A few live decoy birds left in the trap often attract other birds into the trap. Provide food and water to decoy birds. Empty the trap except for decoy birds, at least once a day, since when a number of birds are trapped, their efforts to escape tend to frighten those which have not entered. The funnel trap can be used throughout the year but is most successful during middle and late summer when young English sparrows and starlings are not as cautious as mature adults. Trapping is quite successful whenever the natural food supply is low.

Starling Live Trap. Starling live traps are much larger than the traps previously described. This trap (Figure 41) has been quite successful in eliminating individual flocks. Starling live traps may be built either smaller or larger than the one described, but it is important that the width of the slots through which the birds enter the traps be exactly 1 3/4 inches wide and a 9-inch allowance at either end of the entrance panel to prevent escape.

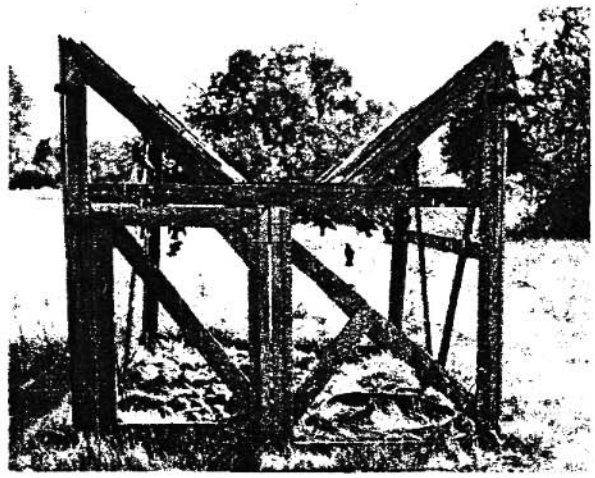


Figure 41. Starling live trap.

Place these traps where they will not be disturbed. It has been shown that traps must be situated at either feeding or watering places or on flyways between these points and the roosting sites.

Bait each trap with one or two boxes of cull apples, bread crumbs, or vegetable scraps from the kitchen. Live decoys will help to attract other starlings into the trap. Six to twelve birds are sufficient for this. The traps must not be placed among trees but in open areas on the flyways where starlings in flight can readily see the decoys and baited traps. The plans shown in Figure 42 can be used to construct this trap.

Liberating Protected Species

Birds of a number of ground-feeding species may frequently be caught in traps set for English sparrows. Among them are native sparrows, titmice, chickadees, and several others of similar size. The English sparrow and starling are generally the only species which need control. Nearly all of the other species that may be caught are protected by state or federal laws. These birds must be released unharmed unless justification for the control of the particular species involved has already been produced and permission obtained from state and federal authorities.

Repellents

Repellents are used primarily on roosting areas which are frequented by English sparrows or starlings. Repellents serve the temporary purpose of driving the band elsewhere to find new

Top panel (make two)

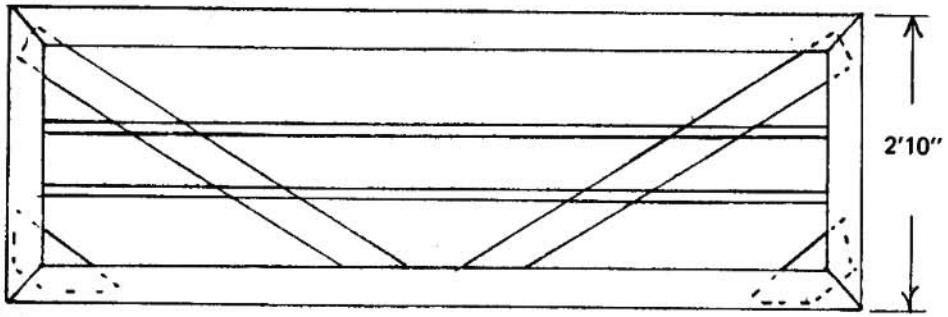
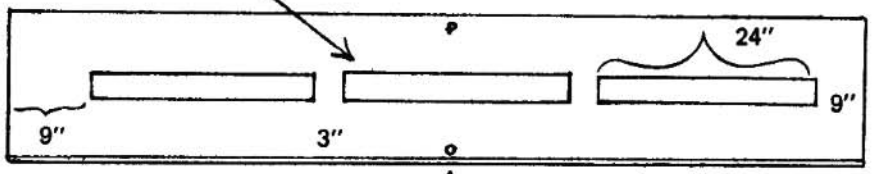


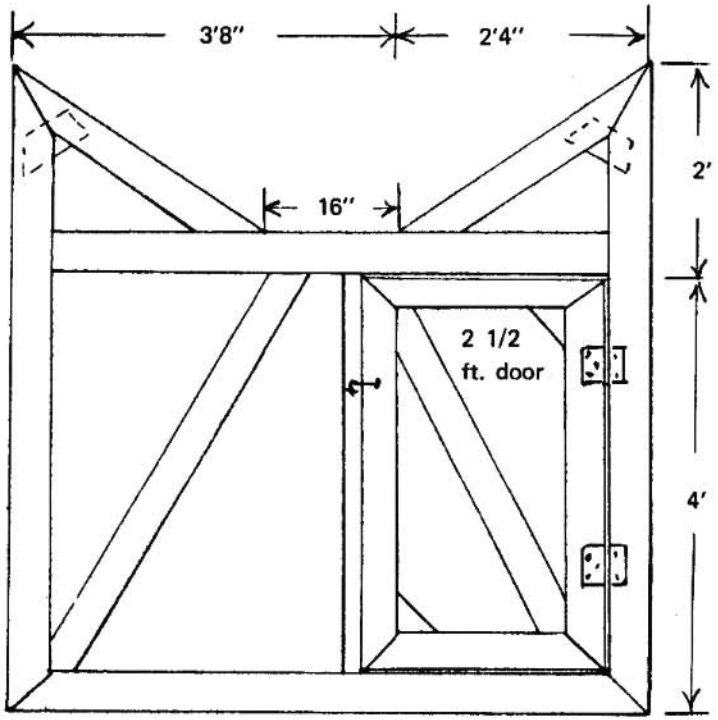
Figure 42. Plans for starling live trap.

Materials needed for trap:
15 1 x 4s 8 ft. long
25 1 x 4s 6 ft. long
4 1 x 1s 8 ft. long
1 1/2 x 16 in. exterior plywood 8 ft. long
2 hinges
2 lbs. staples
40 ft. 6 ft.-wide chicken wire 1-inch mesh

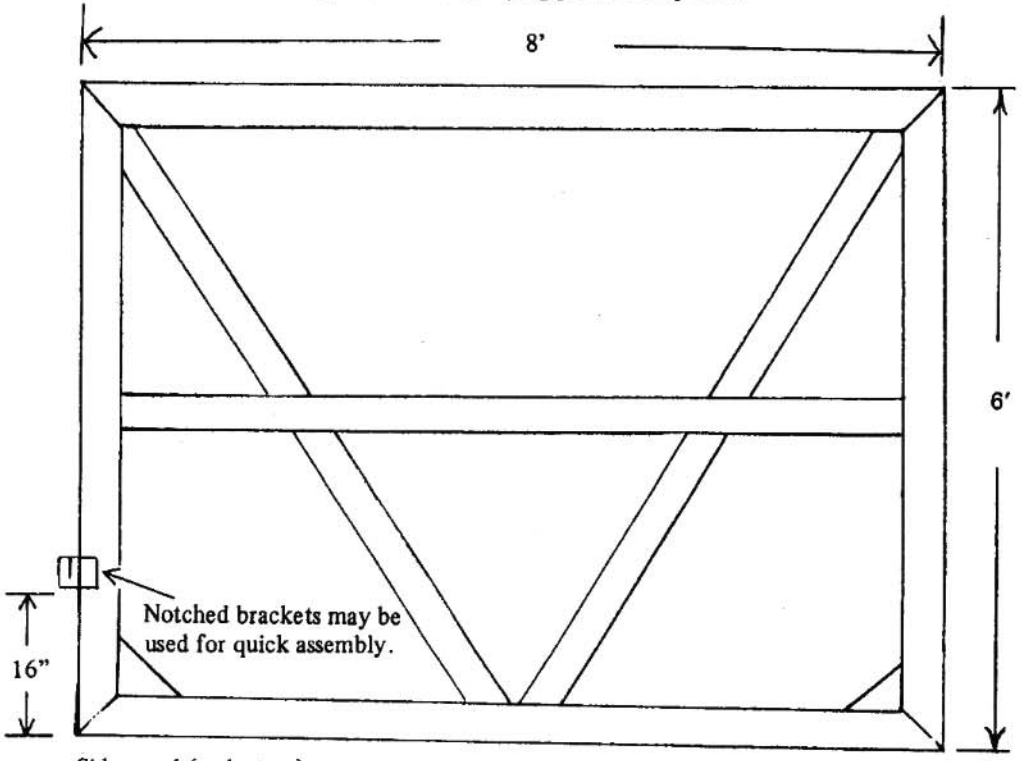
Entrance panel (plywood)
Entrance slots mut be exactly 1 3/4 in. wide.



1/2-inch holes for tying panel to trap roof.



Front panel
Rear panel (omit door)



Side panel (make two)

The only repellents registered for use in roosting areas (1982) are products containing polyisobutylenes manufactured by the Velsicol Chemical Corporation and polybutenes manufactured by the Tanglefoot Company.

After repellents have driven the birds off, seal off the openings by which entrance is gained, such as, holes or broken windows.

Poisoning

The use of poisons for bird control is severely limited and is for use primarily by licensed pest-control operators. Therefore, investigate local, state, and federal laws as to the use of poisons.

The use of some poisons has been prohibited by law and others are for use only to licensed pest-control operators. Therefore, investigate local, state, and federal laws as to the use of poisons.

Use the poisoned bait method with a great deal of care for control of English sparrows or starlings to prevent destruction of other birds and animals. With proper placement of bait, there is little likelihood that other birds, except possibly pigeons, will be harmed. Avoid areas which abound with native, seed-eating birds. Winter is the most desirable season to expose poison bait. Prebaiting sites which are to be used with unpoisoned grain for several days increases the chance of success and saves poisoned bait material. It will also permit observation of birds that feed at the site and thus prevent destruction of desired species.

Placement of poisoned baits on wide girders and rafters in barn lofts, airplane hangers, and other such enclosed areas will usually produce satisfactory results without resorting to placement of poison bait out-of-doors. Fasten shallow pans or feeding trays made of wood or metal to girders or rafters to contain the bait. On sloping roofs of buildings, attach short boards and sprinkle poison bait along the upper edge. Poison baiting can also be effective in unused poultry pens where English sparrows are accustomed to feeding. Starlings, as well as English sparrows, are quick to detect danger and associate their misfortune with the areas in which these occur. For this reason, it is preferable to have a number of spots reserved for poisoning.

Scaring Devices

Gas exploders which produce a loud noise at automatically timed intervals have been used for the past few years around airports and to reduce depredation in orchards and fields. The location of the exploders has to be changed at intervals of every day or two to be at maximum effectiveness. Some states and local areas have restricted the use of gas exploders by permit only as a result of noise pollution problems. Other scaring devices, such as, noise-producing pans and scarecrows, have rather limited success and only temporary value. Suspend noise-producing pans so as to enable free movement by wind. Move scarecrows at frequent intervals.

PICTORIAL KEY TO SOME COMMON PEST BIRDS OF PUBLIC HEALTH IMPORTANCE

Margaret A. Parsons--Chester J. Stojanovich

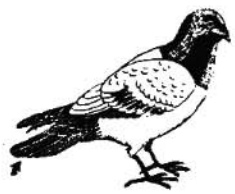
U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
Communicable Disease Center
Atlanta, Georgia 30333
1964

bill short

bill long

male and female. body plump, tail fan-like

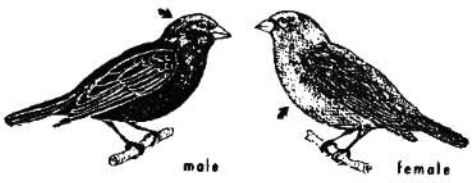
body trim. tail not fan-like



COMMON PIGEON

male. body black, head brown
female. overall dull grey color

male. black throat, grey crown
female. whitish throat, dull eye stripe

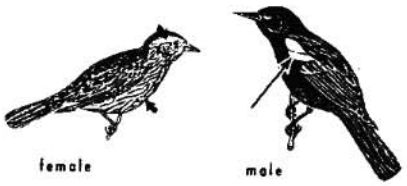


COMMON COWBIRD

HOUSE SPARROW

male. wing with red 'epaulettes'
female. breast heavily striped, light eye stripe

wing without 'epaulettes'
breast not heavily striped



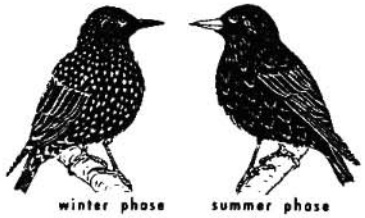
RED-WINGED BLACKBIRD

males. plain bronze or
dull purple back, tail long
females: less iridescent, smaller size

winter. bill dark, body heavily speckled with light dots
spring. bill yellow, color purple and green

male and female.
very large size, coal
black color, tail flat

GRACKLES



STARLING

CROWS

Bats

Bats are important insect feeders, but their importance as pest species is because of rabies infection potential and because of the obnoxious effects of their gregarious roosting. These roosts in homes and other structures are odorous and annoying by the noise and presence of the bats and by the disease hazard presented.

Bats are found almost everywhere, and they can become a nuisance that demands control. Some bats migrate seasonally, following a steady food supply; others remain in protected roosts and hibernate in cold weather.

Many bats roost in caves, hollow trees, and other natural shelters; others are attracted to spaces in attics, hollow walls, and unused areas inside and outside buildings. The scratching, squeaking noises made by bats can be quite annoying. Their droppings have a highly objectionable and persistent odor that attracts new bat colonies after the original ones are broken up.

Bat Facts

- They are not birds–they are the only flying mammals. Their wings are formed by the leathery membrane that joins the elongated bones of the front legs and "fingers."
- Bats benefit us because they feed on insects; do not destroy them needlessly.
- Bats do not become entangled in human hair. Their natural radar equipment enables them to avoid obstacles in flight and to catch their food on the wing.
- Bats normally do not attack people or animals, although sick bats have been known to do so. Vampire bats that feed on blood instead of insects do not occur in Washington. They range further south in Mexico and Central South America.

How Are They Harmful?

Bats may carry parasites such as bedbugs. They may also carry the bat bug (*Cimex*), which closely resembles the common bedbug.

Bats are susceptible to rabies, as are all warm-blooded animals. A decade ago a rabid bat was a rarity, but the incidence of bat-transmitted rabies has steadily increased. Certain kinds of bats may carry rabies without showing symptoms of the disease themselves. Because this disease, always fatal to humans, is apparently widespread, contact with any bat should be avoided.

Do not pick up or handle a bat that is fluttering on the ground or that is actually attacking people or animals–it may be rabid. Bat bites or scratches, no matter how slight, should be treated by a physician *immediately*. If possible, capture the bat without touching it or without damaging the head, so that the health authorities can examine the brain for possible rabies. If the bat is not captured for observation, it is even more imperative that a physician be consulted regarding the possible need for rabies preventive treatment.

Adapted from *Study Guide for Agricultural Pest Control Advisors on Vertebrate Pests,* University of California, Division of Agricultural Sciences. 1973.

How to Control Bats

Bat-Proof Buildings

The only way to permanently control bats is to keep them out. They enter buildings through any opening–the smaller species need only a 3/8-inch space. Large openings can be closed with sheet metal, wood, or 1/4-inch hardware cloth or screen. Narrow cracks can be sealed with caulking compound.

If you are completely bat-proofing a building, make sure all the bats are outside before plugging the last openings. Normally, all bats leave at about the same time. If there are several openings leave one of them unplugged for several days; then close it in the evening after all bats have left the roost.

Repellents

To discourage bats from roosting in attics, scatter 3 to 5 pounds of moth flakes, naphthalene, or paradichlorobenzine over the floor, or hang the flakes in mesh bags from the rafters. Floodlights in the attic or directed upon outside entrances for several nights will sometimes cause bats to leave a building.

Chemical Control

There are no chemicals registered for bat control that can be used in Washington.

Fumigation

Bats can be killed by fumigation if the roosting area is sealed tightly. Space fumigation is highly dangerous and should be attempted only by trained pest control operators.

ANIMAL DAMAGE CONTROL ON FOREST LANDS

During stand development, conifer seeds, seedlings, saplings, and older trees are subject t various kinds of damage by many animals. In simplest terms, damage by animals is the result o any animal activity that reduces or delays total forest yield (15). In a practical sense, such losse frequently are hard to quantify or define, because net effects of animal damage mostly accru over long periods. Conversely, animals may cause substantial losses of seeds and young seedling or extensive feeding injury without significant impact on a developing stand. Thus, anima damage problems must be identified and assessed carefully before control measures are applied

Protection is aimed mainly at plantations established by seeding or planting, because damage o greatest impact occurs on such stands. But protective measures also may be applicable to natura regeneration, because tree squirrels clip cones, and birds and mammals feed on naturall disseminated seeds and foliage of young seedlings after germination (25, 34). Control of anima damage also may be required in young-growth and mature stands, because serious damag (typically bark removal) is caused to older trees by tree squirrels, wood rats, porcupines, an bears. This type of damage mainly affects timber quality, rather than gross productivity o stocking levels. Regional emphasis, therefore, is on the protection of regeneration during earl phases of stand development when animal-caused stocking failures or growth retardation is mos likely and effects may extend over the longest period.

Surveys of animal damage show that animals rank highest in economic impact, ahead of fire competing vegetation, and other causes of loss, as an impediment to reforestation. Federal an state agencies, and private companies reported that animal damage occurred on about 10 to 2(percent of plantations. Reseeding or replanting was required on about one quarter of al reforested areas, and animals were responsible for roughly one out of five reforestation failure (15). Dimoc and Black (15) estimated that damage by animals is costing the timber industr several million dollars each year in Oregon and Washington. (4) Brodie et al. (1979) estimate tha $60 million are lost annually in Oregon and Washington reducing the net capitalized value of timbe productivity by 1.8 billion.

Methods of controlling animal damage to forest-tree seeds, seedlings, and older trees, primarily with chemicals, are reviewed in this section. For each kind of damage, there is a description of the nature and importance of the damage, animals causing damage, and use of repellents, rodenticides, or other means to control damage. Those practices to control animal damage with chemicals that have proved most practical, and that are approved and available for use now are emphasized. In this review, Rochelle's treatment of this topic in 1973 is followed closely (45).

Originally prepared for presentation at the annual *Forest Pesticides in the Pacific Northwest* shortcourse. Major con tributors have been J. A. Rochelle, Weyerhauser Company; P. R. Canutt and H. C. Black, U.S. Forest Service; an J. Evans, U.S. Fish and Wildlife Service.

Nature of Animal Damage

Kind, degree, and amount of damage must be evaluated in ranking animals in order of their destructiveness to regeneration and to older stands in the Pacific Northwest. Actual damage is frequently severe locally, moderate over considerable areas, and completely lacking in other areas (10). Thus, it should not be surprising that assessments of animal damage on public and private forest lands–of the relative importance of each kind of damage and of the animals chiefly responsible–vary considerably, reflecting a diversity of problems by locality and land ownership, as well as different approaches to appraising damage.

The most comprehensive survey of animal damage on forest plantations in the region is the Cooperative Animal Damage Survey (CADS), which was begun in 1963 to study the kind, amount, distribution, and significance of damage by mammals and birds to Douglas-fir and ponderosa pine plantations in Oregon and Washington (3) Black et al. 1979. As determined by annual examinations, animals damaged seedlings on all plantations sampled in 1968. Browsing and clipping of stems and foliage were the principal causes of seedling injury. Cutting of roots and budding, barking, trampling, and pulling of seedlings also occurred. Browsing by deer was the most common source of animal damage on all plots. Animals that injured seedlings, ranked by frequency of damage, were big game, hares and rabbits, grouse, mountain beaver, pocket gophers, domestic stock, and porcupines (3) Black et al. 1979.

The CADS findings showed that significant damage to planted seedlings mostly occurred in one of two ways: seedlings were killed, usually as a result of clipping of stems or roots or by pulling, or growth of seedlings was suppressed markedly because of e tensive and repeated browsing or clipping injuries–this source of damage was of predominant importance (3) Black et al. 1979.

Based on a questionnaire survey in 1969 of animal damage on national forests in Oregon and Washington, Crouch (12) reported that foliage browsing was the most common type of injury, followed by barking, root clipping, foliage clipping, and trampling. Problem animals, rated by frequency of citation, were deer, procupines, pocket gophers, hares and rabbits, elk, livestock, small rodents, mountain beavers, and bears.

Weyerhaeuser Company, in rating losses caused by forest wildlife on their lands in the Pacific Northwest, assigned 44 percent of damage to deer and elk, 35 percent to rodents, 13 percent to bears, and 8 percent to procupines and livestock (37).

In a review in 1969 of animal damage caused by five groups of small mammals in Oregon and Washington, Canutt (7) ranked in order of importance porcupines, pocket gophers, hares and rabbits, mountain beavers, and dusky-footed woodrats. In 1975 and again in 1980, Evans (personal communications) reported that pocket gophers, mountain beavers, and deer were the top three problem species in western forests followed by hares and rabbits, porcupines, elk, and black bear.

Damage to Forest-Tree Seeds

Seed-eating small mammals and birds constitute serious threats to forest regeneration. Nearly all of the Douglas-fir seed produced during years of light to medium seed crops have been estimated as lost to rodents and birds (31). In western Oregon, Gashwiler (25) found that ground-feeding birds and small mammals caused 63 percent of the loss of natural seedfall of Douglas-fir, although birds and mammals destroyed only 15 percent of western hemlock seeds and no western redcedar seeds from seedfall to start of germination.

In the Douglas-fir region of Oregon and Washington, the deer mouse long has been identified as the principal rodent responsible for seed destruction (36). In cage tests, individual deer mice consumed more than 200 Douglas-fir seeds per night (24). As few as two deer mice per acre (densities may exceed 10 per acre) have been estimated to consume in three months the amount of Douglas-fir seed that normally is seeded per acre.

In recent studies of the fate of Douglas-fir seeds in western Oregon, Hooven and Black found that 70 percent of untreated Douglas-fir seeds were eaten, principally by deer mice, within 4 weeks of aerial seeding in December (4). Attrition of seeds continued until about 93 percent of tagged, untreated seeds had been destroyed by the end of germination in May. Fifty-two percent of tagged, endrin-treated seeds were eaten by animals or found missing during the same period in 1966-67. In 1968, pregermination losses of tagged, endrin-treated seeds on the same area averaged 39 percent.

Other small mammals, if abundant, may consume or destroy large quantities of tree seeds. Hooven and I found that the Oregon vole, western red-backed vole, and Pacific jumping mouse eat Douglas-fir seeds readily in cage tests. Shrews also eat Douglas-fir seeds (32, 36), and in controlled feeding experiments, single shrews consumed more than 200 Douglas-fir seeds per night (32). In similar tests with ponderosa pine seeds, ground squirrels and chipmunks each consumed more than 200 seeds per day (47). Both species also consume or store Douglas-fir seeds. Ground squirrels and chipmunks are important seed consumers in the pine region.

Damage to Seedlings, Saplings, and Older Trees

In addition to seed destruction, animals cause injuries to trees by browsing and clipping (foliage, stem, or root), budding, pulling, trampling and barking (gnawing and stripping). A useful reference, the *Guide to Wildlife Feeding Injuries to Conifers in the Pacific Northwest* (34), defines most of these terms, lists the animals that cause injuries, and describes and illustrates the type of injuries caused by each group of animals. Information on life history and field signs of these animals also is included.

Clipping

Injury by clipping is caused by rodents (pocket gophers and mountain beavers) and lagomorphs (hares and rabbits) feeding, and is identified generally by the smooth oblique cut on woody shoots. Clipping seedlings and saplings mainly cause injury to stems, terminal or lateral shoots, or roots. Small seedlings are especially vulnerable and may be killed or suppressed by stem or root clipping.

In the Douglas-fir region, clipping of seedlings and saplings is caused mainly by snowshoe hares, brush rabbits, and mountain beavers. Snowshoe hares are distributed widely on forest lands throughout the region and may cause heavy losses to plantations. Brush rabbits occur mainly in western Oregon. Both cause serious damage to regeneration in some localities. Mountain beavers, currently (1980) the number one problem animal west of Cascade Crest, were causing damage on over 275,000 acres of forest land and the acreage was expected to increase with increased rehabilitation of coastal brushfields (Northwest Forest-Animal Damage Committee 1977).

In the pine region, pocket gophers are rated as the principal problem animal (Barnes 1973) causing damage on over 300,000 acres of forest land (Northwest Forest Pocket Gopher Committee Working Group. 1976). Many plantations have been destroyed by pocket gophers in central Oregon (7). These rodents clip foliage or roots of seedlings (16, 27, 29). Feeding on conifers occurs mostly under snow in winter. Porcupines occasionally clip seedlings and small saplings (7, 19). In a recent survey, porcupines were rated among the least destructive animals to regeneration in the pine region (5).

Browsing

Foliage, buds, and terminal and lateral shoots of seedlings and saplings are injured by browsing of deer, elk, and domestic livestock. It is the most common type of animal damage occurring throughout the region. Browsing injuries are distinguishable from clipping in most instances by rough cuts on stems especially when examinations are made soon after injury. Browsing by deer was the most common damage by animals on all plantations in the CADS survey. Browsing greatly exceeded all other types of animal-caused damage on CADS plots (3) Black et al. 1979, and on national forests in Oregon and Washington (12).

Swanson (48) rated browsing as the most common type of injury caused by elk. He reported that about 30 percent of the Douglas-fir seedlings sampled in a plantation in southwestern Oregon were injured or killed by elk browsing or pulling soon after planting.

Browsing occurs throughout the year, but it is heaviest during the dormant season and during the period of rapid growth in spring. In eastern Oregon and Washington, most deer browsing occurs in fall and winter, but deer browsing takes place during both dormant and growing seasons in the Douglas-fir region (12). In coastal forests, most deer browsing occurs during the early growing season on new growth but also occurs in winter on dormant seedlings (Campbell and Evans 1977).

Browsing affects height growth of trees and also may cause direct mortality. Repeated injury severely checks height growth and may produce a low, shrublike tree with multiple leaders (34). Suppression of growth is the principal effect of browsing, and it is an important kind of animal damage in the Pacific Northwest. Important damage to stands occurs, however, only when enough trees are browsed to bring stocking rates or distribution below established standards, or when growth of the