1999

Trapping Considerations for the Fossorial Pocket Gopher

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CHAPTER 9

TRAPPING CONSIDERATIONS FOR THE FOSSORIAL POCKET GOPHER

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Photo: G. Proulx

Mammal Trapping, pages 131-139, G. Proulx, editor. 1999.
Alpha Wildlife Research & Management Ltd., Sherwood Park, Alberta, Canada

Abstract: Fossorial mammals such as the pocket gopher (*Thomomys* spp.) are well adapted to life in an underground closed burrow system. These animals can have considerable influence on ecosystems and can cause significant damage to agricultural crops, forest resources, and field machinery. The research and management of pocket gopher populations poses many challenges to land managers and research biologists. Both live-trapping for research purposes and kill trapping for control purposes are important tools for working with pocket gophers. Trapping can be an effective and efficient tool if the proper traps are used and trappers are trained to place traps properly and avoid some common mistakes. Many types of kill traps are available on the commercial market, but live traps are more difficult to obtain. In this paper, we review the types, availability, and use of kill traps and live traps for pocket gopher control and research.

INTRODUCTION

The three genera of pocket gophers (*Geomys, Pappogeomys, Thomomys*) are widely distributed in North and Central America (Case and Jasch 1994). These fossorial mammals are well adapted to an underground life in closed burrow systems (Chase et al. 1982). Ecological equivalents to pocket gophers occur on most continents (Nevo 1979). These animals can influence ecosystem structure and function by soil mixing and aeration, seed and spore dispersal, the alteration of plant species composition and successional processes, and by providing a prey base for avian and mammalian predatory species. Pocket gophers are active all year, foraging for vegetation both above and below ground, and storing clipped foods in underground food caches. Burrow systems are quite complex with a nest chamber about 1 m below the ground surface (Witmer et al. 1996). The soil mounds from tunnel excavations are quite distinctive and the most obvious sign of the presence of pocket gophers. Pocket gophers are territorial, strongly defending their burrow systems. Individuals of most species live solitary lives except to breed or when they have young.

Pocket gophers may cause considerable damage to many resources because of their foraging, digging and gnawing habits (Witmer et al. 1995a). Significant damage to various agricultural crops, reforestation, and buried cables has been reported (Case and Jasch 1994, Marsh 1992). Efforts to reduce damage by pocket gophers have relied upon population reduction, primarily by the use of kill traps or toxicants (Case and Jasch 1994, Proulx 1997a, Witmer et al. 1995b). Some toxic baits are not well accepted by pocket gophers and considerable effort may be required to find an effective bait (Proulx 1998; Witmer et al. 1995a, 1995b). In some situations, these methods can be effective, but they are relatively labor intensive. Additionally, they must be repeated, usually on an annual basis, because of the high reproductive rate of surviving or reinvading animals (Witmer et al. 1996). The maintenance of a buffer zone of control around the crop field, once the rodent population has been largely eliminated, can greatly reduce the reinvasion rate (Proulx 1997a). Research is underway to develop other, primarily nonlethal, methods to reduce damage, but little success has been achieved using either physical barriers or repellents (Witmer et al. 1995a, 1997).

In this paper, we review the types, availability, and use of kill traps and live traps for pocket gopher control and research. In particular, we use published literature and our own experiences to provide guidelines for unexperienced persons needing to trap pocket gophers. Our experiences are based on many years of work with various species of *Thomomys* in forest and agricultural settings of California, Idaho, Nevada, Oregon, and Washington. Reference to

trade names does not imply U.S. government endorsement of commercial products or exclusion of a similar product with equal or better effectiveness.

KILL TRAPS

There is a long history of development and use of kill traps for pocket gopher control in the United States, dating back at least to 1864 (Gerstell 1985, Marsh 1997). Over 100 trap types have been developed and tried over the years, but only a few types are in common use in North America and readily available on the commercial market (Case and Jasch 1994, Marsh 1997, Proulx 1997b). Commonly used traps are illustrated in Figure 1.

Pocket gopher traps can be classified according to their basic design and type of trigger mechanism (Federal Provincial Committee for Humane Trapping [FPCHT] 1981, Gerstell 1985, Marsh 1997). Most types kill by striking, constricting, or puncturing the animal's body. Usually, a coiled spring provides the force to the killing mechanism. Traps are usually triggered by a pan or lever that the animal pushes against or travels over. Some traps are self-setting and are considered safer and easier to set (Marsh 1997). Most of the commonly used models are durable and easy to use, and are readily available at many hardware, garden, or farm supply stores. Extensive listings of suppliers of pocket gopher traps, probes, baits, bait delivery systems, and other materials were presented by FPCHT (1981), Hygnstrom and Hafer (1994), and Marsh (1992).

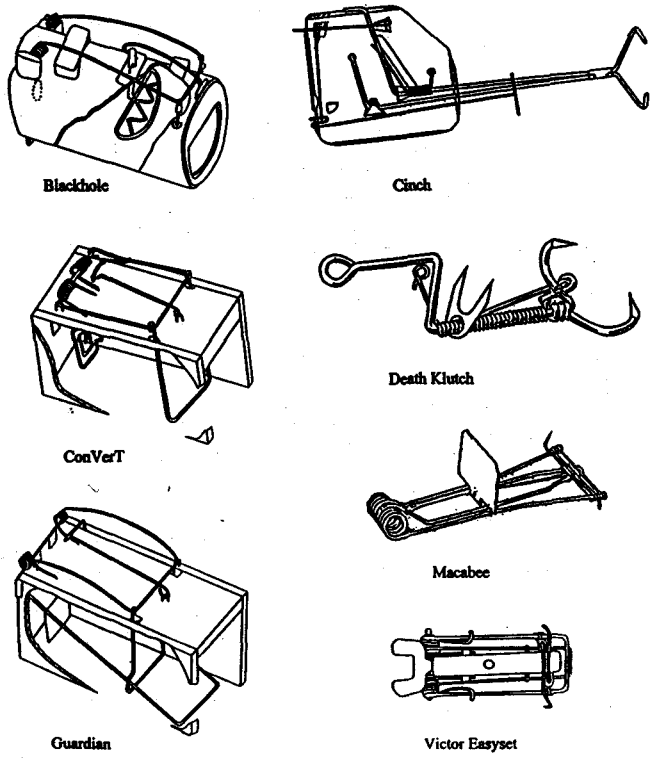

Figure 1. Illustrations of some commonly used pocket gopher traps.

LIVE TRAPS

Live traps are mainly used for research purposes. For example, pocket gophers may be captured and taken into captivity for food habits, repellents, or physical barriers studies and trials (Davis 1997, Witmer et al. 1997). On the other hand, they may be captured, marked with radiotransmitter or other device, and released for data collection on basic ecology or toxicant efficacy (Witmer et al. 1995b, 1996). Some home gardeners, seeking to reduce pocket gopher damage, may prefer to use live traps with subsequent relocation of captured animals rather than the traditional lethal methods. It is important to realize, however, that relocated animals may have low survival rates (e.g., Robinette et al. 1995).

Few companies produce pocket gopher live traps because of the very limited market. A trap manufactured by H. B. Sherman Traps, Inc., Tallahasee, Florida, is available by special order and we have had a live trap specially manufactured by Don Sprague Sales, Inc., Woodburn, Oregon. We have found a few references in the published literature on live traps used by other researchers (Baker and Williams 1972, Howard 1952, Ingles 1949, Sargeant 1966, Sherman 1941). One variety of live trap consisted of a cylindrical plastic tube with the back end sealed off and a drop door on the front (Baker and Williams 1972). The trigger mechanism consisted of a top-mounted rat trap that springs the door closed when an internal wire loop is pushed by the pocket gopher. Another live trap was also a cylindrical tube, but was constructed of wire mesh (Sargeant 1966). With this trap, the pocket gopher chews through a piece of string within the trap that allows the door to be pulled closed by a spring. The Sherman trap and our specially manufactured trap are rectangular box traps of metal construction. Our custom made trap has solid metal sides, top, and door, but a wire-mesh floor and back end. The mesh floor can be embedded in the soil so that the pocket gopher continues to walk on soil as it enters the trap. The entire trigger mechanism is located within the trap so that it is not set off by adverse weather, soil falling into the excavation, wandering animals, or other random events. The animal enters the trap, pushes against a wire-mesh plate that releases the spring-loaded drop door. A drop pin was added to the roof of the trap so that researchers can visually determine, without removing the trap, when the internally-located drop door has been sprung.

USING POCKET GOPHER TRAPS

The basic procedure for trapping pocket gophers involves finding and excavating burrows, placing traps, marking trap locations, returning to check traps, processing or disposing of captured animals, and finally, removing traps and filling in excavations. These basic procedures are described and illustrated in various publications (e.g., Case and Jasch 1994, Washington State University 1996). The basic equipment includes a metal probe, a spade or shovel, a hand trowel, traps, gloves, and wire flags (or an adequate alternative for securing traps and marking trap locations). Researchers should also have a site map, a data book and pens, and appropriate materials for processing live or dead animals. There are many additional considerations, discussed below, that can help avoid problems and improve efficiency and capture success.

The probe is a metal rod about 1 m long that is sharpened at the lower end with the upper end bent at a right angle to form a handle. It takes practice to become efficient at probing to

locate burrows. Burrows used for trapping are mostly in the top 25 cm of soil, the root zone where pocket gophers actively move about and forage. Burrow systems usually have main "runways" with many side, "dead end" tunnels that lead to soil mounds where the pocket gopher pushed soil from excavations or to earthen feeding plugs (about 4 cm in diameter) where the gopher had surfaced to clip vegetation and take it back into its burrow. One can probe for main runways, which are usually about 40 cm from mounds, between mounds that are about 1 m apart, or for runways near earthen feeding plugs. One probes by walking and sharply jabbing the probe into the ground every 5-10 cm until one feels a "give" or lessening of pressure. This will often indicate that the probe has dropped into a burrow, although other situations can give a similar result, such as a rotted, large root. Once the burrow is found, a circular area about 25 cm across can be excavated for the placement of 1 or 2 traps. We have often found it more efficient, however, to stick a wire flag into the hole and proceed with probing until many burrows in the area have been located. A pocket gopher burrow system may cover an area about 20 m in diameter and we try to place about 2-3 trap sets per burrow system. Often the most active portion of a burrow system is readily identified by a cluster of relatively fresh mounds or earthen feeding plugs.

One begins excavation with a spade or shovel. Often, the burrow opening will quickly appear; at other times, one must jab the sides of the excavation with a stick or hand trowel to locate it. If the burrow cannot be found, the prober was "fooled" and must begin probing the area again. Once the burrow is found, one must work by hand or with the trowel to prepare the burrow and excavation for the trap(s). It is best to locate burrow openings going off in roughly opposite directions (i.e., a 2-way burrow) and prepare and set traps in each direction. If one finds a burrow going off in only one direction, one may be near a tunnel's dead end and somewhat less likely to capture a pocket gopher at that set. A stick should be used to make sure that each burrow opening is going off in a straight line for at least 20 cm, that it does not fork immediately, and that there are no major impediments (roots, rocks) to the trap's smooth operation. Occasionally, one may locate a "chamber area" of a burrow system that has ≥ 3 openings going off in various directions. It is best to continue excavating the area because several of the tunnels will usually either dead end or double back to one of the other openings. If a tunnel forks and only one trap is available, set the trap in the downward sloping fork as it will more often lead to the main runway.

The area excavated should be appropriately sized for the trap used. Kill traps should fit into the burrow opening as per the manufacturer's directions. It is important to make sure that no protruding roots, stones, soil, etc., will interfere with the trap's trigger mechanism and that loose soil will not dislodge, fall on, and spring or otherwise interfere with the trap. Use loose soil on the floor of the excavation to provide a level, firm platform for placing the trap. Live traps are usually embedded firmly into the soil surface with the opening flush against, or projecting a little into, the burrow opening. Clods of soil can be used to seal off any gaps between the excavated soil wall and the perimeter of the front of the live trap. A wire-mesh floor on live traps can be embedded into the soil floor, more closely simulating natural conditions with the hope that the animal will be more inclined to enter the trap. Proulx (1997b) also noted better capture rates using kill traps when the lower surface was soil. If the trap is not well placed, or a wary pocket gopher is involved, one will often find the trap and excavated

area "back filled" with loose soil by the resident pocket gopher. Usually, the burrow will be tightly packed with soil for about 25 cm and will have to be relocated through excavation and probing so that the trap may be reset.

Because pocket gophers maintain a closed burrow system and "patrol" the system regularly, there is no need to bait kill or live traps. The pocket gopher is captured as it investigates, or attempts to repair, its burrow system. Some trappers place a large soil clod or other item (wood, tarpaper) over the excavated area, but the senior author has not found this necessary in the Pacific Northwest region of the United States nor did Proulx (1996) in Alberta, Canada. In the case of live traps, a piece of carrot or apple and perhaps some grass in the back of the trap will help sustain the captured animal until the trap is checked. Live traps should be checked once, but preferably twice, per day. Kill traps can be checked every few days. The location of all traps should be well marked so as to be visible from a distance. Some small kill traps fit entirely within the burrow. These should be secured by string or wire to the marker flag or a stake. Securing traps helps prevent predators from removing the trap while scavenging carcasses.

Trapping can be conducted during any snow-free, nonfrozen soil period. In the northern, temperate region, however, it is often best to trap pocket gophers in the spring/early summer or in the fall when there is adequate soil moisture to make probing and digging easier and pocket gophers are actively excavating new burrows. In the case of irrigated agriculture, the soil moisture is under the control of the land manager. Fresh soil mounds provide a good sign as to where to probe and set traps. During dry seasons, pocket gophers may abandon shallow burrows and spend most of their time in deep burrows that are cooler and more moist.

OTHER CONSIDERATIONS

There appears to be a low probability of capture of nontarget animals with well-placed traps in active pocket gopher burrow systems. This is probably because the systems are kept closed and are actively defended by resident pocket gophers. In forest habitats, we have occasionally caught small numbers of nontargets, including ground squirrels (*Spermophilus* spp.), chipmunks (*Eutamius* spp.), moles (*Scapanus* spp.), weasels (*Mustela* spp.), and on very rare occasions, small passerine birds. We have captured about one nontarget animal per 1,000 trap sets in forested situations. Smeltz (1992), also in forest habitats, reported capturing about 3 nontarget animals per 1,000 trap sets. In orchards or vineyards, the capture of nontarget animals is generally less than 1 per 5,000 trap sets. A more serious problem at some sites has been interference by livestock or wild ungulates. Both may pull out wire flags or break off wooden stakes. Livestock may occasionally step into excavated holes and set off or damage traps, although we have never found this to be a serious problem. Extensive, heavy trampling by livestock, however, can compact soils and make probing more difficult.

It is difficult to predict the capture rate and cost of pocket gopher trapping. This is due to a number of variables: number and type of traps used, number and experience of trappers, soil and weather conditions, pocket gopher density and distribution over the trapped area, and the goals of the trapping effort. Over 4 ha experimental areas, we have been able to kill-trap (or live-trap, mark and release) most pocket gophers with about 3-4 persons and 100 traps in a five day period. Smeltz (1992) described the results of contract trappers used by the USDA Forest

Service to remove pocket gophers from reforestation units. A 10-person crew could trap 400 ha twice in about two months. A second trapping session is usually recommended to remove many of the animals missed in the first session. They used about 20 trap sets per 0.4 ha and caught about 5 pocket gophers per 0.4 ha. They believed that they removed about 80% of the pocket gophers on the units. Baker and Williams (1972) reported a capture success rate of ≥ 70% with live traps. Few costs of contract trapping have been reported, but those we could locate reported about $100 (U.S.) per ha (Smeltz 1992, Teipner et al. 1983). This was considered to be about twice the cost of contract baiting to remove pocket gophers over an area of the same size. On the other hand, some states pay a bounty on pocket gopher carcasses. On some irrigated alfalfa croplands, land managers pay $1-2 (U.S.) for each pocket gopher carcass turned in. Once most pocket gophers are removed from a crop field, one person can effectively keep them out, using a border trapping strategy that requires as little as 2 h per week (Proulx 1997a).

Not all kill traps are equally efficient at capturing pocket gophers. Proulx (1997b) was able to capture one pocket gopher per 3.2 trap-nights with the ConVerT trap, but only one pocket gopher per 7.1 trap-nights with the Victor Easyset. The difference, in part, may be that the open floor of the ConVerT trap allows continuous contact between the pocket gopher's feet and the soil so that the animal is less hesitant to enter the trap.

CONCLUSIONS

Pocket gophers and other fossorial rodents can cause substantial damage to various human resources. Kill traps can be used to reduce populations and, hence the damage, to acceptable levels. Traps can be efficient, given experienced field crews with the proper equipment. The method is labor-intensive, hence relatively costly. Trapping may become a more important method of pocket gopher control in the future because of inadequate efficacy of many toxic baits and increased restrictions on the use of toxicants. Conversely, many states have enacted legislation that restricts the use of some traps in some situations. There is a urgent need to test the humaneness of existing traps, improve or develop new traps, and to establish international trap standards (Barrett et al. 1988, Proulx and Barrett 1991, Proulx 1999). More research is needed to develop nonlethal methods to reduce damage by fossorial mammals. We are investigating physical barriers and vegetation management (Engeman et al. 1995, Owsiak 1996), repellents (Witmer et al. 1997, 1998), and immunocontraception (Miller 1996).

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