CONTROL OF RODENT PESTS IN MONTANA

BY
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U. S. Biological Survey

Armatus Ground Squirrel.

ISSUED BY
THE MONTANA EXTENSION SERVICE
The need for a bulletin on rodent control in Montana has become urgent. In order to know how to combat rodents when they become crop pests, farmers and extension workers must know what particular species is involved.

Many requests are received for aid in the control of "gophers." All pocket gophers are rodents, but not all rodents are "gophers." It is difficult to prescribe methods of control unless the specific rodent is known. This bulletin is designed to aid farmers and extension workers in the identification and control of rodents that are detrimental to agriculture and horticultural interests.

Montana State College Extension Service
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Introduction

Montana is the third largest State in the Union, and no section of it is rodent free. A good many of its rodents, however, are of the non-injurious type or of such scattering infestation as to give no cause for control measures. Some species, on the other hand, as the Columbian ground squirrel, are so prolific and so resistant to present control methods that they present a constant and increasing menace to the agriculture of the state.

The approximate range, description, and habits of 14 rodents, each of which is of some economic importance, are here discussed briefly, and control methods are given for each. Some of the native species have become troublesome only recently, as the activities of the farmer have broadened or as their own numbers have increased under more favorable conditions. Two introduced species, the brown rat and the house mouse, have become acclimated to this region in the last few years and now constitute rodent problems.

Suitable control measures to be used against all rodents cannot be worked out in a short time; consequently a few of the methods here discussed may not in all cases give satisfactory results. The bureau of biological survey maintains a control methods research laboratory at Denver, Colorado, which develops new and improved systems of combating rodents. As the laboratory and field men find better control methods they will introduce them to the needy agriculturist.

Jack rabbits and cottontails are not members of the true rodent order, Rodentia, but belong to the order Lagomorpha. From the control standpoint, however, they may be treated as rodents.
Development of Control Methods

The control of crop destroying rodents has been one of major concern to the western farmer ever since the first prairie sod was turned under to make way for cultivated crops and livestock replaced the herds of buffalo, elk, and deer.

The earliest record we have of community effort in the control of rodents was unearthed in California, where it was found that a ground squirrel campaign was carried on near the Santa Barbara Mission in 1808 with strychnine that had been shipped by boat around Cape Horn. Individual farmers and ranchers have used every conceivable poison—arsenic, phosphorus, cyanide, strychnine, and others—on all sorts of grain, with little thought given to the danger of the poisons to other forms of wildlife.

Individual effort was unable to cope with the situation, and finally in 1915, Congress appropriated funds for the department of agriculture to perfect methods and to assist landowners in organizing concerted drives to reduce the losses caused by these little animals. The biological survey, in cooperation with the extension service and other federal, state, and private agencies, has developed methods that are highly specific and that offer little danger to birds or to animals other than rodents.

Strychnine has been found to be the most satisfactory toxic agent for controlling most field rodents. It is constant in its action, there is an adequate supply always available, and when used in the proportions and exposed according to the methods recommended, it is practically harmless to the gallinaceous group of birds—quail, pheasants, mountain and sage grouse.

Heavy, plump-kerneled oats are recommended as the best bait material. They are a favorite food for prairie dogs, ground squirrels, and other native rodents, and are not attractive to small seed-eating birds. By steaming the oats, and so rolling them that the kernel is flattened and exposed, the size of the individual grain is increased and becomes more tempting to the rodent and less attractive to birds. Dirty, chaffy, oats mixed with weed seeds or wheat should never be poisoned and exposed for rodents.

To facilitate the preparation of suitable rodent baits, the biological survey, in cooperation with the chamber of commerce of Pocatello, Idaho, has established a supply depot at that point, where choice grain is purchased.
from nearby sections, including Montana, and is thoroughly cleaned, steamed, crushed, and scientifically treated with poison in large mixing machines. It is then sacked in suitable containers and distributed to all parts of the country. This, or similar bait prepared locally, may be obtained from the various county agricultural agents or the Bureau of Biological Survey, Box 1251, Billings, Montana.

The mixing of the poison bait by individual farmers and ranchers is not recommended, as more satisfactory results can be obtained from the use of the ready prepared material. For the convenience of isolated individuals who may wish to treat their own grain, however, the following formula, developed specifically for the control of the Columbian ground squirrel, but effective also for other species, is presented:

**Columbian Ground Squirrel Poison Formula**

<table>
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<th>Ingredient</th>
<th>Measurement</th>
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<tr>
<td>Oats (clean and heavy) by measure</td>
<td>38 quarts</td>
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<tr>
<td>Strychnine (alkaloid)</td>
<td>5 ounces</td>
</tr>
<tr>
<td>Baking soda</td>
<td>¼ pound</td>
</tr>
<tr>
<td>Syrup (good grade)</td>
<td>¼ quart</td>
</tr>
<tr>
<td>Petrolatum oil (heavy)</td>
<td>¼ quart</td>
</tr>
<tr>
<td>Water (boiling)</td>
<td>1½ quart</td>
</tr>
<tr>
<td>Borax</td>
<td>½ pound</td>
</tr>
<tr>
<td>Starch (gloss)</td>
<td>2 ounces</td>
</tr>
<tr>
<td>Salt (fine)</td>
<td>½ pound</td>
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**Directions**

1. Place the oats in a heap on a smooth concrete or wooden floor and hollow out the center.
2. Put the water on and when boiling stir in the borax.
3. Put the syrup and petrolatum oil into a large dish-pan and mix thoroughly.
4. Mix the strychnine and soda together dry, crushing all lumps. Add this to the syrup and oil and mix well.
5. Dissolve the gloss starch in a little cold water. Stir this slowly into the boiling water. Boil and stir continuously until a clear, fairly thick paste is formed, taking care not to allow the paste to scorch.
6. Add the starch paste to the poison mixture and stir thoroughly until a smooth, creamy mass, free from lumps, is formed. Make sure that none of the heavy syrup paste sticks to the bottom of the pan.
7. Pour the mixture over the oats and mix rapidly with a wide shovel, using care to prevent the paste from running to the floor before it is taken up by the grain. Mix well until no dry kernels remain.
8. Sift the salt over the wet bait and mix again.
Fig. 1. Map showing approximate distribution of the Columbian ground squirrel and prairie dog, two important rodents.
Fig. 2. Map showing approximate distribution of the Richardson ground squirrel and armatus ground squirrel, two important rodents.
Allow the oats to remain in a heap for a few hours before using. Bait used while fresh is most effective.

**Caution:** This bait is highly toxic and must be kept in suitable containers out of reach of livestock, poultry, children, and irresponsible individuals.

All utensils used in the preparation of poisons and all poison containers should be kept plainly labeled and in a safe place. Domestic chickens and such game birds as grouse and pheasants are quite immune to this strychnine poison, but ducks and geese are killed by small quantities of it.

**Prairie Dog**

(*Cynomys ludovicianus ludovicianus*)

Range, Description, and Habits—The prairie dog (fig 3) in Montana confines itself principally to the eastern, or great plains portion of the state. It is found in the western part of the state, however, in Sweet Grass and Park counties and extends over an irregular front from Jefferson and Lewis and Clark counties northward approximately to the Great Northern Railway in Toole county, then eastward to the east half of Phillips county, where it crosses Milk River and extends north again to the Canadian line. The distribution map, which occurs as figure 2, (p. 9) shows the approximate range.

There are two species of prairie dogs in the state, the blacktailed (*Cynomys ludovicianus ludovicianus*), and white-tailed (*Cynomys leucurus*); but the latter's range covers just a small portion of southern Carbon county and this form does not constitute a separate problem.
The black-tailed prairie dog cannot be mistaken for any other rodent in the state. It is a robust, heavy-bodied squirrel with a comparatively short tail that invariably jerks forward and backward as the “dog” “barks.” The upper coat is a pinkish cinnamon color, with touches of black and tan. The under parts are white to creamy white. The tail is short, heavy, and black-tipped for about a third of its length. In winter its pelage becomes longer and softer and has few dark markings.

The white-tailed prairie dog resembles it very closely, except that it is a little more squirrel-like and has a white-tipped instead of a black-tipped tail.

Prairie dogs are very gregarious by nature and for the most part are found in colonies, or “towns,” that vary from just a few individuals to thousands. As a rule the colonies are started in places that provide the most succulent grasses and spread from such centers.

In Montana these rodents might be called semi-hibernating. They are active during fair weather throughout the year but may remain in their borrows for several months during severe cold weather. They do not store up food for winter, as is commonly supposed, but when confined to their dens, live on their body fat.

During hibernation they curl up and go into a stupor that lasts until fair weather or excessive hunger awakens them and sends them to the surface. Experiments indicate that they eat very little during the winter, even when food is available.

The young are usually born in early April in underground nests, and appear above ground during the first part of May. Occasionally very small ones are seen during the middle of the summer.

The number of young in a litter varies from four to nine, and so far as is known, only one litter a year is produced. In a short time the young animals begin eating grass, roots, etc., and sit up and chirp or bark just as do the adults. By the middle of the summer the young are beginning to make new burrow diggings of their own or have appropriated the homes of their parents.

Not only do these rodents eat considerable quantities of valuable forage, but they cut down a great deal more in order that they may have a good protective view from their mounds. In time a good range or even cultivated crops will be completely ruined by the activities of prairie dogs.

Control by Poisoned Oats

Prairie dogs are comparatively easy to control with a little persistence on the part of the landowner. Their large numbers over a great area make it seem hopeless to combat them, but gradually they are being driven from the agricultural areas.

Strychnine-poisoned oats prepared according to the biological survey formula (p. 7) are very effective against them. For best results use bait when fresh. Early in the spring, when the prairie dogs are all out, go over the colony carefully and drop a tablespoonful of the bait on a
hard, grass-free surface near each live burrow. Allow the poison to scatter so that livestock cannot pick it up. Do not put the grain on the loose dirt of the mound or down the hole, as it will be largely wasted. If all the prairie dogs are not killed with the first treatment, try again in about two weeks.

Columbian Ground Squirrel
(Citellus columbianus columbianus)

Range, Description, and Habits—The Columbian ground squirrel (fig. 4) is found in the area from central Glacier county in the north, western Broadwater county in the south, and westward to the Idaho line. See map 1 (p. 9). It is found in varying numbers from the fertile valley bottoms to the highest mountain meadows and readily adapts itself to almost any condition within its range, digging its burrows either in the open or in the dense grass or thickets. It is an aggressive rodent and is gradually spreading eastward in the state.

The Columbian is the largest ground squirrel in the state. It has a large, rounded head with blunt nose and low, rounded ears; short limbs; a comparatively short, flat, and bushy tail, and long, very strong curved claws. The upper parts are very distinctive, presenting a grizzled, reddish, yellowish, grayish appearance with rusty reddish or yellowish hairs on head and limbs, the hair throughout being banded with black. The tail, above and below, has somewhat the same grizzled coloration with black predominating and with white-tipped end hair. The under parts are a more solid rusty yellowish, some whitish with blackish base hairs.

This ground squirrel hibernates in the late summer or early fall...
and does not appear again until the snow melts in the spring. The valley bottom dwellers come out of hibernation a month or six weeks earlier than those living high on the mountains. The young squirrels appear usually in May and number from four to eight to the litter. Only one litter a year is produced.

The Columbian eats a great variety of foods—seeds, grains, green vegetation, insects and their larvae, bird eggs and young birds, hen eggs, and even others of its kind, upon occasion.

Control by Poisoned Grain

Due to its hardy nature, wide distribution, and resistance to poisons, the Columbian is the most difficult ground squirrel to control. Since agriculture in western Montana began, farmers have waged continual war against this pest, but still it persists. It plays a large part in spreading the nymphs and larvae of the Rocky Mountain wood tick, which carries spotted fever and tularaemia germs.

Improvements are being made in control methods, and a variety of poisoned-grain formulas are being used. To date no one formula is completely successful on all areas. To obtain the best method, contact the local county agent or write to the bureau of biological survey.

Use fresh bait for best results. Drop a teaspoonful of poisoned oats near the burrow entrance allowing it to scatter over a small area. Do not drop grain into thick grass or loose dirt or down the burrow as it will be largely wasted. Use slightly larger quantities after young appear.

Richardson Ground Squirrel

(Citellus richardsonii)

Range, Description, and Habits—The Richardson, or Flickertail, ground squirrel (fig. 5) is found in Montana extending over an area including Beaverhead and Madison counties, northern Gallatin, Park, Sweet Grass, and Stillwater counties, and counties northward to the Canadian line, and Glacier and the northernmost tier of counties eastward to the North Dakota line. See map 2 (p. 8). It confines itself mostly to plains and foothills and is not common in high mountain parks as are some of the other species.

The Richardson is a medium-sized ground squirrel of rather uniform coloration. The upper parts are a buffy yellow to grayish, with a fine irregular mottling of buffy to blackish under-coloring. The sides of the neck, limbs, and under parts vary from a buffy to grayish; the tail above is of a mixed blackish to buff, fringed with white hairs on the outer edges and end. It is about one-fourth of the total body length and not very bushy.

The claws are slender, black, slightly curved, and not as strong as those of the Columbian ground squirrel. The winter coat of the Richardson is much lighter in color and of a longer silkish texture.

The young Richardson ground squirrels usually appear during early
to middle May and run from four to eight to the litter. They mature rapidly and soon eat a varied diet of seeds, roots, green vegetation, grains, and, to a very limited extent, insects or animal matter.

Fig. 5. Richardson ground squirrel (Citellus richardsonii).

Control by Poisoned Oats

The wide distribution of the Richardson ground squirrel, particularly over marginal and other cheap range lands, keeps it close to the top of the list of obnoxious rodents. It not only does great damage to forage and cultivated crops but also is a carrier of the nymph and larvae stages of the Rocky Mountain wood tick, which may cause spotted fever and, in some cases, tularaemia.

The Richardson is one of the easiest ground squirrels to control. It takes poisoned grain quite readily and does not have as high resistance to it as some other species have. Distribute poisoned oats as for the Columbian ground squirrel.

Armatus Ground Squirrel

(Citellus armatus)

Range, Description, and Habits—The Unita, or, as it is more commonly known in Montana, the armatus, or black ground squirrel (frontispiece), occupies a comparatively limited range. Its typical home is in the foothills and higher meadows of the mountainous area in southern Madison, Gallatin, Park, and Sweet Grass counties. See fig. 1, (p. 8). Of recent years, however, has spread out from its original home and now occupies some of the fertile valley lands that adjoin the foothills.

The armatus is a medium-sized ground squirrel with fairly short tail
and soft, dark pelage. The upper parts are a mixed gray and black with a wash of dark brown. The shoulders and thighs are a little lighter in color, blending into a rusty buff on the lower legs. The tail is a mixed gray and black, not bushy. The under parts are gray washed with buff. The armatus is slightly shorter and slimmer than the Richardson ground squirrel and, of course, darker, so that the two should not become confused. It also has a shriller chirp than the Richardson.

The armatus hibernates early in August and comes out late in the spring. It produces one litter of four to seven young a year. It eats seeds, grasses, roots, and insects, or flesh upon occasion.

Control by Poisoned Oats

The armatus ground squirrel apparently is closely related to the Richardson, and lives side by side with it on some areas. It is a much more difficult rodent to combat, so that control measures used against the Columbian are more applicable to it. It is an aggressive little animal and does not accept poisoned baits readily. When its native food is scarce, however, it will take them quite satisfactorily. Distribute poisoned grain as for the Columbian ground squirrel.

Thirteen-Striped Ground Squirrel

(Citellus tridecemlineatus tridecemlineatus)

Range, Description, and Habits—The 13-striped ground squirrel (fig. 6) is of minor importance in Montana as to distribution and obnoxiousness. It is found along the eastern and southeastern borders of the state. It occupies somewhat the same area as the prairie dog and is frequently found throughout prairie-dog towns, but very seldom is found a concentration of individuals in sufficient numbers to do any damage. Once in a great while a number of these little fellows will attack a grain field or garden, and control measures must then be adopted.

![Fig. 6. Thirteen-striped ground squirrel (Citellus tridecemlineatus tridecemlineatus).](image)
slender tail, less than half of its total body length. The upper parts are distinctly marked with many alternate longitudinal stripes of dark brown, with a lighter tinge, and whitish. The dark stripes have central rows of whitish spots. The stripes on neck to shoulders are solid and unbroken by spotting.

The end of the nose is a yellowish brown blending into indistinct stripes on top of the head. The forelimbs and lower sides of the body are of a whitish to yellowish tinge. The under parts are a mixed whitish and yellowish with darker base hairs.

The tail is a mixture of black, buff, and white, with the black predominating toward the tip end. It is possible there are several subspecies of this squirrel in the state, but for all practical purposes they can be considered the same.

Control by Poisoned Oats

The 13-striped ground squirrel is one species that stores its food; consequently, it will carry off a great deal more grain or garden seed than it eats on the spot. It easily locates planted gardens or grain seed, with which it fills its internal cheek pouches to take to its underground storehouse. Because of this hoarding instinct, it can be poisoned easily with grain bait. Many of these squirrels are killed incidentally when prairie-dog towns within the squirrel area are baited.

Scatter poisoned bait along a furrow around the edge of a field or along squirrel trails leading out from field or garden. On grain fields successful kills can also be obtained by scattering poisoned grain on top of the ground over the freshly sowed seed around borders of the field.

Pocket Gopher

(Thomomys, various species)

Range, Description, and Habits—Pocket gophers (fig. 7) are becoming of increasing economic importance in Montana. They are found in varying degrees of infestation over a good part of the state. There are still large areas that have no infestation, but gophers can usually be found without travelling many miles in any direction. They adapt themselves to modern agricultural conditions and, except on irrigated areas, multiply more rapidly than under native conditions. They are becoming numerous in alfalfa fields and meadows, but do not confine themselves to any particular type of soil or food. They can be found in heavy clay loams of the valley bottoms or in the loose gravel type of the mountain tops. Very seldom are they found in timbered areas, as the plant food there is not especially to their liking.

During the last few years of drouth gopher damage has been more noticeable on grazing lands, particularly in the mountain meadows where moisture and vegetation have been more plentiful. The drouth also has forced the gophers from the dry hard-packed fields toward the streams and irrigation ditches in search of more succulent food and easier digging. This gopher
migration in itself as been quite an expense to the farmers in repairing washed-out ditch banks and large water cuts into their fields, caused by gopher diggings.

The pocket gopher is the only true gopher in the state. Practically all of the squirrels are misnamed "gophers," thus making it difficult for the specialist to recommend control measures unless he knows to which rodent reference is made.

The Montana pocket gopher, of which there are several groups under the genus Thomomys, is fairly small. It is considerably larger than the largest field mouse but only about one-third the size of a Richardson ground squirrel. It seldom exceeds 8 inches in length. It has a broad head with strong curving incisors, and its neck and legs are short, making it a very compactly built little animal. The tail is about one-third of its total body length and rather sparsely haired. One of its most easily distinguished characteristics is the fur-lined cheek pouch on each side of its face.

It is equipped with powerful claws on the forefeet and with much smaller and weaker ones on the hind feet. Its fine, soft hair varies in color from a dark brown to a slate gray. Blackish patches are usually found about the head with touches of white about the lips, lining of cheek pouches, and feet. The tail is light in color and blends into the top hair of the underside. Short dark base hairs are found along the under side.

Very little is known about the breeding habits of pocket gophers. In the higher elevations of Gallatin county young were produced during September. Prenatal litters of four and five were taken from trapped females. Whether or not this indicates a second litter or is merely the normal season for young, cannot be definitely stated at this time.

It is quite definitely known that pocket gophers, except during the breeding season and during the nesting of young, usually live alone in one burrow system. Where the infestation is heavy, separate systems are
apt to cross and more than one individual can be caught at one set.

Gophers feed almost entirely upon vegetable matter. They are active throughout the year, and consequently store up food for the winter months when the ground is frozen. Investigations are now under way to determine, if possible, just what foods gophers do prefer in this state. A great variety of roots, bulbs, tubers, and grasses, including the roots of alfalfa, clover, grains, and fruit trees, have been found in their stores of food. They are fond of root crops, such as potatoes and carrots, and will completely destroy a garden in time.

Control

Pocket gopher control can be divided into two classes—small scale and large scale. On small areas, or even on large areas where there are only a few gophers, trapping is by far the most successful method. On large areas of heavy infestation it is more practical to poison the runways first, then later go over the area with poison or traps. This method is much faster and cheaper than trapping alone but is not quite as effective.

Trapping

Correct trapping gives 100 per cent kills, and the problem is solved until more gophers come in. It is slower than poisoning and more expensive if hired labor has to be used but is the surest system in the end. Many make the mistake of trying to trap gophers with improper traps. Ordinary steel, box, and many so-called gopher traps on the market give but partial success. A small-sized trap should be made especially for gophers. It should be constructed of light but tough spring steel and have a set jaw spread of more than 2½ inches.

There are two methods of locating a trap in a gopher runway. First, select the freshest appearing mound and uncover the main runway with trowel or shovel. Use a stick about a foot long to determine if the runway is open, then set one trap, if only a single chamber is found, or two traps as the case may require. These traps will catch gophers traversing the runway in only one direction, so it is advisable to set a trap in each direction.

The second method is by using a probe. A probe is an instrument made from a piece of ½- or ¾-inch steel rod about 18 inches long and two pieces of ¾-inch pipe, one 18 inches and the other 6 inches long. Weld the steel rod and 18-inch pipe together at ends, and at this union weld the 6-inch pipe as a foot piece. Sharpen the free end of the steel rod and bluntly draw out the free end of the pipe over an iron cone.

The pipe end of this probe is not necessary for trapping but is used in poisoning operations as will be described later. With the smaller steel end of the probe slowly sink holes into the ground for several inches in a horizontal line at right angles to the line of gopher mounds and between

2 For more complete and detailed information on pocket gopher control, write to the Office of Information, U. S. Department of Agriculture, Washington, D. C., or Biological Survey, Billings, Montana, for a copy of Pocket Gopher Control, U. S. Department of Agriculture Farmers' Bulletin No. 1709.
two of the freshest mounds. When the dirt caves in below the probe the runway has probably been located. This may be directly between the two mounds or several inches to one side. Then dig down to the runway and set traps as described above.

**Poisoned Bait**

Poisoned vegetable baits give the most consistent results in Montana. Carrots seem to be preferred by the gophers to other root crops. Sweet potatoes are also good but are quite expensive. Cut 2 quarts of clean, solid carrots (or sweet potatoes) into pieces 1½ inches long and about ½ inch square. Dust over these from a salt shaker, while stirring, ¼ ounce of powdered strychnine alkaloid. Mix thoroughly and use immediately. Keep vegetables covered so they will not dry out excessively while in the field.

The strychnine-poisoned steam-rolled oats as prepared for other rodents at the biological survey supply depot at Pocatello, Idaho, (p. 7) has given good results. This bait is ready-prepared and will keep indefinitely. Consult the local county agent or the biological survey before this method is used.

In poisoning, probe for the runway as in trapping. Then enlarge the runway and probe hole with the large or pipe end of the instrument. Do not disturb the bottom of the runway more than necessary. Then drop a couple of poisoned vegetable baits or a teaspoonful of rolled oat bait into the hole and cover with a rock or piece of sod and loose dirt. Keep the vegetable baits clean and fresh and do not allow dirt to fall on them after placement. Treat each runway or mound system in at least two places.

**Woodchuck**

*(Marmota, various species)*

**Range, Description, and Habits**—The woodchuck in Montana, of which there are several species, occasionally becomes obnoxious. The “chuck” stays mostly in the more rugged mountainous areas of the western and south central part of the state. It lives principally under rocks, logs, or in holes not far removed from such natural protection. At times it ventures some distance out into fields and digs a permanent home. It is especially fond of fresh, green alfalfa or grain crops and will do considerable damage, if it occurs in any appreciable numbers.

The woodchuck, rockchuck, marmot, or ground-hog, by whichever name it may be called, is one of the largest members of the squirrel family. It has a thick, heavy body; broad, short head; blunt nose; low rounded ears; small eyes; a short, flat, well-haired tail; and strong, sharp claws well adapted for digging. The upper parts are a mixture of long, brown, gray, red, and black hair.

The individuals vary considerably. Some look almost red, others dark brown, and some are almost gray. The general appearance is grizzled. The under hair is usually a dark gray at base with cinnamon or buff tips. The
legs, feet, sides, and under parts of most of our species are a deep cinnamon with darker base hair. The head and tail are a dark brown to black with grayish markings, particularly about the nose.

Woodchucks hibernate in the fall and come out after spring is well advanced. They feed on various grasses, seeds, clover, alfalfa and other native vegetation. They can be readily attracted to a salt bait.

Control

Trapping or Shooting—Woodchucks can be trapped, and it is sport to shoot them. Trapping and shooting are slow and expensive if the "chucks" are damaging crops.

Poisoning: Formulas

The most practical control method for woodchucks is poisoning. There are three effective strychnine poison formulas that have proven very effective in this state: First and best, poisoned green alfalfa leaves; second, poisoned whole oats; and third, poisoned salt.

Caution: Keep these poisons and the containers used in their preparation plainly marked and out of reach of irresponsible persons and livestock.

Poisoned Green Alfalfa Tips—Place 10 pounds of fresh, green alfalfa tips in tub or other container and sift 1 ounce of powdered strychnine alkaloid over this. Mix until all alfalfa is coated and has a grayish appearance. Distribute in small handfulls in and around "chuck" dens and trails in the evening or early morning.

Poisoned Oats—Mix preparation described on page 7, using whole oats and adding ½ pound of salt in addition to the ½ pound already called for. Distribute handfuls of poisoned oats in and around dens and trails if no livestock or game can get at it. If on large game or livestock areas, put oats under rocks or down "chuck" burrows so that other animals cannot get at it.

Poisoned Salt—Mix 1 ounce of powdered strychnine alkaloid with 5 pounds of fine salt. Distribute salt in tablespoonfuls beside dens, or on rocks where "chucks" sun themselves. This preparation is especially good in early spring when the "chucks" first come out of hibernation.
Brown Rat
(Rattus norvegicus)

Range, Description, and Habits—Montana is the last state to become infested with rats, and even now if the people fully understood the seriousness of rat plagues, control measures could be instituted that would keep the state practically rat free. The brown, house, or Norway rat (fig. 8) is a comparative newcomer. Evidence indicates that rats were introduced into the state a number of times after common carriers were put into use, but through some strange circumstance they never became acclimated until about 10 years ago. Old-timers remember seeing rats on the boats that plied up and down the Missouri and Yellowstone rivers years ago.

Apparently the pests did not at first find sufficient food and shelter to permit propagation and thus became no problem. Some time between 1920 and 1935, however, rats got into the city of Lewistown in Fergus county and made themselves at home. At first they were found just around the dump grounds and older buildings of the city, but they spread out rapidly so that now they can be found almost any place in the county. There may be small unreported infestations in other sections of the state, but so far as is known, other major cities of the state are rat free.

The brown rat is easily distinguished from the native pack, or mountain rat. It is good-sized, with medium-sized, nearly naked ears; long semi-naked tail with rather conspicuous scale-like markings, rather dusky above and lighter below; coarse, grayish or brownish upper coat; lighter colored under coat; and whitish feet.

Of all the obnoxious animals this rat is one of the most prolific. Young females will breed when only 3 months old and 6 to 10 times a year. Litters of young rats numbering over 20 each have been found, but the average litter is about 10 young.

Brown rats are active the year around and as their numbers increase, they migrate rapidly in search of food and shelter. In Montana there is some seasonal migration from outdoors into buildings and vice versa as the weather...
governs. They adapt themselves to almost any kind of habitation, eat anything that will sustain life, either meat or vegetable matter, and thrive on spoiled, tainted garbage. They are, without doubt, one of the worst pests in the world. It has been conservatively estimated that they annually destroy almost $200,000,000 worth of food-stuffs and property.

Control

The control of rats does not consist merely in preparing and putting out poison for them. They are so numerous that the killing of one lot simply makes way for another migration unless more permanent control measures are taken. Rat control to be successful must be worked from all possible angles.

Exclusion, Destruction, and Legislation—The following suggestions should be considered before an anti-rat campaign is started. First, work for the permanent exclusion of rats by (a) rat proofing, (b) removal of shelter, and (c) cutting off food supply. Second, select the best method or combination of methods of control, as (a) poisoning, (b) fumigating, (c) trapping, or (d) miscellaneous. Third, carefully plan the campaign before starting it by (a) getting cooperation of entire community and (b) instigating anti-rat legislation by city and county officials. Each of the above points is fully discussed in Farmers' Bulletin No. 1533.

Poisoning: Formulas

The following poisoning suggestions are recommended for isolated cases. Red squill powder has been developed into the best rat poison for general use. It is harmless to humans and domestic animals. Rats take it readily and succumb to its effect quite satisfactorily.

Obtain good standard quality of red squill, guaranteed by the manufacturer to be of proven uniform toxicity. The powdered form generally is better than the liquid. Mix the squill with any of a variety of food-stuffs to make excellent baits. The three outstanding foods for bait are fresh fish, fresh meat, and cereals.

Place teaspoonful quantities of any of the following poisoned baits in small paper sacks and close the sacks by twisting the tops. Distribute these sacks over the infested premises in the evening. Put out enough bait to kill every rat on the place should they eat it. The following morning pick up all uneaten baits together with dead rats found and burn them. Do not try poisoning again for at least two weeks.

Caution: Sacks should be marked POISON.

Poisoned fish—Obtain fresh fish and grind with a food chopper. Mix 1 ounce of powdered red squill with a little water to form a thin paste free from lumps. Add this to 1 pound of the ground fish and mix thoroughly.

Cheap canned fish, as salmon or mackerel, can be used with some success if the fresh fish is not obtainable.

Poisoned meat—Mix thoroughly 1 ounce of powdered red squill that has been mixed with water first to form a thin, lump-free paste, with 1 pound of freshly ground hamburger or similar meat.

Poisoned cereal—Mix together, dry, 1 ounce of powdered red squill to 1 pound of cereal meal, such as oatmeal, graham flour, cornmeal, or bran. Add 1 pint of sweet milk or water and stir to a mushy consistency.

Wood Rat
(\textit{Neotoma cinerea})

Range, Description, and Habits—The Montana wood, pack, mountain, or trade rat (fig. 9) is only an occasional pest. It is found here and there over the state but is more common in or adjacent to mountainous areas. Its natural home is in rock slides, timber falls, other places that provide adequate shelter, and any buildings that may be available. Deserted cabins or other buildings that are infrequently occupied often become the harbors of pack rats.

![Fig. 9. Wood rat (\textit{Neotoma cinerea}).](image)

The wood rat is a typical rat, resembling in many ways the house rat. It is fairly large and has large, upstanding ears; large, bright eyes; plentiful, long whiskers; body darker above than below, flattish; long, fairly bushy tail; long, thick, grayish buff upper coat, sprinkled with dusky to black; and white feet and under parts.

In this state, where the winters are long and summer cabins are not in use for months, caution must be taken to protect certain property against wood rat activities. The wood rat is not nearly as destructive as the brown rat but at times is very annoying. It will carry off silverware, rings, or other small, bright objects and frequently leave pine cones, sticks, or rocks
in return. It enjoys good food and is not above cutting into cloth, paper, or wooden food containers and helping itself. It has also been known to destroy clothing, mattresses, and woodwork.

Wood rats in an attic create more disturbance than their size would indicate. They are very curious and playful and have a way of expressing their feelings by thumping their hind feet on boards until sleep for the occupants is impossible. If they remain long in one building their smelly, sticky excrement becomes very unpleasant.

They never hibernate and are active mostly at night, although they can be seen during the day. As far as is now known they have only one litter a year, averaging from three to six in number.

Control

Wood rats are somewhat like their kinsmen, the brown rats, when it comes to being controlled. They are suspicious of new foods and have a very delicate taste. They are extremely curious and this many times means their undoing. If there are only a few wood rats around, trapping is by far the most practical control measure. Large numbers of rats are difficult to clean out by trapping, however, so that poisoning must be tried.

Trapping

Ordinary steel traps, No. 1, or common snap rat traps are very good for wood-rat trapping. The trap may be baited with some tempting morsel of food, as candy, cracker, or piece of dried fruit, which should be tied to the pan of the trap with thread so that pressure will have to be exerted in getting it loose.

One of the most successful baits is a piece of bright tin or mirror tied to the trap pan. Curiosity causes the rat to investigate and it sets off the trigger. Many rats can be caught by placing sets traps in likely rat runways, as the top of rafters, behind boxes or boards that are near the wall, or in stove pipe that is laid horizontally along the wall. It is always best to wire the trap to some solid object so that the rat cannot carry it off if caught by a foot.

Poisoned Bread Crumbs: Formula

Wood rats are rather difficult to poison in any numbers. Usually the first few take the poison readily, then the others become suspicious and will not touch it or else will leave the premises.

Mix thoroughly 4 pounds of dried bread crumbs, finely ground, and 1 ounce of petrolatum oil or glycerin and then stir in slowly 1 ounce of strychnine (alkaloid powdered) until completely mixed.

Expose in teaspoonful quantities. Prebaiting or exposing clean, un-poisoned bread crumbs for a few nights, to get the rats accustomed to eating them, before putting out the poisoned crumbs, is a good plan. Try to put out enough poison in well-scattered places to feed the entire rat population of the premises the first night. After one night's poisoning, pick up and destroy the dead rats and the unused poison. Do not try poisoning again for about 2 weeks.
**Kangaroo Rat**  
(Dipodomys ordii luteolus)

**Range, Description, and Habits**—The kangaroo rat (fig. 10) is found in various localities over the eastern third of the state. It does not have a general distribution over this area but is localized on the tracts of land that are most suited to its needs. Although not of major importance, it has increased to such an extent that its competition has been keenly felt during these last few years of drought.

![Fig. 10. Kangaroo rat (Dipodomys).](image)

The kangaroo rat, is a small rodent with elongated hind legs and short front legs. It hops along on its hind legs and can leap several feet into the air or along its line of travel. The front legs are used mainly to assist in putting food into the external fur-lined cheek pouches, one on each side of the head. It has a short, robust body with fairly long and soft body hair; a large head; large eyes; rounded ears; and a tufted tail, about 30 per cent longer than the body.

The upper parts are a dusky cinnamon buff darkest along the backbone and gradually getting lighter until they meet the distinct white line of the pure white under parts well down on the sides. There is a light spot over each eye and a white patch of hair back of each ear. The ears are a blackish brown blending into buff and white hairs at base. Some of the whiskers are long and blackish; others short and whitish.

The tail has two distinct brownish and two whitish stripes running its full length. The tuft at the end of the tail varies from a buff to brownish.

The kangaroo rat’s den is in the more sandy loam types of soil that work easily, yet pack enough to prevent cave-ins. Rat mounds are found in alfalfa fields, grain fields, sage brush flats, or open grassy areas. In fields the rats annoy by destroying considerable forage and leaving the ground in a plowed-up state that makes harvesting of hay or grain difficult. As a rule, on certain tracts numerous rat mounds, then rat-free acres, and then another system of mounds are found.

Their infestations are distinctive and their working habits very interesting. They work only at night and then only during fair weather. They gradually build up mounds as the dirt from their burrow diggings is brought to the surface. There are usually several openings into the mounds, which apparently are used, plugged up, cleaned out, and used again as the occupant sees fit. Underneath the ground there is quite an intricate system of old and new tunnels, which lead to the food stores and nests.
Only during the breeding and maternal seasons are there more than one rat to a mound. Very little is known of the kangaroo rat's breeding habits in Montana. Observations indicate that the breeding season varies throughout the year and that one litter or more of from one to three young is produced. In captivity, this is a docile little animal, but it does not like company of its own kind and will viciously fight an intruder of either sex.

The kangaroo rat is active the entire year and depends upon stored food to tide it over the winter months and periods of unfavorable weather. It builds nests of grass and relies mainly on seeds and fruits for food. Excavations of dens have uncovered varied food stores from 2 to 12 pounds in weight. Stores of native grass seeds and crowns, alfalfa seeds, wheat, oats, barley, and other unidentified seed and crown material have been uncovered.

The type of food stored clearly shows the damage kangaroo rats do to plants. The destruction of plant seeds and crown does a great deal more harm than that of blades or leaves.

Control by Poisoned Oats

Due to their preference for seeds, kangaroo rats can very easily be killed with poisoned grain. Obtain or prepare strychnine-poisoned whole oats as for the Columbian ground squirrel (p. 7) and scatter tablespoonfuls about entrances of burrow. One rat will probably fill its cheek pouches with grain before getting enough strychnine to kill it, as its storing habit usually prompts it to store food before it is eaten. Poisoned grain scattered along the distinct rat trails leading from the mounds will also give satisfactory results.

Field Mice

(Microtus, various species)

Range and Habits—No part of Montana is free of the so-called field mice. There are a number of different species, any or all of which may become troublesome to some phase of agriculture. Some of the more common ones are the meadow, white-footed, red-backed, tree, harvest, pine, and grasshopper mice. Because they are much alike, a control measure that is effective against one is quite likely to succeed against another.

In some sections of the state field mice infest granaries and barns where they destroy much grain, gnaw harness, cut sacks, etc. In other sections, they attack fruit trees and shrubs or infest stacked hay and grain in destructive numbers. During certain years meadow mice become so numerous in pasture or hay land that they cut down the crop yield seriously and plow up many acres of fertile soil. Mouse infestations go in cycles, which are governed by natural local conditions, food supply, natural enemies, prevalence of disease, and activities of the farmer.

Control In Buildings

Field mice frequently infest a barn or granary and do considerable damage, especially during the winter months in Montana. These pests are much easier to exterminate than the house mouse. First, pick up all refuse, hang empty sacks on rafters, and keep the building clean so that mice cannot find a place to hide.
Poisoning

Obtain strychnine-poisoned grain baits as shown on page 7 and expose at various places throughout the buildings.

Caution: Do not put the poisoned grain in places where animals or birds will be endangered, or where there is any likelihood of it becoming mixed with clean grain.

A poisoned water preparation, consisting of 1 ounce of strychnine (sulphate) dissolved in 1 gallon of hot water, exposed in a shallow container may also give good results.

Repellent Paint

Should the mice attack harness or other leather goods, paint the posts or walls on which the harness hangs with a good pine tar product. Mice dislike the odor of tar and will usually keep away from it.

Control in Orchards and Small Fruit Plantings

Field mice often attack the bark of fruit trees or berry bushes and completely kill or seriously injure them. Frequently they build their nests out of litter at the base of trees or bushes and fatally injure the growth before the owner is aware of their presence. Every fall and spring the orchardist should inspect his trees and bushes to detect the presence of mice. Should any be found, take protective measures.

Clean Cultivation

First, all refuse or litter should be cleared away for several feet from around the trees. This often solves the mouse problem. Mice naturally seek refuse in which to hide and build nests and will not stay where there is no protection.

Repellent Washes

If clean cultivation is not possible or does not give relief, repellent washes may be tried. On trees over two years old, a wash of 1 part creosote oil and 2 or 3 parts coal tar is quite effective. This preparation may injure the bark of young trees and bushes, however, and should not be used on them.

The common undiluted lime sulphur solution is quite an effective general purpose wash but does not remain on the tree long. By adding 1 pound of glue to 1 gallon of the solution the adhesive qualities of this wash are much improved. Apply the wash from the ground to a height of 18 inches or 2 feet. This may also act as a repellent for rabbits.

Mechanical Protection

Trees or bushes are quite effectively protected against meadow mice and rabbits by woven wire netting of ¼-inch mesh, wood veneer, painted galvanized wire, or heavy paper placed loosely around the tree to a height of about 18 inches. These protectors should be removed in the spring so as not to harbor the larvae of insect orchard pests.

Trapping

The most effective control measure to use against field mice is to
kill them by trapping or poisoning. Trapping, although a reasonably sure method, is quite slow and expensive, and is practical only in small orchards or plantings. Use ordinary little snap traps.

Poisoned Grains

For general use, strychnine has been found to be the most effective field mouse poison. Its use must be varied to meet the local condition. There are several successful strychnine-poisoned grain baits. Rolled oats bait as prepared for the Columbian ground squirrel (p. 7) is good if properly used. Establish poison stations throughout the orchard by making a number of false boxes with top, bottom, and only two sides, and place the bait inside. Make top of box 8 inches square and bottom 6 inches square. Fasten together on opposite sides with 1½-inch strips. Pieces of 1½-inch pipe, glass jars, or inverted troughs may also be used as poison stations. Clean out stations and add fresh bait frequently. Another successful strychnine preparation is mixed about the same as for the Columbian squirrel except that wheat is substituted for the whole or steam-crushed oats.

Control in Stacked Grain or Hay

It is very difficult to get rid of any number of mice that have infested a grain or hay stack if they have become well established. Poisoned grain baits and repellent preparations are used.

Poisoning or Repellents: Formulas

Some mice can be killed by exposing poisoned grain, as mixed for ground squirrels, under inverted troughs at the base of the stacks, but no permanent control can be gained this way. The most practical method is to mix a repellent preparation with the hay or grain as it is being stacked.

Mix 1 pint of salt with 2 tablespoonfuls of sulphur and dust this over the grain or hay as the layers are added. Hydrated lime may also be used in stacked grain in the proportion of 7 or 8 pounds to each ton of sheaf grain. Hay or grain may also be stacked over inverted troughs of 1½-inch pipes in which quantities of poisoned grain have been placed.

Control in Meadows by Poisoned Oats—Very seldom do mice get so numerous in the meadows in Montana as to demand attention. If this happens, they can usually be controlled by scattering the standard poisoned oats around on the infested ground.

House Mouse

(Mus musculus musculus)

Range

The well-known common house mouse is found any place where there are buildings that it can enter. This mouse, like the brown rat, is an introduced species and has become one of the major pests. Like the rat it can adapt itself to almost any condition and thrives on filth.

Control

Trapping—There is no better method of controlling house mice than by trapping. Use the ordinary little wood snap trap; try a variety of
baits fastened securely to the trigger and change the location of traps often to obtain good results.

Poisoning: Formulas

In large buildings, such as warehouses, where trapping would be a long, expensive job, the mice must be poisoned. If the number of mice is to be kept at a minimum, different poisoning systems must be used, as the mice soon become wary of one particular bait. Poisoned water has been used in some localities with success, and poisoned oats, bacon, and other foods have proved successful.

Caution: Strychnine will kill cats and dogs. Expose the bait carefully.

Poisoned water—Dissolve 1 ounce of strychnine sulphate in 1 gallon of hot water. Place some of this solution in shallow pans about the building where mice are doing damage. Keep the dead mice picked up and the water pans full.

Poisoned steam-crushed oats—Obtain standard steam-crushed oat bait and place out in small containers. Ordinary oatmeal substituted for the steam-crushed oats frequently gives better results.

Poisoned bacon—Strips of bacon cut into long, thin, narrow pieces and sprinkled with powdered strychnine, sometimes do a good job. A variety of other foods can also be mixed with strychnine alkaloid to make a good mouse bait.

Jack Rabbit

(Lepus campanius)

Range, Description, and Habits—Jack rabbits are not true rodents but closely resemble them and can be treated accordingly. They are found in every county in Montana. In the higher timbered elevations they are relatively scarce, but at times can be counted by the score in the plains areas of the northern and eastern parts of the state.

Their abundance or scarcity is governed a great deal by weather conditions, food supply, and prevailing rabbit diseases. This means irregular cycles of jack rabbit infestations with consequent damage to agriculture. For years “jacks” may be so scarce as to command little attention, and again they may come in droves and raid crops, causing heavy losses to the farmer.

There are several species of jackrabbits in the state, but the most abundant is the white-tailed. A smaller western white-tailed jack rabbit and a black-tailed species also occur, both closely resembling the white-tailed except that they are smaller and the black-tailed has a black-tipped tail. The white-tailed jack rabbit is large and heavy-bodied with large ears and a fairly long tail.

In summer this “jack” has a more or less uniform buffy gray upper coat with slight yellowish tinge. The tail is usually all white, but occasionally has a faint dusky median line above. The under parts are always white except for a little gray on the throat. The legs are marked much alike,
with hind feet more whitish than the front. The ears in summer are a buffish gray with black tips.

In winter the entire outer coat is pure white except for black-tipped ears and somewhat irregular grayish patches on top of forefeet, nose and about eyes, and sometimes a reddish tinge about the front and inside of ears. There is usually an underfur of grayish or buffy brown on the top coat that cannot be seen except on close examination. This rabbit breeds in early spring and produces an average litter of four young. During some favorable years it may raise several litters.

Control

During years when jack rabbits are abundant, they must be controlled or agriculture suffers heavy losses. When scores of rabbits feed on growing alfalfa, cured hay, or grain crops they destroy large quantities of stock feed.

Experiments conducted by the biological survey in Arizona show that the average jack rabbit consumed 0.68 pound of green food per day. On this basis as few as 11.8 “jacks” consume as much green forage in a day as an average sheep, and 58.8 “jacks” eat as much as an average 750-pound cow.

Experiments with cured alfalfa hay show that it takes only .14.2 jack rabbits to eat as much dry feed as does the average 120-pound ewe. There are two general methods of control—poisoning and driving.

Poisoning: Formulas

Summer control is very difficult in this state. Shooting is about the only method that brings results in that season except during very dry years when the rabbits congregate about green fields and can be poisoned. Control is most successful during the cold winter months when feed is scarce and snow is on the ground, as the rabbits usually concentrate then about certain food areas, such as alfalfa fields or stacks, and will eat poisoned bait more readily.

Poisoned Green Alfalfa Tips—A fairly successful summer bait is prepared as follows: Place 10 pounds of fresh green alfalfa tips in a tub and sift 1 ounce of powdered strychnine alkaloid over them. Mix until all alfalfa is coated and has a grayish appearance. Distribute in evening and early morning in small handfuls along trails, back from a green field.

Caution: Great care must be taken to expose this bait so that it will not be picked up by livestock. All mixing equipment also must be kept plainly labeled and out of reach of irresponsible persons and livestock.

Poisoned Alfalfa Hay Leaves—Poisoned alfalfa leaves have given more uniform results in this state than grain baits. Put 10 pounds of alfalfa hay leaves in a tub or other container and sprinkle over this a solution made by dissolving 1 ounce of strychnine sulphate in 2 gallons of hot water. Mix leaves thoroughly and distribute in small handfuls in lines a few feet apart, back from fields where rabbits come to feed.

If the snow is deep put this bait only in trails or corrals that have been prebaited with clean alfalfa leaves. If strychnine sulphate is not
available, strychnine alkaloid may be used by substituting 1 quart of vinegar for 1 quart of hot water.

Jack Rabbit Drives

In communities where jack rabbits are unusually abundant, organized drives can be conducted with success if everyone in the community cooperates. Several hundred people can be used on a drive if capable leaders organize them properly before starting operations.

Some seasons the rabbit fur is marketable for felting purposes so that it pays to pelt them. Occasionally the meat can be sold to fur farms or dog kennels so that the drive may pay for itself.

First, select a suitable location for a corral, preferably at one end or side of the rabbit-infested area, if possible in natural cover, such as brush or rank growth of weeds and grass, as the rabbits will enter the pen more readily there than if it is placed in the open. It will help if it can be placed on a slight elevation, as rabbits invariably run uphill when disturbed, if they can.

The corral should be at least 50 feet in diameter and constructed of 2-inch mesh wire netting, 36 inches high. The netting can be held upright by 7/16-inch iron rods or by steel or wooden fence posts driven into the ground to a depth of at least one foot.

From each side of the corral entrance, a wing should be built extending forward and outward for at least one-third of a mile to form the sides of an inverted V- or fan-shaped area. If a portion of a fine mesh woven wire fence already in place can be used for pen or wings it will minimize costs.

Assemble the people, both horsemen and footmen, who are to take part in the drive and instruct them to form a semicircular line of drive with its center (preferably the horsemen) at least a mile and a half in front of the corral entrance and with its end beaters about a quarter of a mile from the ends of the wings. Have each person carry a stout club for driving and killing the rabbits. Permit no guns, for fear someone may get hurt.

Appoint a leader for each five persons and make each leader responsible for keeping his men in the proper order during the drive, at the start of which the interval between beaters should not be less than 20 to 30 feet, gradually decreasing as the drive closes in.

At a given signal from one person in charge of all, the entire line should move forward, slowly and steadily. The group leaders must see that their men keep in a uniform position at all times, gradually moving in toward the corral, driving the rabbits ahead. When a few rabbits enter the corral the rest will follow. Then the gates should be closed and the rabbits killed.

Drive contiguous areas every 10 days or two weeks until the rabbits are very few in number. Make the drives organized barbecues and the attendance as well as results will be gratifying.

*For more complete details on driving and construction of pens, write to the Chief, Bureau of Biological Survey, Washington, D. C., for leaflet BS-69, Directions for Organizing and Conducting Rabbit Drives.*
Cottontail Rabbit
(Sylvilagus nuttalli grangeri and S. auduboni baileyi)

Range, Description, and Habits—Cottontail rabbits can be found over most of Montana but reach their greatest abundance in localities supporting brush, heavy rank grass, or badlands. Very seldom are they found on the open plains in typical jack rabbit areas. Like the jack rabbit, the cottontail is not a true rodent but can be treated as such for control purposes. There are several species, similar in general appearance. The Wyoming and Black Hills cottontails predominate.

The cottontail rabbit is of small to medium size, with fairly long hind legs and shorter, weaker front legs. It has a short, fluffy tail, white below and rusty brown to gray above, which suggests the name cottontail. It has large ears, but they are not out of proportion to the rest of the body.

In summer it has an upper coat of dark buffy brown with reddish tinge blending into the gray of the sides and white under parts. In winter it has a more uniform grayish coat with darker rufous wash. The legs in both summer and winter are of a darker hue than the upper coat.

Cottontails raise several litters of three to seven young a year in this state, from early spring until late fall. In years of abundant food, mild climate, few natural enemies, and no disease, the cottontail propagates very rapidly. It is quite susceptible to rabbit fever (tularaemia), and dies off in large numbers when stricken with this disease.

Control

The cottontails for the most part are small game animals in this state and provide much sport for the .22 rifle enthusiast. They are very good eating when thoroughly cooked. Very seldom do they become sufficiently numerous in any locality to do any damage. Occasionally, however, they congregate about some particular orchard, truck patch, or small fruit farm and have to be checked. For the average farmer who is bothered by just a few, the best method of control is to trap or shoot them.

Trapping or Shooting

Cottontails are easily caught in the old-fashioned box traps or other newer inventions. Bait the trap with a piece of apple or carrot, and the rabbit cannot resist the desire to enter.

Mechanical Guards or Repellent Washes

In orchards where rabbits are working on fruit trees, use one of the mechanical guards or repellent washes as described under field mouse control. If impractical, the remaining control measure is poisoning.

Poisoned Grains

The strychnine-poisoned whole oats bait (p. 7) put out in tablespoonful quantities near the trees where rabbits have been working often gives good results. Strychnine-poisoned alfalfa leaves, as for jack rabbits, also make a good cottontail bait.