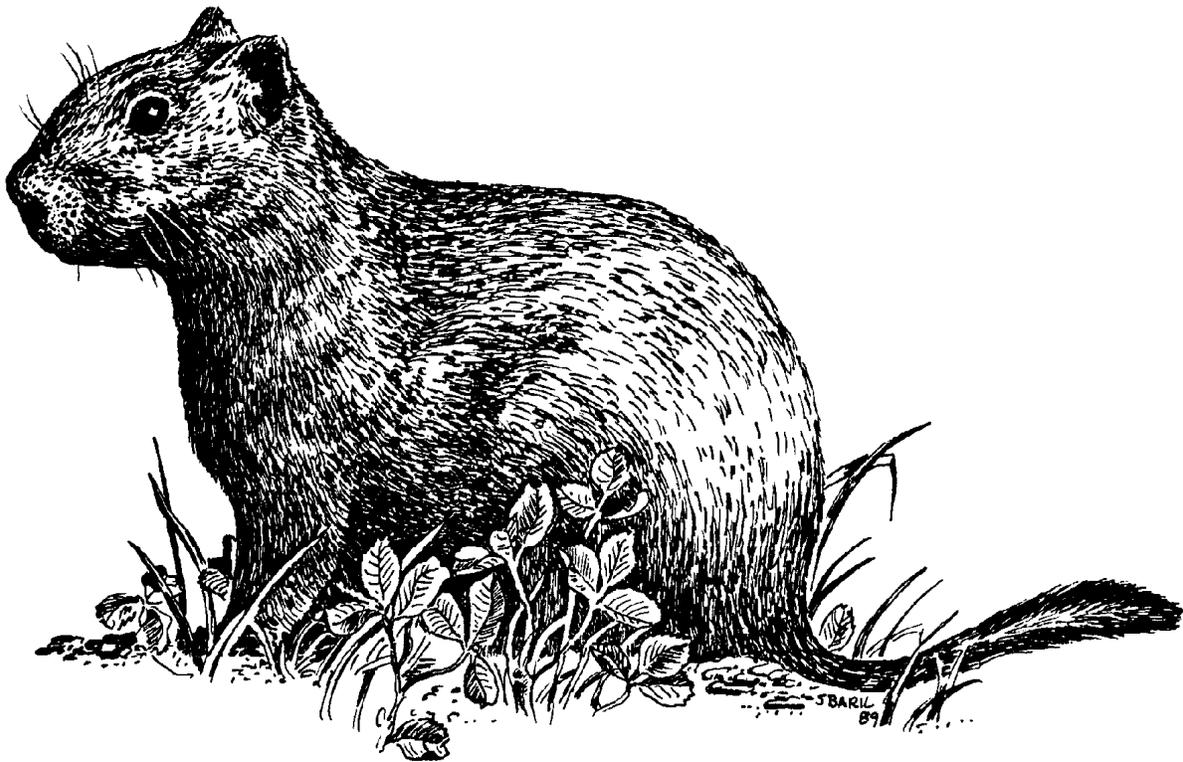


THE RICHARDSON GROUND SQUIRREL
ITS BIOLOGY AND CONTROL



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BIOLOGY

The Richardson ground squirrel (*Spermophilus richardsoni*) is a medium-sized ground squirrel of rather uniform coloration. It is yellowish tan to grayish in color. The tail is about one-fourth of the total body length and is blackish to buff with whitish hairs on the outer edges and end. Adults are 7-9 inches long and weigh 11-18 ounces.

The Richardson ground squirrel is found in Montana east of the Continental Divide, except in the southeastern areas. It is found throughout most agricultural areas, but is not common in high mountains or heavily forested ranges.

These ground squirrels emerge from hibernation in February to April, depending largely on elevation and local weather conditions. Males emerge first and establish breeding territories. Females begin emergence from hibernation about two weeks later. The breeding period is short and synchronous in a local area but may extend over several weeks from one part of the squirrels range to another. The young are usually born in April and May after a 24 day gestation period. Only one litter averaging 6 to 7 young is born per female each year. The young become active above ground about 4 weeks after birth. By the end of the summer, juveniles are nearly adult size.

Ground squirrels are primarily herbivores and consume a wide variety of grasses and forbs. Green, succulent vegetation is preferred forage, probably because free water is not generally available in habitats occupied by squirrels. Because of their high fat content, seeds of plants and domestic crops are an important dietary supplement. Squirrels will occasionally feed on insects and carrion.

As vegetation dries during mid to late summer, many ground squirrels enter hibernation. Some portions of the adult population may begin hibernation in late July, although the majority of squirrels wait until August. Young of the year and some adults continue activity into September and October. During a mild autumn, some activity may occur even into November.

Ground squirrels are true hibernators. Respiration, heart rate, and other metabolic functions are severely depressed during hibernation. Squirrels are not known

to eat or drink during hibernation but slowly metabolize the fat reserves accumulated during the summer activity period. One of the reasons juveniles and smaller adults remain active into September and October may be their need to acquire sufficient fat reserves to carry them through hibernation.

DAMAGE

Because of the Richardson ground squirrel's extensive distribution in Montana, its reproductive potential, and its ability to damage a wide variety of agricultural crops, it is one of the most economically important rodent species in Montana. Ground squirrels damage grain crops by consuming and trampling the grain plants. Damage most often occurs when squirrels reside in uncultivated border areas and enter the crop edges to feed on the grain plants. Forage crops, such as alfalfa, pasture, and range are often inhabited by ground squirrels. Squirrel feeding and mounds covering the crop reduces production and available livestock forage. Squirrel mounds can cause costly equipment damage to machinery used to harvest forage crops. Mounds and burrow openings present a potential hazard to livestock. Burrowing activity may contribute to increased soil erosion and provide sites for undesirable weed plants to grow.

CONTROL

When cost versus benefit justifies a control program for Richardson ground squirrels, several control methods may be considered. The control method you select should be both safe and effective. Because of the reproductive capability of ground squirrels, it is necessary to reduce their numbers by 90% or greater for long term control. If reduction is much less than 90%, a ground squirrel population may return to or exceed its original level within one or two reproductive seasons.

A. CULTURAL AND BIOLOGICAL

While not being a total answer to reduce ground squirrel damage, cultural and biological controls are part of an integrated control approach. Frequent crop rotation or tillage of the soil often helps discourage dense populations of rodents within an area. However, border areas can still be populated with ground squirrels and severe damage to crops can occur along

field edges. Frequent flood irrigation can reduce rodent problems in some cases. Coyotes, fox, weasels, owls, hawks, eagles, badgers, skunks, snakes, and other predators prey upon Richardson ground squirrels and other rodent pests. While their impact on rodent populations may not eliminate rodent damage, predators contribute to the overall control effort and their presence should be encouraged.

B. SHOOTING

Shooting may reduce damage in isolated areas or after baiting operations where small populations of ground squirrels are under constant shooting pressure. This is an expensive and time consuming practice. It may also be dangerous if conducted near occupied dwellings or livestock.

C. TRAPS

Traps may be used around schools, cemeteries, homes, and populated areas where other methods may be considered too hazardous. When using live-traps, ground squirrels are easily caught using grain, peanut butter, or fresh greens for bait. Better results are obtained when traps are wired open and pre-baited for several days. Traps should be placed in areas where squirrels are active and should be anchored to the ground. Dogs can be a severe nuisance when live-trapping squirrels. They can damage the traps, carry them off entirely, and unnecessarily maul the captured squirrel. If dogs are a problem, the trapping area should be carefully monitored. Squirrels may die of heat stress when caught in a trap exposed to the sun. For this reason, traps should be shaded and the captured squirrels relocated or humanely killed.

Leg hold traps or body traps such as the Conibear can also be used effectively to control ground squirrels. These traps are set directly in front of or over a burrow entrance and must be securely anchored to the ground. No bait is needed. Although generally safe, certain non-target animals can be injured or killed, particularly domestic dogs, cats, and certain wildlife species such as weasels, badgers, and skunks. Trapping is an effective, generally safe control method for ground squirrels and no pesticide license is required. It is labor intensive and practical only for small areas.

D. BURROW FUMIGANTS

Burrow fumigants are products that release toxic gases when used in a burrow system. Labor and cost of materials usually restrict the use of fumigants to small acreages or small populations. They are recommended

as a cleanup method after the use of poison bait or in areas where it is considered unsafe to use poison baits.

The ignitable gas cartridge is the most commonly available burrow fumigant. When ignited, they produce toxic gases, primarily carbon monoxide, and consume available oxygen in the burrow system. After the fuse is lit, the cartridge is placed well down into the burrow. The burrow opening should then be plugged with sod, sealed with soil, and tamped tightly with a shovel. Any adjacent burrow opening from which smoke is escaping should be plugged with soil. Caution should be exercised when using gas cartridges in dry situations since they are a fire hazard. Gas cartridges are a general use pesticide.

Aluminum phosphide tablets or pellets are another type of burrow fumigant that release toxic phosphine gas in the presence of moisture. The tablets should be placed well down into the burrow. A length of 1-2 inch diameter plastic pipe can be used to place the tablet down into the burrow. After removing the pipe, plug the burrow opening with crumpled newspaper or sod, cover with soil, and tamp tightly with a shovel. Treat every burrow opening. Atmospheric humidity and perspiration on the hands cause gas release. Since phosphine gas will absorb through the skin, always wear gloves and stand up wind during application. Open the canisters only outdoors, secure the lid when not in actual use, and store in a dry area not inhabited by humans, pets, or livestock. Do not apply this product within 15 feet of a building foundation. Follow label instructions carefully. This is a restricted use pesticide requiring a license to purchase and apply.

E. GRAIN BAITS

Timing

Use of toxic grain baits is the most effective and economical method to control Richardson ground squirrel populations over large acreages. Bait should be applied only when the entire squirrel population is active and readily accepting grain. Bait application when the squirrels first emerge from hibernation is not advised since only males are present. The breeding period (two or three weeks after emergence), before vegetative growth has begun and when both sexes are active, is often an ideal time for control operations. Control at this time eliminates adults and potential young and insures minimal crop damage by the rodents for the current year. However, this period is relatively short in duration. Once the females begin bearing and rearing young, their activity is reduced and baiting is not as effective. After green-up of vegetation acceptance of grain bait by the squirrels is reduced. If

bait is not applied during the breeding season, control should be postponed until the young appear above ground and are feeding independently. Baiting is not recommended after mid-July since squirrel activity declines as squirrels enter hibernation.

To help determine correct timing for early spring bait application, a sample of 12-20 ground squirrels should be collected by shooting or trapping. The specimens should be sexed and internally inspected. A sample of at least 50 percent females indicates good activity by both sexes. A sex ratio heavily favoring males indicates that female activity is minimal and baiting will be less effective. Baiting should be postponed if the sampled females are bearing or nursing young. Such sampling is not necessary for summer baiting.

Acceptance

Once you have determined that the entire population is active, test the squirrels' bait acceptance. You must know before applying bait over a large area if it will be well accepted. This is easily done by scattering a teaspoon of untreated whole oats in a 6 inch circle near 25 or more burrows. Space these test spots apart by at least 25 feet. Mark each spot so they can be relocated. Monitor these sites 1 or 2 days after placement. If the bait is readily consumed, then a similar response can be expected when the poison bait is applied. If the whole oats are poorly accepted, application of the poison bait should be delayed until bait acceptance improves.

Use good quality bait. Since it must compete with food items the squirrels are accustomed to foraging on, it is important for the poison bait to be the best quality possible. Use bait that is fresh and recently manufactured. Potency of the bait usually does not degrade but it may desiccate or be contaminated during storage. If bait must be carried over to the following season, store in cool to moderate temperatures to reduce dehydration. To prevent contamination, store bait in a separate, mouse proof area away from other chemicals. Avoid frequent baiting. If control is poor initially, frequent re-baiting will probably give poor control also. Squirrels surviving the first bait treatment may have eaten a sub-lethal dose of the bait. These surviving squirrels may associate their illness with the bait and may be reluctant to consume it a second time. Each exposure to the bait reinforces this aversion resulting in bait shyness. For this reason, time the bait application only when tests show good bait acceptance.

Available Products

Zinc phosphide and Rozol (Chlorophacinone anticoagulant) are currently the only rodenticide baits registered for hand baiting Richardson ground squirrels

in Montana. **Strychnine baits are no longer registered for use on any rodents, birds, or animals except pocket gophers and its use for ground squirrel control is strictly illegal.** Zinc phosphide is most effective when applied early in the spring shortly after the squirrels emerge from hibernation and prior to spring green-up. Rozol bait should be effective the entire period that ground squirrels are active. It is essential that 2 applications using 1 tablespoon per burrow be applied 3 to 4 days apart. This is to insure that the ground squirrels will eat the multi-feed bait several times over a several day period. Do not apply the bait if weather conditions will not be favorable for a 4 or 5 day period.

Pre-baiting is a recommended practice when the poison bait being used has aversive characteristics (i.e. zinc phosphide baits). Pre-baiting is the application of untreated bait that is the same or similar to the poison bait. Pre-bait the entire treatment area several days before applying the poison bait. This accustoms the squirrels to eating grain and results in increased bait acceptance and increased rate of consumption. This practice increases the cost and labor of treatment but when using an aversive rodenticide, pre-baiting is recommended in order to obtain effective results. Pre-baiting is not necessary when applying Rozol bait.

Before applying poison bait, read the label instructions carefully. The amount of bait specified on the label should be scattered near every burrow entrance or along trails between burrow openings. Do not drop the bait down the burrows or in thick grass. Do not place bait in piles. If the bait is scattered over a 2-3 square foot area, acceptance by the squirrels will be unaffected and the hazard to livestock and other non-target species will be decreased.

Treating a buffer zone around the main treatment area is a technique to reduce the rate of population recovery on the treatment site. Ground squirrels are capable of moving considerable distances, although most probably disperse less than 250 yards in a year. Treatment areas adjacent to nearby squirrel populations can be quickly reoccupied by dispersing squirrels and may return to pretreatment levels by the following season. In some cases, treatment of a buffer zone around the treatment area may give 2 to 3 years of protection before re-treatment is again necessary.

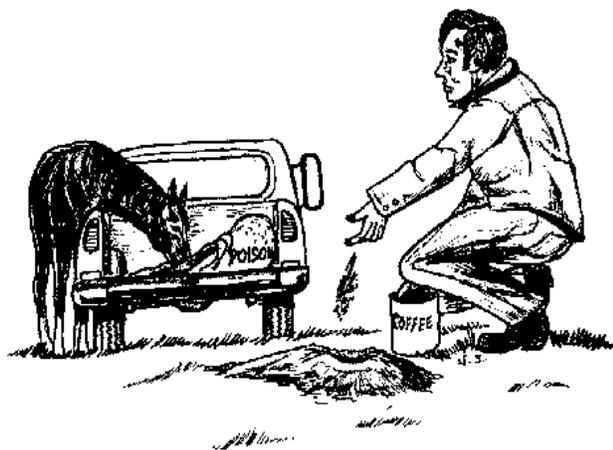


Figure 1. What is this man doing wrong?

- A) Left open bait bag in pickup. B) Carrying bait in open can with improper labeling. C) No gloves. D) No bait dipper. E) Putting bait in hole.

Availability of certain rodenticides is sometimes uncertain because of changing registration status. Contact your local county extension agent, pesticide dealer, or the Montana Dept. of Agriculture to obtain information concerning availability of bait in your area.

Bait Stations

In recent years, anticoagulants have been used to control field rodents. Anticoagulants are toxicants that inhibit the ability of the blood to clot. Animals receiving a lethal dose die from internal hemorrhaging and external cuts that continue to bleed. Anticoagulant products with the active ingredients Chlorophacinone (Rozol grain bait) and Diphacinone (Ramik Green pelleted bait) are the only rodenticides registered for use in bait stations for ground squirrel control in Montana. These are multi-dose poisons and must be eaten by the squirrels several times over several days to cause death.

A bait station is a covered container which holds the bait and allows access by the squirrels while restricting access to most other animals. Bait stations must be maintained regularly to replenish the bait. They must be placed in sufficient density so all squirrels have an opportunity to feed on the bait and must be maintained for at least 30 days. For these reasons, this control method is not generally practical for squirrel populations on large acreages. Like the burrow fumigants and trapping, it is a very useful and effective method for small acreages and public use areas.

SAFETY

Hazard to non-target animals from toxic baits are present in two ways: primary poisoning - direct consumption of the bait material; and secondary poisoning - consumption of poisoned squirrel carcasses by predators or scavengers.

Non-target animals most at risk from primary poisoning are domestic livestock and poultry and certain seed-eating wildlife species including waterfowl, grouse, and some songbirds. Hazards from primary poisoning can be reduced by following pesticide label directions and precautions and common sense safety practices such as:

- 1) Keep baits in original labeled containers and store in locked, weather tight, rodent proof storage when not in use.
- 2) During application, keep excess bait in locked or latched storage to prevent access by livestock or children.
- 3) Use calibrated dippers or spoons for applying bait. Apply only the label recommended amount. Scatter the bait over a 2-3 square foot area near each active burrow. Do not pile the bait because this increases



Figure 2. Correct and safe baiting practices.

- A) Bait kept in locked and marked box. B) bait carried in marked and zippered canvas bag. C) Wearing gloves. D) Using calibrated dipper. E) Scattering bait on surface near burrow opening.

the hazard to livestock and wildlife and it is not a natural food placement for squirrels.

4) Remove livestock from treatment areas when possible. In addition to reducing risk to livestock, ground squirrel control will improve if livestock are not trampling on bait placements.

5) In areas known to be frequented by waterfowl or other seed eating birds, consider additional precautions such as patrolling the area or using scarce devices after bait application. Consider use of alternative methods such as burrow fumigants or bait stations in high risk areas.

6) Pick up and bury any spilled bait.

Secondary hazard from rodent bait application is caused by ingestion of carcass tissues of rodenticide killed rodents by predatory and scavenging birds and animals. Animals that consume the entire carcass such as dogs, coyotes, badgers and owls are most at risk. Wild and domestic canine and feline species are especially susceptible to poisoning from anticoagulant rodenticides (Rozol and Ramik Green). When practical, burial of ground squirrel carcasses helps reduce the hazards to potential non-target animals. Always notify neighbors of your bait applications. Suggest confinement of dogs, cats, or other animals for a period of time after bait application. In warm weather, carcasses decompose rapidly and present little hazard after 5 to 10 days.

Secondary hazard from zinc phosphide is considered low. Zinc phosphide in the presence of digestive acids within the gut converts to phosphine gas, the actual poison agent. The phosphine gas dissipates from the carcass quickly after death leaving little residue to cause secondary poisoning.

DEPARTMENT SERVICES

As with most programs, rodent control will be most effective where a coordinated effort is established by all landowners. Department of Agriculture Vertebrate Pest Specialists will work with County Commissioners, Extension Agents, and landowners to establish a program suited to local and county needs. Field demonstrations are provided free of charge to inform landowners how, when, and where to control Richardson ground squirrels and other field rodent pests. Interested individuals should contact the Montana Department of Agriculture, Capitol Station, Helena, Montana 59620 (444-2944) or your area Vertebrate Pest Specialists:

In Billings: Monty Sullins
Phone - (406) 652-3615

In Helena: Daniel Sullivan
Phone - (406) 444-5400

Additional ground squirrel control information in pamphlet form is available from the Montana Department of Agriculture:

"Managing Ground Squirrels with Bait Stations."

"Controlling Burrowing Rodents with Burrow Fumigants."

"Using Zinc Phosphide Rodenticides Effectively"

"Rozol Ground Squirrel Bait – Proper Use Practices"

**MONTANA POISON CONTROL
INFORMATION CENTER
1-800-525-5042**

**ROCKY MOUNTAIN
POISON CENTER
1-800-332-3073**

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