BIOLOGY AND CONTROL OF THE NORTHERN POCKET GOPHER *(Thomomys talpoides)* IN ALBERTA

DESCRIPTION

The northern pocket gopher is a 20-cm long, burrowing rodent with a large head, small eyes and ears, stout body, thick and muscular forearms with long, curved claws, and a short, nearly naked tail. It has prominent, yellowish chisel-like front teeth that grow continuously and are used to cut vegetation. The pocket gopher is named for its external, fur-lined cheek pouches which open on either side of the mouth and are used to carry food. The fur is fine and soft, usually steel-gray on the back and slightly paler on the belly. Gophers weigh, on average, 150 g; adult males are larger than adult females.

SIMILAR SPECIES

The northern pocket gopher is also commonly referred to as a "mole". True moles feed on insects and are not found in Alberta. Mammals other than the northern pocket gopher that are frequently called "gophers" are the **thirteen-line ground squirrel** (*Spermophilus tridecemlineatus*) which is similar in size to the pocket gopher and has alternating dark and light stripes on the fur, and the **Richardson's ground squirrel** (*Spermophilus richardsonii*) which is 30-cm long with a light ventral fur and a yellowish brown dorsal coloration speckled with darker hair. They both forage on the surface of the ground in the daytime. They hibernate from late summer to early spring.

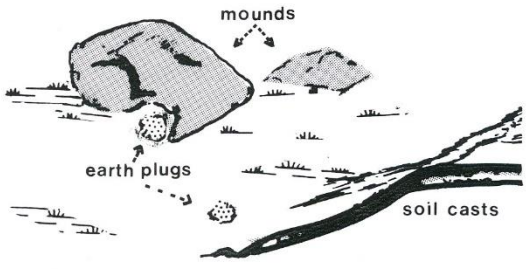
DISTRIBUTION

The distribution of the northern pocket gopher in Alberta coincides with that of the most suitable soils for agriculture, i.e., the dark brown and black soils of the southern and central agricultural regions. Pocket gophers are found in pastures and haylands, particularly alfalfa fields, and surrounding crops (peas, canola, and others), headlands, shelterbelts, gardens, golf courses and urban parks.

GOPHER BURROW SYSTEMS

Pocket gophers are active throughout the year. They use their strong front claws and sometimes their large incisor teeth to excavate extensive burrow systems. These consist of tunnels reaching one or more nest chambers, located more than 30 cm below the surface. Contrary to ground squirrels, pocket gophers usually maintain a closed burrow system.

The size of burrow systems varies with vegetation, soil conditions, and water drainage. The course of a burrow system is usually marked by a series of **mounds** which are concentric piles of soil pushed to the surface of the ground during the maintenance and expansion of the tunnels. **Earth plugs** are also visible on the ground. They are 3-8 cm diameter holes filled with non-mounded soil connecting the underground tunnels to the surface. Sometimes, in winter, gophers dig tunnels through snow and pack them with soil which appear as **soil casts** when the snow melts.



REPRODUCTION AND DISPERSAL

Except during the breeding season, pocket gophers are solitary animals. Their average lifespan is 2 years or less. They are sexually mature at 1 year of age. Breeding occurs in spring and females usually have one litter of 2 to 10 young in April-May. However, work conducted in central Alberta indicated that a few of them also had a second litter. Young gophers start to leave maternal burrow systems in mid-June. This dispersal lasts until late summer and is associated with an increase in mounding. During this dispersal, young gophers travel above ground, sometimes covering distances exceeding 60 m within a week.

MORTALITY

Little is known about mortality in pocket gopher populations. Survival rates vary considerably between seasons and years according to habitat conditions, population densities, and relationships with other species. Mortality due to parasites and diseases does not appear to be important. When on the surface, pocket gophers are subject to predation, particularly by birds of prey such as hawks and owls. In Alberta, artificial perches were used to attract birds of prey in alfalfa fields but pocket gopher populations were not significantly affected. Coyotes (*Canis latrans*), badgers (*Taxidea taxus*), weasels (*Mustela* spp.), domestic cats (*Felis domesticus*) and snakes are also known to feed on pocket gophers. However, predation is not sufficient to influence the size of pocket gopher populations inhabiting alfalfa fields.

FOOD HABITS

Northern pocket gophers feed on plants only. They change their diet seasonally in response to plant availability and nutritional values. Stem and leaf material are more important in summer; roots are more important in winter. Gophers will also cache plant material underground. Some of it, however, may only be discarded foodstuff. Pocket gophers do not limit their feeding activities to their burrow openings. Protected from predation by a vegetative cover, they travel on the surface, as far as 1 m (3 feet) away from their burrow system, to feed and gather stems and leaves.

POCKET GOPHERS ...

- are active during both day and night
- spend approximately 50% of their time digging and feeding
- can dig through soil at a rate of 4 cm (1 3/4 inches) per minute
- eat approximately 100 g (3 ounces) of fresh alfalfa daily.

ECONOMIC STATUS

The distribution of pocket gophers is not continuous within fields. Also, gopher population densities vary greatly among habitats, and from year to year. There may be as few as as 5 gophers/ha in newly established alfalfa fields or more than 25 gophers/ha in older ones. In haylands, pocket gophers' feeding and burrowing activities result in:

- a reduction in forage yield (farmers must cut the hay higher to avoid pocket gopher mounds);
- a reduction in forage stand life (high mound densities make forage harvesting difficult and force farmers to plow their fields before time);
- a greater forage contamination by soil;
- an increase in operational costs because of significant machinery breakdown and repairs;
- a reduction in the speed and efficiency of forage harvesting due to the roughness of the fields.

Pocket gophers also feed on tree roots, sometimes killing the trees, and they can delay the establishment of shelterbelts. They are considered a nuisance in gardens where they feed on vegetables, and in lawns, parks and golf courses. The annual economic loss caused by northern pocket gophers in Alberta has been estimated at more than $ 14 million per year.

HOW CAN POCKET GOPHERS BE CONTROLLED?

POISONING

Poison baiting is perceived as the most efficient means to control pocket gophers. Various 0.35 - 0.40% strychnine-treated cereal grains, 2% zinc phosphide pellets, and anticoagulants are marketed in Alberta for the control of pocket gophers. These are all dry baits that are used by the pesticide industry because they are easily handled and last longer. However, research carried out in central Alberta showed that:

- pocket gophers eat very little dry baits; because these baits are not attractive to pocket gophers, they usually fail to control their populations. Northern pocket gophers prefer wet baits (i.e., vegetables and fruits) to dry ones (i.e., cereal grains, pellets, ...)

- current strychnine-treated baits and zinc phosphide pellets are not readily accepted by pocket gophers. In the field, they generally control 35% or less of pocket gopher populations. Since female adults can produce, on average, 6 young during the summer, such a control level is inadequate.

Behavior is the first line of defence of pocket gophers against poison. Pocket gophers usually plug the tunnel area where a poison bait has been introduced into the burrow system. Also, many use the bait itself as plugging material. The bait is often mixed with dirt, abandoned, or possibly cached away. However, it is uncertain if gophers return to these specific caches.

Previous studies also suggested that pocket gophers had or could acquire a feeding strategy that would enable them to consume what normally is in excess of a lethal dose of a poison such as strychnine, by eating sublethal amounts periodically throughout a 24-hour period. Pocket gophers can also detect and avoid poisonous substances. The behavior of pocket gophers has prompted the use of anticoagulants which are slow acting and cause internal hemorrhages when they constitute a substantial part of an animal's diet over a period of days. Studies carried out in central Alberta showed that, when no other food is available, pocket gophers die from eating anticoagulants. However, in the presence of alfalfa, pocket gophers eat only small amounts of anticoagulant baits and do not die. Not enough poison is ingested to cause hemorrhages. It is also possible that pocket gophers feeding on alfalfa ingest sufficient amounts of vitamin K (antihemorrhagic vitamin present in plants) to counteract the effects of the anticoagulant.

FUMIGATION

Gases are inefficient to control pocket gophers. The animals can quickly plug off portions of their burrow system to block the passage of gases.

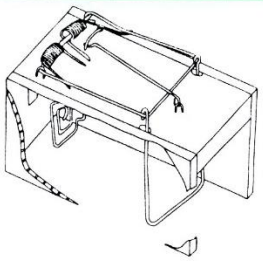
OTHERS

Farmers have tried everything and anything to control pocket gopher populations. Repellents such as naphthalene (moth balls), vibrators such as windmills, and chewing gum have all been recommended at some time to kill pocket gophers. Unfortunately, these recommendations based on testimonials (with little or no scientific support) do not work.

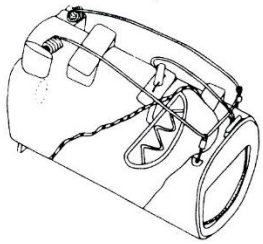
TRAPPING IS THE ONLY EFFICIENT WAY, AT THIS TIME,

TO CONTROL POCKET GOPHERS.

HOW TO TRAP POCKET GOPHERS ?



There are many models of pocket gopher traps on the market. However, killing box traps usually are more efficient than other trapping devices for the control of pocket gophers.

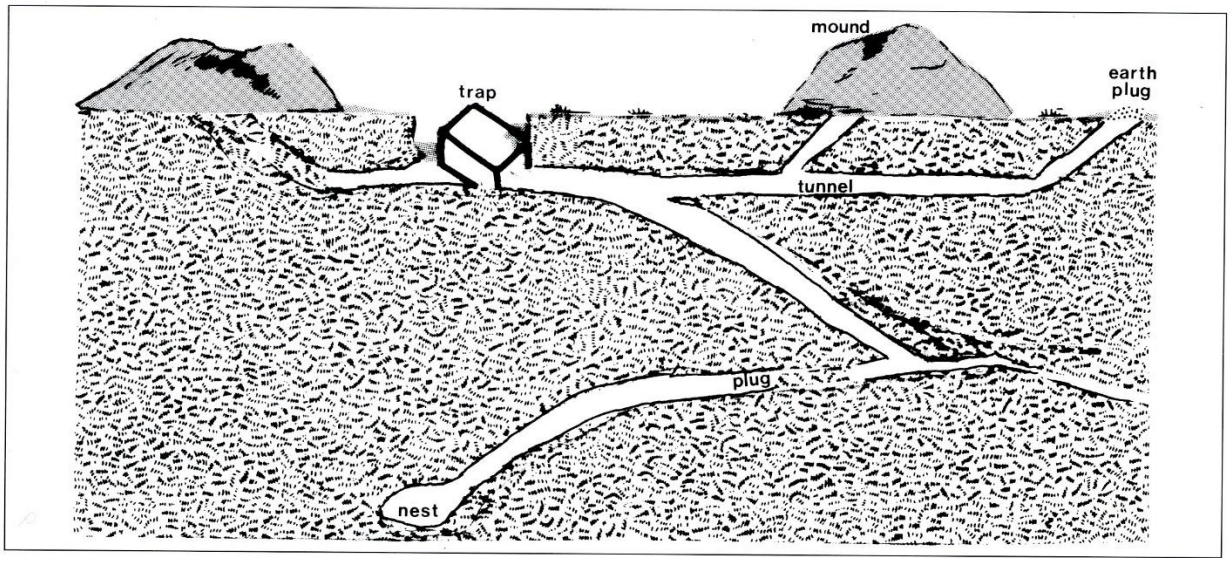


- The ConVerT -
A KILLING BOX TRAP

- The Blackhole -
A CYLINDRIC KILLING TRAP

SET THESE TRAPS AS FOLLOWS:

- ❑ Look for fresh mounds or earth plugs. Note that pocket gophers do not mound as much in spring as at other times of the growing season.
- ❑ Use a 1 m (3 feet)-long strong stick or metal rod to probe the ground 30 to 45 cm (12 to 18 inches) away from the mound to find a tunnel. The release of ground friction will be felt when the probe drops into a tunnel. A tunnel can also be found by probing through an earth plug located near the edge or in between mounds.
- ❑ Open the burrow system with a shovel.
- ❑ Insert a trowel or a stick in the tunnel and reach as far as you can in each direction to ensure that the tunnel is active and has not been plugged off.
- ❑ Set the trap into the tunnel's mouth. Ensure that no air can seep around the trap except through the airhole at the back of the trap. Set the trigger so that it can easily be fired. Tie the trap to a stake.
- ❑ Flag the burrow system for easy retrieval of the trap.
- ❑ Check traps daily.



THE BORDER CONTROL STRATEGY

If done properly, trapping can efficiently control pocket gopher populations. In fields that are 3 years old or less, pocket gopher populations can usually be brought under control with the *border control strategy:*

- Trapping must be initiated in early spring. Pocket gophers should be removed before early June. Use at least 2 dozen traps for 8 ha of hayland. Note: where pocket gopher populations are very dense or spread over large areas, initiate trapping in the fall of the previous year. It is unlikely that areas where pocket gophers have been trapped out will be reinvaded over the winter by pocket gophers inhabiting adjacent areas.

- Start trapping at the center of the field and move out toward the edges. Gophers are equally active day and night; no particular time of the day is better for trapping. Visit traps daily.

- Leave traps in the burrow systems for up to 48 hours. When a gopher is caught, level the mounds, plug all but one small hole in the tunnel and move the trap to another location. Monitor this small opening and if it becomes plugged, it means that a new pocket gopher has invaded the burrow system.

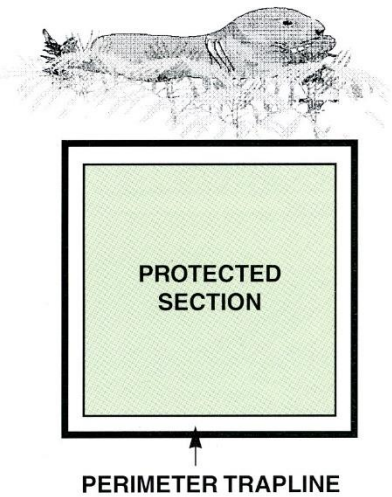
- When the pocket gophers have been trapped out, establish a trapline (at least 20 m wide) around the border of the field by setting traps in old burrow systems. Gophers do not invade fields equally from all sides, e.g., more animals will enter from a side bordering an alfalfa field with a dense gopher population than from a side bordering a woodlot with only a few gophers. Recognizing those areas will help to properly distribute traps around the field.

- Check the trapline at least once a week. Remove dead animals and reset the traps.

- Inspect the field on a regular basis (about every 2 weeks). Remove pocket gophers that have crossed the border trapline and established themselves in the field.

The implementation of the border control strategy requires a serious commitment from farmers, particularly during the first year when many pocket gophers must be removed. During the following years, however, control efforts are significantly reduced and farmers can easily keep pocket gopher populations under control.

A well-maintained trapline will intercept at least 75% of all invading pocket gophers.



The Border Control Strategy: an example ...

In a Camrose alfalfa field, in spring 1994, there were 22 pocket gophers/ha. After removing pocket gophers and establishing a perimeter trapline, the field was considered gopher-free in October 1994. In spring 1995, there were only 1.4 pocket gophers/ha and a perimeter trapline was re-established to intercept pocket gophers. In spring 1996, there were no pocket gophers in the alfalfa field.

A COMMUNITY APPROACH

Northern pocket gophers are well adapted to their environment and in alfalfa, the preferred hay crop in Alberta, their populations are thriving. Because pocket gophers are adaptable, their populations are also expanding in a variety of other crops. Therefore, one farmer's pocket gopher problem is also the neighbours' problem. Farmers attempting to control pocket gophers in their agricultural fields must speak to their neighbours and discuss their plans. If all the farmers of an area cooperate with each other to trap out pocket gophers and implement the border control strategy, pocket gopher control will be achieved more rapidly and with less effort. The control of pocket gopher populations would work best as a community affair.

ECOLOGICAL CONCERNS

Pocket gophers have inhabited Alberta for thousands of years and should not be exterminated from their native range. Their constant working and reworking of the soil and their impact on plant composition have contributed to the evolution of the western rangelands. A diversity of small mammals, reptiles, amphibians and insects inhabit their burrow systems. Pocket gophers are also part of the diet of many birds of prey and terrestrial carnivores.

Current poisons and gases do not adequately control pocket gopher populations and can harm non-target species. Traps can efficiently and selectively remove pocket gophers. Although trapping is labor-intensive and time-consuming, it produces tangible results.

THE COUNTIES' POCKET GOPHER CONTROL RESEARCH PROGRAM

In the past, toxic poisons such as thallium sulfate, sodium monofluoroactetate and strychnine (2-5% liquid concentrates) were used to control northern pocket gophers and other rodents. However, because of societal concerns and the possible poisoning of non-target species, they are no longer available for the control of pocket gophers. In the early 1990's, farmers with left with ineffective control methods and the pocket gopher problem in Alberta was considered to be beyond control. Despite the severity of the problem, nothing was being done to ensure adequate control of pocket gophers.

Impatient with the lack of research and tools available to control pocket gophers, affected Agricultural Service Boards throughout Alberta contributed funds with support from Canada-Alberta Environmentally Sustainable Agriculture Agreement (CAESA) and other groups towards a major research program to resolve the issue. From 1993 to 1996, a steering committee of Agricultural Fieldmen from the Counties of Lacombe, Ponoka and Red Deer worked closely with Alpha Wildlife Research & Management Ltd. to implement a multifaceted research program which:

- investigated the biology of the northern pocket gopher and studied the species' behavior below and above ground;
- showed that poison baits that are currently available on the market are inefficient for the control of pocket gophers;
- identified scents that attract pocket gophers to traps and significantly speed up their removal;
- developed a border control strategy that can efficiently control pocket gopher populations.

Text and Pictures: Gilbert Proulx, PhD
Alpha Wildlife Research & Management Ltd.

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Published by the Counties' Pocket Gopher Control Research Program.
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