



# The Mountain Pine Beetle Issue: Questions & Answers

Extension Circular 1100 / May 1982

*increase costs  
10% per yr*

**OREGON STATE UNIVERSITY  
EXTENSION SERVICE**

*5M-1660.71  
33¢ (all .75)*

# ***Acknowledgments***

Quite a few Oregon State University staff members made contributions to this publication. The principal contributors were:

Paul Adams, Extension Watershed Specialist, Forest Engineering Dept.

Joseph Capizzi, Extension Entomology Specialist, Entomology Dept.

David deCalesta, Extension Wildlife Specialist, Fisheries & Wildlife Dept.

William Emmingham, Extension Silviculturist, Forest Science Dept.

Kenneth Kingsley, Extension Communication Specialist, Agricultural Communications

Michael Manfredo, Assistant Professor, Resource Recreation & Wildlife Dept.

Robert McMahon, Forest Products Economist, Forest Products Dept.

Gary Pitman, Extension Protection Specialist, Forest Science Dept.

Charles Sutherland, Forest Economist, Forest Management Dept.

Marvin Young, Extension Agent, Deschutes County

We thank the staffs of forestry agencies and firms in the area, especially of the Oregon Department of Forestry, the U.S. Forest Service, and Diamond International Corp., for information supplied and for review of the manuscript.

*James T. Krygier*

Coordinator, Forestry Extension

# ***Introduction***

Outbreaks of the mountain pine beetle are a natural and common occurrence in western pine forests. However, the current outbreak in central Oregon is a new situation for most local residents, landowners, and land managers. The outbreak is serious and will have widespread effects over the next few decades.

Outbreaks often are poorly understood, leading either to inaction or inappropriate action by citizens. There are a number of questions and issues that emerge for which the answers are well known, but the information is not always widely available. This publication was developed to answer questions commonly asked about the mountain pine beetle outbreak. The authors and reviewers hope that this information will assist decision-making, reduce losses, and increase public awareness and understanding of the outbreak.

The Oregon State University Extension Service has additional publications and educational programs concerning the mountain pine beetle. For more information, call, write, or visit the Extension Office in your county.

## ***The Insect***

### **1. What is the mountain pine bark beetle?**

Mountain pine bark beetles are destructive insects that bore beneath the bark of all pine species found in Oregon. The brown to black adult beetle, about the size of a grain of rice, lives out its developmental stages beneath the bark of host trees, emerging in the summer (July through September) to attack green trees.

### **2. How do beetles kill a tree?**

Beetles kill a tree in two ways. In constructing a vertical egg gallery, the female beetles inoculate the sapwood (water-conducting tissue) with a blue-staining fungus that quickly spreads and blocks movement of water and nutrients to the crown. In addition, there is a girdling effect by the young larvae as they feed at right angles to the egg gallery.

**3. What are the visible signs of an attacked tree?**

Pitch clumps (tubes) form on the trunk, usually starting from the lower trunk upward, and/or the presence of red boring dust in bark crevices and accumulating on the ground close around the trunk. In the spring following attack, the foliage begins to yellow. Subsequently, the needles turn red and drop. Under the bark, affected trees will exhibit many vertical egg galleries and horizontal larval galleries. A blue stain identifies affected sapwood.

**4. What are the visible signs of an infested forest?**

Large numbers of pine trees turning yellow, then red.

**5. What kinds of trees are attacked by the beetle?**

Primarily pines (lodgepole and ponderosa) that are 6 inches or larger in diameter.

**6. Do all trees die when infested by the beetle?**

Trees under massive attack will certainly die from girdling and the effects of the blue-stain fungus. Trees in vigorous condition sustaining only a few beetle entries may survive, their pitch flow repelling and often killing the beetles and preventing the establishment of the fungus. Some trees injured in one year may die when infested in the following years.

**7. Are some kinds of trees attacked more than others?**

Yes. The preferred tree species in Oregon, by order of preference, are lodgepole, ponderosa, and sugar pines. Mountain pine beetles are generally host-specific. For example, those attacking lodgepole usually stay in lodgepole. In mixed stands, or when the lodgepole are killed, beetles attack adjacent ponderosa pine.

**8. Can a tree be saved once it is successfully attacked?**

No. Once the beetles have overcome a tree's resistance, nothing can be done to save it. Even if the beetles could be killed, the fungus they introduce will kill the tree.

# ***The Outbreak***

## **1. What is an outbreak?**

An outbreak of mountain pine beetles is the high point in a population cycle. Large numbers of mature trees (70-plus years old) are generally killed. It is generally considered an outbreak when more than 10 percent of the mature pines in an area are killed. The intensity, destructiveness, and frequency of these outbreaks are largely associated with the advanced age and crowding of host forest stands.

## **2. What is the current extent of the outbreak in central Oregon?**

See map on pages 10-11. The outbreak is widespread throughout the lodgepole pine type of central Oregon, including private lands and the Deschutes National Forest. It is quite evident in the Fremont National Forest. Early signs are appearing in the Winema National Forest. The outbreak is most evident in the Paulina Lakes area east of LaPine.

## **3. Will the infestation of lodgepole pine and ponderosa pine shown on the map spread to other areas?**

Yes. Eventually pine beetles will probably spread to most of the 1.4 million acres of the lodgepole pine forests in south-central Oregon.

## **4. Are all stands with lodgepole and ponderosa pines susceptible to mountain pine beetle attack?**

No. Stands that are young and small in size or vigorous and healthy are not susceptible to beetle attack. The great majority of lodgepole pine stands found in south-central Oregon are susceptible to attack. A pine stand with trees over 6 inches in diameter that has not been thinned and fertilized within the last 10 years is likely to be susceptible to beetle attack.

## **5. How extensive is the current outbreak?**

The 1981 outbreak is still being assessed. Through the end of 1980, an estimated 300,000 acres had been attacked. In areas attacked in the past 2 to 3 years, 60 percent or more of the mature trees have been killed. In some areas, nearly 100 percent of the larger-diameter trees are now dead.

**6. Has an outbreak like this occurred before?**

Yes. Outbreaks like this have occurred numerous times throughout the western United States and Canada. They are a natural occurrence in lodgepole pine forests that are overcrowded and older. An outbreak is presently terminating in northeastern Oregon.

**7. How long will this infestation last?**

In other regions, the infestation lasted 15 to 20 years, with the greatest tree mortality occurring during the earlier phases of the outbreak.

**8. What causes the infestation to decline?**

The outbreak will decline when most susceptible trees 6 inches or larger are killed, removed, or improved in vigor through appropriate silvicultural practices.

**9. Will an outbreak like this occur again?**

Yes, it can be expected periodically in *dense*, unmanaged stands as they grow, mature, and stagnate.

**10. Why has the public been largely unaware of the seriousness of this outbreak?**

The onset of this type of infestation is subtle and lacks the drama and immediacy of a pest such as the Douglas-fir tussock moth. The public may not realize the seriousness of the problem, unless people can see the destructive nature of this insect. Various agencies have attempted to create public awareness of the growing infestation.

## **Forecast**

**1. How many trees will be killed in stands attacked by beetles?**

In susceptible stands, 60 to 80 percent of all lodgepole pines will be killed, and 80 percent of the board foot volume will be lost. Loss may range from only a few trees per acre killed to complete killing of all lodgepole pines greater than 6 inches in diameter.

- 2. What do these potential loss estimates mean to homeowners and small woodland owners with pines on their properties?**

These loss estimates apply in nearly all lodgepole pine stands where management is not practiced.

- 3. How are these estimates made?**

They are developed from reviewing records of mountain pine beetle outbreaks in many similar lodgepole pine stands throughout western North America, including Oregon.

- 4. As a small woodland owner, if I manage my stand properly and adjacent stands are left unmanaged, will I still lose trees to the beetle?**

Probably a few, but in all probability at a much lower level than would have occurred if you had not undertaken stand improvement.

## ***Fire Danger***

- 1. Is fire hazard greater in beetle-killed stands?**

Yes. As trees die and eventually fall, fuels will accumulate and create a potentially hazardous fire problem. Not only are fire starts more likely in this material, but the rate of spread and difficulty of control will increase greatly. Lightning-caused fires are common in this area.

This increased fire hazard is made worse by the fact that much of central Oregon is attractive for recreation and homesites—which increases the risk of fires and the potential for loss of life and property.

## ***Control Options***

- 1. What are the alternatives for controlling mountain pine beetles?**

There are two principal approaches to controlling mountain pine beetles: (1) Saving part of the stand by maintaining healthy, fast-growing trees is the best

long term protection against beetle attack. This can be done by heavy thinning. (2) Large-scale removal of susceptible stands by clearcutting will also control an outbreak by replacing the old stand with a young, nonsusceptible one.

**2. What is silvicultural control and how effective is this approach?**

Silvicultural control involves thinning, or thinning and fertilizing, stands so that they become healthy and vigorous. Normally, as stands develop in nature, individual trees compete with each other until all trees grow slowly and become more susceptible to beetle attack. Thinning involves removing enough trees so that the remaining trees have adequate room to grow vigorously. Fertilizing thinned stands will also increase tree vigor. Beetle populations will not build up to an outbreak in healthy, vigorous stands.

**3. Is taking no action a genuine alternative?**

Taking no action is a *high-risk* alternative, especially if the pines are already susceptible. Outbreaks last for several years; each year the opportunity for tree loss is repeated.

**4. Can chemicals be used on the bark to prevent attack?**

Chemicals can be used, but only for high-value trees, such as those around homes and businesses. The insecticide carbaryl in the formulation Sevimol 4 is registered and recommended for temporary protection of susceptible, high-value trees. It must be sprayed on the bark each year prior to beetle attack. The cost of such treatment is high; it is not an economically feasible solution in large woodlands and forest stands. See OSU Extension Circular 1085, *Mountain Pine Bark Beetle, Protecting Individual High-Value Pine Trees*.

**5. Is aerial spraying of chemicals a method of control?**

No. There is no way to spray chemicals aerially and prevent attack. The effective chemical must be sprayed directly on the bark of individual trees.



**6. What about the use of chemical attractants, such as pheromones for trapping beetles?**

At this time, these chemical lures have not been perfected and are not effective in control of mountain pine beetles.

**7. Will the removal of infested or dead trees control beetles and save other trees nearby?**

Yes and no. Removal of infested trees will lessen the chances of attack on nearby trees. Removal of dead trees (from which the beetles have already emerged) will have no effect. In either case, unless the remaining trees are vigorous or outside the susceptible size class, such treatment will probably not succeed.

**8. Isn't control of an outbreak and prevention more or less the same?**

Yes and no. *Control* implies action to eliminate an existing pest population. *Prevention* requires action in advance of an outbreak, such as thinning, which reduces the number of susceptible trees. Prevention is much easier to accomplish than control.

## ***Economic Effects***

**1. What kinds of effects can occur for homeowners with lodgepole pine on their properties?**

Loss of value for residential property depends on the esthetic loss from tree-killing. A few trees killed on a well-stocked lot will not affect property value. If all trees on a lot are lost, then property value could be reduced by several thousand dollars per lot.

Cost of removal of dead trees can be very high and depends on the size and density of trees and their proximity to houses and utility lines. There is some offset to cost if firewood or some other commercial product is produced from the dead trees.

**2. What kinds of economic effects may be sustained by woodland owners, the timber industry, and Federal forests?**

Prices for sawlogs will drop as supply increases. As insect attacks outrun harvest efforts, dead trees will deteriorate, reducing log quality. After trees have been dead for several years, use will likely be limited to wood chips and firewood.

Other than price, the economic effects of the mountain pine beetle will depend on who owns the land:

- a. Private nonindustrial forest owners, lacking control over mills that utilize the timber, may suffer large losses.
- b. Private industrial forest owners will be least affected. Many companies anticipated the beetle attack and have logged or are logging their lodgepole pine stands. If not, then these companies are most able to shift their logging to the affected areas.
- c. Federal forest managers control most of the timber that can be attacked. Required planning and administrative procedures make fast reaction difficult. Therefore, greater losses will be sustained on Federal land than on private industrial land.

**3. How will the market for timber influence losses?**

Poor markets for lodgepole pine timber in this region will increase losses. Forest product prices, except for firewood, have been dropping because of the recession. Log buyers for mills are reluctant to increase inventories.

**4. How will the increase in dead timber influence mills in the region of the outbreak?**

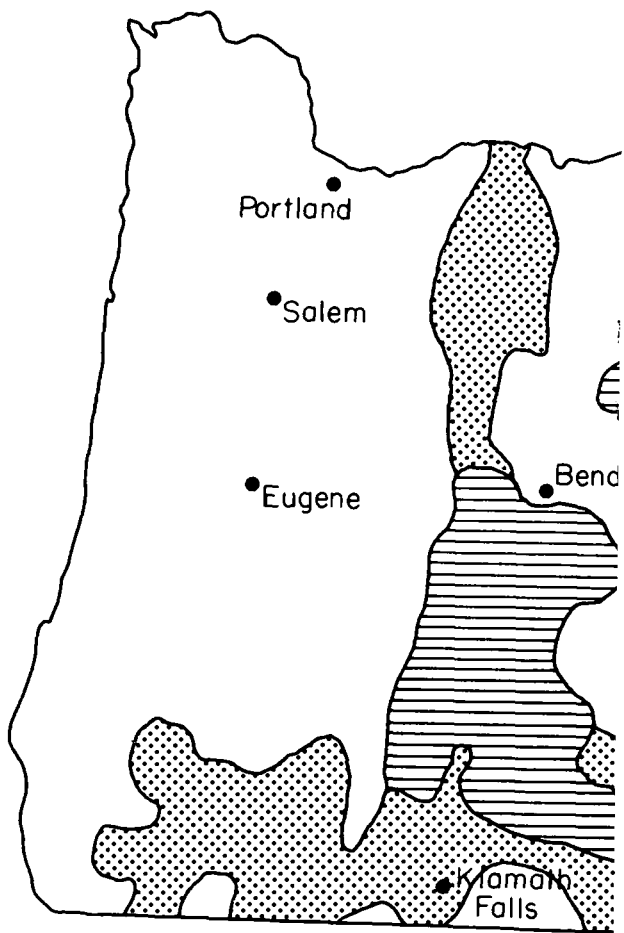
The rapid increase in supplies of logs from dead timber could saturate the market for both lumber and pulp chips. Pulp chip buyers from western Oregon may cross over the Cascades to buy timber for whole-tree chipping if chip markets improve. The poor housing market has reduced the supply of byproduct chips from lumber and plywood production in western Oregon.

**5. How much timber could be lost under the worst outbreak conditions?**

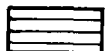
The worst conditions would assume that the beetle attack runs unchecked through the stands. In that case, it is estimated that 80 percent of the lodgepole pine stands in the size class between 6 and 22 inches in diameter would be killed. How much of this would be salvaged depends entirely on the markets for lodgepole and ponderosa pine.

**6. Is a reduction in loss likely through silvicultural methods? What are the costs?**

Although research results are encouraging for reducing beetle attack by heavy thinning, extensive appli-



**Many Lodgepole & Ponderosa**

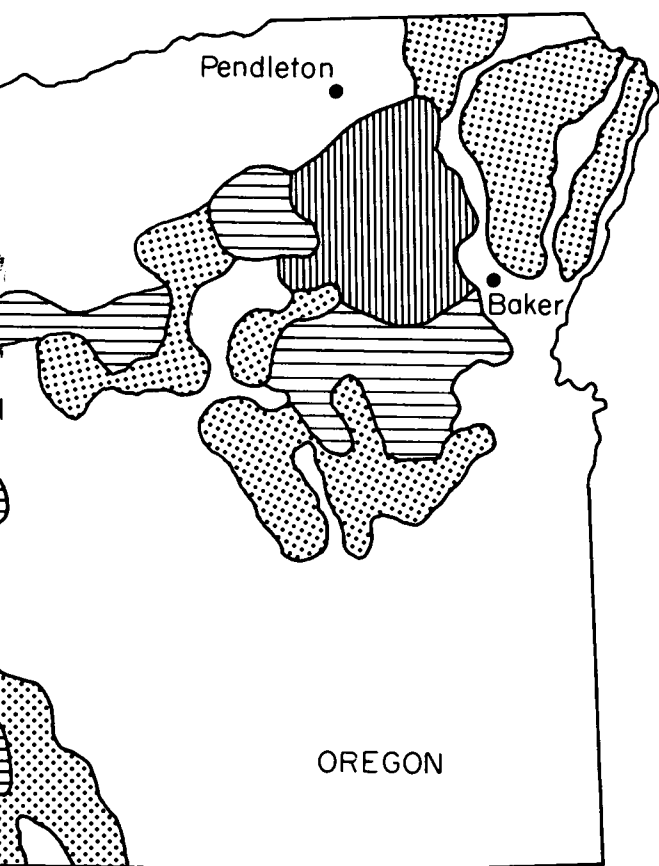


**Current Outbreak**



**Scattered Pines Attacked**

**Pine Beetle I**



**errosa Pines Already Dead**

**d**

**nfestation, 1982**

cation has not been tried. Extensive adoption of heavy thinning is not likely with the current market for timber. Costs will depend on markets and diameters of trees harvested. Good markets and harvesting larger-diameter trees encourage profitable thinning.

**7. Are there other types of economic impacts?**

Severance tax payments on harvested timber and Federal payments in-lieu-of tax on harvested timber will be reduced per unit of timber harvested because of depressed stumpage prices. Because severance taxes and in-lieu-of tax payments by the government are used to offset local property taxes, local tax rates can be expected to increase. Good markets for timber could reverse this trend.

Employment will be affected adversely by the beetle attack. If beetle-killed timber deteriorates, it will be manufactured into chips rather than lumber. Chip production requires less labor per unit than lumber production.

**8. Will there be increased costs of fire control? of forest management?**

Additional fire control costs caused by the beetle attack will depend on many factors. Weather, harvest schedules for beetle-attacked trees, and public perception of the fire danger will all affect fire control costs.

Forest management costs will increase. Preparation costs for timber sales will increase, and planning costs will rise because of changes made in management plans to adjust for timber losses.

## ***Industry***

**1. What are the effects of the outbreak on timber companies in the area?**

The most immediate effect is a potentially sizeable increase in the availability of timber for use. We would expect to see an accelerated cutting of lodgepole pine on private and public lands.

**2. What are the opportunities to make use of dead timber?**

Normally, the opportunities would be reasonably good. Lodgepole pine has been used for several different products in the past. (Markets in winter 1982 were severely depressed for lumber and plywood, very slow for chips, but fairly good for firewood and posts and poles.)

**3. How about the potential for using dead timber as firewood?**

Firewood is one of the brighter opportunities. Although there is an active, local, you-cut market, it can use only a small amount of the available material. Commercial operations are developing in response to reported prices of \$300 per cord delivered in southern California, but only if low stumpage prices exist in Oregon.

**4. Will mills be able to use beetle-killed timber?**

Much of the dead and drying timber could be used, subject to certain limitations of mill capacity, timber size and volume, and harvest scheduling.

Mills in the area have indicated they can handle the volume of additional lodgepole pine the U.S. Forest Service and Bureau of Land Management expect to harvest over a 20-year salvage period. Whether the mills will be able to sell their production at prices that cover production costs is uncertain, given the generally depressed market conditions that may persist through 1982.

**5. Can harvesting be speeded up to salvage more volume and value?**

Yes and no. Speeding up the harvest rate would permit salvaging a larger volume of higher-value products, but it might also drive down stumpage prices in currently depressed markets. Surges in the number of trees killed during the early stage of an outbreak means that losses of timber volume and value will increase without accelerated harvests and the existence of active markets in which to sell products.

**6. What is the likely effect on prices that mills will have to pay for timber?**

An accelerated harvest on public and private lands could have a double-edged effect on lodgepole pine stumpage prices in the area. The first result would be to depress bid prices for public timber and prices offered by independent loggers and mills for private timber. But this initial drop in price, particularly for public stumpage, could be offset somewhat by increased demand if buyers from the west side of the Cascades continue to be attracted by the low-priced timber.

**7. What problems will confront mills in attempting to use timber?**

Besides depressed markets, there are physical obstacles to utilization. Timber becomes unsuitable for lumber after several years, and probably also for plywood veneer, although this is less certain at present. Very little dead timber can meet specifications for posts and poles. Trees dead more than several years can be chipped, but their tight bark hinders debarking; the wood is harder, which dulls chipper knives faster and slows chipping speed.

**8. Could beetles emerge from log decks located in the woods or around mills and attack trees nearby?**

Yes, depending on when infested timber is cut. Loggers, however, should avoid moving logs containing beetle larvae into uninfested areas prior to the beetle flight each year. Keeping log decks wet also will inhibit beetle development and spread.

## ***Wooded Homesites***

**1. Will trees around my home be attacked?**

In an outbreak area, pines in susceptible size and age classes around homes will almost certainly be attacked.

**2. Is spraying the bark of trees with Sevimol effective for preventing attack?**

Yes, under proper conditions and only for highly valued trees around homes, businesses, etc. The insecticide carbaryl in the formulation Sevimol 4 is registered and recommended for temporary protection of susceptible, high-value trees. It must be sprayed on the bark each year prior to beetle flight. The cost of such treatment is high; it is not an economically feasible solution in large woodlands and forest stands. See OSU Extension Circular 1085, *Mountain Pine Bark Beetle, Protecting Individual High-Value Pine Trees*.

**3. What sprayer is most effective?**

Power sprayers have been more effective than hand sprayers. Of the hand sprayers, the "trombone" type is best.

**4. When is it too late to spray?**

It is too late if trees are already attacked (if you can see pitch tubes and/or boring dust).

**5. Should I spray ponderosa pines?**

Spray ponderosa pine of the size of susceptible lodgepole. Mountain pine beetles rarely attack very large trees.

**6. Should I spray fuelwood?**

No. Spraying is not effective.

**7. What about tree injection?**

Tree injection of systematic insecticide is not effective in the prevention or control of mountain pine beetles.

**8. Will fertilizer help reduce chances of attack?**

Not by itself. Fertilization must be combined with thinning for best results.

**9. If I thin trees, will the chance of attack be reduced?**

Yes. Thinning stands to the proper spacing is the best long term protection against attack.



**10. Could beetles emerge from infested pine firewood and attack green trees around a home?**

Yes. Susceptible pines near infested, stacked firewood will likely be attacked by emerging beetles.

**11. Is there a way to prevent tree losses around homes when gathering or storing firewood?**

Losses of susceptible pines around homes caused by beetles from stored firewood may be minimized by following these guidelines:

- a. Collect only wood from pines that have turned red or have lost their needles. There will be no mountain pine beetles in these trees.
- b. If you gather infested wood with pitch tubes and green or fading foliage, burn it up before the beetle flight begins in early July.
- c. Store infested fuelwood under a clear plastic tarp with maximum exposure to the sun; seal edges with soil.
- d. If feasible, use wood other than pine for fuelwood. See OSU Extension Fact Sheet 279, *How to Avoid Beetle-Infested Wood*.

## ***Chemicals and Health***

**1. What effect can the chemical Sevimol (used on the bark of trees) have on humans?**

It's unlikely there would be any effect on humans. Deliberate or accidental ingestion would be the only hazard.

**2. Could the chemical get into streams and water supplies?**

Not very easily. The chemical would remain on the bark of trees; even if it should wash off, it would bind with soil particles and would not be expected to reach streams and water supplies.

**3. Should care be exercised when using this chemical?**

Yes. Normal precautions used with any toxic substance are advised. Use protective clothing when applying any pesticide.

**4. How long will Sevimol persist in the environment?**

The persistence of Sevimol affords protection against the mountain pine beetle for up to 90 days. The effective life of Sevimol on foliage of soil is much less than that on bark, depending on moisture, temperature, and other factors.

**5. What about using Lindane?**

While Lindane is registered for use, *it is not recommended* because of its toxicity, persistence, and uncertain approval for use in the future. Sevimol is less toxic, less persistent, and does not accumulate in plant or animal tissue.

## **Recreation**

**1. Are recreation sites in Oregon being affected by the mountain pine beetle?**

Yes. Many popular recreation sites in the Cascades are located in areas currently infested by mountain pine beetles. Noticeable damage to the majority of recreation sites has been minimal. However, some developed campgrounds have been heavily affected, and in some locations the orange and brown of killed trees intrude on scenic vistas. The problem is likely to worsen over the next few years.

**2. What are the effects of mountain pine beetles at developed recreation areas, such as campgrounds?**

When mountain pine beetles attack a campground area, several very noticeable things happen. Infested trees turn red and die, reducing the shade cover and increasing fire hazard. Removal of infested or dead trees leaves stumps and some site disturbance. The major overall effect is to make the site less appealing esthetically and to contribute to the feeling of crowding (campers are more likely to see nearby campsites because of the loss of cover).

**3. Are there any favorable pine beetle effects for recreation?**

The diversity and amount of wildlife should increase as the composition of large continuous stands of

lodgepole and ponderosa pine are altered. Changes in vegetation offer greater habitat diversity to wildlife; as new vegetation comes in, a greater source of forage will be available. This will likely increase opportunities for hunting or viewing wildlife over the short term (see "Wildlife").

**4. What alternatives do recreation managers have in dealing with mountain pine beetle infestation at popular recreation areas?**

Managers have four options that may be appropriate, depending on the type of recreation area:

- a. In most of the highly developed recreation areas, managers will remove infested or high risk trees. This poses a short term disadvantage of esthetically unpleasing surroundings.
- b. In classified wilderness areas or national parks, managers will allow the pine beetle attack to run its course without preventative management action. The idea is to let the forest renew itself as it has in the past from beetle attack and/or natural fire.
- c. In some cases, managers may consider an annual insecticide bark spray of the most valuable trees. This approach is effective, but is costly in time and money, making it useful on a limited basis at specific locations (such as campgrounds).
- d. In areas not reserved for special management purposes (such as wilderness and parks), the best long term solution is to maintain healthy stands through proper thinning and harvesting.

**5. How can recreation managers plan to avoid infestation at recreation areas?**

Managers can reduce the probability of future infestation by increasing the vigor of trees at developed areas or by changing the composition of vegetation. Thinning and fertilization can increase tree vigor and resistance to beetle attack. In addition, managers should consider planting species that are not susceptible to mountain pine beetles, such as Douglas-fir, white fir, and larch, if these are adapted to the site.

# Wildlife

## 1. How will the outbreak affect wildlife?

There will be large-scale alterations of wildlife habitat. Habitat provides food, breeding places, and protection from weather and predators. The alteration of these elements of the habitat directly affects the well-being of wildlife.

## 2. What is the effect on wildlife of doing nothing following mountain pine beetle attack?

*Short term:* There will be an increase in dead standing trees (snags) and fallen woody material. This will lead to a large increase in the numbers of insects for insectivores, such as woodpeckers. The increased number of snags will provide nesting sites for cavity-nesting birds and perches for hawks and other birds. Increased light penetration to the forest floor may increase forage production for big-game animals but decrease their protective cover.

*Midterm:* In 3 to 6 years following beetle kill, much of the dead wood will fall to the forest floor, increasing buildup. The loss of upright trees and snags will result in fewer birds and small mammals (such as flying squirrels) that use snags for feeding and nesting. The increase in material on the ground will lead to increases in ground-dwelling mammal populations, such as mice and rabbits. This deadfall material may create a barrier to travel for big-game animals, possibly causing them to avoid potential forage and cover areas.

*Long term:* The large amount of downed woody material will create a buildup of fuel conditions suitable for devastating forest fires and large-scale wildlife losses. Such fires lead to a succession of plant communities, beginning with grasses and forbs, then shifting to shrubs and later to trees. Each successional plant community favors a different set of wildlife species.

## 3. What will be the effect on streams?

The large amount of deadfall could partially clog small streams and possibly serve as a barrier to the movement of fish. Where the primary streamside vegetation is pine and it provides significant shading, its loss could lead to higher water temperatures with a negative effect on fish.

**4. Would some wildlife species become extinct following a mountain pine beetle attack?**

No. Large-scale beetle attacks and fire are natural occurrences in pine forests. Wildlife species have evolved to fit the pattern of plant succession created by these occurrences.

**5. How will deer and elk be affected by clearcutting, thinning, and salvage operations?**

Removal of protective cover from key fawning and calving habitat adjacent to wet meadow areas will have a negative effect on deer and elk herds. If large open areas (over 40 to 50 acres) are created by clearcutting or heavy thinning, they will be used less by elk and deer. However, in the long term, opening the forest by thinning and clearcutting will result in more forage for big-game animals.

## **Water**

**1. Will tree-killing or logging affect the quantity of water available for municipal, agricultural, or other uses?**

Water supplies will remain unchanged or possibly increase for several years, since fewer living trees will be drawing up water that otherwise contributes to streamflow. Such an increase would probably also occur during the dry summer season, when added water supplies are desirable.

**2. Will there be effects of tree killing or logging on water quality?**

As trees lose their needles, fall over, or are harvested, temperatures may temporarily increase in some streams due to reduced shading. Good logging practices, in compliance with Oregon's Forest Practice Rules, will produce negligible changes in other water-quality characteristics. This is particularly likely in eastern Oregon, because the typically gentle landscape does not normally promote excessive erosion, stream sedimentation, or tree debris in streams.



---

**The Oregon State University Extension Service** provides education and information based on timely research to help Oregonians solve problems and develop skills related to youth, family, community, farm, forest, energy, and marine resources.

**Extension's forestry program** improves Oregonians' knowledge of forest resources and their options for expanding benefits from these resources. This educational program assists forest owners, managers, processors, and users in understanding small woodland production and management and use of all forest lands. Priority subjects are reforestation, growth, management, harvesting, processing and use of wood, protection of soil and water, and other multiple uses and values.

---

Extension Service, Oregon State University, Corvallis, Henry A. Wadsworth, director. This publication was produced and distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. Extension work is a cooperative program of Oregon State University, the U. S. Department of Agriculture, and Oregon counties.

Oregon State University Extension Service offers educational programs, activities, and materials without regard to race, color, national origin, or sex as required by Title VI of the Civil Rights Act of 1964 and Title IX of the Education Amendments of 1972. Oregon State University Extension Service is an Equal Opportunity Employer.

---