Understanding Trapping as a Tool to Manage Pocket Gophers

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ABSTRACT: The pocket gopher is one of the most damaging vertebrate pests in California and throughout much of North American. Many options are available for managing pocket gophers including the use of rodenticides, burrow fumigation, and trapping. Trapping can be time consuming and labor intensive in some situations, but the efficacy of this approach can often offset these negative attributes. As such, we have engaged in several research projects over the last 5 years to increase the utility and effectiveness of trapping as part of an Integrated Pest Management (IPM) program for pocket gopher control. When comparing traps, we found that the Gophinator trap was a more effective trap than the Macabee, particularly when trapping larger pocket gophers. There does not appear to be a substantial benefit to covering trap-sets in most situations, but if trapping when temperatures are high, covering trap-sets may provide a slight increase in capture efficiency. If covering trap-sets, utilizing peanut butter might provide a slight increase in capture success; attractants provide no benefit if using uncovered trap-sets. Trapping was a highly effective technique for managing pocket gopher populations in crop fields. Furthermore, only 3 days were required for novice trappers to become efficient at capturing pocket gophers, although additional experience does increase the rate of capture. Collectively, these results validate the importance of including trapping in an IPM program, and should benefit all individuals who utilize trapping for managing pocket gopher populations.

KEY WORDS: attractants, Integrated Pest Management, IPM, pocket gopher, rodent control, *Thomomys* spp., trapping

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INTRODUCTION

Pocket gophers (*Thomomys* spp.) are short, stout burrowing rodents, usually 6-8 inches in length. They spend most of their time below ground where they use their front legs and large incisors to create extensive burrow systems. If left unchecked, pocket gophers will cause extensive damage to crops, natural areas, and residential and urban properties. A recent study in California estimated losses of 5.3-8.8% when pocket gophers are present in croplands (Baldwin et al. 2014b). This damage includes consumption of tap roots and above-ground vegetation that can result in reduced vigor and/or mortality of plants; loss of irrigation water down burrow systems; and chewing on underground drip lines. Pocket gopher mounds can result in additional problems including serving as weed seed beds, burying of plants, and causing damage to farm equipment.

A number of options are currently available for controlling pocket gophers including rodenticides, burrow fumigants, and trapping. Rodenticides are frequently utilized for pocket gopher control as they are relatively quick and inexpensive to apply. However, efficacy tends to vary tremendously with rodenticides (e.g., 0-100%; Tickes et al. 1982, Evans et al. 1990), thereby making results less predictable. Burrow fumigation with aluminum phosphide is highly efficacious (Baker 2004, Baldwin et al. 2013b), but new restrictions have limited its utility in some areas (Baldwin 2012). Trapping can also be very effective (Smeltz 1992, Proulx 1997, Proulx 2002), but is often considered to be too time consuming, and thus too costly for pocket gopher management over large areas (Engeman and Witmer 2000). Nonetheless, the cost and time for application may be offset by effectiveness. Plus, trapping can be used in areas where burrow fumigants and rodenticides cannot (e.g., organic production, sites close to buildings, etc.). Therefore, we have been involved in several research projects over the last 5 years looking at increasing the utility and effectiveness of trapping as part of an Integrated Pest Management (IPM) program for pocket gopher control. This includes testing factors that may increase visitation and capture rates of pocket gophers, quantifying the importance of experience in the effectiveness of a pocket gopher trapping program, and testing how effective trapping can be as part of an IPM program. In this publication, we provide highlights of results obtained from these studies. More thorough analysis and discussion can be found in previously published articles listed in their respective sections.

IMPACT OF TRAP TYPE

Several types and brands of pocket gopher traps are available. The most common type is a two-pronged, pincher trap such as the Macabee (The Macabee Gopher Trap Co., Los Gatos, CA), Easy Set (Woodstream Corp., Lititz, PA), or Gophinator (Trapline Products, Menlo Park, CA), which the pocket gopher triggers when it pushes against a vertical trap pan. Of these traps, the Macabee is generally considered to be the most commonly used trap in California, while the Gophinator is one of the newest traps currently being used for pocket gopher management in California. As such, we wanted to see which was more effective. Therefore, we trapped pocket gophers throughout the state using both traps. We found that the Gophinator trap was the most effective, primarily because it captured larger individuals at a greater rate. Capturing larger individuals is imperative for a successful management program, as these larger

individuals are responsible for much of the reproduction that occurs in the pocket gopher population. Having a trap that maximizes capture success of these larger individuals should increase the efficacy of pocket gopher management programs. Therefore, the Gophinator appears to be a good trap option. Greater detail on this study can be found in Baldwin et al. (2013a).

IMPACT OF COVERING TRAP SETS

There has been much debate for years whether or not trap-sets should be covered to eliminate light and maintain temperature and humidity within a pocket gopher burrow system. There are two conflicting viewpoints on this topic. One belief is that by covering a trap-set opening, this will keep the pocket gopher from noticing anything abnormal within their burrow system, thereby increasing the likelihood of capture. The other viewpoint suggests that by keeping trap-sets open (i.e., uncovered), this will increase visitation rates by pocket gophers to these trap-sets because they do not like open burrow systems, thereby increasing capture rates. Given the uncertainty on this topic, we decided to investigate further. We found no difference in capture rates between covered and uncovered trap-sets during autumn. During warmer weather in late spring and early summer, we observed an 8% increase in capture rates using covered trap sets. However, this slight increase in capture success was offset by a 35-second increase in time required to cover and uncover trap-sets during the trapping process. As such, we do not see much reason to cover trap sets unless an individual is looking to maximize capture success rates to the greatest extent possible. This likely will not be the case in agricultural settings, at least when initially knocking down populations. However, in urban settings, covering may be worthwhile. For greater detail on this study, please see Baldwin et al. (2013a).

IMPACT OF ATTRACTANTS ON VISITATION AND CAPTURE RATES

Trappers have long sought to find an attractant that maximizes capture rates of target animals. This holds true for pocket gophers as well, yet little information exists on the effectiveness of potential attractants for increasing capture efficiency of this species. As such, we tested several attractants that are readily available and have been reported as potential attractants for pocket gophers. These attractants included peanut butter, anise oil-infused petroleum jelly, carrot oil-infused petroleum jelly, and a commercial grapefruit-scented attractant (Lee's Gopher Getter, Wildlife Control Technology, Inc., Fresno, CA). We also tested if capture rates for the varying attractants differed between covered and uncovered trap sets.

We found that the attractants did not affect either visitation rate or capture rate. However, when no attractant was used, the number of pocket gophers captured per 100 trap nights was greater when trap-sets were uncovered vs. when covered, indicating that the opening was serving as an effective attractant. In contrast, capture rates were generally high and consistent when using peanut butter as an attractant regardless of whether or not the trap set was covered or uncovered. Combined with data from a previous investigation (Baldwin et al. 2013a), this suggests that there is no advantage to using an attractant when utilizing uncovered trap sets, but there is likely some benefit to using peanut butter in covered trap sets (approximate increase in capture efficiency of 7%). Using peanut butter in covered trap-sets may be particularly useful for follow-up trapping after initial trapping efforts are complete. Pocket gophers that have sprung a trap but were not captured will likely be much more difficult to capture if following the same trapping protocol (e.g., uncovered trap-set). Therefore, trappers may see increased capture success in follow-up trapping programs if they switch to using covered trap-sets that are baited with peanut butter. Greater detail on this study can be found in Baldwin et al. (2014a).

EFFICACY

Trapping will only be a viable tool for managing pocket gopher populations if it is effective. A study addressing the efficacy of various management techniques in alfalfa showed that after two treatments separated by one week, trapping was most efficacious ($\bar{x}$ = 92%, SE = 3%). Burrow fumigation with aluminum phosphide ($\bar{x}$ = 84%, SE = 2%) and carbon monoxide ($\bar{x}$ = 62%, SE = 2%) were somewhat less effective. Clearly, trapping can be an effective technique for managing pocket gopher populations. Further detail on this study can be found in Baldwin et al. (2013b).

IMPORTANCE OF TRAPPING EXPERIENCE

How much experience is required for novice pocket gopher trappers to become effective has not been studied in the past, yet would be valuable information for novice trappers so that they are informed on what success to realistically expect when first initiating a trapping program and how long it takes to become proficient. If expectations are too great, novice trappers may become discouraged by their trapping results and abandon this effective management tool. Therefore, capture efficiency and rate of capture by novice trappers were recorded and compared to an expert trapper over the course of a 4-day trapping period to determine the impact of trapping experience on these metrics. We found that after only 3 days of trapping experience, novice trappers were already trapping at a mean efficiency of 94% of that observed by the expert trapper. We observed a similar trend with capture rate ($\bar{x}$ = 77%), although the percentage was muted when compared to capture efficiency, indicating that experience is more important in the speed required to identify pocket gopher tunnels and set traps than it is for capture efficiency. Nonetheless, this study showed that trapping pocket gophers is not a particularly difficult skill to acquire, and that with a bit of persistence, trapping should become a very valuable tool for managing pocket gophers. More information on this study can be found in Baldwin (2014).

DISCUSSION

As with past investigations (Smeltz 1992, Proulx 1997, Proulx 2002), our studies have shown that trapping is a highly efficacious method for managing pocket gopher populations. Trapping is an appealing manage-

ment technique for a variety of reasons, including the fact that there is minimal risk to the trapper, there is no concern of primary or secondary poisoning as there can be with some rodenticides, trapping is allowable for use in organic crops, trapping provides certainty that you removed the offending animal, and trapping can be cost effective depending on the prevailing conditions (e.g., soil type, soil moisture, burrow depth, population density, etc.) at the treatment site (Proulx 2002). Additionally, we have shown that trapping pocket gophers is not a particularly difficult skill-set to develop, further increasing its utility for managing this species.

That being said, there are still steps that can be taken to increase the efficacy and efficiency of trapping programs. For example, in agricultural areas, covering trap sets does not appear to be warranted in most situations. However, in residential areas, where success of removal efforts for a small number of pocket gophers is at a premium, using covered trap-sets with peanut butter as an attractant may be warranted. Additionally, the Gophinator trap appears to be a highly effective trap; its use should increase the efficacy of pocket gopher management programs for growers, pest control operators, and home-owners that have historically used Macabee or similar-style traps.

Although trapping is highly effective in many situations, it may not be the best management option in all situations. For example, in heavy clay or gravely soils, digging holes and setting traps can be very difficult and time consuming. Alternatively, if a trap is sprung but the pocket gopher escapes, it can be very difficult to recapture that individual. For this reason, we strongly advise that individuals interested in managing pocket gopher populations implement an IPM program that utilizes multiple techniques to manage the pest population (Engeman and Witmer 2000). IPM programs have numerous advantages over the use of any single approach including: 1) greater efficacy when incorporating multiple control strategies, 2) lower potential hazard to non-target organisms and the environment when compared to relying solely on pesticides, 3) no limitation on the time of year when control actions can be implemented (e.g., burrow fumigation is only effective when soil is moist), and 4) reduces the probability of behavioral or biological resistance or adaptation to a control mechanism. Fortunately, we have several effective management tools (e.g., burrow fumigation with aluminum phosphide, baiting with strychnine, etc.) to use to construct an IPM program for pocket gophers.

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