POCKET GOPHER DAMAGE TO CONIFERS IN WESTERN FORESTS: A HISTORICAL AND CURRENT PERSPECTIVE ON THE PROBLEM AND ITS CONTROL

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ABSTRACT: Pocket gophers (Thomomys spp.) damage or destroy regeneration on hundreds of thousands of acres of forestland in the western United States each year. Despite years of research, poisoning the offending animals--a technique developed around the turn of the century on agricultural land--is still the most prevalent practice for controlling damage on western forests.

Except for the unquantified effects of seed-eating rodents, pocket gophers (Thomomys spp.) appear to be the most serious animal hazard to reforestation in the western states. Although these animals are seldom seen and weigh less than a quarter pound, it is likely that they destroy, by severing stems and girdling roots and stems, more natural and planted conifers than all other wild mammals combined on western forests. Losses of forest regeneration to gophers were reported more than 60 years ago, but gopher damage to agricultural crops has been known much longer (Scheffer 1910, Dixon 1917, Korstian and Baker 1925, Stahelin 1941). Moreover, the measures employed on forests in the early years to control losses from gophers were adapted directly from agriculture, and today are still the most prevalent practices (Lantz 1903, Crouch 1933, Teipner et al. 1983).

Damage to ponderosa pine (Pinus ponderosa) plantations was reported in eastern Washington in the mid-fifties (Dingle 1956). This date could be viewed as the beginning of the "modern era" of pocket gopher problems on western forests. Since then, damage has been reported throughout the West, with the most recent "discoveries" of large-scale problems occurring to several conifer species in plantations in north-central Idaho (P. Laird, pers. comm. 1985) and southwestern Colorado, where more than 4,000 acres were treated with poisoned bait in 1985 in the first operational control program in that area (pers. observ.).

Obviously, gopher-caused problems did not materialize overnight. Predation on trees by gophers is historic, or perhaps prehistoric, but was of little economic importance until the 1950s. Problem recognition and concern about gophers were triggered in nearly all areas by massive increases in forest regeneration programs, mainly by planting on clearcuts, and on burned-over and other nonstocked sites (Crouch 1969, Barnes 1973). More than 190,000 acres were reportedly incurring damage in 1975 (Northwest Forest Pocket Gopher Committee 1976), and that acreage has probably increased since then.

As plantation failures mounted, reasons for lack of success were sought; and although the problems had been identified and were thoroughly described and understood in many areas, they periodically have needed to be "rediscovered" locally, national forest by forest, BLM area by area, and industrial tree farm by tree farm.

Presently, damage by gophers has been reported to every commercial conifer species, including ornamentals and Christmas trees, in most every western state (Crouch 1979). Essentially, some level of damage has been found wherever regenerating conifers and gophers occur in the same place at the same time.

Measurable economic losses in forest productivity were fairly well recognized by the middle 1960s (Canutt 1970). At that time, control efforts were limited mainly to hand-applied poisoned bait containing strychnine[1] or compound 1080. This period also saw development of tractor-towed baiting machines at Davis, California (Kepner and Howard 1960) and Fort Collins, Colorado (Ward and Hansen 1962). These machines, originally designed for use on agricultural lands, including alfalfa fields and orchards, were quickly adapted for use on forestland. Local modifications to commercial burrow-builders for use on forests have been so extensive that virtually no two machines are exactly alike. Discussion of these efforts and other forest-gopher concerns can be found in proceedings from many of the earlier Vertebrate Pest Conferences.

Control of damage by gophers using either hand- or machine-delivered baits, with strychnine as the toxicant, is currently practiced on thousands of acres of forest plantations each year, often with mixed results. Baiting with strychnine or zinc phosphide, the only registered toxicants available, is still the only effective control method for large-scale programs, and procedures have changed little over the past 80 years. Because opportunities for machine baiting are restricted by terrain, soil characteristics, and mechanical problems, hand application of baits is by far the more widely used practice.

The logistics of baiting are demanding. Proper timing is essential. For successful hand application, gophers must be surface-active, that is, they must be building mounds or surfacing to feed to permit identification of burrow systems that are occupied at the time of treatment. Treating inactive burrows by hand is virtually useless.

[1]This paper mentions pesticides. All uses of pesticides must be registered by appropriate state and/or federal agencies before they can be recommended.

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Machine application requires sufficient soil moisture to permit construction of artificial burrows into which baits are automatically dispersed by the machine. This treatment does not require surface evidence of burrow occupancy, because the burrows constructed intersect both active and inactive natural underground systems over the entire treated area (Marsh and Cummings 1968, Canutt 1970).

Although baiting can be successful, its effects are not permanent or even long-lasting in most areas. Success seldom, if ever, results in mortality of all gophers, and the standard baits lose effectiveness in a relatively short time, often leaving enough animals to repopulate in a year or two. Thus, baiting must be repeated periodically on some areas until the trees essentially overwhelm the gophers, and their numbers decline to nondamaging levels. Recent evidence of root damage to mature firs (Abies spp.) in northern California suggests that such an equilibrium may not occur on some sites (Gross and Laacke 1984).

Alternatives to baiting are few. Trapping can be effective, but it has the same logistical requirements as baiting, is more labor intensive, and is more costly. Like poisoning, trapping must kill high proportions of the offending animals to be successful (Crouch and Frank 1979).

Small-scale tests and limited operational applications of herbicides have been employed to control herbaceous vegetation that appears to be the primary food supply of gophers in most areas (Crouch and Hafenstein 1977, Black and Hooven 1977, Crouch 1979, Crouch in press). Most trials have been successful, but environmental concerns associated with herbicide use on public and industry lands, and costs of treatments in relation to current product values on the latter ownerships have virtually precluded further development of herbicide-based controls.

Other procedures to alleviate damage involve problem prevention (Crouch 1982). Prompt regeneration after clearcutting can minimize opportunities for gopher populations to build to damaging size. Thus, every effort should be made to ensure that the initial regeneration program is successful. Areas deforested by wildfire or insects also need prompt reforestation. Failure to succeed the first time usually requires mechanical site preparation to lessen competition between herbaceous and woody vegetation and the trees. This practice probably equals clearcutting as the most favorable technique for improving gopher habitat, especially on shrub-covered sites. Personal observations suggest that, in many areas, a positive relationship exists between intensity of site preparation and the probability of gopher problems.

Based on recent history, it appears that little more can be done to curtail wildfires or their effects that favor gophers. On the other hand, silvicultural systems that employ harvesting methods other than clearcutting may result in fewer problems from gophers than total overstory removal with one cutting (Barnes 1974, Capp 1976, Crouch 1982). Certainly, selection cutting cannot be employed in all forest types or in all stands, but it can be effective in some environments. Also, sale areas can be baited before harvest to reduce the breeding population base that is available to expand in response to logging. Because gophers respond to site disturbance, including disturbance by logging, minimizing that factor also can be beneficial.

Several practices can be employed to evaluate potential hazards from gophers. In the long run, forest inventory programs should record the presence of gophers as a part of field data collection. Also, information can be obtained during sale layout or cruising, and sale plans can provide for monitoring and control treatments if needed.

Finally, it is clear that pocket gophers present major deterrents to reforestation, but these problems can be avoided in some instances and controlled in others. Prevention should be practiced where feasible; elsewhere, damage must be anticipated. If gopher-caused problems are not discovered until seedlings are disappearing or saplings are dying, it is too late for anything but direct control by baiting or trapping, and even that may not help. As with most environmental problems, early warning and prompt action are essential for successful solutions.

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