The Above-Ground Movement and Dispersal of the Plains Pocket Gopher (*Geomys bursarius*)

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Abstract: The Plains pocket gopher has the largest range of its genus, and it is the gopher that inhabits much of Wisconsin. Gophers are fossorial herbivores that have a dramatic impact on natural and agricultural ecosystems. Throughout the summer of 2005, I completed a population analysis of the plains pocket gopher in a variety of habitats in Buffalo and Trempealeau Counties, Wisconsin, that provided valuable insight into the complex population dynamics of the gopher and served as a foundation to this project. Pocket gophers are known to be strictly subterranean; however, it is not uncommon to find their remains inside the contents of owl pellets. This raises the question: to what extent if any are predatory birds utilizing pocket gophers as a food source? Therefore, determining the above-ground habits of pocket gophers will provide valuable information as to their ecological impact and social interactions in a variety of habitats. I assessed pocket gopher activity in western Wisconsin in 2006 by continuing to monitor population densities, and by incorporating a live trapping protocol that utilizes luminescent dust to track above-ground movements of the pocket gopher. I improved upon my newly-developed protocol as the study was carried out, and results show this to be a viable option for the live trapping of pocket gophers. No gophers were found to utilize above-ground movements for emigration or dispersal; however, mounding activity once again displayed that the dusting protocol was a reliable tool and provided additional insight into the movements of the pocket gopher and their role as a prey species. Population densities in alfalfa production areas and in Conservation Reserve Program lands (CRP) or native grasslands continued to parallel those of my prior trapping projects, reinforcing population trends in these areas.

Key Words: alfalfa, burrow, Conservation Reserve Program, fossorial, *Geomys bursarius*, grassland, herbivore, Plains pocket gopher, subterranean, Wisconsin

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Introduction

The Plains pocket gopher (*Geomys bursarius*) has the largest range of its genus and is the gopher that inhabits much of Wisconsin. Gophers are fossorial herbivores that have a dramatic impact on natural and agricultural ecosystems. A single pocket gopher is capable of moving 2 tons of soil (Grinnell 1923) while burrowing. This aeration of the soil is ecologically critical in many natural areas but can be economically detrimental in agricultural areas. Pocket gophers inhabit a variety of habitats, preferring to feed on forbs rather than grasses (Nietfeld and Roy 1993), establishing elaborate burrow systems, resulting in dramatic effects on the ecosystem due to burrowing, mounding, and feeding. Pocket gopher ranges have been well documented in most areas, yet density distribution remains poorly understood. Dispersal of offspring will likely take place in early spring (Teipner et al. 1983, Bonar 1995), possibly creating higher densities or a greater area impacted by pocket gopher activity.

Throughout the summer of 2005, a population analysis of the plains pocket gopher was completed in a variety of habitats in Buffalo and Trempealeau Counties, Wisconsin. The study was developed and executed to most effectively and efficiently evaluate pocket gopher populations. Plots of 2 - 4 acres were kill-trapped, after dispersal of young occurred, over 7 sessions, using equal effort and the principle of diminishing returns regression analysis. It was found that pocket gopher densities in the study areas varied greatly. A direct relationship between increased populations and disturbance caused by pocket gophers was observed. Consequently, an inverse relationship between increased mounding and burrowing activity due to increased populations resulted in decreased desired plant species. However, an inverse relationship also existed between decreased pocket gopher populations in areas of lower carrying capacity and the increased disturbance to the same areas. This was likely due to the gophers being forced to excavate longer main burrows and lateral burrows in order to meet nutritional requirements, providing even further confusion concerning population analysis of the pocket gopher. Undoubtedly, this project reinforced the concept of how poorly understood the pocket gopher is, yet this research also provided valuable insight into the complex population dynamics of the gopher.

Pocket gophers are known to be strictly subterranean; however, it is not uncommon to find their remains inside the contents of owl pellets. This raises the question: to what extent if any are predatory birds utilizing pocket gophers as a food source? Therefore, determining the above-ground habits of pocket gophers will provide valuable information as to their ecological impact and social interactions in a variety of habitats. This information will serve as foundation for further research concerning the pocket gophers as a prey species to raptors, mammals, and reptiles in prairie ecosystems, and may contribute to a greater understanding of the unique question of why and how the Wisconsin River serves as a barrier to pocket gopher populations in Wisconsin.

This project had 2 purposes: 1. To determine to what extent the plains pocket gophers utilize above-ground movements for dispersal of young in a variety of habitats, and 2. To determine if and when pocket gophers utilize above-ground movement for emigration out of populations of varying densities in a variety of habitats.

Study Sites

Sites were chosen near Eleva, Gilmanton, Mondovi, and Strum in Buffalo and Trempeleau counties, Wisconsin, where damage to alfalfa production areas traditionally occur. Study sessions took place for 2-3 consecutive days each week over a period from May 26 to August 9, 2006.

Methods

I analyzed 4 study sites, each consisting of CRP land or native grasslands adjacent to various types of production or pasture lands. I used equal effort kill trapping in combination with the principal of diminishing returns including regression analysis to determine pocket gopher densities at these sites.

I accomplished live trapping of pocket gophers in study plots immediately adjacent to the 4 study sites utilized for population density estimates, by replacing the “kill” mechanism of a Victor black box trap with 5-strand nylon cord, pinning the pocket gopher to the box, but not injuring the animal (Figure 1). I constantly monitored traps, and prior to being released unharmed to their burrows, trapped gophers were appropriately dusted with a long-lasting luminescent dust typically used in criminology research (Figure 2). A different color of fluorescent dust was used for each trapping session, and a permanent mark was placed on the inside of the rear leg of all live trapped gophers. If the animal was captured again in a live or kill trap, the marked animals would provide additional information towards determining gopher movement in the study area. An ultraviolet light was used to search adjacent tunnel systems for any sign of gopher activity above ground after release. I recorded, diagramed, and compared all results of the population survey completed throughout the spring and summer, providing information concerning movements at times of dispersal and possible emigrations from populations.

Results

Pocket gopher population density paralleled results for the density study conducted throughout the summer of 2005 (Figure 3). Pocket gopher populations in alfalfa production areas were greater than double those in CRP or native grassland areas.

Live trapping success was calculated by comparing the percentage of live gophers captured to the number of traps that were contacted by gophers during a trapping session. Contact with a gopher is defined as a trap being set off, resulting in no capture, or by a trap being buried as a gopher plugged the tunnel system. Trapping success increased as the study progressed (Figure 4).

A short-wave ultraviolet lamp was used to thoroughly search for luminescent dust each night of the study. No sign of above-ground pocket gopher activity was documented. However, 2 mounds that had luminescent dust mixed within the soil were located. One gopher marked in the CRP and native grass habitat was kill-trapped 3 weeks later in an adjacent alfalfa production area. The permanent mark placed earlier on the animal was visible, but no sign of luminescent dust could be seen in the peleage of the animal.

Discussion

The population density data from this study reinforces the pocket gopher population data collected in 2005. This information can serve as a foundation or benchmark to work from when making decisions concerning gopher management in Wisconsin.

The increase that occurred in trapping efficiency can most likely be attributed to modifications made to the live traps over time, e.g., increasing the length of the loop of nylon cord in the box traps, and utilizing 2 small pieces of tape to keep the nylon cord tight to the sides of the box trap, in a position most likely to pin the gopher when the trigger mechanism is tripped. There has been little formal research completed involving the live-trapping of pocket gophers. A reliable method of live capture is a positive result obtained from this study. It was displayed that the live-trapping protocol outlined above is a sound scientific method, and it can be used and possibly improved upon to most efficiently capture pocket gophers for live study.

Both gopher mounds found with traces of luminescent dust contained a color of dust that was placed on the gophers during a trapping session one week earlier. There was some concern that the dust may wear off after a period of a day or two, but these observations seem to indicate that the dusting strategy used is a serviceable tool of study for this project and would appear to work for a minimum one week's time. However, is not likely to last for 3 weeks; more research needs to be done in this area to validate these ideas, but a starting point has been established.

Management Implications

The health of mammals, raptors, and reptiles that regularly feed on gophers should be considered when making pest management decisions. Various chemical controls are commonly used to reduce gopher populations, and the possibility of some of these chemicals accumulating in a predator is real. However, this project provides information that displays there is little above-ground movement at any time of day by the Plains pocket gopher, easing concerns some might have for chemical controls reaching raptor populations through natural feeding processes.

Producers in Wisconsin may utilize the density data obtained from this project to make more prudent decisions regarding future pest management.

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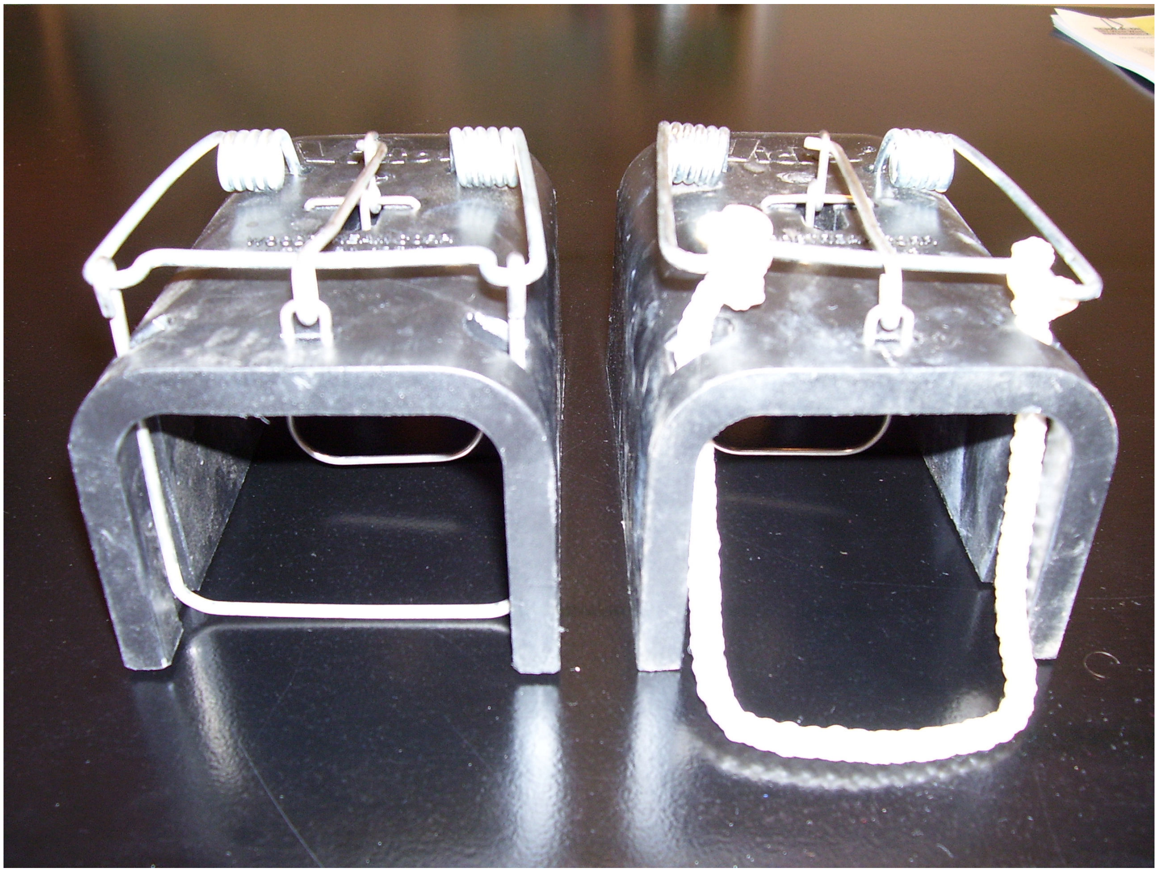

Figure 1. Victor Black Box Trap (left), and modified version (right).

Figure 2. Live-trapped gophers were placed into a 6-gallon bucket, moved away from their burrow systems, and appropriately dusted prior to release, to ensure no stray fluorescent dust contaminated the study location.

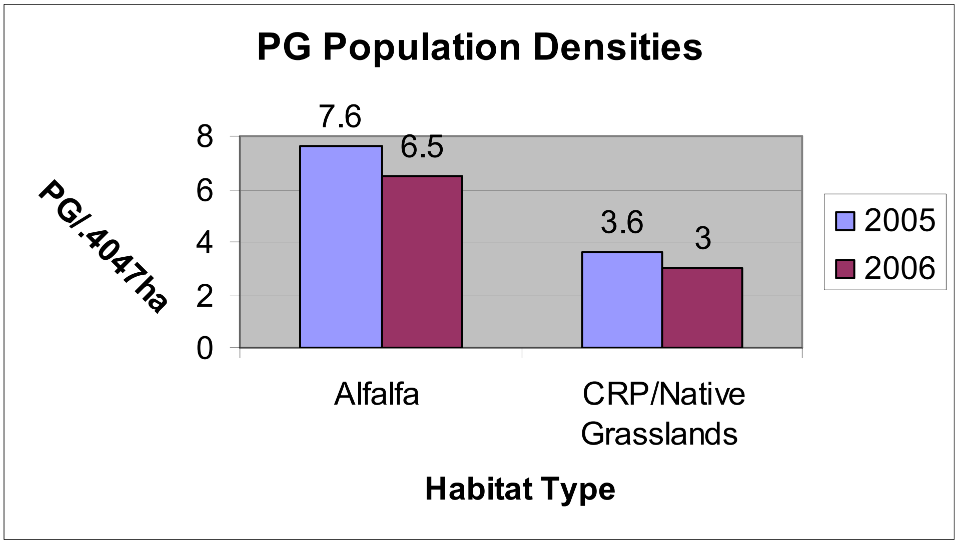

Figure 3. Densities of pocket gophers determined in alfalfa and CRP grasslands during 2005 and 2006.

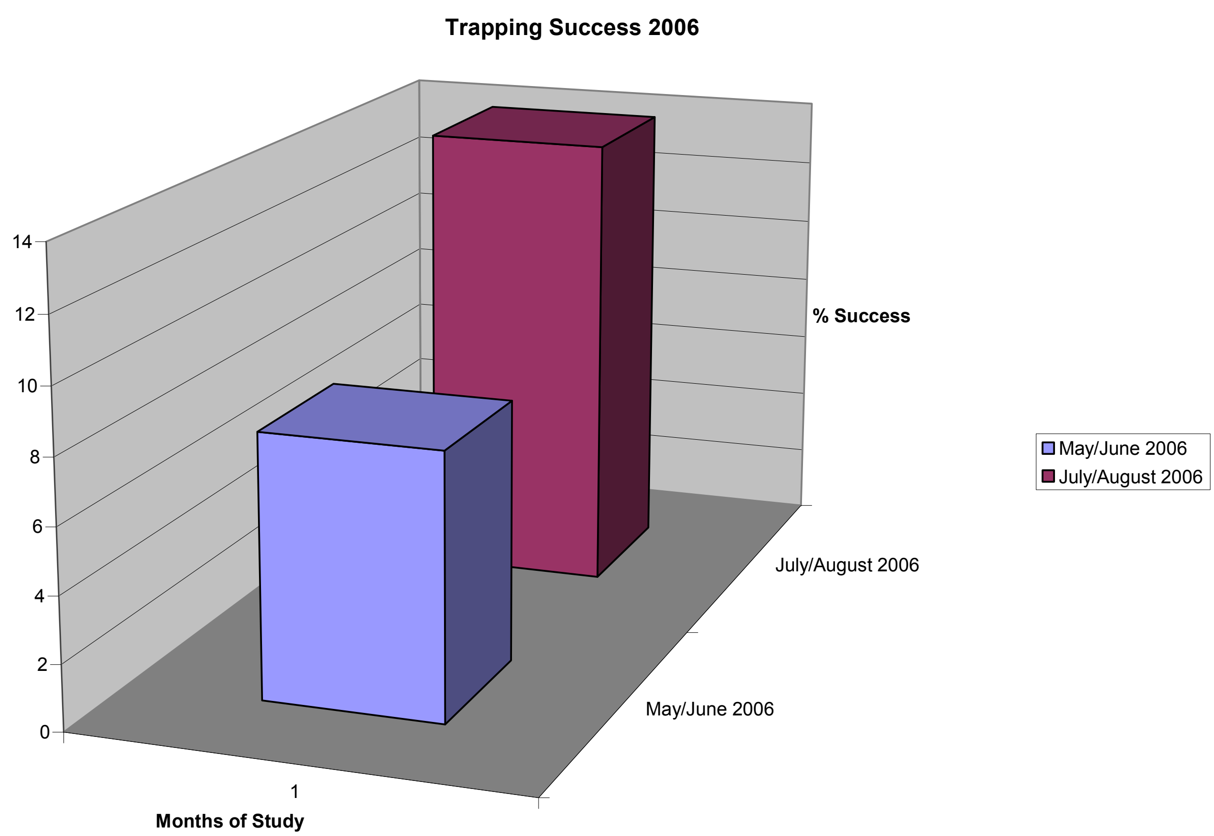

Figure 4. Trapping success improved during 2006 as the study progressed.