

# AGRICULTURAL EXPERIMENT STATION

KANSAS STATE AGRICULTURAL COLLEGE  
MANHATTAN, KANSAS

DEPARTMENT OF ZOOLOGY

## CONTROL OF MAMMALS INJURIOUS TO AGRICULTURE IN KANSAS <sup>1</sup>

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### INTRODUCTION

The mammals, or haired animals, that are injurious to agriculture are nearly all gnawing animals called rodents. Rodents are distinguished by the presence of two long curved chisel-like teeth in the front of each jaw. This paper deals with rodent control, or suppression of those rodents which are *harmful*, such as the pocket gopher, prairie dog, and rat. It also deals with the destruction of the mole, which is chiefly an insect-eating animal and is not a rodent.

While destruction of the distinctly harmful types of mammals is encouraged, conservation of other wild life is urged.

### CONTROL OF THE POCKET GOPHER

**The Gopher.**—The pocket gopher has a bulky appearance, especially about the head and shoulders. The head is broad and flat, then eyes are small and shotlike the legs are short the front ones

1. Contribution No. 76 from the Department of Zoölogy.

NOTE.—The work of the Department of Zoölogy of the Agricultural Experiment Station in rodent control is in cooperation with the United States Biological Survey. The work of the Biological Survey is performed through the Division of College Extension. Kansas State Agri-

having long curving claws with which the animal can tunnel rapidly. The tail is short and almost hairless. The gopher has a vicious disposition.

**Description of Mounds and Runways.**—The work of the gopher should not be confused with that of the mole. From its main tunnel, which may be crooked, branched, and long, the pocket gopher digs short lateral tunnels to the surface and here pushes out the soil in a mound, the shape of a palm-leaf fan or somewhat bean-shaped. (Fig. 1.) It plugs the opening of the lateral, and the plug may be seen as a circular area in the mound near the indented side. There is no ridging of the soil above the runway between the mounds as there is in the case of the mole. Mole mounds, if any are thrown up at all, also differ from those of the pocket gopher in that they are volcano-shaped, with the plug pushed up high in the center.

**Favorable Seasons for Control.**—If unmolested by man, gophers enter and soon take possession of alfalfa fields, because of the abundant food and the absence of natural enemies. The mounds smother plants and interfere with mowing. Large numbers of roots are cut, leaving the tops to die in dry weather. Gophers may be killed any time they are active. Especially favorable seasons are late fall, when food is being stored and burrows extended, and early spring, when new mounds are again thrown up. Later in the spring the vegetation tends to conceal the mounds and the gopher population will be doubled or trebled due to the birth of young.

**Methods of Eradication.**—*Baiting with poisoned wheat (formula 1, page 9)* is recommended as the best method of eradication. Poisoned oats are not equally efficient, probably due to the animal's hulling them somewhat, thereby losing part of the poison. Sweet potatoes or parsnips (formula 2, page 10) may be used, but are not so convenient as wheat in a community drive or in large fields. Gophers may be trapped with special gopher traps which are found on the market, but this method is slower, involves more labor, and is less effective than poisoning.

**Baiting.**—The main runway is found, by probing with a wagon rod or thin probe. (Fig. 1, *a*.) This is done about a foot (8 to 12 inches) from the mound, and on the side where the plug to the hole is seen. (Fig. 1, *A*.) When the rod has been pushed into the ground a few inches and suddenly sinks about three inches more without increased pressure, the runway has been located. The hole made by the rod is enlarged by inserting a sharpened broomstick (*b*). The

broomstick should not be pushed too far in or a depression will be made in the bottom of the runway, into which the bait will fall. With the broomstick properly inserted the top end of it is rotated in a circle to make the hole still larger and make its wall firm so they will not "cave in" (c). The stick is then drawn out, a partly heaping tablespoonful of poisoned grain or two or three pieces of sweet potato or parsnip are dropped in (d), and the hole is covered (e), care

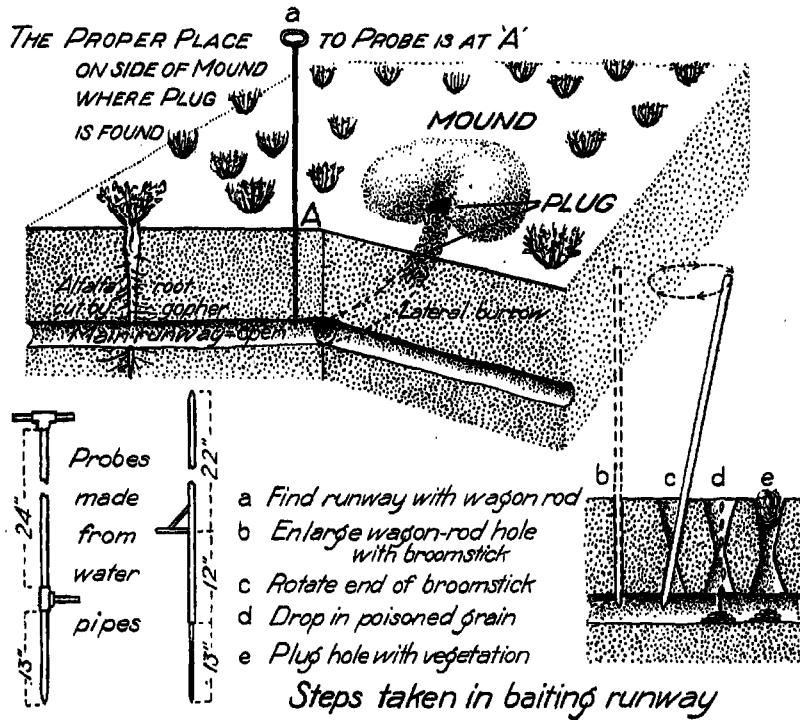


FIG. 1.—Diagrammatic representation of a pocket gopher runway, showing method of placing poison

being taken not to let dirt fall in and cover the bait. The mound should be marked by partially kicking it down. Every fourth or fifth mound should be baited, or each system belonging to one gopher should be treated in at least two places.

A probe made by a blacksmith from a water pipe about 34 inches long and a rod about 18 inches long is a help where much baiting is to be done. This probe and another type, preferred by some, are illustrated in figure 1.

**Rebaiting.**—If new mounds are thrown up after baiting, they should be treated as: before. Thoroughness pays, and as often as necessary re-treatment should be made. Whenever possible it is well to drag down the mounds after each treatment.

**Need of Cooperation.**—A farmer can keep his fields free from gophers more easily if all his neighbors are likewise working to destroy the gophers, hence the need for a community campaign against these animals.

#### ERADICATION OF THE PRAIRIE DOG

**Habits.**—The prairie dog is really a squirrel and lives chiefly on vegetation. Burrows are made which go down at an angle for a short distance, then almost straight down for ten or more feet, finally turning sharply to the horizontal. “Towns” are formed which spread over whole pastures reducing the grazing value 50 to 75 per cent. To prevent this loss and also to prevent damage to crops and the spreading of the animals to other farms, the community should unite to exterminate prairie dogs. In this the Kansas law aids, for it requires townships to provide materials, and township trustees to supervise the work of killing prairie dogs.

**Poison Grain Method.**—*The use of strychnine-poisoned oats is recommended as the cheapest, easiest, and quickest method of killing prairie dogs.* (Formula 1, page 9.) In efficiency it probably is practically equal to any other method, provided the baits are properly applied in clear weather. Kafir and wheat may be slightly more efficient, but are more readily taken by birds and should not be used except where it is impossible to secure clean, heavy oats. Prairie dogs may be poisoned anytime during clear weather when they are active. They take the bait most quickly when hungry, as early in the morning during late fall or early spring. Early spring poisoning is much preferable to late spring poisoning because it kills the females before the young are born. Also, some pastures are free from live stock at that time.

With a grain sack fastened (one upper corner tied to one lower corner) over the right shoulder and containing a peck or two of poisoned grain the “town” should be gone over carefully and the occupied burrows treated. A shaken tablespoonful of the grain, or about as much as one can pick out of the sack between the thumb and first, three fingers, is scattered by a throw of the hand on the dry, hard ground near the burrow. It should not be thrown on loose dirt, or in the burrow, or in the grass. When young are present and feeding,

two or three baits should be scattered near the home dens. *Emphasis must be laid on properly scattering the bait, otherwise live stock will be endangered by being able to pick up the grain.* If livestock show inclination to eat the grain they should be kept out until the bait is practically gone or there has been a heavy rain.

Re-treatment with Grain.—Not infrequently where the work has been carefully and thoroughly done all the prairie dogs are killed with the first treatment. More often, however, some animals escape. In two or three weeks the burrows which are still occupied should be re-treated with oats, rather liberally to make sure there is plenty of the bait. As before, *the grain should be well scattered.* If a third treatment is necessary, wheat or kafir bait should be used. Should a few “dogs” still remain, one may fumigate with liberal doses of carbon disulphide or calcium cyanide.

**Caution.**—*Keep poison grain away from children, irresponsible persons, and animals.*

**Fumigation.**—Near farm buildings, fumigation followed by closing the holes tightly with sod and dirt is less dangerous to farm animals than the use of poisoned oats. An ounce (about two tablespoonfuls) of carbon disulphide is poured on absorbent material (a dry corn cob or lump of horse manure will do) which is then rolled as far into the burrow as possible. The liquid evaporates to a heavy gas which sinks into the burrow. This method is very effective but is more expensive and laborious than the poison grain method.

Fumigation may also be done with calcium cyanide flakes, which in the presence of moisture generate hydrocyanic acid gas. A heaping tablespoonful or one and one-half tablespoonfuls are put down the occupied burrow as far as possible with a long-handled spoon. Whether closing the holes yields better results has not been determined, but this should be done near farm buildings to avoid killing poultry. It is too early to state whether calcium cyanide is equal to carbon disulphide as a fumigant. Like the latter it is more expensive than the poison grain method.

**Caution.**—*Keep carbon disulphide and calcium cyanide in tightly covered or stoppered containers and away from children. Handle only in the open air. Avoid breathing fumes. Do not smoke when handling carbon disulphide.*

### CONTROL OF THE GROUND SQUIRREL

**Habits.**—On account of their insect-eating habits the thirteen-line ground squirrels should probably not be destroyed except where they are known to do serious damage to crops. Even then, reduction in number is rather to be sought than extermination, especially since they are easily killed and therefore not hard to control,

The gray ground squirrel is larger than the thirteen-lined one and is somewhat spotted instead of striped. It is not abundant in Kansas. It tends to stay near woodlands. Both species of ground squirrels sometimes dig up and eat sprouting seed corn.

**Methods of Control.**—A teaspoonful of poisoned oats (formula 1, page 9) is scattered near the entrance to the burrow but not in the burrow. Oats are preferred because they are not readily taken by birds. In addition, to treating at the burrows, some of the poisoned oats may be scattered in the part of the field where the corn is being dug up.

### CONTROL OF THE WOODCHUCK OR "GROUNDHOG"

The woodchuck is found in eastern Kansas. When numerous, woodchucks may do much more serious damage than ground squirrels. They may be trapped to some extent. Treating with two tablespoonful doses of poisoned oats (formula 1, page 9) scattered on the ground near their burrows will reduce their numbers. The kind of grain should be changed when re-treating. The remaining animals may be gased with carbon disulphide or calcium cyanide as directed for prairie dogs. The burrow should be tightly covered. Re-treatment should be applied to any opened after a week.

**Caution.**—*Keep all poisons away from children. Do not smoke while handling carbon disulphide. Avoid breathing fumes of either carbon disulphide or of calcium cyanide.*

### CONTROL OF THE MEADOW MOUSE

Very serious injury to fruit trees may be done by mice. The trees may be protected by pushing cylinders of quarter-inch mesh wire netting into the ground around the tree trunks. If these are 18 inches high they will serve as protection against cottontail rabbits also. Sheltering vegetation around the base of the trees and also between the trees should be removed. A wash of about 1 part creosote oil to 2 or 3 of coal tar may be applied to trees two years old or over. It would injure young trees. It would also injure older trees below the level of the ground. Much good can be done by trapping with the wood and wire spring traps used for house mice. In larger

orchards poisoned wheat (formula 1, page 9) should be placed in pieces of drain pipe or wooden poison stations next to the bases of the trees. The wooden stations consist of a board for floor and a somewhat wider board for a flat roof. A strip one and one-half inches high is nailed between the two boards at each end. The floor may be hollowed out to hold the poisoned grain, which should be supplied as needed. Sweet potato bait (formula 2, page 10) may also be used.

#### CONTROL OF THE HOUSE MOUSE AND THE RAT

The house mouse may be successfully trapped with the small inexpensive snap traps on the market. Baiting with cheese, oatmeal, bacon, etc., is satisfactory. They do not "get wise" to trap as rats do. The writer has eliminated mice by scattering poisoned wheat on the concrete floor of the basement. The mice died near the grain and *so* were easily found. Barium carbonate as directed for rats may also be used.

Rats do untold damage and are difficult to eradicate. Only a brief statement can be given here. Special bulletins on rat control are available. Dwellings should be built rat proof. The basement should be lined with concrete. No openings should be left between the basement and the spaces within the walls of the house. These should be closed with concrete or plaster. If rats do occur in a house, use different traps and baits, varying them from day to day. Barium carbonate may be used in the house for both rats and mice, but there is some chance of the animals' dying there. Rats in stables, granaries, and corn cribs are best poisoned with barium carbonate, though often very good results are obtained with poisoned grain (formula 1, page 9). The barium carbonate (1 part by weight) is mixed with the following moistened baits (4 parts): (1) Ground or mashed meats or fish, (2) pieces of fruit or vegetables, and (3) cereals. Teaspoonful baits of all three kinds are wrapped separately in pieces of paper or small paper bags. The bags are scattered in places where rats occur. Remaining baits must be removed and destroyed each morning and fresh ones put out each evening. This should be done till the rats are gone. Eggs mixed with barium carbonate and set out in half shells have been recommended. If possible other foods should be kept away from rats before poisoning is commenced.

The keeping of a rat terrier or a Scotch terrier dog, trained to catch rats, has been suggested to the writer as a good means of freeing farm buildings of rats.

*Caution.*—Keep barium carbonate away from children and domestic animals, including cats, dogs, and poultry.

### CONTROL OF THE RABBIT

Where rabbits are not very abundant, hunting may be the only method of control needed. Cottontail rabbits may also be trapped in box traps 6 x 6 x 21 inches, a wire door falling shut when a long wire trigger holding it up is pushed back by the rabbit. In the winter, trees may be protected from rabbits by painting with a poison wash (formula 3, page 10). Cylinders of one-inch mesh poultry netting may be fastened to stakes around a tree to avoid injury by rabbits. Wood protectors or burlap wrappings securely tied to the base of the tree are effective, but should be removed in the spring as they afford protection for insects. Feeding rabbits in the winter to prevent their attacking orchards may in some cases be worth while. Winter prunings may be left in the orchard.

Jack rabbits afford considerable sport in hunting and whole communities sometimes unite in a rabbit drive. An area of several square miles is surrounded and the animals are driven from all sides towards a corral. Wing barriers guide the animals into the inclosure, where they may be slaughtered and, if the weather is cold, disposed of for food.

Rabbits may be killed with poisoned oats (formula 1, page 9) scattered in tablespoonful doses along their paths. Partly ripe heads of wheat or barley soaked in the strychnine mixture may be scattered along the rabbit runs but care must be taken lest they be eaten by live stock. In winter apple tree twigs may be dipped in the poison mixture and used as baits.

### THE MOLE IN GARDEN AND FIELD

**Work and Habits.**—The mole is not a rodent and therefore does not have the long, curving, chisel-like teeth of the animals already considered: Instead, it has a larger number of small teeth adapted for eating grubs, insects and worms, which comprise most of its diet. It has a soft, pointed snout, has no visible eyes, and its fore legs are very strong and armed with broad trowel-like nails used in digging and pushing up the ridged runways. These raised ridges in the field distinguish its work from that of the gopher, which does not produce ridges between its mounds. The mole hill, if present, differs from a gopher mound in that it is rather cone-shaped, highest in the middle, and rather rough. The gopher mound is bean- or fan-shaped and is smooth and rounded on top.

While their habits of eating insect larvae are beneficial, moles may become obnoxious in undermining lawns and in following the corn



rows in the fields, especially if the corn has been listed. Probably the mole starts to follow a row because of the ease in tunneling for insects. That it eats the corn in its path can no longer be doubted. It has been found by Dr. F. L. Hisaw and verified by the writer that moles normally eat considerable corn when it is available.

**Methods of Control.**—Because of their food habitse moles are difficult to poison, and trapping with a good mole trap has proved to be the most effective means of control. Of the three types of traps most common on the market (harpoon, scissor blade, and choker), the choker appears to give best results. Whichever type is used, the directions that come with the trap should be followed carefully. Each trap has a broad trigger which should rest on the ridge of the runway, the ridge being first pressed down flat at that spot. When the mole comes through the runway again it raises up the depressed portion and springs the trap.

Putting lye in the runways has been recommended as a means of killing moles. The use of barium carbonate mixed with hamburg steak and the use of poisoned corn (formula 1, below) are being tried by the writer. No conclusive results have as yet been obtained.

#### POISON FORMULÆ

##### 1. Poison Grain

In a gallon pail containing three-fourths pint of boiling water, mix slowly and thoroughly 1 ounce powdered strychnine (alkaloid), one-tenth of an ounce saccharin, and 1 ounce common baking soda (bicarbonate). Next add 1 tablespoonful of glycerin, then a heaping tablespoonful of dry laundry starch (first dissolved in a little cold water), and finally one-fourth of a pint of heavy corn sirup. Stir well while adding the different substances. The soda foams when the sirup is added, hence the container should be large. After stirring several minutes, pour the mixture while still hot over 13 quarts of *clean heavy* grain and mix until all the grain is coated.

For 10 bushels use 5½ quarts of water; 25 ounces, strychnine; 2½ ounces, saccharin; 1½ pounds, baking soda; 4 ounces, glycerin; 1 pound, laundry starch; and 7 pounds, sirup. A dish pan or can holding more than five gallons is desirable for mixing the poison. Mix the grain with shovel on concrete or water-tight floor.

Poisoned wheat and oats may both be Obtained from the Department of Zoölogy of the Agricultural Experiment Station, K.S.A.C., Manhattan, Kan., at approximately cost. A current price list will be sent on request.

**2. Sweet Potato Bait**

Cut 4 quarts of sweet potatoes or parsnips into cubes a half inch or less in length. Wash and drain. Place in a metal pan. Sift slowly over the moist bait one-eighth of an ounce of powdered strychnine (alkaloid); one-eighth ounce, baking soda; and one eightieth of an ounce, saccharin (all shaken together or ground together in a mortar), stirring to distribute the poison evenly.

Small shakers of the above mixture may be procured from the Department of Zoölogy of the Agricultural Experiment Station, K.S.A.C., Manhattan, Kan.

**3. Poison Wash**

Dissolve 1 ounce of strychnine (sulphate) in 3 quarts of boiling water. Dissolve one-half of a pound of laundry starch in 1 pint of cold water. Pour the starch into the vessel containing the strychnine. Boil a short time till clear. Add 6 ounces of glycerin, stirring thoroughly. When cold enough, apply with a paint brush to the tree trunks.

**INFORMATION REGARDING PURCHASE OF POISON BAIT**

**Baits Available at the Poison Laboratory.**— In order to make available at all times poison baits of the kind recommended the Department of Zoology of the Agricultural Experiment Station maintains a laboratory for the manufacture of poison grain (formula 1) and of the mixture to be used on sweet potatoes (formula 2). All poison materials are unmailable. Small orders go by express. Larger orders can be sent by freight if requested. *Terms:* Cash or C.O.D. The express company adds 30 cents or more for collection on C.O.D. orders.

**Amount of Bait Required.**— One quart of grain is enough for about 40 baits for prairie dogs, pocket gophers, and rabbits; 20 baits for woodchucks; or about 80 baits for ground squirrels. Directions for poisoning should be read and an estimate of the amount of grain needed made before ordering. In order to save express, it is better to order sufficient grain in one shipment than to send for two smaller shipments. Baiting directions are found in this circular, and also in each sack of grain. Poisoned grain retains its strength indefinitely if kept dry.