

N E T A F I M U S A



RODENT MANAGEMENT STRATEGIES

MANAGING RODENTS IN SUBSURFACE DRIP IRRIGATED FIELDS

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INTRODUCTION

Unmanaged populations of rodents in agricultural fields cause significant damage and loss of productivity. In field crops small rodents, such as mice and voles, often unearth and devour newly planted seeds and snack on the shoots and roots of the young seedlings that survive. Pocket gophers and ground squirrels damage field crops by eating the root system out from under the plant. According to Colorado State University Cooperative Extension, pocket gophers reduce productivity of portions of alfalfa fields by 20 to 50 percent. Rodents can also cause damage to farm equipment and infrastructure. They may gnaw on small diameter cables and irrigation pipes. The mounds created by these rodents can damage or disrupt harvesting equipment while the tunnels can cause leaks in irrigation channels and even destabilize small earthen dams.

A wide variety of rodents may inhabit agricultural lands, from voles, mice and rats to ground squirrels and gophers. In general, rodents responsible for the majority of damage to agricultural crops and systems live underground for at least part of their lives. A physiological feature common to rodents is that their teeth grow continuously. As a result these animals must chew to wear down their teeth so that they fit in their mouth. Damage to crops and equipment occurs both from feeding and the need to wear down their teeth.

Growers in susceptible areas should implement a rodent management plan to maintain yield and minimize damage to equipment. Those employing drip irrigation, in particular subsurface drip irrigation (SDI), need to control rodent populations to avoid potential costly damage to their irrigation system. An SDI system will need some repairs over the course of the season but these can be reduced by implementing a rodent management plan.

MANAGEMENT PLAN

There is no “silver bullet” for controlling rodent overpopulation on agricultural lands. Control of these potential pests requires a well designed plan that is executed on a consistent basis. The formation of a systematic plan for managing rodents in subsurface drip irrigated fields requires research into the predominant species in your region and rules regulating how these populations may be managed. It is not the purpose of this fact sheet to be a comprehensive manual on rodent population control throughout North America. This document is meant to outline the components of a rodent control plan, and to guide growers to local resources to help them formulate such a plan. A reference list at the end of this guide will assist you in finding more information on your local conditions.

Management of rodent populations on agricultural land generally falls into the following categories.

- Habitat modification and exclusion to reduce population pressure
- Proper drip line installation practices
- Biological control
- Use of repellants to deter invasion
- Use of repellants to deter invasion and protect equipment
- Extermination



HABITAT MODIFICATION TO REDUCE RODENT PRESSURES

Assessing and controlling rodents in a field and the surrounding area before you install a drip system is critical.

Existing rodent pressures either from surrounding fields or within a newly planted field is the first source of conflict between rodents, your crop and equipment. A cultivated block surrounded by unkempt ground or by open lands infested with rodents presents a continuous battle. Thus, the first step in an integrated rodent management program is to reduce the pressure of high rodent populations in the entire area.

High rodent populations are usually obvious. Large rodents such as pocket gophers will leave telltale mounds. The presence of “runways” in grassy areas is one sign of small rodent activity. Assessing the rodent population in the general area will give you an indication of the intensity of the management required to protect your crop and irrigation system. Your local vertebrate pest management specialist can assist you in determining rodent pressure and recommend a clean-up procedure for your property.

When preparing to plant a new field, it is recommended that you destroy the burrow systems by deep ripping the ground. This will eliminate many of the gopher’s burrows and kill some of the gophers allowing a fresh start to the field.

After your field and the surrounding are is cleaned up, establish a buffer zone around the field. Elimination of weeds, ground cover and litter around the field will render the habitat less suitable for rodents. Cultivating this area is a good deterrent for small rodents as it destroys runways and may kill them outright. Larger animals such as pocket gophers can burrow under it, but the lack of food may slow them down. If cultivation is not an option, weed control is still imperative especially for pocket gopher management. Weeds often have

large tap roots which are the preferred food for gophers. A buffer zone of fibrous rooted grasses is less appealing to this pest. The opposite is true for smaller rodents such as mice and voles which enjoy the cover that grasses provide. A cultivated strip around the field is the best way to reduce mouse and rat pressure from surrounding areas.

PROPER DRIPLINE INSTALLATION PRACTICES TO REDUCE RODENT DAMAGE

After the rodent population in the field and surrounding areas is under control the field is ready for dripline installation. Dripline installed and left in a field for several weeks or more is susceptible to rodent and insect damage. Your Netafim USA Dealer understands the best practices to reduce this damage. When plowing thin walled dripline into the soil, the installation shank can leave cracks in the soil and a path down to the dripline that mice love to follow chewing as they go. Best installation practices dictate that following installation, cracks in the soil be sealed by running a tractor tire over cracks created by the plow. This will close the opening in the soil made by the plow and cut off easy access by mice or voles to the loose soil around the dripline.

The following installation procedures can significantly reduce potential rodent damage to subsurface driplines. It is highly recommended that all these procedures be followed.

1. Prepare a buffer area around the field and apply rodenticides according to a plan drawn up with your local extension agent if rodent pressures are high.
2. The field should be as free of crop residue as possible. Field mice are especially fond of plant residues.
3. Apply drip line as deep as practical for the crop being grown. In some soil types the incidence of rodent damage is reduced at dripline depths greater than 14". Crop rotation and germination must also be considered when determining the appropriate depth for the dripline.
4. Apply a repellent or toxicant as you install the dripline.
5. Pack the shank slit with front tractor tires to reduce ready made paths for small rodents. The front tires should be narrow, single ribbed, cultivating tires (see Figure 1 on following page) and the front of the tractor must be weighted. This operation must be completed the same day as installation.
6. Run the system for 12 hours/zone within two weeks of completing the install. Installing the tube in the fall and running the first water in the spring is asking for problems.

TRAPPING AND REMOVAL

Trapping can be an effective method to reduce the population of large rodents such as pocket gophers on small to medium sized fields (less than 50 acres). Trapping is also effective to clean up remaining animals after a poison control program. In the case of smaller rodents such as mice, trapping is not usually cost effective because these animals have such rapid reproduction rates.

Body-gripping traps work exceptionally well for capturing pocket gophers. Traps can be set in the main tunnel or in a lateral, preferably near the freshest mound. Gophers usually visit traps within a few hours of setting so newly placed traps should be checked twice daily. If a trap has not been visited within 48 hours, move it to a new location. Trapping is usually most effective in the spring and fall when the gophers are actively building mounds. The information section at the end of this document lists several sources for purchasing and placement of these traps.

BIOLOGICAL CONTROLS

Biological controls can be divided into two large categories, those that affect the population-at-large and irritants targeted to keep the rodents from gnawing on cables or small diameter tubing such as dripline. One common biological method for controlling rodent populations is to attract rodent predators, most frequently by using owl boxes. Because they are relatively inexpensive and can be populated for a long time, owl boxes are being employed in greater numbers as part of a rodent management program. The principle is simple, the higher the owl population the fewer the rodents. Recent work in California by the U.S. Fish and Wildlife Service showed demonstrable declines in pocket gopher activity following the installation of owl boxes in a vineyard. Consult your local extension service for the design and placement of owl boxes appropriate for your area.



Wet soil can be an effective deterrent for rodents that spend much of their time in tunnels. The repellent effect of wet soil seems to be the result of poor oxygen transfer through the wet soil. Rodents that live in tunnels depend upon the air traveling through the soil for oxygen. In wet soils, the rate of oxygen diffusion is greatly reduced and produces an environment inhospitable to the rodents. Other general repellents are not effective in rodent management over a large area. Sound or ultrasound generators have not been proven effective in driving out rodents.

Targeted repellents, those applied on or around the object you wish to protect, cable or dripline have not received much formal study but show promise when combined with a plan to reduce overall populations. Some growers have reported success using castor oil as a general repellent around driplines. Castor oil should not be injected through driplines as it may clog the emitters. Some commonly used pre-plant pesticides with strong odors or fumigation effect like dimethomate, Vapam or Tellone EC seem to irritate burrowing rodents and keep them away from dripline. These may be applied during injection of the dripline. Always follow the label and local regulations before using any crop protection chemical.

- Flush each zone at pressures recommended by your dealer.
- If the field is dry, pre-water each zone for 6 hours.
- Inject N-pHuric at 200 ppm for 1 hour before shutdown of each zone. Shut down zones leaving N-pHuric in the lines.



FIGURE 1
Tractor on left installing thinwall dripline while tractor on right packs soils left open by shank.

PROTEC-T™

Protec-T is a dripline maintenance product marketed exclusively by Netafim USA for use with Netafim Subsurface Drip (SDI) systems. When properly applied, Protec-T is an irritant to vertebrate pests. It has been shown to drive rodents out of their burrows and out of treated fields. This keeps them away from the subsurface driplines and drives them to the surface where they are exposed to predation from owls, hawks, and other predators.

Netafim provides support services to assist you on the correct application and integration of Protec-T. Recommended application of Protec-T will vary depending on field conditions, but in general, the recommended application is at the rate of 1 gallon material per acre (see product label for further instructions and application recommendations). The drip system should be clear of contamination, in good repair with no breaks and properly flushed prior to treatment to assure even distribution of the material.

Injection:

1. To assure uniform application of the Protec-T material and depending on the total acreage to be treated, a 15-30-60 gallon per hour pump should be utilized. The Protec-T material should be injected into the mainline post-filtration and prior to entering the entire distribution system.
2. To insure uniform distribution of Protec-T thru the system it is critical to begin injection of only after the entire zone is pressurized and all laterals filled.
3. For multi-zone systems, it is recommended that the initial zone be filled and then treated. Once the desired amount of Protec-T to treat a zone is injected, switch to the next irrigation zone.
4. Before injecting Protec-T into the second and any subsequent irrigation zones, each zone must be fully pressurized and all laterals filled.

5. Inject the desired amount into the second (and subsequent zones) following the same process as in number 3 above.
6. Once the final zone has been treated, continue to irrigate that zone for an additional 2 hours to ensure that all Protec-T has exited the pipe and tubing network to the field for maximum efficacy.
7. Once the 2 hour run time on the final treated zone, return to the other zones in the system and begin irrigating for 2 hours per zone to insure all Protec-T has exited the pipe and tubing network.

Checking for distribution and presence of the Protec-T material can be done by opening lines at the end of the system 30 minutes to 1 hour into treatment (Smell Test). The applicator should note odor of rotting vegetation or similar in the water. Repeated application of Protec-T may be needed depending on the severity of the rodent population.

Protec-T has been proven effective in field trials (U.C.C.E. standards), when used as an integrated plan, with significant in mound activity.



EXTERMINATION

Several rodenticides including toxicants and anticoagulants have been registered with the federal government and are in current use for managing rodent populations in and around agricultural fields. New fields being considered for drip irrigation, as well as the immediate surrounding areas should be cleared of rodents prior to installing dripline. To inhibit rodents from invading a clean field placing approved bates around the perimeter of the field prior to irrigation system installation is a good practice to follow. For pocket gophers in particular, a mechanical "burrow builder", a torpedo that creates an artificial burrow and releases bait at set intervals is effective in perimeter applications. The user must be careful that the "torpedo" is creating a good tunnel otherwise the gophers may never find the bait. (See References for sources and plans for burrow builders).

For existing drip fields with a minor rodent infestation, hand baiting tunnels is effective for the trained applicator but can be time consuming. Other products on the market used for eliminating small gopher populations include using a wand to pump a mixture of propane and oxygen into the tunnels and igniting the mixture killing the rodents by concussion.

RODENT MANAGEMENT ACTION PLAN

An integrated approach must be taken to reduce rodent damage to crops and equipment. This plan must involve reducing acceptable habitats for rodents close to the field and may involve trapping or poisoning to control active populations. In addition, the dripline itself can be protected using the repellent effect of some pesticides and slightly acidifying the soil around the lines.

Fall and spring are the most active time for rodents and they seem to be the worst seasons for damage - thus any management program must focus on these seasons. Do not underestimate the wealth of reference materials and the help of local extension agents and pest control specialists. Many growers have implemented successful plans for rodent management on their fields - protecting the investment in their irrigation system and improving yields. To be effective, any rodent control plan must be diligent and consistent in a time frame determined by the extent of the rodent pressure in the general area.



REFERENCES

The following websites offer excellent information on the management of pocket gophers and mice and provide lists of additional resources.

<http://www.ext.colostate.edu/PUBS/NATRES/06515.html>

“Developing an IPM Program for Controlling Pocket Gophers in Alfalfa” by Dr. Roger Baldwin, UCCE Wildlife Pest Management Advisor, California Statewide IPM Program

<http://alfalfa.ucdavis.edu/+symposium/proceedings/2010/10-151.pdf>

http://extension.usu.edu/files/publications/publication/NR_WD_005.pdf

www.icwdm.org/Publications/WildlifePublications.asp

Internet center for Wildlife Damage Management - an extensive site for all types of human wildlife interactions. Site includes an excellent publication on pocket gophers with an extensive university reference section.

www.berrymaninstitute.org

Concentrates on human wildlife interaction. Excellent article on Pocket Gophers.

<http://www.ipm.ucdavis.edu/PMG/crops-agriculture.html>

Washington State University list of links to vertebrate pest control sites

www.snohomish.wsu.edu/garden/verturl.htm

SELECTED REFERENCES

Clark, J.P., ed. Vertebrate pest control handbook, 4th Edition. State of California, Dept. of Food and Agric., Division of Plant Industry, Integrated Pest control Branch. 1994

Hygnstrom, S.E., R.M. Timm and G.E. Larson, eds. Prevention and Control of Wildlife Damage. University of Nebraska, Institute of Agric. and Natural Resources; USDA/APHIS, ADC and Great Plains Agric. Council, Wildlife Committee. 1994.

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<http://www.target-specialty.com/products/pest.asp>

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and Packaging Co.
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Liberty, MO 64068
(800) 223-3684

Pestcon Systems, Inc.
PO Box 339
Wilson, NC 27894
(800) 548-2778

Research Products Co.
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Salina, KS 67402-1460
(913) 825-2181

Van Waters and Rogers
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Seattle, WA 98124-1325
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Pocatello Supply Depot
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(208) 236-6920
Pocatello, ID 83201
(208) 236-6922 Fax

South Dakota Dept. of
Agriculture

Rodent Control Fund
Anderson Bldg.
Pierre, SD 57501
(605) 773-3724 Fax

Van Waters and Rogers
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inventiveagproducts.com

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(800) 792-3246

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(605) 336-7716

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