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Using Burrow Builders for Pocket Gopher Control

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This NebGuide discusses how to use tractor-drawn mechanical bait applicators to manage pocket gophers. Another NebGuide, Controlling Pocket Gophers in Nebraska G1509, describes in more detail pocket gophers, their damage and other methods of control.

Pocket Gopher Damage and Costs

Pocket gophers spend nearly their entire lives underground and may only appear aboveground when they excavate soil to the surface or when they disperse to new areas. Each animal moves tons of soil during a year and creates dozens of mounds, sometimes in the span of a few days. Pocket gophers create more mounds in spring and fall than in winter or summer. A pocket gopher's burrow system may cover one to two acres. Each adult pocket gopher occupies its own burrow system most of the year but animals in neighboring burrows can quickly re-occupy a burrow in which the animal has been removed. For plains pocket gophers, a population of six to eight animals per acre is considered a high density.

Pocket gophers damage more than \$10 million worth of the major field crops in Nebraska each year. They can cause yield reductions up to 35 percent, 30 percent, and 40 percent to alfalfa, tame and wild hay, and range, respectively, in areas that they inhabit.

Conversely, pocket gophers have a beneficial ecological role, providing food for a variety of predators. The burrowing and excavation activity of pocket gophers also plays a beneficial role in promoting the vertical cycling and mixing of soil constituents.

Burrow Builders

Burrow builders (*Figure 1*) are used most successfully for managing pocket gophers when the following conditions exist: 1) large fields that have extensive pocket gopher populations at high densities; 2) the effects of control and evaluation of control can be delayed for several days; and 3) hand baiting and trapping have been considered. The cost to rent or buy a burrow builder, as well as the time and materials involved in application, should be considered. Prices for burrow builders vary considerably between models and brands. New machines range from \$1,200 to more than \$3,000 at 2003 prices. Custom rates for burrow builder operations usually are about



Figure 1. A burrow builder or “gopher getter.”

\$5.00 per acre. Information on burrow builder suppliers and manufacturers are included in Appendix A.

Burrow builders create tunnels through the soil and drop a measured amount of toxic grain bait into tunnels. The machines are drawn by a tractor across the field where the tunnels intercept or come near the burrows of pocket gophers. Pocket gophers subsequently, through their natural digging activities, intercept and enter the tunnels, and eat the toxic bait.

Burrow builders, sometimes called “gopher getters,” are used to reduce pocket gopher damage in alfalfa fields, pastures, orchards, windbreaks, cemeteries, golf courses, parks, and playing fields. They also have been used on rough terrain, primarily in forested areas. Machines for these areas require free-floating hitches and are drawn by tracked vehicles.

Before You Use Burrow Builders

Poor soil conditions can sometimes limit your success with burrow builders. Also, certain areas, like golf courses, may require less disturbance to sod or plant roots than what is possible with burrow builders. If the area that needs management is not extensive, substitute other methods, such as hand baiting or trapping, for burrow builders.

Judge each control situation individually. Greater levels of control are desired where high value crops or areas occur, as in orchards, windbreaks, and golf courses. In contrast, the levels of control in rangeland can be lower. Weigh the benefits of pocket gophers as well as risks. Pocket gophers mix and aerate soils and provide habitat for other animals.

Examine the field and note the number and distribution of pocket gopher mounds. Determine the areas most recently affected by pocket gophers. You may need to use a tractor-drawn leveler, harrow, a float, or rod weeder to flatten mounds so that you can determine where recent activity is occurring at a later date.

Burrow Builder Design and Operation

Burrow builders consist of five basic parts: 1) a knife or shank opener and torpedo tube 2) a rolling coupler blade 3) a packer or press wheel 4) a seed box or bait hopper and 5) a metering unit that controls the rate of bait flow from the box (*Figure 2*). Burrow builders are hydraulically operated and mount on the draw bar or a three-point hitch of a tractor. A tractor rated at a minimum of 45 horsepower is required. Four-wheel drive pickups also can be used for pull-type burrow builders.

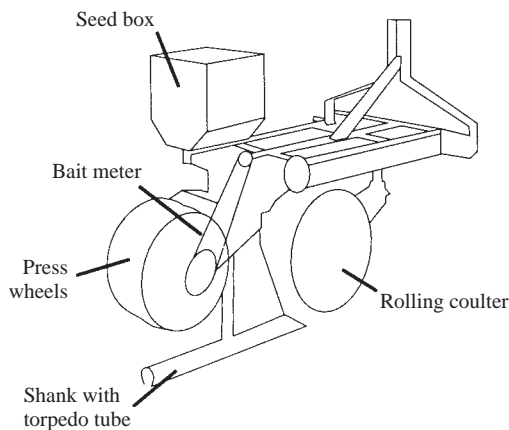


Figure 2. Basic parts of the burrow builder: 1) rolling couler, 2) shank with torpedo tube, 3) bait box, 4) bait meter, 5) press wheel(s).

The rolling couler blade cuts surface trash and shallow roots ahead of the shank. Align the couler to cut directly in front of the shank at a depth of four to six inches. Trash will build up occasionally between the shank and couler blade in some models or in some field conditions. Check and clean the shank periodically. Chrome-plated shanks resist abrasion in sandy and rocky soils. The plating also improves scouring of the point and creates a better tunnel.

Set torpedo tubes parallel or tipped slightly downward to the soil surface to bite into the soil. Operate the depth of the tube at the same depth as the pocket gophers' burrows. Dig through several mounds and find the burrows to select for the correct depth of the torpedo tube. You may need to add weight to the machine to allow the shank and tube to penetrate the ground to the correct depth. Raise the shank out of the ground when making sharp turns to avoid damaging the machine. Lower or raise shanks only when the tractor is moving forward to prevent undue strain on both tractor and gopher getter. Do not stop the tractor while it faces uphill to avoid the clogging of the bait outlet. Check the outlet periodically to see if bait is being dispensed.

The press wheel should close the narrow slit at the top of the tunnel formed by the upper portion of the shank. Too much pressure collapses the tunnel. Too little pressure allows light to enter the tunnel. Pocket gophers avoid light entering their burrows by blocking entrances with soil. Consequently

pocket gophers may not enter the tunnels created by the burrow builder.

Use a test run, making a tunnel about 50 feet long. Then use a shovel to dig a cross section out of the newly formed tunnel. Dig down slightly below the tunnel and remove all loose soil from the hole. Feel and look to see if a clean, open tunnel has been created in either direction.

For better inspection, dig out two holes that cross-section the tunnel as described above and at six feet apart along the tunnel's length. Direct a flashlight into the tunnel opened by one hole that leads toward the other hole (*Figure 3*). Use the back of a bright shovel inserted into the second hole to reflect the light from the flashlight, indicating a clean, well-formed tunnel.

The press wheel sprocket drives the bait metering sprocket. Check this sprocket assembly periodically to see that bait is dispensed. You may want to select different sprockets or seed plates to allow greater quantities or rates of application. Positive flow seed meters improve seed placement.

Pull the machine across rows of mounds to intercept as many burrows as possible (*Figure 4*). Make a criss-cross pattern of tunnels only in the area of the field that contain either old or new mounds. Run the torpedo tube below the ground only for short distances in areas that contain gopher mounds. Otherwise, the tunnels created may serve to spread gopher activity. Space the tunnels as recommended on the pesticide label.

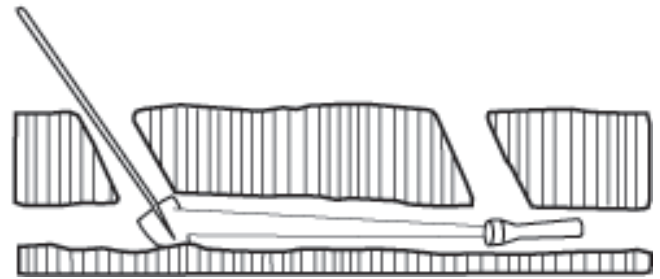


Figure 3. Inspecting a well-formed tunnel with a flashlight and the back of a shovel.

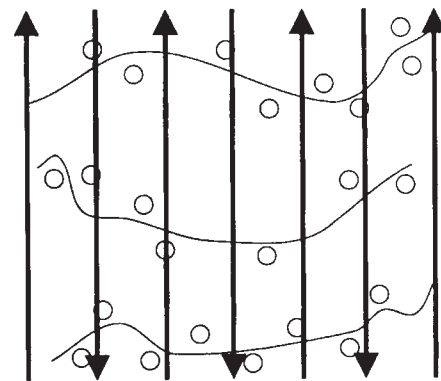


Figure 4. Passes of burrow builder across rows of mounds.

If rows of mounds are evident, drive across them and near the newest mounds. New mounds may appear moist and be a different color than older mounds, but they can lose their distinction in only a day if drying winds are present. Apply only to those areas where pocket gopher mounds occur to reduce the cost of operation.

Soil moisture should be near the upper limit of the range used for plowing or cultivating. Dig down about eight inches

to the level of a pocket gopher's burrow. Collect a handful of soil and squeeze it. The soil should stick together and not drip water. In very sandy soils, the best conditions may be only a day or two after rainfall or irrigation.

Use in Alfalfa. Look for patterns of pocket gopher mounds that indicate individual burrow systems. Mounds are most visible in spring, prior to and during green-up and after a cutting of hay or alfalfa. You should only treat areas that contain old or new mounds. Higher densities of pocket gopher mounds appear along levees or ditches than elsewhere in flood-irrigated alfalfa fields. Apply bait parallel and on either side of levees, ditches, and terraces. Elsewhere, create short runs with the torpedo tube to avoid creating extensive tunnels where gophers may spread. Since the rolling coulter and shank can damage roots and crowns of alfalfa, do not treat areas that have no evidence of pocket gopher activity.

Use in Windbreaks, Orchards, Christmas Tree Plantations, and Other Specialty Crops. In these areas, as in hay and alfalfa fields, it is best to create short runs of tunnels. Drive parallel to tree rows in orchards and windbreaks. Lift the torpedo tube out of the ground whenever mounds are not present. In new plantings of trees with no current evidence of pocket gophers, lift the torpedo tube out of the ground every 75 to 100 feet. Place a tunnel between rows and on either side of the plantation. To avoid damage to tree roots in older plantations, select a tunnel depth and distance from the trees based on the growth form of the roots of each tree species.

Be careful to avoid buried irrigation pipes, stumps and other objects. You can occasionally lift the torpedo tube out of the ground and still get adequate control.

Selecting Baits and Toxicants. Grain baits with strychnine alkaloid or zinc phosphide are currently registered for use in mechanical bait applicators that control pocket gophers. Always apply fresh bait and store excess in a dry, safe place. Choose seed plates in your seed box that work best with the chosen grain.

Strychnine acts more quickly than zinc phosphide. Formulations may differ in percent active ingredient. Select higher concentrations so fewer bait pieces or grains are required to kill a pocket gopher and less bait is applied. Populations of pocket gophers can be reduced up to 85 percent to 95 percent at application rates of one to two pounds per acre of 0.3 percent to 0.5 percent strychnine alkaloid grain.

Baits with zinc phosphide baits are available at 2 percent active ingredient. Effectiveness of this bait ranges from 10 to 50 percent. Select grain baits, such as hulled, rolled or crimped oats, in which the toxicant penetrates the grain.

Safety Precautions and Legal Restrictions. Do not apply any toxic baits above the ground. Gophers very rarely feed aboveground and the baits are hazardous to other wildlife. On models not equipped with brakes on free floating press wheels, bait may fall through the shank as the machine is raised, leaving hazardous poison aboveground. Bury spilled grain out of reach of animals or apply as directed on the label. Remove all bait from burrow builders after use. Store unused bait in proper and marked containers and in cool, dry storage areas.

Hazards to humans in applying zinc phosphide or strychnine include the following:

- **Harmful or fatal if swallowed.**
- **Do not get in eyes or on skin or clothing.**
- **Do not breathe the dust or fumes.**

Human safety precautions include the following:

- **Wear rubber gloves and a long-sleeved shirt when handling.**

- **Wash all materials and utensils that have contacted the pesticide.**
- **Use soap and water on your skin after using the pesticide and before eating or smoking.**

Zinc phosphide and strychnine are both Restricted Use Pesticides. Strychnine is further limited to belowground applications. Obtain a commercial or private pesticide applicator's license before applying these pesticides. Guidelines for obtaining these are available at your local University of Nebraska–Lincoln Extension office.

Grain treated with zinc phosphide or strychnine is available through USDA-APHIS-Division of Animal Damage Control, 5940 S. 58th St., P.O. Box 81866, Lincoln, NE. 68501; phone, (402) 434-2340. Commercial suppliers may be listed under Agricultural Chemicals in the Yellow Pages Directory.

Application Rate. The amount of bait needed depends on the type and rate of bait in each drop, the distance between drops and the distance between passes of the machine. Read the pesticide label and apply the recommended amount of bait per acre. Recommended rates are typically 3 pounds or less per acre.

Select the correct seed plate to control the amount of bait in each drop. Select the correct drive sockets for the bait hopper and press wheel to control the distance between drops. Select longer distances if you plan to operate through an entire field. Choose shorter distances if you selectively operate through specific areas of the field or specific burrow systems. Follow the pesticide label for recommended row spacing.

Most burrow builders should be operated at less than five miles per hour for best performance. At a tractor speed of 4.0 miles per hour and a row spacing of 20 feet, an operator can treat about 10 acres per hour.

Use the following procedure if the operator's manual does not specify how to calibrate the machine to apply a known rate of bait. Weigh untreated grain and place it in the seed box. Operate the machine for 1,000 feet at the planned depth and speed. Then, weigh the grain that remains in the seed box and subtract this amount from the original amount to determine the amount applied. Look for this amount in *Table I, Column 1*. Read across to the amount under the desired row spacing to find the amount of bait applied per acre.

For example, if 0.9 pounds of bait was applied per 1,000 feet of tunnel, then about 2 pounds per acre would be applied when using a 20-foot distance between passes. If a higher or lower rate was desired, change the seed plates and/or drive sprockets and repeat the test.

Consider renting versus owning burrow builders. A few farm machinery dealers and Natural Resource Districts have rental units. Rental rates may be by the day or acre or by bait used. Also, some private owners may rent to others in the community.

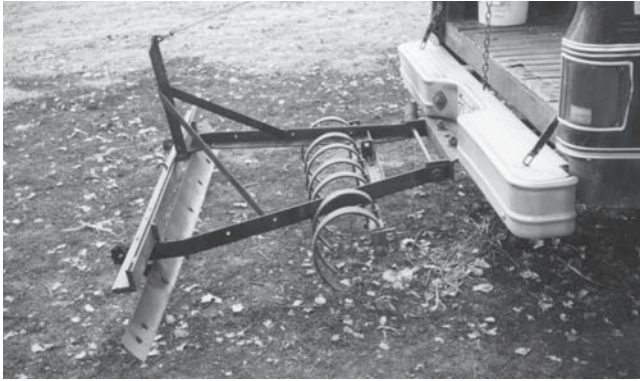
Assessing Effectiveness of Control

Option 1 — A drag can be pulled behind a burrow builder machine at the time of operation to flatten all mounds. Alternately, you can use a scraper or a harrow in a separate operation to knock down mounds (*Figure 5*). The soil should lay evenly distributed across the surface. Then, examine any new mounds that are created subsequently to your control efforts. Allow one week for gophers to locate the tunnels and eat the bait or for them to create new mounds.

Option 2 — Several days before using a burrow builder, visit the area to be controlled and dig through a new mound

Table I. Acres treated with burrow builders at different distances between passes.

<i>Pounds Applied Per 1,000 ft.</i>	<i>10 ft between passes</i>	<i>14 ft between passes</i>	<i>20 ft between passes</i>	<i>24 ft between passes</i>
0.5	2.2	1.6	1.1	0.9
1.0	4.4	3.1	2.2	1.8
1.5	6.5	4.7	3.3	2.7
2.0	8.7	6.2	4.4	3.6
2.5	10.9	7.8	5.4	4.5
3.0	13.1	9.3	6.5	5.4

**Figure 5. A scraper blade or harrow operation following the burrow builder operation is one technique used to evaluate control.**

in each pocket gopher burrow system. Be sure that you open only one hole per system. If mound systems cannot be distinguished, walk about 50 feet before opening another mound. Open and flag at least 25 mounds. Return the following day to count the number of holes that have been closed to establish a level of activity before control.

To assess activity level after control, wait at least a week after using the burrow builder. Reopen the holes that were flagged before control. Return the following day to count closed holes. You can assess the level of control by using the following formulas:

$$\frac{\text{Number of Holes Closed by Gophers PreControl}}{\text{Number of Holes Opened by Operator PreControl}} = \text{Activity Level PreControl}$$

$$\frac{\text{Number of Holes Closed by Gophers PostControl}}{\text{Number of Holes Opened by Operator PostControl}} = \text{Activity Level PostControl}$$

$$\frac{\text{Activity Level PreControl} - \text{Activity Level PostControl} \times 100}{\text{Activity Level Precontrol}} = \% \text{ Reduction in Activity}$$

You can count new mounds in a given area both before and after control, but this is less accurate than the open hole or mound scraping methods discussed above.

Indirect Control Methods

Pocket gophers prefer alfalfa and plants that contain high levels of moisture. Gophers can easily enter alfalfa fields, irrigated lawns, and orchards from adjacent native range or pasture. Plant a buffer strip of grain around areas that need protection. Rotate susceptible crops with annual grains to disrupt the perennial food supply of pocket gophers. For alfalfa, try varieties with fibrous roots rather than a single taproot.

Flood irrigation in heavy soils discourages pocket gophers by causing soil to stick to their claws and fur. The high soil moisture also draws heat out of their bodies and limits

the exchange of oxygen and other gases between burrows and soil. Unless the crop normally requires it, flood irrigation as a method of controlling pocket gophers should not be undertaken because of high expense and low efficiency.

Remove weeds that have large roots that are attractive to gophers. Most species of trees and shrubs have roots palatable to pocket gophers. If your situation allows, select plant species that have large fibrous roots rather than those with tap roots to reduce potential damage caused by pocket gophers.

Appendix A

Burrow builder manufacturers and suppliers:

Manufacturers:

Rue R. Elston, Co., Inc.
706 N. Weber
Sioux Falls, SD 57103
1-800-845-1385
(605) 336-7716

All American Ag
(The Verminator)
724 Woodward Canyon
Touchet, WA. 99360
(509) 522-6220
theverminator@allamag.com
www.allamag.com/theverminator/

C.A.P., Inc. (Redball)
(Gopher Eradicator)
P.O. Box 159
Benson, MN 56215
(877) 332-2551
www.reball-cap.com

Suppliers:

Eckroat Seed Co.
P.O. Box 17610
Oklahoma City, OK 73136
1-800-332-7333
(405) 427-2484
www.eckroatseed.com

Beaver Valley Supply Co.
E. Hwy. 36
Atwood, KS 67730
1-800-982-1280
(785) 626-3251

McArthur Equip. Co.
1777 Hwy. 285
Burlington, CO 80807
719 346-8213

*This list is not exhaustive and does not imply an endorsement of these companies or products nor any implication about those not listed.

Acknowledgments

The authors thank Elton Weich, Hoskins, Nebraska for his comments and suggestions. *Table I* was adapted from the publication "Pocket Gopher Control with Mechanical Bait Applicator," Leaflet 2699, Division of Agricultural Sciences, University of California, Davis. 1977 by Rex E. Marsh, Specialist, Wildlife and Fisheries Biology and Maynard W. Cummings, Extension Wildlife Specialist.

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