)

Scolytus ventralis, Fir engraver (true firs)

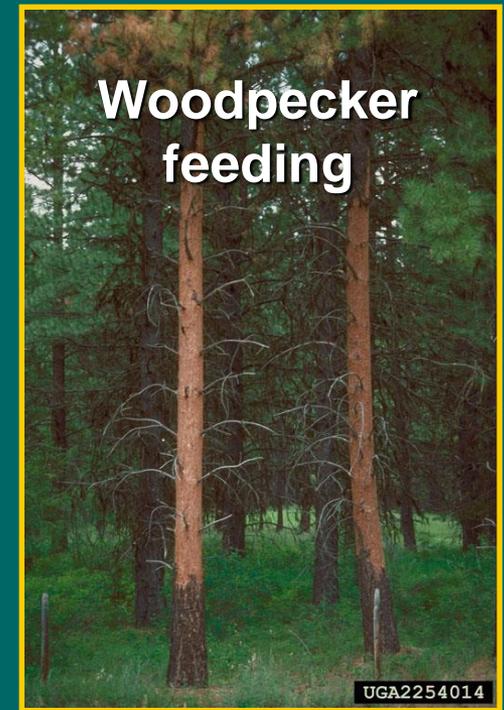
Western pine beetle, *Dendroctonus brevicomis*

Hosts: Coulter, ponderosa pine

Two generations per year in northern part of range; *three* and sometimes *four generations* in southern portion



Larvae in
outer bark

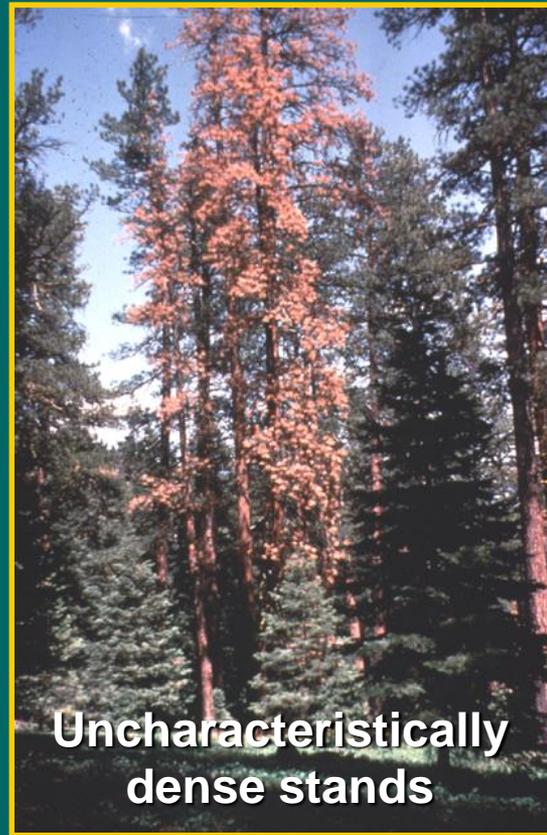
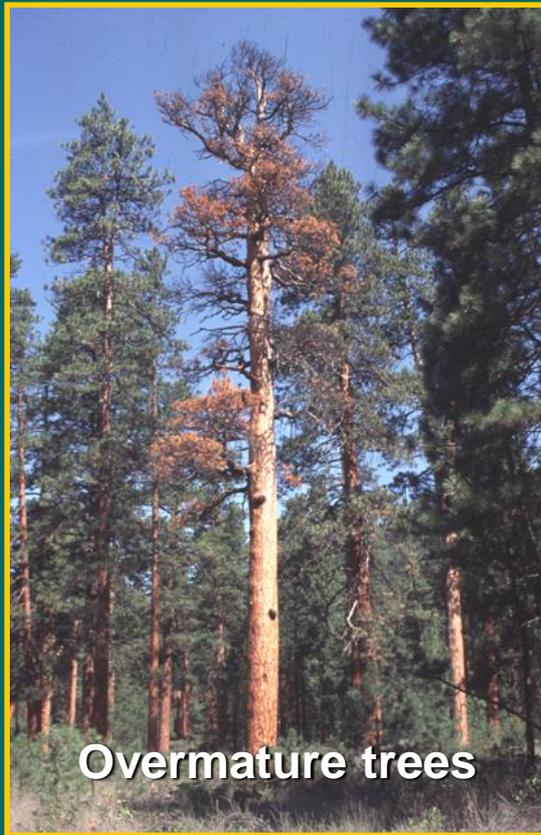


Woodpecker
feeding

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Western pine beetle, *Dendroctonus brevicomis*

Large-diameter ponderosa pine



Second-growth overstocked ponderosa pine stands are also infested

Red turpentine beetle, *Dendroctonus valens*

Hosts: All pines

Attacks occur on lower bole and are usually **not** lethal



RTB adult
(largest of the
bark beetles)



Red turpentine beetle, *Dendroctonus valens*

Hosts: All pines

Adult flight takes place throughout the spring and summer with a peak in **May**



California five-spined ips, *Ips paraconfusus*

Hosts: All pines

More common west of the Sierras and Cascades and in Coast Range

Associated with slash and tops of larger trees

Four generations per year

Slash management is most critical for this species of engraver



Engraver beetle management



Engraver beetles breed in fresh slash and subsequent generations can attack and kill residual trees.

Timing of slash creation is critical; the **safe time** for thinning and creating slash is between *July and December*

Engraver beetle management

Engraver beetle concerns are greatest on **dry sites** and during **dry years**.

Stacked material is more conducive to population buildup than material that is scattered or crushed.



Host material **<3"** in diameter is not a problem

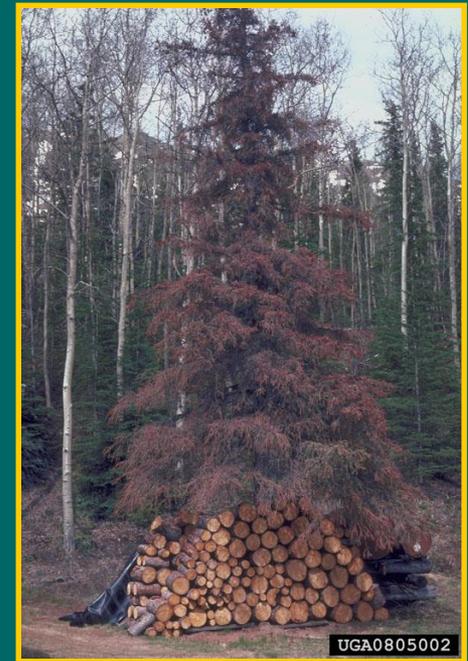
Bark Beetle Management in the Urban Forest

- Thin trees to appropriate spacing for the site
- Be mindful of grade changes during construction
- Avoid compaction to roots (vehicles, horses, etc)
- Avoid damage to roots (trenching, grading, excessive fill, etc)
- Avoid damage to trunk
- Be careful with watering (over, under, abrupt changes)
- Prune dwarf mistletoe infections if possible

How can I save my trees?

Short-term

- If they are already infested it is too late
- Remove infested trees
- Deep watering
- Preventative spraying of uninfested trees
- Anti-aggregation pheromones
- Avoid leaving green slash or firewood near standing live trees
- Fertilizers will not save your trees
- Systemic injections?????



Removing infested trees

- To be effective removal must be accomplished before beetle emergence
- Be careful not to damage surrounding trees
- All material larger than 3" in diameter should be removed from the site, chipped, buried, or burned
- Firewood cut from infested trees should be stacked in a sunny location away from live trees
- Covering woodpiles with heavy, clear, plastic in sunny location can effectively kill beetles

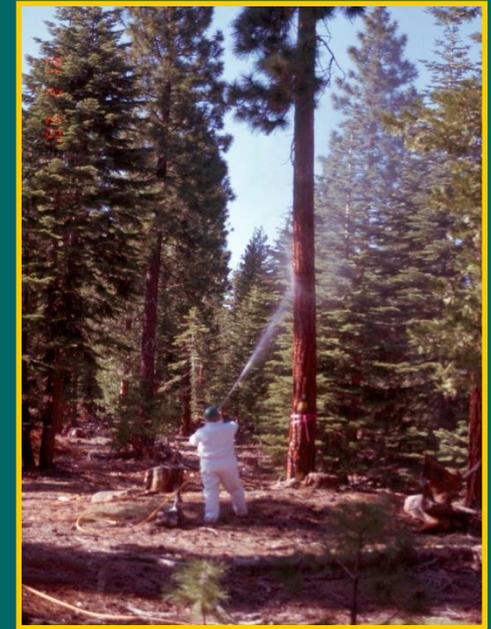


Watering trees

- Watering should occur early in the growing season after a drier than normal winter
- Soil should be saturated down to 2 feet in a donut shape at the drip line or outer edge of tree branches
- Over watering during the growing season may cause root damage

Preventative spraying

- Spraying **uninfested** but susceptible trees can prevent bark beetle attack
- Due to high cost and environmental concerns only “high-value” trees should be treated
- Treatments should be limited to susceptible host species
- Treatments should focus on stressed trees: trees with mistletoe, wounds, soil compaction, other insect damage, or growing under intense competition
- Treatments should occur in early spring before beetle flight (March/April)



Systemic Injections

- Systemic insecticides have historically been ineffective for bark beetles
- Problems with getting material to translocate to the phloem layer
- Attacked trees still killed by blue stain fungi
- Recent research and testing has shown some promising results for some beetle/host combinations

How can I save my trees?

Long Term

- Reduce tree competition
- **Thinning** is the best long-term solution to increasing tree health and vigor and reducing the chances of bark beetle related mortality
- Thinning should be accomplished in late summer or fall after insect flights have decreased
- Treat logs and slash properly to avoid creating more habitat for beetle development
- Avoid injuring trees during construction or landscaping projects
- Avoid creating stressful growing conditions
- Plant trees native to the area

Conclusions

- Bark beetles are native to the area and play an important role in forest succession and nutrient cycling.
- Promoting tree health and vigor over the long term is the most effective and inexpensive way to prevent bark beetle-caused mortality.
- Spraying insecticides on the bole currently provides the most effective short-term protection