THE WOODLAND WORKBOOK

FOREST PROTECTION

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An Introduction to Forest Protection

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Contents

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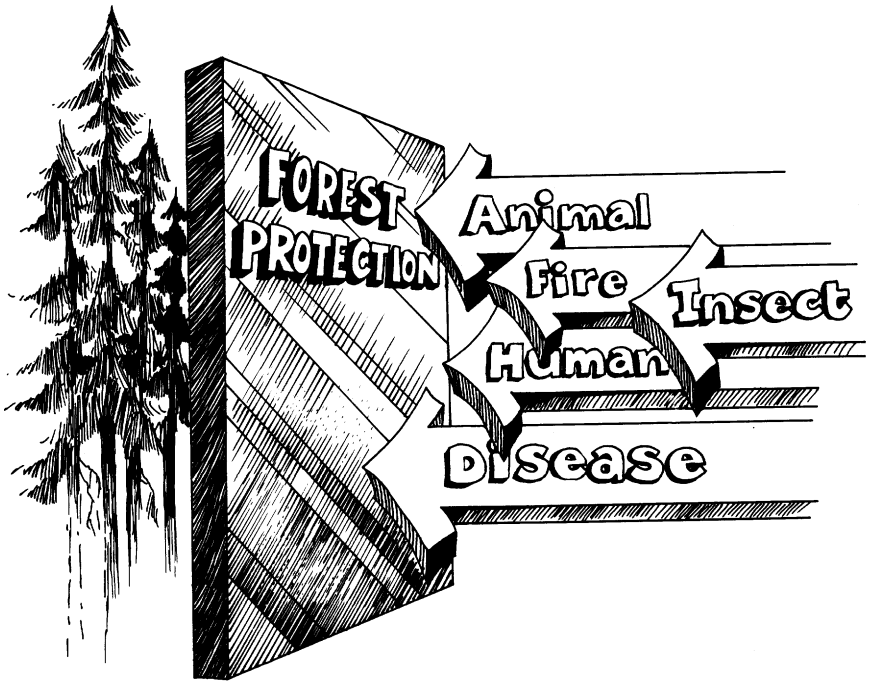

Figure 1.—Forest protection includes prevention and control of damage caused by vertebrate pest animals, diseases, fires, insects, and humans.

The purpose of this publication is to introduce you to the world of forest protection by: (1) providing you with broad definitions of the five principal groups of destructive agents; and (2) presenting some information on the impacts of these groups on the forests of Oregon.

This is an *introduction* to forest protection. Four related OSU Extension publications discuss particular threats: EC 1201, *Understanding and Controlling Deer Damage in Young Plantations;* EC 1255, *Controlling Pocket Gopher Damage to Conifer Seedlings;* EC 1109, *Soil Compaction on Woodland Properties;* and EC 1501, *Abiotic Injury to Forest Trees in Oregon* (see pages 13–14).

The trees in your woodlands live under constant threats of injury and death. Perils to their survival come from a wide range of sources, and they exist all seasons of the year. The health and vigor of your trees, both individual stems and groups of stems (stands), should be a constant concern that you reflect in your management strategy.

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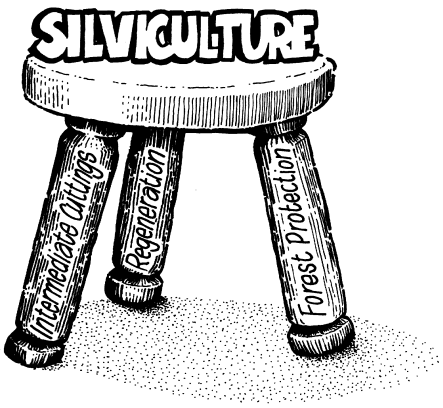

Figure 2.—The three parts of silviculture: forest protection, regeneration, and intermediate cuttings.

Forest protection is action taken to defend your forest or woodland against potential enemies, including vertebrate pest animals, diseases, fires, insects, and humans (Figure 1).

Silviculture is the art and science of producing and tending a forest. Forest protection can be visualized as one leg of an imaginary "silviculture stool" (Figure 2). The two other legs are regeneration and intermediate cuttings—for example, liberation cutting, thinning, improvement cutting, and pruning.

The overall strength of the stool is governed by the strength of the individual legs. Hence, inadequate protection can lead to below-par performance or even to the collapse of a silvicultural program. For example, incomplete restocking of cutover forest land may be the consequence of the woodland manager's inattention to local deer populations.

Forest protection consists of a series of activities that support one or more of the following objectives.

- Maximize production of sound wood
- Minimize negative effects of soil disturbance (compaction, erosion)
- Preserve appropriate wildlife habitat
- Sustain desired water quality
- Maintain an attractive forest environment

A look back

Forest protection is fundamental to sound management. It can even be pictured as the rock on which the rest of management is perched. As a woodland manager, you should know that history records the importance placed on forest resources by other people at other times.

You can affect the protection of these resources in the future by your actions today. In many instances, our finite renewable forest resources, coupled with rapidly increasing demands, have produced—and will continue to produce—a "need-to-legislate" response in order to protect them.

Organized forest protection in the United States apparently had its beginnings in 1743. The State of New York passed a law that gave anyone who discovered a fire (in one of several specified areas) the authority "to require and command" anybody in sight to help put it out. There was a monetary fine for neighbors who objected—or who weren't too quick about helping.

Fire had been identified as a threat to the nation's forests. More than 200 years were to pass before other destructive agents were officially recognized.

It was not until the passage of the Forest Pest Control Act on June 25, 1947 that a cooperative program of protection against destructive forest diseases and insects was launched. This act declared it to be the policy of the federal government to protect all forest land from threats, regardless of ownership. It authorized the Secretary of Agriculture to:

- Conduct surveys
- Identify infestations
- Determine appropriate control measures and implement them against outbreaks as warranted
- Carry out these activities either directly or in cooperation with other federal agencies, state and local agencies, private organizations, and individuals

The Forest Pest Control Act forms the basis of most of our current government efforts to control forest disease and insect problems.

Forest and woodland enemies

Insects

The forests and the woodlands of Oregon are literally crawling with insects. Most species are not harmful to forest trees—in fact, many species, such as pollinators and predators, are highly beneficial. Some insects are of minor consequence; they produce no significant injury and have little economic impact.

Some species of forest insects, however, can seriously damage Oregon's commercial timber. Much of the timber value of individual woodland properties has, in some cases, been damaged severely. The direct volume loss from these insects is estimated at 3.7 billion board feet annually *in Oregon alone* (Figure 3)—and this does not include the consequences of increased fire hazard, loss of wildlife habitat and recreational values, or damage to watersheds.

Insects, as a group, attack virtually all parts of the tree at all growth stages. Some of the damage is obvious, as with defoliators (needle eaters). Other damage may be less visible, especially if it's caused by wood-boring insects that feed under the bark.

Individual insect species feed on specific portions of the tree and, in many cases, are specific about the tree they'll attack. For example, the Douglas-fir tussock moth, a defoliator, won't feed on ponderosa pine. To identify the insect pest involved (Table 1), first identify the host tree and the parts of the tree being attacked.

Biology

In general, insects experience several stages of development (Figure 4, page 6). Some species, such as beetles and moths, have four stages: egg, larva (grub, caterpillar), pupa (resting stage), and adult. This transition is called *complete metamorphosis*.

Other species, such as aphids and termites, go through three stages of development, sometimes called *incomplete metamorphosis:* egg, nymph (immature stage), and adult.

It's the larvae or nymphs that most often cause damage to trees. They feed on the cambium, foliage, roots, seeds, soft shoots, and twigs.

Adult insects are involved primarily with reproduction. They can cause damage in their nest-building activities, such as constructing egg tunnels under the bark (bark beetles) or actually mining the inside of the foliage in order to lay their eggs (certain leaf and needle miners). Some adult insects—the gypsy moth, for example—do not feed. A thorough knowledge of the methods by which various species feed is important to implementing proper control measures.

- *Chewing insects,* such as bark beetles and defoliator larvae, eat portions of the plant.
- *Sucking insects*—aphids, for example—simply remove the juices from the plant.

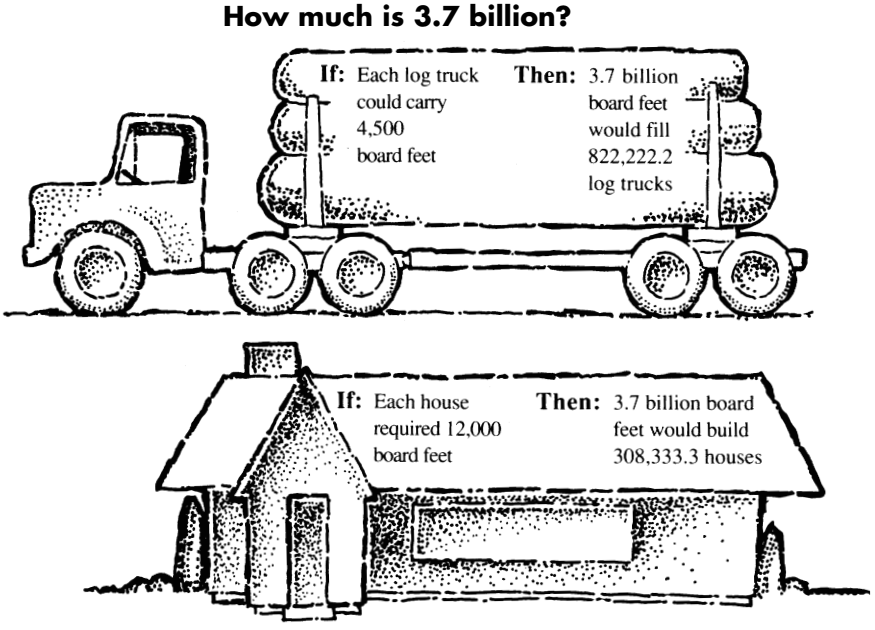

Figure 3.—The approximate equivalent in log trucks and three-bedroom houses of Oregon's annual wood-volume losses due to insect damage.

***Table 1.*—Major forest insect pests of Oregon that attack standing and cut timber.**

Category	Insect	Major host(s)	Part(s) of tree affected
Coniferous trees (needle-bearing, softwoods)			
Seedlings and young trees	pine needle sheath miner *(Zelleria haimbachi)*	ponderosa pine, Jeffrey pine	foliage
	ponderosa pine tip moth *(Rhyacionia zozana)*	ponderosa pine, Jeffrey pine, lodgepole pine, sugar pine, digger pine	buds and shoots
	western pine shoot borer *(Eucosma sonomana)*	ponderosa pine	terminal shoots
	lodgepole terminal weevil *(Pissodes terminalis)*	lodgepole pine	terminal shoots
	gouty pitch midge *(Cecidomyia piniinopis)*	ponderosa pine	current-year shoots
	white pine weevil *(Pissodes strobi)*	Sitka spruce	terminal shoots
	Douglas-fir twig weevil *(Cylindrocopturus furnissi)*	Douglas-fir, white fir, Pacific silver fir	small branches
Mature trees	Douglas-fir beetle *(Dendroctonus pseudotsugae)*	Douglas-fir	inner bark and cambium of main stem
	fir engraver *(Scolytus ventralis)*	white fir, grand fir, California red fir	inner bark and cambium of main stem
	mountain pine beetle *(Dendroctonus ponderosae)*	lodgepole pine, ponderosa pine	inner bark and cambium of main stem
	western pine beetle *(Dendroctonus brevicomis)*	ponderosa pine, Coulter pine	inner bark and cambium of main stem
	pine engraver beetle *(Ips pini)*	ponderosa pine, lodgepole pine, Jeffrey pine	inner bark and cambium of main stem
	flatheaded fir borer *(Melanophila drummondi)*	Douglas-fir, white fir, grand fir, Pacific silver fir, California red fir, Sitka spruce, Engelmann spruce, western hemlock, western larch	inner bark and cambium of main stem
	western spruce budworm *(Choristoneura occidentalis)*	Douglas-fir, white fir, grand fir, Engelmann spruce	current-year buds and foliage
	Douglas-fir tussock moth *(Orgyia pseudotsugata)*	Douglas-fir, white fir, grand fir, subalpine fir	foliage
	Modoc budworm *(Choristoneura viridis)*	white fir	current-year buds and foliage

Table I.*—Major forest insect pests of Oregon that attack standing and cut timber *(continued).

Category	Insect	Major host(s)	Part(s) of tree affected
Coniferous trees—*continued* Mature trees—*continued*	larch casebearer *(Coleophora laricella)*	western larch	foliage
	hemlock sawfly *(Neodiprion tsugae)*	western hemlock	foliage
	spruce aphid *(Elatobium abietinum)*	Sitka spruce, Engelmann spruce	foliage
Deciduous trees (broadleaf, hardwoods)	western tent caterpillar *(Malacosoma californicum)*	species of oak, willow, cherry, plum, cottonwood, birch, alder, and ceanothus	foliage
	bronze birch borer *(Agrilus anxius)*	species of birch	inner bark and cambium of branches and main stem
	western oak looper *(Lambdina fiscellaria somniaria)*	Oregon white oak	foliage
	oak pit scale *(Asterolecanium minus)*	California black oak, canyon live oak	twigs and branches
	fall webworm *(Hyphantria cunea)*	species of alder, ash, cottonwood, madrone, maple, willow, and various fruit trees	foliage
Cut trees (coniferous and deciduous)	ambrosia beetles (various species from the genera *Trypodendron, Gnathatrichus, Monarthrum,* and *Xyleborus)*	various hardwoods and softwoods	wood fibers
	flatheaded borers (various species from the genera *Buprestis, Melanophila,* and *Trachykele)*	various softwoods	wood fibers
	roundheaded borers (various species from the genera *Archopalus, Leptura, Semanotus,* and *Xylotrechus)*	various hardwoods and softwoods	wood fibers

- *Gall-forming insects,* such as the Cooley spruce gall aphid, cause part of the tree to swell or form a gall, which houses them while they feed and develop.

Control

Control of insect pests is either by natural means or through human intervention. Normal (endemic) insect populations are maintained naturally by the feeding and reproductive habits of the insect, weather fluctuations, feeding by parasites and predators (birds, mammals, and other insects), and the intrusion of naturally occurring bacteria and viruses.

Human intervention into insect control usually happens when pest populations become epidemic.

Methods include chemical (insecticides) and biological (introducing predators, parasites, or disease-causing organisms). In addition, antibiotics and insect-resistant (genetically modified) trees are receiving increased attention as potential control methods.

The best insect control is prevention. You can accomplish this through appropriate silvicultural treatments such as thinning.

Other silvicultural approaches that help to prevent unreasonable losses from forest insects include sanitation and salvage

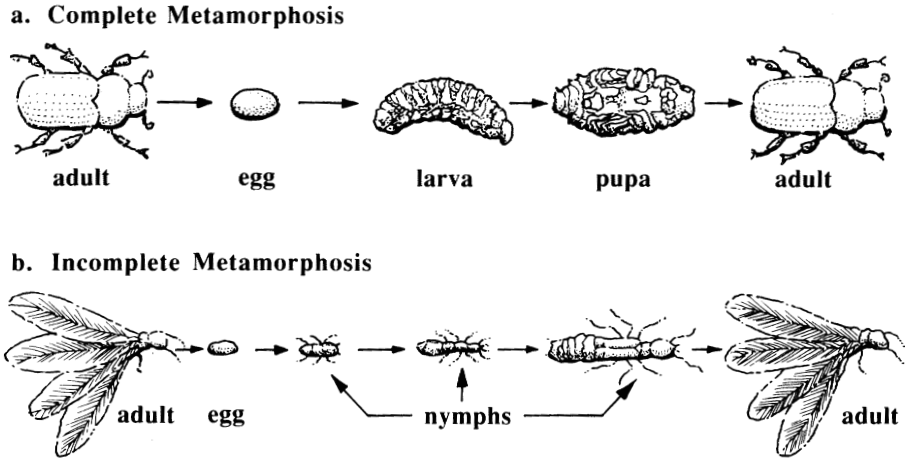

Figure 4.—Examples of insect developmental stages: (a) complete metamorphosis (bark beetles, *Dendroctonus* sp.); (b) incomplete metamorphosis (subterranean termites, *Reticulitermes* sp.).

cuttings to remove dead and dying insect-susceptible or insect-infested trees. Consider, too, practices that promote the development of habitats for insect predators and parasites (birds, mammals, ants, and other insects).

Carefully planned and executed silvicultural procedures can help mimimize population expansions or prolong the interval between outbreaks of some insects that threaten your woodland resources.

Integrated pest management (IPM)—using a combination of techniques—appears to be more successful in controlling insect outbreaks than the application of any single method.

Use pesticides safely!

- Wear protective clothing and safety devices as recommended on the label. Bathe or shower after each use.
- Read the pesticide label—even if you've used the pesticide before. Follow closely the instructions on the label (and any other directions you have).
- Be cautious when you apply pesticides. Know your legal responsibility as a pesticide applicator. You may be liable for injury or damage resulting from pesticide use.

Diseases

Tree diseases might be called the invisible enemies of the forest. The visible signs of their presence are not nearly as striking as those that accompany fire and insect damage. In general, tree diseases spread slowly, over long periods of time.

Sometimes, there's little visible evidence that a particular disease is present until the tree dies. In some cases, the amount of deterioriation caused by a disease is not apparent until trees are cut. It's no wonder that estimates of actual volume losses caused by forest diseases are sketchy.

Even less is known about the impacts of diseases on nontimber resoures—wildlife habitat, water quality, and recreational values, for example. One fact is certain, however: *Forest diseases cause more losses annually than either fires or insects.*

Forest diseases may be divided into two broad classifications, biotic (infectious diseases caused by living organisms), and abiotic (noninfectious diseases caused by the nonliving environment).

Diseases within each classification can be placed in a variety of categories. The categories in the following sections contain some of the more important diseases of the forests and woodlands of Oregon (see also Table 2, page 8).

Biotic (infectious) diseases

Stem decays are caused by fungi that break down the wood fiber of a tree trunk. They can severely reduce recoverable wood volume, with little effect on growth or mortality of the infected trees. Stem decays cause more annual merchantable volume loss than all other diseases. Much of this deterioration occurs in old growth stands.

On the positive side, trees with stem decay often provide habitat for cavity-dwelling and nesting wildlife.

Dwarf mistletoes are parasitic flowering plants that depend on the host plant for food (Figure 5). They're usually host-specific; that is, a given species of mistletoe infects only a certain species of conifer.

As parasites, they severely retard growth and, in severe infections, cause eventual mortality. Infected trees are unsightly and, because the mistletoe plants can weaken branches, they may be a safety hazard.

Root diseases are caused by fungi that destroy roots and eventually kill the tree. Some growth retardation can occur after introduction of a particular root disease, and infected trees may be less windfirm (Figure 6).

Root diseases can be troublesome to control—they often persist on the site for many years, even after infected trees have been removed.

Stem cankers/rusts are caused by fungi that attack and kill stems and branches. With the exception of white pine blister rust, which has destroyed millions of white pines, most of these diseases cause only minor loss statewide. A few of them can cause severe local damage.

Foliage diseases may appear dramatic, but they usually account for only minor wood loss. Their general impact is reduced tree growth and, in the case of *Elytroderma* disease, branch deformation. A large number of foliage diseases of conifers are often important to Christmas tree growers, but they have little impact in forest stands.

Figure 5.—Dwarf mistletoe stems and seeds on an infected ponderosa pine. If mistletoe growth is heavy enough, it can lead to breakage of tree limbs.

Diseases of deciduous trees

Broadleaf trees also have diseases that result in deformation, growth reduction, and mortality. The significance of these diseases will increase as hardwood trees become more prominent in Oregon's timber economy.

Figure 6.—Root disease can contribute to windthrow damage in timber stands.

***Table 2.*—Examples of the major forest tree diseases found in Oregon.**

Group	Disease	Major hosts	Pathogen
Infectious (biotic)			
Stem decays	Indian paint fungus	true fir	*Echinodontium tinctorium*
	red ring rot	Douglas-fir, pine	*Phellinus pini*
	brown cubicle rot	Douglas-fir, pine	*Phaeolus schweinitzii*
Dwarf mistletoes	Douglas-fir dwarf mistletoe	Douglas-fir	*Arceuthobium douglasii*
	western dwarf mistletoe	ponderosa, Jeffrey, knobcone, and Coulter pine	*Arceuthobium campylopodum*
	lodgepole pine dwarf mistletoe	lodgepole pine	*Arceuthobium americanum*
	larch dwarf mistletoe	western larch	*Arceuthobium laricis*
	hemlock dwarf mistletoe	western and mountain hemlock	*Arceuthobium tsugense*
	true fir dwarf mistletoe	grand, white, noble, and red fir	*Arceuthobium abietinum*
Root diseases	laminated root rot	conifers	*Phellinus weirii*
	black stain root disease	Douglas-fir	*Ceratocystis wageneri*
	Armillaria root disease	conifers, hardwoods	*Armillaria ostoyae*
	Port-Orford-cedar root rot	Port-Orford-cedar	*Phytophthora lateralis*
	Annosus root disease	true fir, pine	*Heterobasidion annosum*
Stem cankers/rusts	white pine blister rust	white and sugar pine	*Cronartium ribicola*
	western gall rust	lodgepole pine	*Peridermium harknessii*
	Phomopsis canker	Douglas-fir	*Phomopsis* sp.
	Atropellis canker	lodgepole pine	*Atropellis piniphila*
Foliage diseases	Elytroterma disease	ponderosa pine	*Elytroterma deformans*
	Rhabdocline needle cast	Douglas-fir	*Rhabdocline pseudotsugae*
	Swiss needle cast	Douglas-fir	*Phaeocryptopus gaumannii*
	red band needle blight	ponderosa, lodgepole pine	*Dothistroma pini*
Some diseases of deciduous trees	shoot blight	cottonwood	*Venturia* sp.
	stem canker	cottonwood	*Cytospora* sp.
	Armillaria root disease	oaks, other hardwoods	*Armillaria* sp.
	cottonwood leaf rust	cottonwood	*Melampsora occidentalis*
	cottonwood leaf spot	cottonwood	*Marssonina populi*
	common hairy mistletoe	oaks, other hardwoods	*Phoradendron villosum*

Group	Disease	Cause
Noninfectious (abiotic)	top kill	low winter temperatures
	frost damage	low winter temperatures
	shoot tip dieback	high temperatures and/or soil moisture deficiency
	breakage	mechanical (ice, snow, wind)
	needle drop and/or needle discoloration	air pollution

Abiotic (noninfectious) diseases

This group includes chemical, mechanical, and weather injury. Many causes of tree decline can be attributed to these diseases. In some parts of the world, air pollution and acid rain have become major causes of forest decline.

Abiotic diseases are particularly important because they involve stresses or damage that predispose trees to other pests.

Animals

Animal damage results from the activities of wildlife (birds and mammals) and domestic grazing animals. A 1979 survey estimated that wildlife causes an annual loss of $14 to $16 million in the value of Pacific Northwest forest resources. Animals can directly affect tree survival, growth rate, form, and reproductive capability. Indirectly, they can weaken trees, making them susceptible to further damage or death from attack by insects or disease organisms. The impact of animal damage is more severe in young plantations where new trees are of a single species, are accessible, and are succulent and rich in nutrients. Survival from the direct consequences of animal injury becomes less a problem, however, as trees increase in diameter, height, and root mass. The nature of animal injuries varies widely according to the needs of the individual species. Here are seven types of damage and the animals responsible (an asterisk indicates a major pest species in Oregon).

- *Barking*—gnawing or stripping away the outer protective layers of a tree (*bears, *porcupines, tree squirrels, wood rats, *voles)
- *Browsing*— eating buds, foliage, and small shoots (*deer, *elk, livestock)
- *Budding*— feeding on buds and emerging foliage (blue grouse)
- *Clipping*—severing shoots, stems, and roots (*hares, *mountain beavers, *pocket gophers, *rabbits)
- *Pulling*— extracting seedlings from the soil, at least partially (*deer, *elk, livestock)
- *Rubbing*— damaging the branches or main stem of a tree (*deer, *elk, livestock)
- *Trampling*—bruising or crushing seedlings (*deer, *elk, livestock)

These types of damage are, of course, not all-inclusive. There are more indirect kinds that can deteriorate a forest stand. One example is soil compaction caused by excessive concentrations of large animals. Another is the reduction of natural regeneration caused by large populations of seed-eaters (birds and small mammals).

To determine the actual culprit, you'll need to investigate animal damage to your forest or woodland carefully and thoroughly. Make this assessment before you take adequate control measures.

EC 1201, *Understanding and Controlling Deer Damage in Young Plantations*, and EC 1255, *Controlling Pocket Gopher Damage to Conifer Seedlings*, provide control information for specific problems (see "For further reading," page 13).

Fires

It's important to understand that fires in the forest or woodland are not always detrimental. They can have benefits, including controlling some forest diseases,

The big three

Three diseases account for more than 90 percent of the annual volume loss that we can blame on disease (values are approximate):

Stem decays	43%
Dwarf mistletoes	30%
Root diseases	21%
All other diseases	6%
	100%

In western Oregon, most losses result from stem decays and root diseases. In eastern and southwestern Oregon, dwarf mistletoes cause most losses.

Figure 7.—Wildfire, such as the one that damaged this stand, is caused principally by lightning and by human activity.

preparing seedbeds for new stands, eliminating high-risk populations of wood-destroying insects, and improving forage for wildlife and domestic animals.

Prescribed fire (using it deliberately) is receiving wider application as a silvicultural tool in the management of Oregon's forests.

The very nature of fire gives rise to concern, even fear, in many landowners. To some, the thought of wildfire conjures up an image of mass destruction. At the very least, wildfire commands respect for its potentially awesome consequences. It's not surprising, then, that people think wildfire is the single most destructive force in our forests. Such is not the case, with modern fire prevention and suppression techniques.

Fire can injure forests in one or more ways:

- Death or weakening of trees
- Reducing wood quality of fire-scarred trees
- Deteriorating soil properties and erosion
- Destroying esthetic value
- Eliminating or reducing wildlife populations
- Removing forage
- Impairing air and water quality

The Oregon Department of Forestry identifies lightning and people as the two primary causes of wildfire (Figure 7). People-related causes are railroad, lumber/logging, camper, smoker, debris, incendiary, and miscellaneous.

The breakdown identifies how fires start. When combined with data on the number of fires and acres burned, it shows which causes need the most attention (Table 3).

Preventing wildfires should always be your primary goal. It's a lifelong practice for the small woodland owner.

***Table 3.*—Annual incidence of fire, by cause, on lands protected by the Oregon Department of Forestry, 1958–1987 (rounded 30-year averages)[a]**

Cause	Number of fires	Acres burned
People-related		
Railroad	34	385
Lumber and logging	73	1,689
Camper	83	425
Smoker	150	1,712
Debris	118	864
Incendiary	41	1,036
Miscellaneous	227	4,191
Subtotal	726	10,302
Lightning	343	6,356
Total	1,069	16,658

[a] Oregon Department of Forestry

The two principal approaches needed for a strong prevention program are:

- Reducing risk—minimizing or eliminating possible sources of ignition
- Reducing hazard—decreasing the volume or combustibility of potential fuels

Incorporate preparations for possible wildfires into your woodland management plan. Helpful activities include:

- Upgrading old logging roads or trails
- Creating new water sources
- Developing better access to existing water sources
- Constructing firebreaks
- Minimizing concentrations of slash
- Maintaining basic suppression equipment (shovels, rakes, backpack sprayers)

It's also important to develop good communication links with adjoining neighbors and Oregon Department of Forestry personnel in your area. You'll find helpful information in *A Guide to Legal Requirements for Preventing and Controlling Fires by Operators Logging, Clearing, and Constructing on or near Forest Land in Oregon* (see page 14).

Humans

Human injury to forest environments can be divided into two primary categories, voluntary (willful) and involuntary.

Voluntary injury

This injury, either active or passive, occurs when people engage in activities that they know will or could damage forest values. An incendiary fire (set intentionally to inflict damage) is an extreme example of the active role some people have in causing harm to forest values.

The lack of proper consideration to potential consequences of a logging operation might be termed *passive injury*. An example of this kind of "permitted damage" is a landowner who neglects to construct water bars along the route of an abandoned skid road when he or she is well aware of the potential outcome.

Involuntary injury

This injury to forests and woodlands can occur when people are truly unaware of the likely result of their activities. The injury is unintentional. Introducing exotic forest pests are fine examples.

White pine blister rust, caused by *Cronartium ribicola,* was first discovered in Geneva, New York, in 1906, although it's believed to have been released accidentally in North America as early as 1898. This disease has become a major threat to the survival of white and sugar pines as commercial tree species in the United States.

The gypsy moth, *Lymantria dispar,* was accidentally released in Medford, Massachusetts, in 1870. It had been brought from Europe in 1869 for use in silk production. The gypsy moth has caused severe damage to forests in the eastern United States. It was first discovered in Oregon in 1979, and millions of dollars have been spent trying to contain and eradicate it.

What you can do

As a small woodland owner, you can influence the type and amount of human injury that can occur to your forest resources by being aggressive in:

1. *Your vigilance*— be constantly alert to what is happening on your property
2. *Your operational concern*— be careful in each woodland activity: logging, road building, and site preparation
3. *Your cooperation with neighboring landowners* in their management activities; for example, maintain a joint system of roads to preserve the largest possible number of productive acres between adjacent properties.

You'll find useful information on how to mimimize human injury to your woodland in EC 1109, *Soil Compaction on Woodland Properties;* EC 1110*, Designated Skid Trails Minimize Soil Compaction;* and EC 1143, *Soil and Water Conservation: An Introduction for Woodland Owners* (see page 13).

Oregon forest law

Compliance with Oregon's forest laws is an important part of protecting the forest resources belonging to you and your neighbor. You can find information on protection from fire, insects, and diseases within the pages of these laws.

Chapter 477 of the Oregon Revised Statutes deals with the protection of forests and vegetation from fire. Here are two examples.

"477.005 Policy. The preservation of the forests and the conservation of the forest resources through the prevention and suppression of forest fires hereby are declared to be the public policy of the State of Oregon."

"477.625 Permit to use fire or power-driven machinery; conditions. Every person conducting an operation using fire in any form or power-driven machinery shall first obtain from the forester (the State Forester or his authorized representative) a written permit for the calendar year."

Chapter 527 contains sections on insect and disease control. Here are two examples.

"527.320 Pests and diseases harmful to timber; a public nuisance. Forest insect pests and forest tree diseases harmful, detrimental and injurious to timber and forest growths infested thereby are declared to be a public nuisance."

"527.330 Owner to destroy pests and diseases. Every owner of timberlands or timber shall control and destroy forest insect pests and forest tree diseases, or provide for the same to be done on timber lands or timber owned by him or under his control. In case of his failure, neglect, or inability to do so, the work may be performed as provided in ORS 527.350."

Each of these chapters lists responsibilities of both the state and the landowner in meeting the requirements of the law. Each of these chapters contains many other laws and regulations that are important to sustained-yield management in Oregon's forests.

Oregon's forest laws cover all state-protected forest lands, generally including all ownerships except for properties of the U.S. Forest Service, the National Park Service, the Bureau of Indian Affairs, and the Bureau of Land Management (BLM).

There are no chapters in Oregon forest laws that deal with protection against damage caused by animals or humans. Certain human activities are regulated, however (such as logging, slash treatment, and reforestation), and there are appropriate laws that require compliance with the Oregon Forest Practices Act, which was passed in 1971.

Contact the Oregon Department of Forestry office in your county or the state office (2600 State St., Salem, OR 97310) for detailed information about Oregon forest laws and the Oregon Forest Practices Act.

EC 1194, *Oregon's Forest Practice Rules,* gives an overview of the objectives, scope, and nature of these regulations.

Planning for protection

A plan to protect your forest resources will fit quite easily into the overall management scheme presented in EC 1125, *Management Planning for Woodland Owners: Why and How,* and EC 1126, *Management Planning for Woodland Owners: An Example*.

These two publications describe and illustrate the five sections of a woodland management plan: objectives, woodland descriptions, inventory, management recommendations, and recordkeeping.

You might include your forest protection plan under one or more of these sections.

Objectives

Protecting your timber resource is essential to realizing a high financial return on potential products and to maintaining other amenities—fishing, hunting, and visual aesthetics—that come with a healthy forest.

Woodland descriptions

Identify and discuss any destructive agent (animal, disease, or insect) known to exist in the area. Note special areas where these threats seem to be concentrated.

Inventory

Note tree species, volumes, and acres affected by destructive agents.

Management recommendations

Provide recommendations on how to prevent or control damage to your timber resource. Give a priority to each one, and list the dates by which these measures are to be implemented.

Recordkeeping

Good records are essential to planning and management success. List each destructive agent, identify the kinds of control or preventive measures you used, discuss their effectiveness, record appropriate costs, and document financial losses that result from any damage.

Forest protection is fundamental to good stewardship. It's an essential part of the wise use of your forest resources.

For further reading

Soil Compaction on Woodland Properties, EC 1109. 1998. P.W. Adams. Corvallis: Oregon State University Extension Service. $1.50

Designated Skid Trails Minimize Soil Compaction, EC 1110. 1997. J.J. Garland. Corvallis: Oregon State University Extension Service. $1.50

Management Planning for Woodland Owners: Why and How, EC 1125. 2002. M.C. Bondi and C.G. Landgren. Corvallis: Oregon State University Extension Service. $1.50

Management Planning for Woodland Owners: An Example, EC 1126. 1998. C.G. Landgren and M.C. Bondi. Corvallis: Oregon State University Extension Service. $1.50

Soil and Water Conservation: An Introduction for Woodland Owners, EC 1143. 1997. P.W. Adams. Corvallis: Oregon State University Extension Service. $1.00

Oregon's Forest Practice Rules, EC 1194. 1996. P.W. Adams. Corvallis: Oregon State University Extension Service. $1.00

Understanding and Controlling Deer Damage in Young Plantations, EC 1201. 1999. R.E. Duddles and W.D. Edge. Corvallis: Oregon State University Extension Service. $2.00

Controlling Pocket Gopher Damage to Conifer Seedlings, EC 1255. 1993. D.S. deCalesta and K. Asman. Corvallis: Oregon State University Extension Service. $1.50

Abiotic Injury to Forest Trees in Oregon, EC 1501. 1999. A. Campbell 3rd. Corvallis: Oregon State University Extension Service. $2.00

Forest Disease Ecology and Management, Manual 9. 1995. G.M. Filip, A. Kanaskie, and A. Campbell 3rd. Corvallis: Oregon State University Extension Service. $14.50

Forest Insect Ecology and Management in Oregon, Manual 10. 1998. G.M. Filip, D.L. Overhulser, and P.T. Oester. Corvallis: Oregon State University Extension Service. $5.50

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OSU College of Forestry publications

These publications are available from Forestry Publications Office, 227 Forest Research Laboratory, Oregon State University, Corvallis, OR 97331. Quantity rates are available.

Black, H.C., E.J. Dimock II, J. Evans, and J.A. Rochelle. *Animal Damage to Coniferous Plantations in Oregon and Washington, Part I: A Survey, 1963–1975,* Oregon State University, School of Forestry Research Bulletin 25 (Corvallis, 1979). No charge for a single copy.

Brodie, D., H.C. Black, E.J. Dimock II, J. Evans, C. Kao, and J.A. Rochelle, *Animal Damage to Coniferous Plantations in Oregon and Washington, Part II: An Economic Evaluation,* Oregon State University, School of Forestry Research Bulletin 26 (Corvallis, 1979). No charge for a single copy.

Other publications

Scharpf, R.F., tech. coord. 1993. *Diseases of Pacific Coast Conifers,* USDA Forest Service Agriculture Handbook 521. Washington, DC: Government Printing Office, Superintendent of Documents.

Forest Disease Management Notes, USDA Forest Service, Pacific Northwest Region (Portland, undated). Available only on the regional office Web site: www.fs.fed.us/r6/nr/fid

Forestry Program for Oregon. (The 1995 edition is scheduled to be revised in 2002). Oregon State Board of Forestry (2600 State St., Salem OR 97310-1336).

A Guide to Legal Requirements for Preventing and Controlling Fires by Operators Logging, Clearing, and Constructing on or near Forest Land in Oregon. 1998. Oregon State Department of Forestry, Protection Division (2600 State St., Building 2, Salem, OR 97310).

Hawley, R.C. and P.W. Stickel. 1953. *Forest Protection*. New York: John Wiley & Sons.

The Woodland Workbook is a collection of publications prepared by the Oregon State University Extension Service specifically for owners and managers of private, nonindustrial woodlands. The Workbook is organized into separate sections, containing information of long-range and day-to-day value for anyone interested in wise management, conservation, and use of woodland properties. It's available in a 3-ring binder with tabbed dividers for each section.

For information about how to order, and for a current list of titles and prices, inquire at the office of the OSU Extension Service that serves your county.

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