

Reforestation



Controlling Mountain Beaver Damage in Forest Plantations

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Damage to conifer regeneration by mountain beavers, more commonly called *boomers*, results in significant losses in Western Oregon annually. Most of the damage is to 1- to 5-year-old conifer seedlings. Where populations are high, repeated clipping by mountain beavers can cause loss of production through poorly stocked acres—even reforestation failures.

Damage can continue on saplings up to 15 to 20 years old; however, newly planted seedlings are particularly vulnerable. In a few instances, extensive burrowing can undermine the roots of larger trees enough to topple them.

This publication will help you design a program to reduce mountain beaver damage in your forest plantations to acceptable levels. First, we discuss mountain beaver biology to familiarize you with some of the animal's behavior; this will help you control its damage. Then we discuss control techniques.

Finally, we discuss integrating control methods with silvicultural practices as a way to maximize the effect of your control program.

Biology and habits

Mountain beavers (*Aplodontia rufa*) are medium-sized rodents about 12 inches long, weighing 2 to 3 pounds at maturity (figure 1).



Figure 1.—Adult boomer. Although also called *mountain beaver*, it's not related to the true beaver.

As burrowing animals, mountain beavers don't construct well-defined trails aboveground. They have powerful shoulders and large, heavily clawed front feet adapted for burrowing. Other adaptations include small eyes and ears and short, dense fur for repelling soil particles.

Mountain beavers have poor eyesight in full daylight, but they have a keen sense of smell and long whiskers for navigating dark tunnels. They'll occasionally forage for food during the day, but they're mainly nocturnal.

A typical mountain beaver burrow system is 80 to 100 feet long, with a system of lateral tunnels 6 to 10 inches below the ground. Frequently, a

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portion of the burrow will run directly underneath logs; here, it's open at the top. This opening to the system, which may extend for 10 feet or more past the log, is a good trap-setting location.

Mountain beavers construct underground chambers for nests, food storage, and fecal deposits. They pile mounds of excavated soil on the surface called *kickouts*. The burrow system and kickouts are positive evidence of their presence. Burrows of other animals (voles, moles, pocket gophers, and ground squirrels) are much smaller and different in appearance.

Mountain beavers are commonly found on most timbered lands west of the crest of the Cascade Range. Preferred habitats are sites with deep soils for tunneling, abundant supplies of preferred foods, and cool, moist surroundings. Habitats may range from old growth forests to riparian zones and clearcuts.

Especially preferred habitats are cool, moist stream bottoms and north slopes that are characterized by a heavy understory of swordfern, vine maple, and salmonberry. Red alder stands frequently support high densities of mountain beaver.

Mountain beavers feed on a variety of plants, depending on availability. Preferred foods include swordfern, huckleberry, bracken, salal, Oregon grape, thimbleberry, salmonberry, elderberry, miners lettuce, and grasses. They'll eat woody plants, including vine maple, alder, and conifer seedlings. When food supplies are short, they're one of the few animals that will eat even Sitka spruce seedlings.

They may clip food plants from ground level to as high as 10 feet or more aboveground, and they usually take them to the burrow for eating or storage (figure 2).

It's common to find swordfern fronds and other foliage piled at a burrow's entrance to dry for a day or two before mountain beavers move them inside, to eat in safety from predators. They get most of their water from the food they eat.

Unlike most rodents, mountain beavers have a low reproductive rate. Females don't bear young until after the second year, and they usually bear only one litter a year with two to four



Figure 2. — Presence of mountain beaver is often indicated by clipped seedlings.

kits. Because of this low reproductive capacity, it's possible to reduce populations through lethal control measures (trapping or poison baits), and to keep population levels relatively low with continued followup treatment.

Mountain beavers are solitary in nature, excluding other adults from their burrow systems except during the breeding season (February-March). The young stay with the mother until fall of the first year, when they're forced from the maternal burrow to make it on their own.

They may move as much as 600 feet or more in searching for a suitable new habitat, where they may adopt an abandoned burrow or dig their own.

Mountain beavers lack the mobility to travel great distances. Their home ranges rarely exceed 1 acre. Burrow systems are exclusive to each animal, but they may border or overlap with others.

Densities of animals may be as high as five per acre in ideal habitat; however, fewer than one per acre is more common. Mountain beavers rarely move far from established burrow systems.

Recognizing mountain beaver habitat, including the presence of preferred foods, can help you evaluate the potential for problems on your regeneration sites. Knowing their densities and damage on adjacent sites helps you evaluate the potential for problems.

The low potential for rapid repopulation means that lethal control measures started early and thoroughly (preferably before time of planting) can reduce populations enough to give outplanted conifer seedlings a good chance for survival.

Identifying damage

If you're finding damage in your plantation, it's important to correctly identify the pest responsible. Misidentification can lead to inappropriate (possibly illegal) control methods that can endanger and harm nontarget species. The results will be lack of control and a waste of time, money, and effort.

Surrounding habitat, burrow systems with fresh looking kickouts, piles of swordfern and vegetation, and damage to conifer seedlings—these are all good indications that mountain beaver are present. Smaller seedlings such as plugs and 2-0's are often clipped about 1 inch above ground level (figure 3).

On larger seedlings, such as plug-1's, 2-1's, or 3-0's, mountain beaver often clip off lateral branches close to the stem with the same characteristic 45° angle. On older trees, they may use the clipped laterals as steps to climb the seedling until they can clip off the leader.

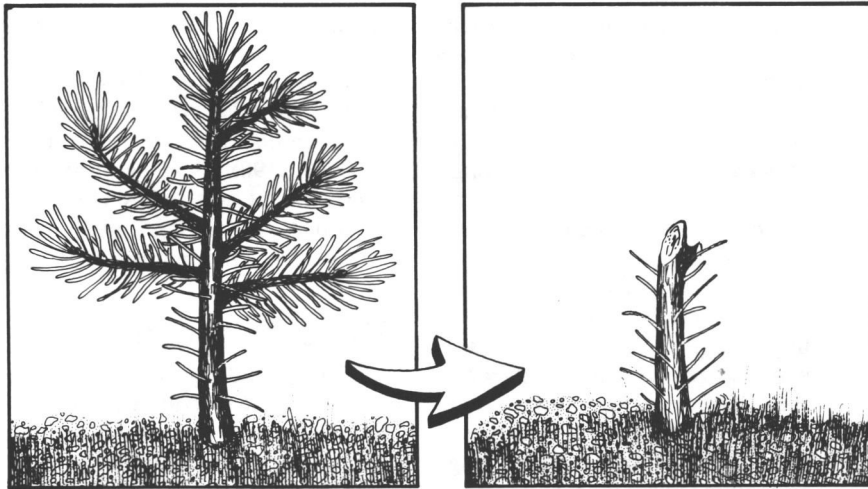


Figure 3. — Mountain beavers clip seedlings with a sharp 45° cut. Grooves that match the 1/8-inch width of their incisor teeth are often visible.

Mountain beavers commonly strip or peel the bark off the base of older saplings. They may also chisel the base in the manner of the true beaver, toppling saplings up to 10 feet high.

It's important not to confuse other types of damage with that of mountain beavers.

Rabbits tend to push over seedlings and clip laterals farther out toward the end at a secondary branching point. They also scatter their droppings around the damaged seedlings, while mountain beavers usually leave theirs belowground in their burrow system. Rabbit droppings are 3/8-inch spheres that look like they're made of particle board.

Porcupines. The best tool for separating mountain beaver damage from that done by porcupines is the difference in width of incisor teeth marks on the cambium: 1/8 inch for mountain beavers; 3/16 inch for porcupines. The presence of large, hard oval scats is also good porcupine evidence.

Controlling damage

Site preparation. Proper site preparation can play an important role in reducing the potential for mountain beaver damage in your plantations. Whether you accomplish this by burning, mechanical piling, or herbicides, it's one of the cornerstones of an integrated mountain beaver program.

Lack of lush vegetation for food source creates a water shortage because the animals derive much of their water from what they eat. This forces them to forage greater distances, making them more susceptible to predators.

Dens and runways are more visible on properly prepared ground. This exposure, combined with the increased activity, makes trapping easier and more effective.

You can reduce or eliminate mountain beaver habitat by burning logging debris. A hot broadcast burn may actually reduce the number of animals by suffocating them. Burning removes the brush species used for food and retards their resprouting for 1 to 3 years.

Broadcast burning on small woodland properties has some limitations. It may be difficult to plan an effective burn on small areas of only a few acres. Burning north-facing slopes that contain mostly alder slash is difficult without ideal weather conditions.

Broadcast burning requires pre-planning, labor, and equipment. It also requires compliance with your area's smoke-management regulations—and proper liability protection in case the fire escapes your property boundary.

If the areas you plan to reforest are relatively flat (30% slope or less), and if you can operate a cat or similar tracked machine, you may want to pile the slash.

It's preferable to use a toothed brush blade to pile slash. A brush blade can uproot standing brush, which minimizes resprouting. It also reduces topsoil disturbance and carries less dirt into your slash piles.

Windrows and piles of slash create excellent cover for mountain beaver, from which they can easily move to feed on newly planted trees. It's imperative to burn slash piles promptly and thoroughly to reduce this hazard.

A good followup weed control program, using appropriate herbicides, is important to prevent reestablishment of vegetation that mountain beaver use for food and cover. This will minimize the attractiveness of your site to animals and will maximize the effectiveness of your other control measures.

Trapping is the most common method for effective control of mountain beaver damage. It's labor-intensive, however. You must check traps every few days, and you must periodically move them to new locations.

Trapping is effective, but you must be persistent to be sure that you've removed most of the mountain beavers in the area. Survivors will continue to damage trees, and they'll repopulate the area if you don't carry out good vegetation management together with trapping.

The trap most commonly used is the body grip Conibear 110 (see figure 4).

It's important to select the right location to set the trap. Look for fresh mountain beaver sign. Recent cuttings of swordfern, salmonberry, and conifer seedlings stacked next to exit holes indicate active runways.

For indications of recent, frequent use, look for runways that:

- are clean with no spiderwebs,
- have no litter or leaf accumulation or grass growing, and
- are hard-packed and shiny.

Insert the set trap into a runway. A good place to set traps is at openings in the roof of runways.

Enlarge the opening, if necessary, so the trap just fits in the runway. It's important to secure your trap so it won't fall over. Otherwise, it could be bumped and fail to catch the mountain beaver when the jaws snap shut.



Figure 4. — Conibear traps are inexpensive and generally available at local hardware stores. They can also be ordered through forestry and reforestation supply houses. Each trap weighs about 1 pound. Replacement triggers, springs, and special safety setters are also available.

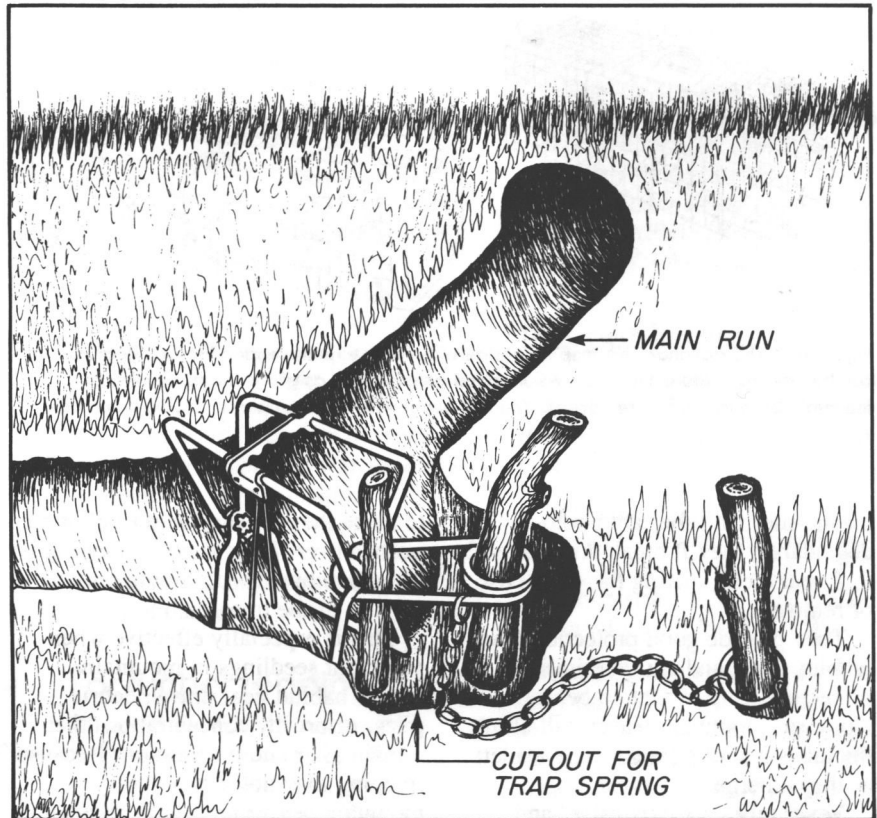


Figure 5. — Typical runway set for the Conibear #110 trap.

To secure the trap, place one stick between the spring bars next to the jaws and another stick through the ring at the end of the spring bar (figure 5). If you set a trap aboveground in front of an exit hole, you'll catch nontarget animals (skunks, rabbits, or weasels) more often than mountain beaver.

Predators (coyotes, foxes, bears, bobcats) will find the trapped animals and pull them out of the runways. If you don't secure the trap, the predator will leave with the animal *and* the trap. Secure the trap by wiring the trap chain to a log or sapling.

Successful trapping requires close monitoring and good record keeping. If you're setting only a few traps in a nearby, accessible area, it's easy to check traps every day. On larger projects, you'll need a schedule for monitoring. Professional trappers check traps every 3 days.

Marking trap locations and keeping accurate records of successful trap locations will prevent unnecessary retrapping of areas you've already covered. Use flagging to mark and number trap locations.

Examine each trap. Leave any traps not sprung. Reset sprung traps in the same location. When you make a successful catch, reset and trap again. Wait 2 to 3 days and nights before returning for your final check.

You should relocate traps after this check if you didn't catch any animals—remember, mountain beavers are solitary. If you have a high percentage of successful traps (greater than 10%), keep your traps on the site for 2 to 3 more days.

Maintaining equipment is an important part of a successful trapping program. Trappers often take newly purchased traps and leave them outside to weather for several days before using them. Mountain beavers have a keen sense of smell: Sometimes, the scent of new metal or oil on traps will be enough to cause them to avoid the trap.

Never oil traps. If you need a lubricant, put traps in a pot of boiling water with either western hemlock or western redcedar branches and foliage. The coniferous plant materials will provide a natural lubricant to traps.

You can contract trapping to professionals if you don't have the time or the ability to do it yourself. Contract trapping costs range from \$15 to \$50 per acre.

It's best to trap reforestation areas before you plant seedlings. If logging is completed by late summer or early fall and site preparation by late October, you'll have 2 to 3 months to trap before tree planting.

Trapping is often conducted after sites have been burned for site preparation. These plantations will be relatively clean and easily trapped; you can use fresh kickouts to locate mountain beaver that survive the fire.

Be cautious when you use traps close to residences or in areas that people frequently use. There's some *risk* of exposure to *children and domestic pets* and smaller animals. In some cases, it may be more advisable to use a live trap (figure 6) even though they're substantially more costly.

Tubing. You can place rigid Vexar tubes (figure 7) over planted seedlings to protect individual trees from mountain beaver damage. These

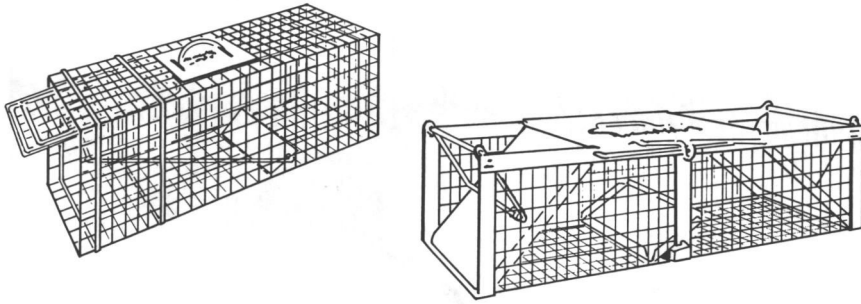


Figure 6. —The Havahart live trap is considerably more expensive than the Conibear, but it can be used to capture small to medium-sized animals such as groundhogs, skunks, and mountain beaver in inhabited areas. You can buy it with either single or double entrances.

plastic-meshed tubes are photo-degradable; they'll break down after 2 to 4 years, eliminating the extra cost of removal.

They provide good protection from rabbits, deer, and elk, and initial protection from mountain beaver. However, mountain beaver will climb the tubes and clip laterals and leaders as they emerge.

Vexar tubes are expensive, and installation is labor-intensive. In areas of heavy snow over 1 foot, and if you use 24- or 36-inch tubes, you'll need

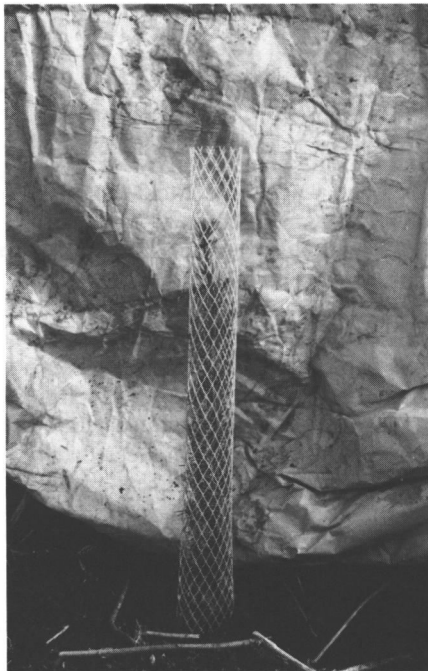


Figure 7. —Vexar tubing is available in a variety of heights, ranging from 18 to 36 inches. Stake them to secure them in an upright position. Tilted tubes increase the risk of terminal deformation.

to stake them so they won't fall or be pushed over. To save cost, trapping is often combined with tubing only a portion of the trees.

This is especially effective when you plant seedlings in mountain beaver habitat near draws, debris piles, or brushy concentrations that remain after site preparation. Because trapping may not remove every mountain beaver present in an area, tubing seedlings in draws or next to slash piles can provide an added level of protection.

In areas that received good site preparation, upslope locations and open sections that have low concentrations of mountain beavers may warrant trapping only, without going the cost of tubing every seedling.

Poisoning. In the past, forest managers have tested a variety of techniques and chemicals to control mountain beaver. Strychnine was used on various baits, including native foods like swordfern. A number of other poisons were tested and ruled out, including a toxic tracking foam that mountain beavers would ingest by licking their fur.

These methods were ruled out for various reasons, and they're not available for use today.

Only a pelleted strychnine bait called Boomer-rid is available for use today. These strychnine-impregnated alfalfa pellets, about 1½ inches long, are treated with a weatherability agent to maintain form and attractiveness for several weeks when placed underground.

Warning: Boomer-rid is a *restricted use* pesticide that can be applied only by a *licensed, certified pesticide applicator*. It has had about 50%

success rate in tests in the Oregon Coast and Cascade ranges, and its continued EPA registration is subject to collecting more data on its effectiveness.

Place two or three Boomer-rid pellets at least 2 feet down each tunnel, to keep them out of reach of deer, elk, and other nontarget animals. You'll get the best results if you treat every active runway and burrow system. Mountain beaver gather the pellets and eat or store them for later use.

Strychnine is a highly toxic poison, and swallowing only one or two pellets will kill most mountain beaver. Bait will maintain its effectiveness for 2 to 3 weeks if it's underground, out of the rain.

Baiting is most effective on freshly burned or cleared sites where little alternative food is available. One pound treats 1 to 2 acres.

Small animals (chipmunks, squirrels, rabbits, skunks, mice, and voles) use mountain beaver burrows on a secondary basis. It's likely that they'll be exposed to baits used to poison mountain beavers; however, there's no way to prevent them from contact.

You'll minimize hazard to nontarget species if you take care to bait active tunnels only, using only two or three pellets. This way, mountain beavers should carry them away before other wildlife find them.

Repellants. Unfortunately, there are no repellants effective against mountain beaver damage.

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.
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Assessing effectiveness and record keeping

To determine how effective your control program is, periodically check plantations for recurring damage. Trapping requires regular inspection and relocation of traps to ensure success.

Tubing requires maintenance. Check to ensure that:

- tubes are in place,
- seedlings are capable of escaping as they grow, and
- seedlings aren't being distorted by the tube.

Monitor poison baiting to determine whether baits are being removed and if fresh sign of mountain beaver activity is ceasing (the bait is working).

Keep good records. When you're applying control techniques in several locations, it's easy to lose track of when and where you applied controls. You can easily keep field records if you use some kind of marking system.

For instance, use colored flagging to denote individual trap locations. You could use different colors for different trapping dates. Keeping records will help you track success and failure rates and identify places where you may need to change your technique or control measure.

Summary

You can best achieve successful management of mountain beaver damage in your forest plantations by an integrated approach that combines seedling protection, lethal control, and silvicultural practices.

Include these steps:

1. Properly identify mountain beaver as the actual pest causing the damage.
2. Anticipate future problems by recognizing good mountain beaver habitat or the presence of high populations.

3. Use site preparation methods such as burning, mechanical clearing, or herbicides, as appropriate, to eliminate mountain beaver habitat and foods.
4. Plan the timing of your harvesting and site preparation so that you can trap or bait before and immediately after planting.
5. Plan far enough ahead so that you can use appropriately large seedlings. Acquiring transplant stock may require planning 1 to 2 years ahead.
6. Combine lethal control measures (trapping or baiting) with seedling protection (Vexar tubes).
7. Conduct followup checks and control until seedlings become established and large enough to be out of danger.

For further reading

Black, H.C., E.J. Dimock, and J. Rochelle Evans, *Animal Damage to Coniferous Forests in Oregon and Washington: A Survey 1963-1975*, Research Bulletin 25, Forest Research Lab, Oregon State University. Single copies are available at no cost from: Publications, College of Forestry, Oregon State University, Peavy Hall 154, Corvallis, OR 97331-5704.

Campbell, D.L., and J. Evans, *Recent Approaches to Controlling Mountain Beavers in Pacific Northwest Forests: Proceedings of Vertebrate Pest Conference*, U.C. Davis, 1988. Single reprint copies are available at no cost from: USDA-APHIS, S&T, 3625 - 93rd Ave. SW, Olympia WA 98502.

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