

## Diseases & Management Strategies

Disease	Method of spread	Major hosts	Management strategies
Armillaria root disease	Roots	All species	Maintain tree vigor and avoid root stress, do not over water oaks
Laminated root rot	Roots	Conifer species	Use resistant species
Annosus root rot	Air, roots	True firs, hemlock, pines	Treat stumps & prevent tree damage
Black stain root disease	Insects, roots	Douglas-fir & pines	Prevent tree damage, use resistant species
Port-Orford-cedar root disease	Water, mud, roots	Port-Orford-cedar	Avoid infested areas & use resistant species

Phytophthora's (e.g. sudden oak death)	Water, soil, roots	Many hosts	Avoid infested areas & practice sanitation
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### Insects, Hosts & Affected Areas of Tree

Insect	Major host(s)	Location	Parts of tree affected	Outcome (mass attack)
Mountain pine beetle	Pines, mostly lodgepole and sugar pines	Main Stem	Inner bark/cambium	Tree death
Western pine beetle	Ponderosa and coulter pine	Main Stem	Inner bark/cambium	Tree death
Jeffrey pine beetle	Jeffrey pine	Main Stem	Inner bark/cambium	Tree death
Douglas-fir beetle	Douglas-fir	Main stem and/or branches	Inner bark/cambium	Tree death or top dieback
Fir engraver	True firs	Whole tree	Inner bark/cambium	Tree death

<b>Insect</b>	<b>Major host(s)</b>	<b>Location</b>	<b>Parts of tree affected</b>	<b>Outcome (mass attack)</b>
Pine engraver (ips species)	Most pines	Top of living trees and green slash	Inner bark/cambium	Top kill in large trees, may result in smaller tree death
Flatheaded fir borer & flatheaded pine borer	Douglas-fir, firs, spruce, pines; hemlock & larch	Whole tree/ dead or dying	Inner bark/cambium	Tree death
Red turpentine beetle	Any pine	Bottom five feet	Inner bark/cambium	Rarely tree death
Ambrosia beetles	Hardwoods & softwoods	Whole tree/ dead or dying	Sap and heartwood	Tree death or top dieback
Cedar and cypress bark beetles	Cypress, juniper, redwood	Whole tree/ dying	Inner bark/cambium	Tree death or branch dieback

<b>Insect</b>	<b>Major host(s)</b>	<b>Location</b>	<b>Parts of tree affected</b>	<b>Outcome (mass attack)</b>
Oak bark beetle	Buckeye, oak, tanoak	Whole tree/ dying	Inner bark/cambium	Tree death