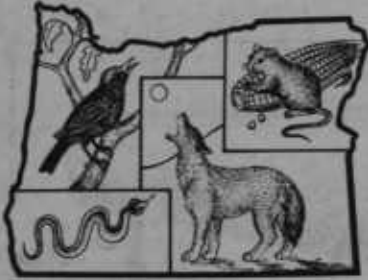


3X 6/22/81 # 86871

# Controlling Ground Squirrel Damage to Field Crops, Ditches, and Dams

David S. deCalesta,  
Extension wildlife specialist, Oregon State University



The two ground squirrels responsible for severe damages to field crops, ditches, and dams in eastern Oregon are the Belding and Columbian ground squirrels. Both occur in large colonies; densities may approach 100 per acre with the potential for severe damages.

The Belding ground squirrel occurs throughout Oregon east of the Cascade mountains; the Columbian ground squirrel is found only in the extreme northeast corner of Oregon. Where their ranges overlap, the two squirrels can't be misidentified one for the other. The Columbian ground squirrel is half again as long (15 inches) as the Belding (10 inches) and has many small, white dots on its grey back. The Belding's ground squirrel has no dots on its grey back but rather a wide band of brown-grey.

## Life history

The annual cycle of activity of both squirrels is similar. They emerge from hibernation as soon as the ground thaws and most of the snow cover is gone—from mid-January to late-February. At this time they are establishing territories and engaging in breeding activities. Five to six young are born 3½ weeks after the female has bred. They are weaned 3 weeks later and appear above ground for the first time in late March to mid-May. Adults utilize stored fat reserves for food during the breeding season and don't feed until February or March, when they begin a furious eating binge. They stop eating in late-June to mid-July and hibernate until the following February. Young ground squir-

rels have large appetites too, and they begin hibernation in late July to early August.

Adult ground squirrels are fairly nonmobile and restrict their movements to a 200-foot radius around the burrow. The young of the year disperse after they leave the nest and movements of distances exceeding a mile have been recorded. Initially, however, the young feed close to the burrow system of their mother.

## Damage

Damage by the squirrels to crops begins as soon as green-up in spring. Generally, the squirrels are distributed throughout crop fields. In fields recently cultivated, damage will be restricted to borders until the squirrels completely invade the field in 2 to 4 years.

The primary damage to crops is caused by eating the above-ground parts or by covering alfalfa with mounds. Additionally, squirrels damage alfalfa crowns, subjecting the plants to later infection by crown and root rot disease. The tunnelling activity of the squirrels damages alfalfa roots and may lead to collapse of ditch banks and earthen dams.

Most of the damage to alfalfa occurs during the first cutting. Estimates in Oregon indicate that 45 percent or more of first cutting of alfalfa may be removed by ground squirrels. By the time the second cutting is approaching maturity, the squirrels have hibernated and little damage occurs. Thus, the period of damage to alfalfa and other crops is fairly short, extending from green-up until shortly after early July.

## Control methods

Fields were flood irrigated in the past, flooding tunnel systems of ground squirrels and providing an effective form of control. Most irrigation now is of the sprinkler system type, which does not flood tunnel systems.

Because it takes ground squirrels 2 to 4 years to fully invade fields, the potential for crop rotation to reduce squirrel damage to alfalfa has been raised. Essentially, cultivation practices such as disking and p'owing disrupt existing ground squirrel burrow systems as well as kill some of the squirrels. The resulting vegetation (especially in new alfalfa fields) is so sparse the season following cultivation that food scarcity also limits ground squirrel population build-ups.

The potential for crop rotation is untested, and pros and cons of taking alfalfa stands out of production earlier than usual must be weighed, considering current losses to ground squirrels, costs of other control methods, loss of a year or more of production while a new stand becomes established, and increased productivity of the newer stand after establishment.

Shooting requires persistent effort, and may be effective if shooting begins as soon as the squirrels emerge from hibernation, the infestation is fairly light, and the acreage is small. Large areas with heavy infestations of ground squirrels usually cannot be saved by shooting, as enough shooting pressure to reduce the populations is hard to achieve.

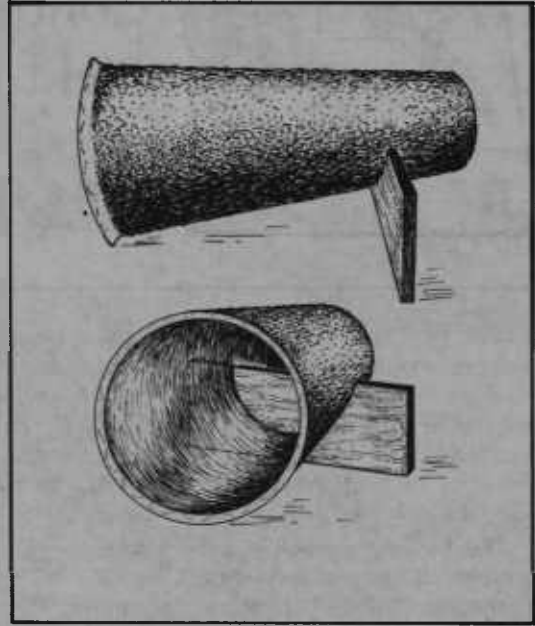
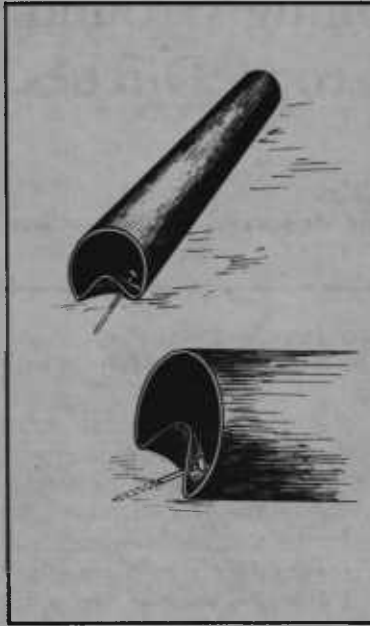
Electro-magnetic repellers allegedly disorient or disrupt ground squirrels

Extension Circular 1078

May 1981

OREGON STATE UNIVERSITY  
**EXTENSION  
SERVICE**

Extension Service, Oregon State University, Corvallis, Henry A. Wadsworth, director. 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. Extension invites participation in its programs and offers them equally to all people.



Bait stations can prevent exposure of baits to non-target animals. Tires can be laced shut to prevent rainfall or irrigation water from entering the tire and soaking the bait.

and cause them to die or leave the area. Research shows that these devices have no effect on ground squirrels or other ground dwelling mammals. They are a waste of money.

The most effective method for controlling ground squirrel damages is poisoning. The advantages of poisons are that they are cheap, effective, readily available, and take little time to apply. Some of the disadvantages include poisoning of some non-target species and the requirement for multiple applications.

Three methods of poison bait application currently are available. (Check with your Extension agent for changes.) The methods include broadcast, spot baiting, and bait stations. Broadcast baiting is done with aircraft, from the back of a pickup truck, or by hand with a cyclone-type fertilizer spreader. Generally, baits are applied in 30-foot swaths, with a 30-foot interval between swaths. Use 2 to 3 pounds of bait per acre. This method is used to apply bait to large fields.

Spot baiting is done simply by applying a teaspoon of bait down individual ground squirrel burrows. Bait stations (18-inch sections of irrigation pipe, old tires, or other designs, as illustrated) are placed at 100-foot intervals throughout fields and kept supplied with poison baits. Spot baiting and bait stations are used to reduce damages to small acreages, ditch banks, and dams. Prelimin-

ary research indicates bait stations (but not spot baiting) are effective in reducing damages in large crop fields.

Costs and effectiveness of three poison baiting methods and shooting (Table 1) differ markedly, with broadcast baiting being the cheapest and most effective, followed by bait stations. Shooting is the costliest, least effective, and most time-consuming method.

#### Environmental hazards

Increasing concern is being expressed by many over hazards of pest control programs to the environment. Studies show that even with proper usage, some non-target wildlife are killed by pesticides.

Flood irrigation and crop rotation pose little risk to wildlife and, inasmuch as they can, should be considered as candidates for control. Shooting provides no risk to non-target wildlife, as only target pest animals are shot. In areas with adjacent housing, however,

there may be risk to humans from ricocheting bullets, and this control method will be unacceptable.

Pesticides pose the greatest risk to non-target wildlife, but some application methods are less risky than others. Placing bait in covered bait stations exposes some non-target species (chiefly other small rodents) to the poisons. Exposure is minimized for birds and larger mammals such as deer. Placing baits down burrow systems would appear to be relatively safe, but in actual practice, bait often is scattered on the mound outside the burrow opening—a visible invitation, especially for birds, to a concentrated dose of pesticide. Broadcast baiting does scatter baits over a large area, but, they are scattered so thinly (individual baits usually are more than 24 inches apart) that they pose little hazard to birds and larger mammals unless the baits are applied to bare ground and are more visible to birds. Judicious use of pesticides, regardless of method of application, greatly reduces the risk to non-target wildlife.

Table 1. Cost and Effectiveness of Poison Baiting and Shooting for Control of Ground Squirrels.

Method	Application time per acre	Cost per acre	Reduction of damage
Broadcast bait	0.01	\$ 2.50	35
Bait station	0.5	\$ 2.50-6.00*	35
Spot bait	1.0	\$ 2.90	0
Shooting	1.3	\$12.00	0

\* Cost varies with expense of bait station.

#### When is control needed?

In pest control, the question often is asked, "Do the costs of anticipated damage justify the known costs of control?" Costs of control using pesticides are so low (\$2 to 3 per acre) that the presence of even a few ground squirrels (3 to 5 per acre) justifies use of

control. Numbers of animals may be low if a population is just building in a newly planted field, but high reproductive rate of the squirrels and the inclination of young to move large distances mean there will be many more next year if some control is not exercised this year. Extent of damage by squirrels to ditches and dams often is hard to diagnose by visual inspection. A good rule of thumb is that, if ground squirrel burrows are detected on dams or ditchbanks, an attempt should be made to remove the squirrels before collapse occurs. Tunnel building over a fairly short period of time (2 to 5 years) can lead to collapse.

As one would expect, the number of squirrels per acre of crop field and the damage are directly related. To predict damage this rough rule of thumb may help. In April, before young emerge, count the number of ground squirrels per acre seen in a 5-minute period and multiply by 0.25 as a percentage of first cutting lost to squirrels. For example, if you can observe 20 squirrels on an acre in 5 minutes, multiply by 0.25 and you have an estimate that they will cost you 5 percent of the crop on first cutting.

Obviously, the best control program would be one where the damage is prevented, such as by flood irrigation, or crop rotation. Neither of these practices is often found on the typical crop field, so the next best option is to apply controls as soon as squirrels (or active burrow systems) are seen within fields or ditch banks and dams. Applying controls early, before total infestation occurs, means lower costs of control and lower environmental risks (if pesticides are used), since the control need be applied only to the infested part of the field, ditch, or dam.

Unless the control method totally excludes squirrels (flood irrigation) control methods often must be applied every year. Studies in Klamath County indicated that even with maximum application of control methods, significant ground squirrel damage occurred the following year in many of alfalfa fields. Migration of squirrels from neighboring, untreated lands, and survival of some animals within treated fields can repopulate a treated field quickly.

### Controlling damages by poison baiting

- *Bait.* Cabbage and oat groats make good baits. Crimped oats make a poor bait, as the squirrels will shell off the hull (to which the pesticide is attached) and sometimes do not get poisoned. Succulent baits such as cabbage seem to do best earlier in the year, when there is little succulent food available. Later, in April and May, oat groat baits do better.

- *Toxicant.* One acute toxicant, strychnine, is available. Although the bitter taste of strychnine reputedly results in its rejection at times, limited evidence indicates strychnine is almost as effective in controlling damages as the bait 1080 was. Unlike acute toxicants, which kill in a single dose, the anticoagulant baits, such as Ramik green, usually require the animal to eat baits on several occasions before it receives a lethal dose. Little is known of the effectiveness of anticoagulant baits on Beldings and Columbian ground squirrels. Registration status of the many pesticides is constantly under review by EPA. Registration of some toxicants is cancelled and registration of other, new toxicants is granted without much public notice. To be sure, check with your county Extension agent for current legal status of a pesticide you wish to use.

- *When to bait.* If spot or broadcast baiting is to be used, be sure squirrels will take the bait. These methods of application expose bait to precipitation and soaking from irrigation. Baits soon lose their effectiveness under these circumstances. Ideally, small bait piles (of unpoisoned bait) are set out in fields and monitored for feeding activity. As soon as squirrels consistently take these baits, start the spot baiting or broadcast baiting.

Because bait stations protect bait from soaking, baits retain their effectiveness in bait stations for weeks at a time. Thus, baits may be applied earlier in bait stations and won't lose their effectiveness after precipitation or irrigation.

- *How many applications?* Two applications of poison baits result in greater reduction of damages than one, when baits were broadcast. For broadcast or spot bait application the first application should be sometime in mid-

April after it has been established that squirrels will take baits. The second application should be at the time the young begin to emerge from burrows. This will help to eliminate adult squirrels that avoid the first application of poisoning and will remove many of the young.

If bait stations are used, baits are re-applied as needed to keep a fresh supply in stations. Check the stations every 10 days and reapply baits as needed. If no baits are taken after 20 days, remove the station, as squirrels either didn't visit station, or all squirrels able to reach station were killed.

- *Where to bait.* Baiting a 200-foot border outside of crop fields, ditches and dams, in addition to the area where damage is occurring, results in the greatest reduction in damage. By doing so you will remove squirrels that would migrate into the damaged areas, especially the young from areas that were not poisoned.

### Caution

Only registered bait formulators may make poison baits in Oregon, including strychnine baits. It is no longer legal to obtain strychnine through druggists and apply it directly to baits. The status of future registration of strychnine and other toxicants is hanging in the balance and any misuse of these toxicants will surely weigh against future registration and use.

### The control program

- *Early Detection Essential.* Monitor fields, ditch banks, dams early in spring (mid-March) for presence of fresh ground squirrel activity. Make sure the animal's are ground squirrels (open hole, large, flat mound) and not pocket gophers (hole usually closed, mounds in clumps and raised above ground 4 to 8 inches).

- *Characterize area of damage.* Is field totally infested? Or, are squirrels invading from edges, or infesting only a local "hot spot" or two? Often squirrels concentrate on ridge tops or hummocks and avoid low, wet, or alkali spots. Are there too few squirrels (less than 1 per acre, none on ditchbanks or dams) to justify "routine" bait application?

- *Select control method.* If infestation is small, and concentrated in the

field, try shooting, followed up by spot baiting. If infestation is large, and neighboring areas are similarly infested, investigate potential for flood irrigation. If that isn't feasible, consider broadcast baiting or bait stations. If there are waterfowl closeby, or concen-

trations of song birds or game birds, consider the use of bait stations.

- *Be persistent.* Ground squirrels rapidly reinvade treated areas from areas without treatment. A check should be made after treatment to determine if ground squirrel numbers and damages

have been drastically cut. If not, repeat control measure. Small problems are easier and cheaper to control than large problems, so areas of damage must be rechecked continually to make sure re-invasion and resumption of damage have not occurred.