Using IPM techniques to Improve Cooperator Effectiveness to Mitigate Damage Caused by Townsend's Ground Squirrels in Irrigated Alfalfa

IPM/SA Mini-Grant Proposal

Project Personnel: Mark Nelson (Project Leader). Terry Messmer (Collaborator). **Cooperators**: Billy Dalton, Beaver County Commissioner; Arlan Mayer, SCD Chairman; Tim Marshall, grower.

Situation Statement

Townsend's ground squirrel's (*Spermophilius townsendi*) populations on agricultural lands in Beaver County are increasing. High populations of ground squirrels can compete with livestock for forage; destroy food crops, golf courses, and lawns; and can be reservoirs for diseases such as plague. Their burrowing activities alter irrigation systems. Burrow mounds not only cover and kill vegetation, but damage haying machinery. The impact of high squirrels densities in irrigated alfalfa fields may have been exacerbated because of recent drought conditions. Hundreds of acres of alfalfa ground in western Beaver County are currently infested with the ground squirrel with the problem get much worse the last two years. They are costing farmers thousands of dollars each year.

Ground squirrels in Beaver County are not a protected species. Townsend ground squirrels live in colonies and construct underground burrows that have a number of entrances. They hibernate during the coldest part of the winter. Males usually become active above ground 1 to 2 weeks before the females in the spring, sometimes as early as late February or early March. A few may be active above ground throughout the year. Breeding occurs immediately after hibernation. The young are born after a 4-to 5-week gestation period with 2 to 10 young per litter. Generally only 1 litter is produced each year. Densities of the ground squirrel populations can range from 2 to 20 or more per acre.

Utah State University Extension has met with cooperators to provide technical assistance regarding control measures. A fact sheet discussing control alternatives to manage damage caused by the squirrels was prepared and distributed at a ground squirrel meeting with twenty producers in April 2008. In the May 2008, Dr. Terry Messmer, USU Extension Wildlife Specialist, met with Mark Nelson and some cooperators to assess the situation and status of control measures used by operators.

This assessment, suggested that for cooperators to better mitigate the damage associated with overabundant squirrel populations, an integrated management effort must be initiated involving affected cooperators. At the time of the assessment some cooperators were implementing some controls, but the effort was not uniformly being applied on a large enough landscape.

Objectives

1. To train Beaver County cooperators impacted by ground squirrels about integrated pest management approaches to mitigate damage in irrigated alfalfa fields.
2. To assess landowner application of integrated pest application approaches, levels of success, and satisfaction in response to training.
3. To compare the effectiveness of pre-baiting in field trials using rodenticides registered in Utah to control ground squirrels.

Procedures

Objective 1.

A workshop will be conducted in Milford, Utah in late January to train cooperators about the application of integrated pest management to mitigate ground squirrel damage in alfalfa fields. This training will include identification of the species, methods to assess population densities, methods and timing of control measures, tips to mitigate impacts on non-target species, and techniques to evaluate effectiveness. The control measures trained will include lethal and non-lethal or cultural approaches.

Cooperators will be provided technical guides and pockets checklists that contain information to reinforce the training and document control efforts. In addition they will be provided a calendar identifying optimum periods to implement specific control measures. This workshop will consist of both classroom and field training. Field training will include techniques used to assess population densities and changes in burrowing activity. Participating cooperators will be asked to complete a workshop evaluation and a pre- and post-workshop questionnaire. This questionnaire will contain questions covering the information to be presented in the workshop.

Objective 2.

A follow-up mail survey will be conducted of participating cooperators at the end of the growing season. This survey will assess landowner perceptions regarding ground squirrel damage in alfalfa fields to include estimates of economic losses. The survey will also assess landowner effort regarding implementation of controls to include costs, man hours, effectiveness, and satisfaction. Such surveys can provide valuable insights regarding innovation strategies to mitigate crop losses.

Objective 3.

Flooding or tillage is not effective at controlling grounds squirrels because they usually adapt by constructing burrows at the margins of fields access to the crop. During the early part of the season they begin foraging from the existing burrow system into the fields until their comfort escape zone is exceeded. Zinc phosphide is currently registered for ground squirrel control in Utah. Zinc phosphide has been used for several years to control ground squirrels. It is a single-dose toxicant when used properly can result in mortality rates as high as 85% to 90%. However, if the animals do not consume enough bait for mortality to occur, they become sick, and will associate their illness with the bait. Thus, they will be reluctant eat the bait. If this happens, repeated baiting with the same bait formulations during the same year will not be successful.

Prebaiting may increase bait acceptance with treated grain baits. Prebaiting means exposing squirrels to untreated grain bait several days before using toxic grain. Conditioning the squirrels to eating this new food improves the likelihood of their eating a lethal dose of toxic grain. Prebaiting often improves bait acceptance and, therefore, control. However, many cooperators often overlook this step in the name of expediency.

To demonstrate to producers the effectiveness of pre-bating will we establish a series of plots to compare the effects of the baiting programs. These field trials will be conducted in cooperation with a

local alfalfa producer. We will select 12 plots at least 10 X 50 m in length located adjacent to alfalfa fields that have a past history of ground squirrel infestations. The plot will be located at least 400 meter from each other. The plots will be randomly assigned to treatment and controls. The treatments will consist of 4 plots that will be pre-baited and than baited with zinc phosphide, 4 plots baited with zinc phosphide without pre-baiting, and 4 plots that receive no treatments. The plots will be randomly assigned.

We will conduct visual census of each plot to determine ground squirrel activity. We will count all ground squirrels on the study plots during a three day period prior to baiting and for three days after treatment. Plots will be counted between 0800-0930 from a fixed point. Each plot will be scanned 4 times during a15 minute period. All squirrels observed during each scan will be recorded. The order which each plot is counted will be varied daily.

After the 3 day pre-treatment counts are completed we will pre-bait 4 randomly selected plots using a clean oats groat. We will use a spot baiting technique, spreading one teaspoon of bait near open burrows or areas of activity. The prebait areas will be marked with survey flagging to facilitate relocation. We will monitor prebait sites for three days to determine bait use. After that time or as soon as the prebait is consumed we will initiate the baiting treatment. The bait will be distributed using a spreader mounted on the back of an ATV. The bait will be broadcast at a rate of 10 lb/ac.

Data Analysis & Presentation of Results

We will use the maximum number of ground squirrels observed the four scan as an index of the population density in each plot for the day counted. We than will calculate the average maximum number of squirrels recorded for each 3-day count period for each plot. We will use Kolmogorov-Smirnov nonparametric test to compare the number of ground squirrels recorded in pre- and post-treatment periods. We also will use a one-way
ANOVA and Duncan's multiple range test to compare results from pre- and post-treatment counts. The measure of the success will ultimately be a reduction in the numbers squirrels counted.

A poster will be prepared and displayed in the County Extension Offices in Milford and Beaver. The results will be discussed in the county extension newsletters. A paper reporting the results will be submitted for presentation at the 2010 Vertebrate Pest Conference sponsored by the Vertebrate Pest Council. A USU Extension Bulletin will also be prepared.

Evaluation

Changes in cooperator knowledge because of the training workshop will be assessed using pre- and post-workshop questionnaires. The questionnaires will be scored. The difference in cooperator scored pre- and post workshop will be used an measure of learning.

The post growing season survey, in addition, to assessing cooperator application of control measures, success and satisfaction, will also contain some questions used on the workshop questionnaire. The questions will be scored to assess cooperator knowledge retention. We will use these data determine if those cooperators who demonstrated greater knowledge of ground squirrels and their control measures,

were more likely to implement IPM approaches and ultimately more success and/or satisfied with their efforts.

If our data, demonstrates a relationship between the effect of better information on cooperator knowledge and increased success and satisfaction in IPM applications, similar approaches could increase the effectiveness of county programs.

Educational Products

Poster for display at counties events in the courthouse and at cooperator meetings

Peer-reviewed paper presented and professional meetings and published in a peer-reviewed journal.

A PowerPoint presentation will be put together to use at local and state farmer meetings.

Extension Bulletin and Fact Sheet

Educational Outreach

The results of the research will be presented at the National Agricultural Agents Association National meeting.

The information will also be shared with other USU Extension Agents at the Utah Ag Agent meetings and will be distributed in the proceedings.

The fact sheet will be peer reviewed and posted to the Extension Website.

Budget

Category	**Requested**	**Match/Berryman Institute**
Travel	$400	$600
Supplies	$400	$600
Publications	$400	
Total	**$1200**	**$1200**