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Fig. 1. Thirteen-lined ground squirrel,
Spermophilus tridecemlineatus (formerly *Citellus*
spp.)

THIRTEEN-LINED GROUND SQUIRRELS



Damage Prevention and Control Method

Exclusion

Buried galvanized hardware cloth is effective, but very expensive.

Cultural Methods

Destroy burrows and habitat by deep soil tillage.

Allow growth of tall rank vegetation.

Plant as early as conditions permit before squirrels emerge from hibernation.

Provide alternative foods in minimum-tillage fields.

Repellents

None are registered.

Toxicants

Zinc phosphide.

Fumigants

Aluminum phosphide.

Gas cartridges.

Trapping

Live traps.

Glue boards.

Wooden-base rat-sized snap traps.

Leghold and body-gripping traps.

Snares.

Shooting

Effective if persistent.

Other Methods

Burrow flooding.

Identification

The thirteen-lined ground squirrel (Fig. 1) is a slender rat-sized rodent weighing about 8 ounces (227 g) with a length of about 10 inches (25 cm) including a tail of 3 inches (8 cm). As its name implies, 13 stripes run the length of this ground squirrel's body. Five of the light-colored lines break up into a series of spots as they progress down the back and over the rump. Five light and four dark stripes extend along the top of the head and end between the animal's eyes. The cheeks, sides of the body, and legs are yellowish, tan, or tan with an orange cast. The chest and belly are thinly covered with light tan fur. Each front foot has four toes with long slender digging claws. There are five toes on each hind foot.



PREVENTION AND CONTROL OF WILDLIFE DAMAGE — 1994

Cooperative Extension Division
Institute of Agriculture and Natural Resources
University of Nebraska - Lincoln

United States Department of Agriculture
Animal and Plant Health Inspection Service
Animal Damage Control

Great Plains Agricultural Council
Wildlife Committee

Some of the common or colloquial names for this species include “thirteen-liners,” “stripers,” “striped ground squirrels,” “striped gophers,” and “gophers.”

Range

The thirteen-lined ground squirrel is a grassland animal. Its original range was limited to the prairies of the North American Great Plains. When Europeans arrived and started clearing forests and establishing pastures, the thirteen-lined ground squirrel was quick to extend its range into the new habitat. Today, it ranges from central Alberta, Manitoba, and Saskatchewan in the north to Texas and New Mexico in the south, and from central Ohio in the east to Colorado in the west (Fig. 2). The forests of the Appalachian Highlands and the Rocky Mountains have halted their east/west range expansion. There are a few colonies in Venango County, Pennsylvania, the result of introductions made in 1919.

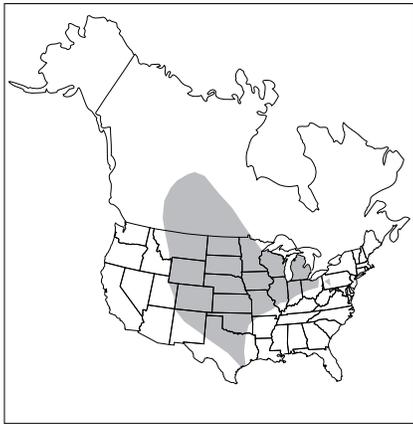


Fig. 2. Distribution map for thirteen-lined ground squirrels. They currently occur in all or part of 22 states and 3 Canadian prairie provinces.

Food Habits

Thirteen-lined ground squirrels are omnivorous. At least 50% of their diet is animal matter — grasshoppers, wireworms, caterpillars, beetles, cutworms, ants, insect eggs, mice, earthworms, small birds, and each other. The vegetative portion of the diet

includes seeds, green shoots, flower heads, roots, vegetables, fruits, and cereal grains. They rarely drink water, depending instead on water contained in their food. They cache large quantities of seeds and grass, but never meat. The cached food may be eaten during periods of bad weather or in the late autumn and early spring when other food is scarce.

General Biology, Reproduction, and Behavior

Thirteen-lined ground squirrels are strictly diurnal, coming above ground when the sun is high and the earth is warm, and returning to the warmth and safety of their burrows long before sundown. They rarely venture out of the burrow on damp, dark, or overcast days. When they venture out, they will often stand upright, with front paws held close to the chest, surveying their domain. If danger threatens, they run, with tail held horizontally, to the nearest burrow. The inconspicuous 2-inch (5-cm) diameter burrow opening is often concealed by vegetation and rarely has soil scattered in front of it like a woodchuck's burrow. The main entrance plunges down 6 inches (15 cm) or more before angling off into a complex system of galleries and side entranceways. The nesting chamber, about 9 inches (23 cm) in diameter and lined with fine dry grass, is located somewhat deeper than the main burrow system. The thirteen-lined ground squirrel's natural enemies include just about all predators, especially hawks, badgers, weasels, foxes, coyotes, bull snakes, and black snakes.

Thirteen-lined ground squirrels begin hibernation in September or early October and emerge between late March and early May in the northern portions of their range. In southern Texas, they have been observed above ground as late as October 27 and as early as January. Males usually begin hibernation earlier in the fall and emerge earlier in the spring than

females. When they hibernate, their body temperature is generally within 3° C of the ambient air temperature. When active, their body temperature can vary 8 to 10° C, without ill effect.

Mating activity begins within 2 weeks after the squirrels emerge from hibernation. Both sexes are sexually active for about 2 weeks. After a gestation period of 28 days, 3 to 14 (average 10) blind, naked, and toothless young are born. Only 1 litter is produced per year. Young ground squirrels weigh about 1/10 ounce (3 to 4 g) at birth. Their stripes begin to appear after about 12 days and their eyes open 28 to 30 days after birth. Young squirrels are weaned and on their own after 6 to 12 weeks. Thirteen-lined ground squirrels are sexually mature at 9 or 10 months of age.

Damage and Damage Identification

The thirteen-lined ground squirrel's preference for insects and field mice may provide some benefit to the agricultural community. Large concentrations of these ground squirrels in pastures, fields, and gardens can, however, cause loss of forages and crops. They dig up newly planted seeds, clip emerging plant shoots, and pull overripening wheat, barley and oats to eat the grain. They will readily feed on commonly grown home or truck garden vegetables, often damaging much more than they consume.

Thirteen-lined ground squirrels will invade golf courses, parks, lawns, athletic fields, cemeteries, and similar wide open grassy sites. Their burrowing and feeding activity can cause major economic and aesthetic damage in such places.

Legal Status

Thirteen-lined ground squirrels are not protected by federal law. They are protected by some state and provincial regulations (Table 1).

Table 1. Status of the thirteen-lined ground squirrel in the United States and Canada.

Alberta ¹	Nebraska ¹
Arizona ¹	New Mexico ¹
Arkansas ⁷	North Dakota ¹
Colorado ¹	Ohio ¹
Illinois ¹	Oklahoma ¹
Indiana ¹	Pennsylvania ^{3,6}
Iowa ³	Saskatchewan ¹
Kansas ¹	South Dakota ¹
Manitoba ¹	Texas ⁵
Michigan ⁴	Utah ¹
Minnesota ¹	Wisconsin ¹
Missouri ³	Wyoming ²
Montana ¹	

¹No restriction on taking or possessing.

²Classed as wildlife, but no restriction on some or all methods of take.

³May be taken only with special state permit.

⁴State permit needed for some methods of take such as poisoning, fumigation.

⁵May be taken only when causing or about to cause damage.

⁶State threatened species.

⁷Believed extinct in state.

Damage Prevention and Control

Exclusion

Exclusion is expensive and generally practical only in situations where cost is not a primary concern. Thirteen-lined ground squirrels are very good at digging and climbing. They can be kept out of electrical substations or similar installations with hardware cloth topped with sheet metal. Most electrical substations or other secured installations are enclosed by a chain link fence that can be made ground squirrel-proof. Dig a trench 18 inches (45 cm) wide and 18 inches (45 cm) deep around the installation next to the outside of the existing fence. Install galvanized 0.5-inch (1.3-cm) or smaller mesh hardware cloth (6 foot [2 m] wide) across the bottom and up the side of the trench nearest the existing fence, continuing 3 feet (1 m) up the fence. Backfill the trench. Securely attach the hardware cloth to the chain-link fence. Attach a piece of sheet metal, 2 to 3 feet (61 to 90 cm) wide, to and above the hardware cloth. Adjust all gates to fit within 0.5 inches (1.27 cm) of the support post and the

ground. It may be necessary to install a cement threshold to keep squirrels from digging under the gate.

Cultural Methods

Activity in fields and gardens can be discouraged by deep soil cultivation, which destroys burrows and changes the habitat. Allow grassy areas to grow as tall and as dense as possible, consistent with local land use practices. Such vegetation discourages ground squirrels but may encourage population of other small mammals, such as voles (*Microtus* spp.). Plant crops as early as possible, before the squirrels emerge from hibernation, to reduce losses to seeds and seedlings.

Deter ground squirrels and other small mammals from feeding on crop seeds and seedlings by providing them with an alternative food source. At planting, broadcast 4 bushels of cracked corn per acre (0.35m³/ha) over the outside four to eight rows adjacent to ground squirrel habitat. It also may be necessary to spot treat fields in areas where damage is expected or observed, especially if conservation tillage is employed.

Pesticides

Before using any pesticide, read and follow all label directions. Many of the pesticides used to control thirteen-lined ground squirrels are Restricted Use Pesticides that may only be sold to and used by certified pesticide applicators or persons working under their direct supervision, and only for those uses covered by the licensed applicator's certification. Some of the pesticides mentioned may not be registered for every use in all states or provinces. Contact your local cooperative extension agent, USDA-APHIS-ADC, state or provincial pesticide regulatory agency, or state or provincial fish and wildlife department for information regarding special permit requirements or endangered species restrictions. Specific use instructions can be found on the individual product labels. Only general use comments will be presented here. Check the **Pesticides** section in this handbook for sample labels.

Repellents

None are registered.

Toxicants

Zinc phosphide-treated baits can be applied by hand in, or broadcast on noncrop areas such as rights-of-way, golf courses, ornamental plantings, nurseries, parks, lawns, field borders, and ditch banks. Apply 1 teaspoon (4 g) of untreated bait (clean oats or other grains similar to the bait) around each active burrow 2 to 3 days before applying treated bait to ensure good acceptance of toxicants. Apply prebait on a bright, warm, sunny day when the ground squirrels are most active. Allow material to fall through the grass to the ground. Do not apply to bare ground and do not apply in piles. Two to 4 days later, after the prebait has been eaten, place 1 teaspoon (4 g) of treated bait in the same locations. Do not apply prebait or bait near homes, where food or feed is grown, over water, on roads, or other bare ground. Bury all carcasses found and any uneaten bait at the end of the program.

For broadcast applications, apply 4 to 6 pounds of prebait per acre (4.5 to 6.7 kg/ha) in 20-foot (6.1-m) swaths using hand- or ground-driven equipment. Two to 4 days later, apply an equal amount of treated bait in the same location. Special care must be taken to prevent application of treated bait over bare ground or in areas of scant vegetation, where it can pose a direct threat to grain-eating birds.

Fumigants should never be used in or around buildings, or where there is any danger that people, livestock, or other nontarget animals will come into contact with the gases. Treat and plug all burrows, wait 24 to 48 hours, and retreat any burrows that have been reopened. Repeat this process until all burrows stay closed. Most burrow fumigants work best when the soil moisture is high and the air temperature is above 50° F (10° C).

Aluminum phosphide tablets and pellets can be used to treat thirteen-lined ground squirrel burrows in agricultural and noncropland areas. Label recommendations are to place 1 to 4 tablets or 5 to 20 pellets as far down into the burrow as possible. The lower rates are recommended for smaller burrow systems under high moisture conditions, and the higher rates are recommended for larger burrow systems when soil moisture is low. Seal the burrow entrance by packing the opening with crumpled newspaper and then shoveling soil over the entrance. Be careful not to cover the tablets or pellets with soil when sealing the burrow. Several states have placed additional restrictions on the use of this material.

Gas cartridges that contain potassium nitrate or sodium nitrate work similarly and therefore will be described together. In the closed burrow system, a burning cartridge produces carbon monoxide (CO), carbon dioxide (CO₂), and consumes oxygen. To use a gas cartridge, prepare it according to label instructions. Cut a clump of sod slightly larger than the burrow opening with a spade or other suitable tool. Kneel at the burrow opening, light the fuse, and immediately place the

cartridge, fuse end first, as far down the burrow as possible. Place the cartridge, do not throw it. Immediately place the sod, grass side down, over the opening and cover with soil to make a tight seal. Close any other openings from which smoke appears.

Gas cartridges come in different sizes. Therefore, make sure the cartridge will fit into the burrow before lighting the fuse. Some cartridges come with built-in fuses; others must have the fuse inserted by the operator. Check the specific product label for instructions and prepare the cartridge accordingly. Avoid prolonged breathing of the smoke when using gas cartridges, and do not use them near buildings or other combustible material because of the fire hazard.

Trapping

A few ground squirrels around a home garden or small row crop operation can be removed easily using wooden-base rat-sized snap traps, glue boards, or live traps. Snap traps and glue boards can kill animals caught in them. If it is necessary to restrict access to traps and glue boards by nontarget animals, place the traps under inverted wooden boxes with a 2-inch (5-cm) hole cut in each end. This will, however, reduce trapping success.

Wooden-base rat-sized snap traps are readily available and the easiest to use for most home gardeners. The biggest mistake most people make when trying to trap nuisance animals is not using enough traps. Set traps in the areas where damage is occurring, next to active burrows, or on active runways.

Peanut butter is one of the most effective baits and is difficult for the ground squirrel to remove without springing the trap. Pieces of apple or other fruit, vegetable, or nut meat, can also be used as bait. Securely attach these baits to the trap trigger. You can increase the attractiveness of most baits by scattering about 1/2 teaspoon of rolled oats on and around the trap. Cover the set, leaving enough room for proper operation of the trap. Check the traps every 24 hours and apply fresh bait. If more than 2 or 3 days go by

without the trap being sprung, move the trap to a new location. If the bait is taken without the trap being sprung, try using mouse-sized snap traps. Young ground squirrels may not be big enough to spring the rat-sized trap.

Glue boards, either commercial or homemade, can be used to capture nuisance ground squirrels in residential areas. Place glue boards in areas where activity or damage is occurring. Bait them with the same type of material used to bait snap traps. Place bait in the center of the board. Once the animal becomes trapped, it can be killed and disposed of. Glue boards do not work well in dusty, dirty environments. Care should be taken when using glue boards outside because they can be attractive to children, pets, and nontarget wildlife.

Live traps are commercially available from a variety of manufacturers (see **Supplies and Materials** at the end of this manual), or they can be homemade. Use live traps that are 3 to 5 inches square and 18 to 20 inches long (8 to 13 cm square and 46 to 51 cm long). The 5 x 5 x 18-inch (13 x 13 x 46-cm) chipmunk-sized trap works well.

Burrow-entrance live traps can be constructed using 0.5-inch (1.3-cm) hardware cloth (Fig. 3). The main body of the trap is formed from a 12 x 20-inch (30 x 50-cm) piece bent to form a rectangular box 3 x 3 x 20 inches (8 x 8 x 51 cm). The joining edges can be secured with hog rings. Use hog rings to secure a 3-inch (8-cm) square piece of hardware cloth to one end of the trap. The trap door is made from a piece of hardware cloth 2 3/4 x 8 inches (7 x 20 cm). Attach one end of the door to the top of the trap with hog rings. Recess the point of attachment about 1 inch (2.5 cm) to permit free movement of the door when the trap is placed in the burrow entrance. Bend the opposite end of the door so at least 2 inches (5 cm) of the door are in contact with the trap floor when the door is closed. A wire handle should be attached to the top of the trap (Fig. 3).

Before setting the trap, spend some time observing the squirrels to determine which burrows are active. Set the

trap by wedging the door end firmly into the entrance of an active burrow. The closed end should be pointing into the air. Prop the trap in position with a block of wood or other suitable object. Gravity will hold the door closed until the squirrel pushes past it to leave its burrow and enters the trap. Dispose of trapped animals in accordance with local regulations.

Snares made of 8 pound (3.6 kg) test monofilament or wire fishing leader are simple and effective. Leghold traps (No. 0 longspring or coil-spring), and Conibear® traps (No. 110) can also be used. However, the effort required to set them, compared to snap traps, glue boards, and burrow-entrance live traps, makes their use questionable.

Shooting

Shooting can provide control if the landowner is willing to put in the necessary time and effort. All shooting should be carried out in a safe manner and in strict accordance with local regulations.

Other Methods

Ground squirrels were often captured by the Native Americans that lived on the central plains and the west coast by pouring water down the animal's burrow, thereby forcing the squirrel to the surface. Similar methods of removing ground squirrels still work. Flooding can enhance the effectiveness of trapping and snaring. Avoid flooding burrows that are adjacent to building

foundations or other underground structures that may be damaged by water.

Economics of Damage and Control

The exact cost of damage caused by the thirteen-lined ground squirrel is difficult to quantify because much of it probably goes unreported. For the homeowner with one or two ground squirrels in the garden or a farmer with a few ground squirrels in the field, the animals may be more of a nuisance than a serious pest. However, when large numbers are present, they can cause serious losses. Thirteen-lined ground squirrels have established colonies in and around borders of minimum tillage corn fields in Nebraska. Extension agents and farmers there have reported losses of 20 to 80 acres (8 to 32 ha) annually in fields during 1989 to 1992.

Results of a survey of USDA-APHIS-ADC state offices, and of the Alberta, Manitoba, and Saskatchewan Provincial Wildlife Services, indicate that the thirteen-lined ground squirrel is only a minor pest in most suburban areas, and a minor to moderate pest in most agricultural situations. Indiana ADC considers them a major agricultural pest in no-till corn. As minimum tillage farming increases, the potential for increased agricultural damage from thirteen-lined ground squirrels may increase.

The most effective method of controlling thirteen-lined ground squirrel damage will depend on the situation and on the temperament of the people involved. Wooden-base rat-sized snap traps, live traps, or gas cartridges may be the best methods for eliminating one or two animals from a garden. Burrow fumigation may be the best method in truck gardens, or in and around parks, athletic fields, and cemeteries where the use of traps or poison could pose a hazard to people, pets, and nontarget wildlife. In orchards, vineyards and noncrop areas zinc phosphide treated baits may be most economical.

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For Additional Information

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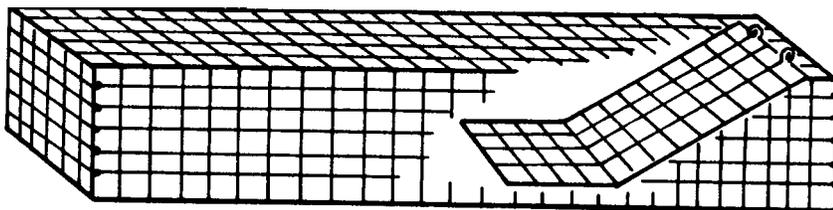


Fig. 3. Ground squirrels can be readily captured in this homemade live trap (Adapted from Wobeser and Leighton 1979).

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