CCOF
Organic Certification Trade Association Education & Outreach Political Advocacy

August 11, 2010

Propane Petition - §205.601

California Certified Organic Farmers, Inc. (CCOF) is petitioning to have odorized propane used in devices for control of burrowing pest animals added to the National List §205.601 synthetics for use in crop production.

Information on the substances being petitioned:
1. The substance's chemical or material common name: **Odorized Propane**.
Other names: propane, liquefied propane gas, LP gas
Chemical name: Dimethylmethane with ethyl mercaptan added as an odorant.

2. Manufacturers
Many for the propane in tanks, Including
CHS Inc., P.O. Box 64089, Mail Station 525, St. Paul, MN 55164 1-651-355-8443 *(MSDS enclosed as #1).*
AmeriGas Propane, P.O. Box 965, Valley Forge, PA 19482 1-610-337-1000 (Safety Dept.)
Northwest Propane Gas Co., 11551 Harry Hines Blvd., Dallas, TX 75229 1-972-247-6121

Manufacturers of explosive devices for rodents that use propane:

Rodenator
Meyer Industries
P.O. Box 39
2447A West Hwy #52
Emmett, ID 83617
Contact: Ed Meyer
(208) 369-4030
www.rodenator.com

Rodex
1077 S.E. 2nd St.
Ontario, OR 97914
(541) 889-7775
www.rodexindustries.com

Varmitgetter
130 N. Main St.
Payette, ID 83661
(208) 642-9889
www.varmitgetter.com

Rodent Blaster
SRM Industries

P.O. Box 2153
Brentwood, CA 94513
(925) 240-1357
www.rodentblaster.com

3. The intended or current use of the substance.
The propane is mixed with oxygen and is exploded underground, causing a rapid expansion of gasses that leads to concussive force that kills burrowing pest animals, with accompanying suffocation from consuming all the oxygen in the tunnel.

4. Crops for which the substance will be used. If used for crops, the rate and method of application of the substance.
All crops that may have gophers, ground squirrels, and other burrowing pests, such as prairie dogs, gophers, moles, voles, squirrels, rabbits, groundhogs, armadillos, chipmunks, muskrats, shrews, rats, mountain beaver, nutria, ground squirrels, badgers, pocket gophers, marmots, bog lemmings, and more. Note that many, but not all, the above pests are rodents.

The method of application is with a device that mixes the propane with oxygen from a tank and ignites it underground in a burrowing pest tunnel. The "application rate" is about 2% liquified propane gas and 98% compressed oxygen. It is injected into the burrow for up to one minute before it is ignited.

5. The source of the substance and a detailed description of its manufacturing or processing procedures from the basic component(s) to the final product.
Propane is a naturally occurring component of natural gas. Liquid Petroleum Gas (LPG) is created from the decomposition of organic material over time. LPG is a combination of several different chemicals that are then separated. Trace contaminants normally found in commercial LPG, such as water, hydrogen sulfide, mercaptans, oxygenates, and unsaturated hydrocarbons are removed using hydrogenation, fractionation, and molecular sieve sweetening technologies. This offers a cleaner, more consistent and stable hydrocarbon. One of the gases that is separated and purified during this process is propane. By law all propane sold in tanks must contain an odorant so that people can detect gas leaks. The odorizing chemical is also a petroleum derivative and is typically used and a concentration of up to 50 parts per million.

About 90% of U.S. propane is domestically produced. After it is produced, North American propane is stored in huge salt caverns located in Fort Saskatchewan, Alberta, Canada; Mont Belvieu, Texas and Conway, Kansas. These salt caverns were hollowed out in the 1940s, and they can store 80 million or more barrels of propane. When the propane is needed, most of it is shipped by pipelines to other areas of the Midwest, the North and the South, for use by customers. *(Information from Petition to NOSB on July 2, 2008 from ConAgra Foods for Propane for Handling, and from Wikipedia).*

6. A summary of any available previous reviews by state or private certification programs of the petitioned substance.

Because the "substance" was in the past thought to be the device itself, organic certification programs had been assuming that the activity of using the device was allowed, just as the activity of flame weeding with propane devices is allowed. Although these devices are fairly new, their use was allowed by many certifiers prior to the NOP rule being implemented (this learned through the ACA discussions on the ACA listserve). Specific certifiers who have verified this statement by personal communication include Oregon Tilth Certified Organic (OTCO), Midwest Organic Services Association (MOSA), Nature's International Certification Services, California Certified Organic Farmers (CCOF), and Organic Crop Improvement Association (OCIA- approval certificate enclosed as #2.) It was never deemed necessary to petition for them specifically until a certifier training in 2007 in which the NOP stated that the devices were not allowed and that the propane had to be petitioned.

7. Information regarding EPA, FDA, and State regulatory authority registrations.

Propane is affirmed Generally Recognized as Safe (GRAS) in FDA regulations at 21 CFR 184.1655. It is not regulated by the EPA or FDA. The Rodenator brand device is registered with the EPA as a pest control: EPA #079470-ID-001. A letter is enclosed (enclosure #3) from the State of Colorado Department of Labor and Employment, Division of Oil and Public Safety, stating that such devices do not meet the definition of "true explosive devices" and therefore do not need to be regulated. This is confirmed in the Federal Regulations published by the ATF in the Federal Register, List of Explosive Materials (2005R-14P). Neither propane nor oxygen are listed as explosives pursuant to 18 U.S.C. 841 et. seq.

8. Chemical Abstract Service (CAS) numbers; product labels.

CAS number: 74-98-6
International Number System (INS) Number: 944
European Commission (EC) No.: 200-827-9
Product label is the same as the MSDS in most cases.

9. The substance's physical properties and chemical mode of action:

Molecular Formula	C_3H_8
Molecular Weight	44.09 g/mol
Melting point	not applicable
pH of 1% solubility (water, oil)	neutral
Solubility in water at 25° C	less than 0.1% (at 0 - 50°C)

(a) Chemical interactions with other substances, especially substances used in organic production;

The odorized propane being petitioned is mixed with oxygen from another tank and then ignited in the underground rodent tunnel. The oxygen is assumed to be non-synthetic for

use in crop production because the NOSB voted it to be non-synthetic in handling and it appears on 205.605 (a).

During the explosion all of the propane is consumed and so it is unlikely to have a chemical reaction with any other substance.

(b) Toxicity and environmental persistence;

Propane is one of the lightest, simplest hydrocarbons in existence, and, as a result, is one of the cleanest burning of all fossil fuels. Burning coal to generate electricity releases carbon dioxide and other pollutants into the atmosphere. Per pound of fuel burned, coal emits more than twice the amount of carbon dioxide as does propane.

Propane gas is nontoxic, so it's not harmful to soil and water. Because propane does not endanger the environment, the placement of propane tanks either above or below ground is not regulated by the Environmental Protection Agency (EPA). According to the EPA, much of the sulfur dioxide in the atmosphere, which produces acid rain, is attributable to coal-fired, electricity-generating facilities. In contrast, neither the process by which propane is produced nor the combustion of propane gas produces significant acid rain contaminants.

(c) Environmental impacts from its use and/or manufacture;

Propane is an approved, clean fuel listed in the 1990 Clean Air Act and the Energy Policy Act of 1992. Propane is one of the cleanest burning of all fossil fuels. Tests conducted by the U.S. Environmental Protection Agency show that propane-fueled vehicles produce 30 percent to 90 percent less carbon monoxide and about 50 percent fewer toxins and other smog-producing emissions than gasoline engines. Propane also is nontoxic, so it's not harmful to soil or water. The manufacture of propane would have the same environmental impacts as the use of any substance derived from petroleum or natural gas.

(d) Effects on human health;

Propane is nontoxic; however, when abused as an inhalant it poses a mild asphyxiation risk through oxygen deprivation. Commonly stored under pressure at room temperature, propane and its mixtures expand and cool when released and may cause mild frostbite.

Propane combustion is much cleaner than gasoline combustion, though not as clean as natural gas combustion. The presence of C–C bonds, plus the multiple bonds of propylene and butylene, create organic exhausts besides carbon dioxide and water vapor during typical combustion. The health hazard from inhaling is reduced significantly by the presence of the odorizing chemical which enables people to smell and leaks before breathing too much.

(e) Effects on soil organisms, crops, or livestock.

The main effects on biological organisms from the use of this device are from either the concussive force or the sound waves generated by the explosion in the underground tunnel. While undoubtedly this may affect earthworms and other soil organisms, there was no research

10. Safety information

Propane has a narrow range of flammability when compared with other petroleum

products. In order to ignite, the propane/air mix must contain from 2.2 to 9.6 percent propane vapor. If the mixture contains less than 2.2 percent gas, it is too lean to burn. If it contains more than 9.6 percent, it is too rich to burn.

Propane won't ignite when combined with air unless the source of ignition reaches at least 940 degrees Fahrenheit. In contrast, gasoline will ignite when the source of ignition reaches only 430 to 500 degrees Fahrenheit.

Proper clothing, ear protection and eye protection must be worn when handling all such devices.

For other safety information refer to sample MSDS, attached.

11. Research information and Citations.
Note: although the petition rules state that information should be included that presents "contrasting positions to those presented" here, no such clear research could be found that take a position against use of these devices in organic production. Some of the general references given below have area of caution or concern mentioned.

Accredited Certifiers, 2010, personal communication through email from OTCO, MOSA, NICS

Carter, William PL, Computer Modeling of Environmental Chamber Measurements of Maximum Incremental Reactivities of Volatile Organic Compounds, Journal of the Air and Waste Management Association, January 25, 1995, 44:881-899. http://pah.cert.ucr.edu/ftp/pub/carter/pubs/etcpap-2.pdf

Custom Certification Services, 2006, Organic Certificate showing approval for OCIA. *(Enclosure #2)*

Internet Center for Wildlife Damage Management, Cornell University, Clemson University, University of Nebraska - Lincoln, Utah State University http://icwdm.org/wildlife/pocketgopher.asp

Knight, James E., 2000, Guide to Pocket Gopher Control in Montana, Montana State University Extension Service, Bozeman, MT. *(Enclosure #6)*

Mach, Jeff J, 2004, Evaluation of the Rodenator Pro™ on European Rabbits (*Oryctolagus cuniculus*), *(Enclosure #4*).

Petitioned Substances Database of the NOP, July 2008, Petition from Con-Agra Foods for Propane for use in Handling. http://www.ams.usda.gov/AMSv1.0/ams.fetchTemplateData.do?template=TemplateJ&page=NOPPetitionedSubstancesDatabase

Propane Education and Research Council Facts: http://www.propanecouncil.org/what-is-propane/facts/

Rodent-Killer, http://www.rodent-killer.com – The home of solutions to all of your rodent control problems. We don't hug em, we kill em!

State of Colorado Department of Labor and Employment, Division of Oil and Public Safety, 2006, letter concerning regulation of Rodenator *(Enclosure #3).*

Sullins, Monty, 2004. Observations of the Rdenator Device for Controlling Black-Tailed Prairie Dogs. Montana Department of Agriculture, Technical Services Division of the Agricultural Sciences Division *(Enclosure #5).*

Wikipedia, entry for propane, accessed 9/14/09. http://en.wikipedia.org/wiki/Propane

Wittman, Thomas, 2009 & 2010, Gophers Limited, www.gopherslimited.com. Personal communication.

12. Petition Justification Statement

This discussion will mostly focus on gophers and ground squirrels because they are the most prevalent vertebrate pests in California, on which this product will be used. The basics of trapping will be similar for other rodents although the specifics may be different. The discussion of alternatives will assume an average gopher population of 25 -30 gophers per acre. Many of the details of how much time would be involved for different methods was provided by Thomas Wittman, the proprietor of a company called Gophers Limited (website in references section)

A. • Why the synthetic substance is necessary for the production of an organic product.

The economic impact of underground burrowing pests on organic crops is impossible to estimate because nobody keeps records of crop destruction when it is spotty throughout a field like it is with these rodents. However the losses are significant, probably the most so in nut crops from ground squirrel damage. Since the decision to prohibit these devices in 2007 pending petition, this is the number one request from CCOF's certified organic growers.

While there are some alternatives listed below that can be effective in small scale situations, the farm of more than 50 acres would have a very hard time achieving a suitable level of pest control with those methods. Each farm is different with respect to labor availability, capital for inputs, competing activities for use of labor, and amount of rodent pressure. All of those factors go into a grower's decision on burrowing pest control. In regions where these animals are a problem, they are usually a "number 1" ranking problem and therefore a variety of tools for control is essential.

It was the intent of the early NOSB to allow for sulfur smoke bombs as discussed below to be used for rodent control. These combustible devices, which were just starting to be on the market at that time, were unofficially decided to be outside the scope of materials review and as "devices", were like flame weeders or other petroleum- fueled power equipment. The smoke bombs have not turned out to be actually feasible, and the "devices"

were suddenly prohibited in 2007 after no warning or previous guidance to the contrary. This created a hardship for CCOF clients and a difficult situation for us.

From the discussion of alternatives below it may become apparent that there are more alternative choices for gopher control than there are for the more destructive and harder to control ground squirrel. In other areas of the country there will undoubtedly be other problem burrowing animals to greater or lesser extent. Because the economics of this type of damage was hard to quantify, there would be no basis to suggest an annotation limiting the use to one type of burrowing pest over another. The economics of purchasing and using these devices is significant and therefore the need will have to be great before this control method is chosen.

• *Describe any non-synthetic substances, synthetic substances on the National List, or alternative cultural methods that could be used in place of the petitioned synthetic substance.*

Traps and Barriers

There are many types of traps and some barriers for rodent control.

Impalement traps such as Macabee and box traps, certainly kill gophers but they are tricky to set up properly, are time-consuming to use, and can leave the animal alive and suffering for many hours before death. They must be checked, moved, and re-set daily. A skilled person could probably set 12 traps per hour, or 1/2 acre per hour. The cinch trap style of trap can be set at a rate of about 25 traps per hour, or an acre per hour. This rate is similar to an explosive device, but it takes experience and persistence to reach that level of speed. These traps cinch around the neck and kill instantly so are more humane. For ground squirrels it would be more common to use live traps including some models called repeating traps that can catch a whole colony from one baiting.

Advantages of traps include the portability of them to reach inaccessible areas where a propane device would need a truck for transport of the tanks. They are more precise when used properly because the exact tunnels can be followed. They are also less expensive.

Disadvantages of traps include the necessity of handling the animals that are caught, whether alive or dead. With cases reported recently of bubonic plague and rabies from contact with ground squirrels, this is not to be taken lightly. They have to be monitored regularly and it takes some skill to use them properly. They are not appropriate for areas near public uses such as parks or schools because they can be obstacles on playing fields and dangerous if mis-handled.

Barriers include fencing and "gopher cages" or wire baskets placed in a hole at planting time to keep gophers out of the root zone. Because of their burrowing nature, gophers and ground squirrels can defeat most fences and the caging idea is confined to use on small acreages with valuable perennial plants.

Other Physical Methods

Flooding out gophers has been used in some situations by flushing large amounts of water through the tunnels. While this undoubtedly works, it is not useful on sloped ground, or for other rodents besides gophers. It also wastes water and can cause erosion.

Shooting rodents is a tried and true physical method of control. It is easier to shoot ground squirrels or above-ground rodents than it is gophers which rarely are above ground.

Shooting is unacceptable in populated areas however, and is more time consuming than trapping or explosive devices.

Non Synthetic Substances

Various non-synthetic substances have been tried and recommended for repelling gophers from a garden area, but all of them have drawbacks a farm-scale use. Planting repellent plants, such as castor bean, squill, daffodils, and euphorbia ("gopher spurge") around the perimeter of an area can be used for small gardens. It is most important to have the gophers already out of the area or they will be trapped inside. Castor bean oil made into pellets is a product on the market for gardeners to use. This is practical in small areas only, since the labor of keeping up with the pellet applications in the tunnel is about the same as trapping.

Strychnine is a non-synthetic substance that kills gophers but it is prohibited on the National List 205.602 because it is highly toxic to other organisms.

Synthetic Substances

One potentially synthetic substance is on the National List for rodent control: sulfur smoke bombs. There are smoke bombs on the market that are fairly effective, however, when certifiers reviewed the one smoke bomb product, it was found to have an igniting agent called "red phosphorus" as an ingredient. This is probably a synthetic component and is not on the National List. Since it is unlikely that anyone would petition for it since we don't truly know what it is, the smoke bombs are not a viable alternative. An alternative igniting agent that has been suggested by some enterprising growers who would make their own smoke bombs is sodium (Chilean) nitrate. This is a non-synthetic substance but is only allowed for fertilizer at the moment. The effort to open this up with a petition for use as an igniter was deemed to be too challenging by this petitioner.

• *Describe the beneficial effects to the environment, human health, or farm ecosystem from use of the synthetic substance that support its use instead of the use of a non-synthetic substance or alternative cultural methods.*

Almost nothing is more frustrating than watching a crop get destroyed by animals of any kind. So the main beneficial effect is to the human health of the grower's psyche, in knowing that there is something that can be done about ground squirrels, which currently have very limited control options and can devour a whole crop in a day or two. The farm ecosystem also benefits because the burrowing rodents become more in balance with the rest of the organisms that make up a farm, rather than dominating the landscape.

The use of these devices would enable growers to choose a diversified approach to burrowing pest control instead of sole reliance on trapping. This would create benefits to the ecosystem in permanent planting such as vineyards where field activities can be modified when there are less rodents and permanent burrows to disrupt cultivation and irrigation.

The incidence of human diseases being spread by rodents and their fleas is coming to the public's attention strongly in recent years, with particular concern for bubonic plague, rabies, and Lyme disease all having cases linked to rodents. Keeping down the rodent

population to decrease the spread of these diseases is a significant beneficial effect to human health.

13. Confidential Business Information

This petition contains no Confidential Business Information (CBI) and no confidential commercial information.

14. Petitioner

California Certified Organic Farmers
Zea Sonnabend, Policy Specialist
2155 Delaware Ave., Suite 150
Santa Cruz, CA 95060
831-423-2263

MATERIAL SAFETY DATA SHEET

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

CHS Inc.
P.O. Box 64089
Mail station 525
St. Paul, MN 55164-0089

Transportation Emergency (CHEMTREC): 1-800-424-9300
Technical Information: 1-651-355-8443
MSDS Information: 1-651-355-8438

PRODUCT NAME: Propane

MSDS: 0148-M7A0 – Rev. F (02/08/07)

COMMON NAME: Propane, Liquefied Petroleum Gas; LP Gas; Dimethyl methane

CHEMICAL FORMULA: C_3H_8

CHEMICAL NAME: Dimethylmethane

CHEMICAL FAMILY: Paraffin Hydrocarbons

Section 2 - COMPOSITION AND INFORMATION ON INGREDIENTS

INGREDIENTS	PERCENTAGES (by weight)	PEL (OSHA)	TLV (ACGIH)	CAS #
Propane	95 - 100%	1000 ppm TWA	2500 ppm TWA Simple Asphyxiant	74-98-6
Propylene	0 - 5%	N/D	Simple Asphyxiant	115-07-1

NOTE: Ethyl Mercaptan added as an odorant.
(TWA) - Time Weighted Average is the employee's average airborne exposure in any 8-hour work shift of a 40-hour work week which shall not be exceeded.
(STEL) - Short Term Exposure Limit is the employee's 15-minute time weighted average exposure which shall not be exceeded at any time during a work day unless another time limit is specified.

Section 3 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

DANGER! Extremely flammable. Compressed gas. At very high concentrations, can displace the normal air and cause suffocation from lack of oxygen. Liquid can cause burns similar to frostbite. Caution: Ethyl mercaptan used as a warning agent may not be entirely effective in all situations because of a condition commonly referred to as odor fade (see section 10 for more information). If you suspect a leak, use a combustible gas indicator or similar device to check for gas leaks.

OSHA HAZARD CLASS

Based on OSHA definitions, the following ingredients in this product are hazardous. The OSHA physical and health hazard categories are shown below. **Note: CHS has not conducted specific toxicity tests on this product. Our hazard evaluation is based on information from similar ingredients, technical literature, and/or professional experience.**

Propane - Flammable Gas, Compressed Gas, Asphyxiant

POTENTIAL HEALTH EFFECTS

ROUTES OF ENTRY: Inhalation, Dermal.

ACUTE EFFECTS OF OVER EXPOSURE:

Eyes - Liquid can cause burns similar to frostbite.

Skin - Liquid can cause burns similar to frostbite.

Inhalation - At very high concentrations can displace the normal air and cause suffocation from lack of oxygen. Symptoms of lack of oxygen include increase depth and frequency of breathing, dizziness, headache, nausea or loss of consciousness.

Ingestion - Liquid can cause burns similar to frostbite.

CHRONIC EFFECTS OF OVER EXPOSURE: None Determined

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Personnel with pre-existing chronic respiratory diseases should avoid exposure to this material

CARCINOGENICITY: NTP: No **IARC:** No **OSHA:** No **EMERGENCY AND FIRST AID PROCEDURES:**

Section 4 - FIRST AID MEASURES

Eye Contact - If liquid propane contacts the eye, flush thoroughly with water for at least 15 minutes, occasionally lifting the upper and lower lids, until no evidence of chemical remains. Get medical attention as soon as possible.

Skin Contact - Frozen tissue should be flushed with plenty of tepid water. Do not use hot water. Cryogenic (low temperature) burns which result in blistering or deeper tissue freezing should be promptly treated by a physician.

Inhalation - Move person to fresh air. If large amounts have been inhaled, keep victim warm and get medical attention. Apply artificial respiration if not breathing.

Ingestion -

Section 5 - FIRE - FIGHTING MEASURES

FLASH POINT: -156°F **AUTO IGNITION TEMP:** 874°F

FLAMMABLE LIMITS IN AIR % BY VOLUME	**LOWER**	**UPPER**
	2.1	9.5

EXTINGUISHING MEDIA: Do not extinguish gas fire unless the gas leak can be stopped. For small fire use dry chemical or Carbon Dioxide (CO_2). For large fires, use water spray or fog and move containers from fire area if you can do so without risk.

SPECIAL FIRE FIGHTING PROCEDURES: Shut off gas source and allow the fire to burn itself out. Gas fires should not be extinguished unless the gas flow can be stopped immediately. Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind, out of low areas, and ventilate closed spaces before entering. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.

FIRE INVOLVING TANK, RAIL CAR, OR TANK TRUCK: Isolate for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions Call CHEMTREC at 1-800-424-9300 as soon as possible, especially if there is no local hazardous materials team available. If gas source cannot be shut off immediately, fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool container with flooding quantities of water until well after fire is out to prevent container from exploding. ALWAYS stay away from tanks engulfed in fire. WITHDRAW IMMEDIATELY in case of rising sound from venting safety devices or discoloration of tank. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Vapors are heavier than air and may travel along the ground and collect in low or confined areas and be exposed to a source of ignition (pilot light, heater, electric motor) some distance away. Withdraw immediately in case of rising sound from venting safety devices or any discoloration of tank due to fire.

HAZARD RATINGS:				
	NFPA 704:	Health- 1	Fire- 4	Reactivity- 0
	HMIS:	Health- 1	Fire- 4	Reactivity- 0

Section 6 - ACCIDENTAL RELEASE MEASURES

STEPS TO TAKE IF MATERIAL IS RELEASED OR SPILLED: ELIMINATE ALL SOURCES OF IGNITION AND STOP LEAK IF YOU CAN DO SO WITHOUT RISK. Notify emergency response personnel as appropriate. Keep unnecessary people away; isolate hazard area and deny entry. Vapors can be dispersed with sustained water spray. Prevent spreading of vapors through sewers, ventilation systems and confined areas. NOTE: Review Section 5 -FIRE-FIGHTING MEASURES before proceeding with clean up. Use appropriate personal protective equipment during emergency response.

Section 7 - HANDLING AND STORAGE

HANDLING AND STORING: Consult the U.S. Department of Transportation regulations on the shipping of petroleum gases. If upon initial receipt inspection a cylinder is found to be in poor condition, contact the supplier. The most common hazard is leakage due to faulty pressure control regulators. Large pressure build-up can result in explosive decompression at the cylinder head, causing the cylinder to rocket like a missile. Prevent entrapment of liquid in closed system. Use check valve to prevent back-flow into storage container. Chain cylinders when not in use. Cylinder storage should be segregated from oxidizers such as oxygen, chlorine, etc. and away from heavy traffic areas to prevent knocking over or damage from falling objects. Valve caps should remain on cylinders.

Section 8 - EXPOSURE CONTROL - PERSONAL PROTECTION

ENGINEERING CONTROLS: Local exhaust and general ventilation may both be necessary in work area to prevent accumulation of explosive mixtures. Provide special ventilation in sumps and confined spaces. If mechanical ventilation is used, electrical equipment must meet National Electrical Code requirements.

RESPIRATORY EQUIPMENT: Personnel should never enter an area of high concentration without proper respiratory protection. Provide NIOSH-approved air-supplied respirator or self-contained breathing apparatus for emergency or non-routine situations where the level is excessive.

EYE PROTECTION: Use face shield or chemical type goggles where contact with material may occur such as when changing valves, hoses, etc.

PROTECTIVE CLOTHING: Use protective clothing, face shield, and gloves when contact with liquid propane is possible.

OTHER (SAFETY SHOWERS, EYE WASH STATIONS, ETC.): Emergency eye wash fountains and safety showers for first aid treatment of potential freeze burns should be available in the vicinity of any significant exposure from compressed gas release.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Colorless gas (liquid under pressure)

ODOR: If odorized, will have rotten egg odor, otherwise odorless.

BOILING POINT: 760 mmHg @ -44°F

SPECIFIC GRAVITY (water=1): 0.5

VAPOR PRESSURE: 190 psia @ 100°F

VAPOR DENSITY (air=1): 1.5

SOLUBLE IN WATER: Very slightly soluble

EVAPORATION RATE (ether=1): N/A

pH:

Section 10 - STABILITY AND REACTIVITY

STABILITY -

STABLE **X** (At normal temperature and storage conditions)
UNSTABLE

INCOMPATIBILITY -

CONDITIONS TO AVOID: Propane vapors will form explosive mixtures with air and will easily ignite by heat, sparks, flames, build-up of static electricity, and other sources of ignition. Note: Ethyl mercaptan might, under certain conditions (when oxygen, water, iron oxide or other oxidizers are present in containers and piping) react with oxidizers which diminish or eliminate entirely its distinct smell, therebv reducing or eliminating the ability of a person to detect a leak. The passage of odorized propane through soil because of an underground leak will also diminish or eliminate entirely the smell of odorized propane. If you suspect a leak, use a combustible gas indicator or similar device to check for gas leaks.

MATERIALS TO AVOID: Strong acids, alkalies and oxidizers such as chlorine (gas or liquid) and oxygen.

HAZARDOUS DECOMPOSITION PRODUCTS: Normal combustion produces carbon dioxide; incomplete combustion can produce carbon monoxide.

HAZARDOUS POLYMERIZATION: Has not been reported to occur.

Section 11 - TOXICOLOGY INFORMATION

Note: CHS has not conducted specific toxicity tests on this product.

Section 12 - ECOLOGICAL INFORMATION

Note: CHS has not conducted specific ecological tests on this product.

Section 13 - DISPOSAL CONSIDERATION

WASTE DISPOSAL PROCEDURES: Releases are expected to cause only localized non-persistent environmental damage. Waste mixtures containing these gases should not be allowed to enter drains or sewers where there is danger of vapors being ignited. When it becomes necessary to dispose of these gases, it is preferable to do so as a vapor. These gases may be used as an auxiliary fuel or disposed of by flaring in a properly designed flare or incinerator. Venting of the gases to the atmosphere should be avoided. Treatment, storage, transportation and disposal must be in accordance with applicable federal, state and local regulations.

Section 14 - TRANSPORTATION

DOT PROPER SHIPPING NAME: Propane

DOT HAZARD CLASS: 2.1

DOT IDENTIFICATION NUMBER: UN 1978

DOT EMER. RESPONSE GUIDE NO.: 115
(Formerly #22)

DOT LABEL, PLACARD: Flammable Gas

Section 15 - REGULATORY INFORMATION

This product may contain the following toxic chemicals subject to the reporting requirements of SARA Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 and of 40 CFR 372.

Cas Number	Chemical Name	Percent By Weight
115-07-1	Propylene	0 - 5%

SARA SECTION 311-312 HAZARD CATEGORIES (40 CFR 370.2):

FIRE: Yes **SUDDEN RELEASE OF PRESSURE:** Yes **REACTIVE:** No **ACUTE:** Yes **CHRONIC:** No

Section 16 - OTHER INFORMATION

Updated By: Gary Bourne / Hue Lam Date: February 08, 2007

Title: EHS Compliance Specialists Supersedes: December 24, 2003

Reason for issue: Periodic review

CENEX® OUR ENERGY COMES THROUGH.™

Custom Certification Services, Inc.
5268 RD 99
Dalton, NE 69131-8213
308-377-2272

ORGANIC INPUT VERIFICATION

Issued to:

Meyers Industries
PO Box 39
Midvale, ID 83645-0039
USA

Certificate Number: CCS-0030112005

OCIA Custom Certification Services has reviewed the process for Rodenator Pro manufactured by Meyer Industries and found that this process is in compliance with the regulations dictated by the following organic programs offered by OCIA:

X The United States National Organic Program (NOP)
X OCIA International Standards accredited by the International Federation of Organic Agriculture Movements (IFOAM)
X Japan Agricultural Standards (JAS)
X Conseil Des Appellations Agroalimentaires Du Québec (CAAQ)
X Council Regulations (EEC) EU 2092/91 (EU)

The verification of this pocesst does not guarantee the quality. It only confirms that the use of this product can be considered as acceptable within the requirements of the above named regulations.

Date: 11/03/2005

Expiration of Certificate

Signed: Marva D Hart

11/03/2006

BILL OWENS
Governor

RICK GRICE
Executive Director

RICHARD O. PIPER
Division Director

DEPARTMENT OF LABOR AND EMPLOYMENT
DIVISION OF OIL AND PUBLIC SAFETY

633 17th Street, Suite 500
Denver, Colorado 80202-3660

October 19, 2006

Meyer Industries
Mr. Robert Bruno, Operations and Licensing
PO Box 39
80 S. Depot Street
Midvale, ID 83645-0039

Re: The Rodenator

Dear Mr. Bruno:

Thank you for contacting the Division of Oil and Public Safety (OPS) regarding permission to sell your product, the Rodenator, in the state of Colorado. It appears to be an effective solution to the challenges faced by many farmers, ranchers, and others.

After reading your letter, viewing the video and contacting several other agencies in the state and in the nation, we conclude that the Rodenator does not meet the true definition of an explosive device and we will not regulate its sale or use.

Thank you for your patience while we conducted our research and reached a decision. Please feel free to call me at 303-318-8481 or Scott Narreau at 303-318-8477.

Sincerely,

Susan DeMeules

Susan DeMeules
Program Manager

cc: Marilyn Hajicek
Scott Narreau

DRAFT REPORT

STUDY TITLE

Evaluation of the Rodenator Pro™ on European Rabbits (*Oryctolagus cuniculus*)

DATA REQUIREMENTS

No current regulation under the USEPA

AUTHOR

Jeff J. Mach

STUDY COMPLETION

*****

PERFORMING LABORATORY

Genesis Laboratories, Inc.
10122 N. E. Frontage Road
Wellington, CO 80549

STUDY NUMBER

04007

SPONSOR

Meyer Industries
P.O. Box 39
Midvale, ID 83645

STATEMENT OF NO DATA CONFIDENTIALITY CLAIMS

No claim of confidentiality is made for any information contained in this study on the basis of its falling within the scope of FIFRA 10(d)1(A), (B), or (C).

Ed Meyer
Meyer Industries

Date

GOOD LABORATORY PRACTICE STATEMENT

The study contained herein, 04007, was conducted in accordance with the requirements of 40 CFR, Part 160, Good Laboratory Practice Standards.

Study Director: _____ _____

Jeff J. Mach Date
Genesis Laboratories, Inc.

Sponsor: _____ _____

Ed Meyer Date
Meyer Industries

Submitter: _____ _____

QUALITY ASSURANCE STATEMENT

Study 04007 was monitored by the Quality Assurance Unit of Genesis Laboratories, Inc. In order to evaluate Genesis Laboratories Study 04007 in terms of compliance with Title 40, Part 160 of the Code of Federal Regulations, Good Laboratory Practice Standards, the study was inspected at critical phases. The dates of inspections and the dates inspection reports were submitted to the Study Director and Management are listed below.

Phase Inspected	Inspection Date	Date Submitted To Study Director	Date Submitted To Management
Protocol	5/17/04	5/17/04	5/18/04
Field application of treatment to test system	5/22/04	5/24/04	5/**/04
Data Package and Draft Report	6/15-16/04	6/16/04	6/**/04
Final Report			

John Baroch
Quality Assurance Unit Manager

Date

LOCATION OF RAW DATA, AND FINAL REPORT

All original raw data, the protocol, protocol amendments and deviations, an electric copy, all communications between the laboratory and the Sponsor, and the final report will be stored in the archives of Meyer Industries. Certified copies of all raw data are temporarily archived at Genesis Laboratories, Inc. until the Sponsor receives the original data. A copy of the final report and protocol, original log books, and all original SOP's will be kept in the archives of Genesis Laboratories, Inc.

PERSONNEL INVOLVED IN THE STUDY

Jeff J. Mach	Study Director
Tim Linder	Laboratory Technician
Jeff Borchert	Laboratory Technician
Ed Meyer	Sponsor Representative
R.C. Bruce	Sponsor Representative

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Study Title:	Evaluation of the Rodenator Pro™ on European Rabbits (*Oryctolagus cuniculus*)
Performing Laboratory:	Genesis Laboratories, Inc. 10122 N. E. Frontage Rd. Wellington, CO 80549
Genesis Lab's Study Number:	04007
Study Director:	Jeff J. Mach
Test Dates:	
Study Initiation-	May 20, 2004
Experimental Start-	May 22, 2004
Experimental Termination-	May 24, 2004
Study Completion-	June **, 2004
Study Sponsor:	Meyer Industries P.O. Box 39 Midvale, ID 83645
Sponsor Representative:	Ed Meyer
Test Device:	Rodenator Pro™ EPA Establishment # 079470-ID-001
Test System:	European Rabbits (*Oryctolagus cuniculus*) Strain: New Zealand White Rabbits Source: Harlan Sprague Dawley, Indianapolis, Indiana
Field Efficacy:	Of 10 test animals, two animals survived treatment (both instances of technical error), seven animals were verified as dead by lack of heart beat within a mean of 16 ± 11 seconds (range 10 to 40 seconds) of ignition, and one rabbit was not recovered. After omitting three rabbits for the stated reasons, seven of seven or 100% efficacy was achieved.

INTRODUCTION

The purpose of this study was to investigate the efficacy and humaneness of the Rodenator Pro™ on European rabbits (*Oryctolagus cuniculus*) in prairie dog burrows as a model for rabbit warrens or burrows.

MATERIALS AND METHODS

Test Device

The test device is composed of the Rodenator Pro™ Wand, oxygen and propane regulators, Harris style torch handle, 50' of "T" grade dual fuel hose, and safety equipment. It is designed to apply oxygen and propane to a burrow and then ignite the gases. The concussion from the explosion is theoretically deadly to the burrowing animal. The device was supplied by the Sponsor.

Test System

Ten European Rabbits (New Zealand white rabbits) (*Oryctolagus cuniculus*) were received from Harlan Sprague Dawley, Indianapolis, Indiana on May 17, 2004. This is a domesticated race of the wild species found in United Kingdom, New Zealand, and Australia. The rabbits were assigned Genesis Lot number 2004-04. Two rabbits (one male and one female) were acquired from the following weight ranges to assure we tested a realistic range of body weights: two @ 0.9 to 1.4 kg, two @ 1.4 to 1.8 kg, two @ 1.8 to 2.3 kg, two @ 2.3 to 2.7 kg, and two @ 2.7 to 3.2 kg.

Pre-test Holding

All animals were logged in upon receipt according to the current version of SOP AS-1. The animals were observed as they were placed in the holding tanks and on a daily basis. They were individually placed in metal stock tanks having a surface area of 6,600 cm^2. Wood shavings were used as bedding. Water bottles were offered *ad libitum* as was Harlan Teklad 8030 rabbit diet.

Environment

Fluorescent bulbs provided lighting. The light period was 12 hours light and 12 hours dark and was measured for intensity. Temperature was not recorded, but was regulated by a commercial gas furnace / air conditioner. The average light intensity at tank level was 16.7 foot-candles with a range of 14.3 to 18.6 foot-candles. Light intensity was measured with a NIST traceable Extech Instruments model light meter.

Exposure Test

The test device is used to control burrowing animals. To simulate the gassed of a rabbit warren, we used prairie dog burrows and the European rabbit. The rabbit was tether on a rear leg, dosed with Telazol, and allowed to traverse the burrow. The propane/oxygen mixture was injected into

the respective burrow for a predetermined period using an applicator wand, and then the gases were ignited by the device. After the explosion, the tether was pulled to draw the rabbit out of the burrow system. Observations and times were recorded on health of the rabbit. More details of the field procedures and adjustments made at the site are described in the Observations section on pages 12-13.

The exposure test, or burrow treatment, was conducted on May 22, 2004. A large black-tailed prairie dog (*Cynomys ludovicianus*) colony was used to simulate rabbit warrens. This provides a higher degree of realism for the test. Average diameter prairie dog burrows were used for the first three treatments, but it appeared that larger burrows were needed because the rabbits were "clogging" the burrow and gas was unable to circumvent the rabbit. This produced a sub-lethal concussion. As a response, larger diameter burrows were used for the remainder of the test—a size more comparative to an average rabbit warren.

Body Weights

Body weights were taken one day prior to the burrow treatment to establish weights for Telazol dosing rates.

Burrow Gassing

Ten prairie dog burrows were fumigated with PhosFume® (EPA registration No. 59209-1-1015) (active ingredient aluminum phosphide 60%). I placed two pellets into each hole, closed the burrow entrance with crumpled newspaper, and then added loose soil to close off the burrow entirely. The burrows were marked with a stack of dry cow scat.

Pilot Dosing of Telazol

As a means of limiting the pain and distress of the rabbits due to the use of the Rodenator Pro, a common drug was used to provide anesthesia and an analgesic to the rabbits. The attending veterinarian, Tracey Jensen, DVM, recommended a DEA-regulated drug Telazol. This drug has two major components that aid in limiting pain and distress. It is 50% Tiletamine HCl and 50% Zolazepam HCl.

To determine the minimum effective Telazol dose to use on the rabbits, we conducted a pilot study. According to Dr. Jensen, we should begin the intramuscular dosing regime in the range of 5 to 25 mg/kg. We dosed the rabbit in the rear leg muscle mass. We dosed rabbits at 5 mg/kg and 10 mg/kg.

Observations

All rabbits were observed each day during the holding period. On day 0, the rabbits were transported in their original shipping containers to the field. The containers were labeled to maintain the identity of the rabbits. During and after the operation of the Rodenator Pro™, we recorded various data including: time of dosing, temperature (ºC) and humidity (%) at dosing, wind speed and direction, actual dose of Telazol (mL), time of drug effect prior to ignition,

animal distance into burrow, unit operation time, burrow extraction time, heart rate upon retrieval, and time to absence of movement. The distance that the animal traversed into the burrow was measured by tick marks on the leash. It had been previously laid alongside a tape measure and the major "foot" marks were transcribed onto the leash. Other observations on the exact treatment method were recorded as well.

Mortality

The percent mortality was calculated using the following formula:

$$\frac{\text{Initial Number of Rabbits} - \text{Rabbits Surviving at Termination}}{\text{Initial Number of Rabbits}} \times 100 = \%\ \text{Mortality}$$

Necropsy

On May 24, 2004; two days after the Rodenator Pro™ field testing, the necropsy was conducted on all the remaining rabbits. The rabbits had been stored in a refrigerator (R-1) during this time. The following areas were examined for effect of the device on the rabbits: external appearance, epidermal examination via skinning, incision of the thorax and abdomen, and examination of all major organs (trachea, lungs, heart, liver, stomach, intestines, pancreas, cecum, kidneys, spleen, reproductive organs, and brain). Special notice was taken of the lungs and brain, as each was previously noted as being sites of tissue damage.

RESULTS AND DISCUSSION

Environment

Animal room environment during the holding period was normal. The temperature and humidity in the field (0915 to 1233 hours) on day 0 ranged from 13 to 20ºC and 48 to 89%, respectively (Table III). Wind was always slight in speed (<5 mph), but was from the East and South.

Body Weight

The body weights were recorded of all ten rabbits. This included five weight levels each with one male and one female (Table I).

Burrow Gassing

After I conducted this work, I decided that it was unnecessary because it would be additional work to clear the burrow entrance of soil, and that the burrows may be too small. Presence or absence of the prairie dogs in the burrows will have little effect upon the performance of the Rodenator Pro™.

Pilot Dosing of Telazol

The first dose of 5 mg/kg to rabbit #1 (the smallest rabbit) caused lethargy and loss of righting reflex within 6 minutes, but the symptoms were wearing off within 13 minutes. The second dose

of 10 mg/kg to rabbit #2 (also a smaller rabbit) caused ataxia, loss of righting reflex within 3 minutes, and only a slight reaction to the "eye touch" and "toe squeeze" for determination of anesthesia effect at 15 minutes. This may have been the peak of the effect. Within 17 minutes the animal was more active, though not mobile.

Based on the pilot work that was conducted on May 21, 2004; and the increase of the severity of the symptoms with the 5 and 10 mg/kg body weight, I feel comfortable with using the 15 mg/kg dose for all rabbits on day 0.

Observations

All of the necessary equipment was ready for use and then we dosed the first rabbit with 0.18 mL of Telazol (equivalent to 15 mg/kg). The rabbit only traveled ~4 feet into the burrow before it was well under the effects of the drug. The wand was operated for 1.5 minutes, O_2 at 30 pounds per square inch (psi), and propane at 15 psi. The ignition produced a loud explosion. The rabbit was immediately pulled from the burrow. It was still alive and the heart rate was racing. It was euthanized by CO_2. (Table II)

The second rabbit was dosed with the respective amount of Telazol and allowed to run down a burrow. Under its own power, the rabbit went down approximately 6 feet. The wand was operated for 2.5 minutes and at 40 psi O_2 / 20 psi propane according to the recommendation of Mike Hill, an experienced Pest Control Operator who controls prairie dogs with this respective model. This new gassing dose produced immediate death according to our established parameters. Also, the heart rate was monitored with a stethoscope immediately after the animal was exhumed from the burrow, and it was unable to detect a heart beat.

The third rabbit was dosed, and allowed to enter the burrow, but it only went a couple of feet and became lethargic or apprehensive to travel further. It was then pushed deeper into the burrow to 3.5 feet. The same gassing parameters were used again and the explosion only seared the fur. The rabbit was still alive and in pain as evidenced by its vocalizations. It was immediately euthanized with CO_2. In retrospect, the result was caused from the rabbit being pushed into the burrow further and closing off the opposite end of the burrow from the gas. The gas could not get to the other side of the rabbit and produce it lethal effect upon the major organs of the head and torso. At this time, we reevaluated the methods of the dosing procedure and determined that the rabbits must be able to traverse the burrow with ease. As a result, this will allow the gas to permeate the entire burrow system and allow the concussion to kill the rabbit.

Based upon the data that we had seen, we decided to find larger burrows, more similar to those of the size of rabbit warrens; dose the burrows with more gas, gas at longer intervals; and use a lower dose of Telazol (Table II). The quick response to the drug at 10 (pilot dosing) and 15 mg/kg body weight (field data), was not allowing the rabbits to get down into the deeper parts of the burrow. Although the drug was to be used to alleviate pain and distress, it was impairing the mobility of the animal to the point that the data was not useful and representative. We determined that the 5mg/kg dose would be used for the remainder of the test, and that the duration from dose of the drug to ignition of the gas should be about 6 minutes. This was identified as being the peak of the drug effect from the pilot work. In this way, some relief from

distress and pain would still be possible and the rabbit would have about 4 minutes before it would become largely affected by the Telazol.

The remainder of the animals were dosed in larger burrows with 6 successful verifications of immediate kill and a single lost rabbit after ignition. Most likely, this rabbit also expired from the concussion as well as dismembered, as the leash was not broken, but the animal leg or carcass was not present. No gnawing or slippage in the lease was observed.

Necropsy

Each of the rabbits dying from use of the device and the survivors that were euthanized post-ignition was necropsied for signs of tissue trauma from the concussion. It was quickly evident that the survivors of the test did not receive serious damage. Both rabbits exhibited singed fur, and small hematomas, one on the stomach and one on the lungs. No other adverse observations were made. Of the dead rabbits, they exhibited consistent signs of singed fur, lesions in the lungs, blood in the thorax, and hematomas in the brain. The concussion also caused injuries including bleeding from the nose, mouth, and ears; bruising, excised stomach, discolored liver, intestinal hematoma, and blood in abdomen. (Table IV)

Mortality

Seven of ten rabbits immediately succumbed to the concussion. The two surviving rabbits were in situations unrepresentative of a "normal" rabbit warren or were not dosed with enough gas. After the method was honed for this particular situation, the device was very effective. Also, a rabbit was not recovered after the ignition. Thus, after subtracting the two improperly gassed rabbits and the rabbit that was not recovered, overall European rabbit mortality was 100% (7 of 7). Based upon the collected data, we can verify that the device is effective to a minimum of 9½ feet.

Humaneness Interpretation

First, to determine the humaneness of a procedure, we must first define "humane". According to Webster's Dictionary (1985), "humane" has one applicable definition: *marked by compassion, sympathy, or consideration for other human beings or animals.* This is obviously an open definition as many opinions may be created to what this means.

Furthermore, the United States Department of Agriculture (USDA) does not provide a definition of "humane", however, they try to apply a more scientific-minded approach with a definition of a painful procedure: "is any procedure that would reasonably be expected to cause more than slight or momentary pain and/or distress in a human being to which that procedure is applied." This definition is used in conjunction with scientific studies, but it can also apply to this control technique. Gassing of the burrows did not appear to cause any momentary distress and should not cause any pain. The gases do not cause any pain or temporary harm to the animals when it is breathed. After ignition, the explosion travels at about 5,000 feet per second and travels in the direction of least resistance. If the rabbit is within the burrow system, the impact of the explosion will cause trauma to the rabbit. From the data we have presented, it suggests that the

concussion is severe enough to cause immediate death, and therefore, less than momentary pain or distress.

Although it is not stated obviously in either statement, both suggest that less pain or distress is preferred compared to more pain or distress, and that a shorter duration of pain/distress is preferred versus a longer duration of pain/distress. If the above definitions are applied, the method appears to be very quick and powerful, as evidenced by the lack of heart beats within the few seconds (maximum 40 seconds) it takes to extract the rabbit from the burrow and evaluate if the heart beat is absent. By inference from the above statements, it appears that the device would be defined as "humane".

Beaver et. al (2001) states that stunning may be used to produce unconsciousness that must immediately be followed with a method to ensure death. This device appears to produce an explosion and resultant concussion that causes unconsciousness and causes immediate death as well. In addition, Beaver et. al (2001) states that "a blow to the head can be a humane method of euthanasia for neonatal animals with thin craniums, such as young pigs, if a single sharp blow delivered to the central skull bones with sufficient force and produce immediate depression of the central nervous system and destruction of brain tissue." This method illustrates that severe depression of central nervous system is imminent.

"A properly placed gunshot can cause immediate insensibility and humane death" as stated by Beaver et. al (2001). Although a gunshot must target the brain only to cause immediate insensibility or unconsciousness, the Rodenator Pro™ has the potential to cause this response. The concussion of the device appears to cause immediate effects.

Each of the aforementioned methods presented by Beaver et. al are considered to be physical methods of euthanasia (2001). "When done appropriately, the panel considers most physical methods conditionally acceptable for euthanasia." The Rodenator Pro™ methods and results fit tightly within the definition of a physical method of euthanasia.

Although the perception of the method may be aesthetically displeasing, the results indicate that it is an effective method for producing mortality and a method that could be considered "humane" because it produces immediate unconsciousness and immediate death. It is important that the two issues of its perceived nature of the application method and the actual mechanism of action be separated. The mechanism of death would be considered "humane" as indicated by the writings of Beaver et. al (2001).

The lack of success during the testing was easily explained as the reasons for failure. This may be a typical result in a "new location", but with experience, the device could be quickly modified to produce the desired result. Although this study was designed to be a realistic field treatment, the combination of smaller prairie dog burrows and larger European rabbits negatively influenced the study in the early stages. However, after realizing the importance of using an appropriately-sized burrow, the application went smoothly and was very effective.

CONCLUSION

To close, the device is effective and is humane based upon the above definitions. The animals do expire quickly and apparently with little pain. After the device is "calibrated" to a given situation, the device can be easily used effectively and humanely.

REFERENCES

Allen, T. 2000. Information Resources for Institutional Animal Care and Use Committees. United States Department of Agriculture, Agricultural Resource Service. Beltsville, MD. 613 pp.

Beaver, B.V. et. al. 2001. 2000 report of the AVMA panel on euthanasia. *Journal of the American Veterinary Medical Association*. 218(5):669-696.

Mish, F.C. 1985. Webster's Ninth New Collegiate Dictionary. Merriam-Webster Inc., Publishers. Springfield, MA. 1563 pp.

Table I

European Rabbit Body Weights

Number	Sex	Body Weight (kg)
1		1.168
3		1.620
5	Male	1.586
7		2.808
9		2.374
2		1.310
4		1.764
6	Female	1.978
8		2.252
10		2.428

Table II

Environment and Dosing Parameters

Number	Parameters at the Respective Dosing Period						
	Sex	Time	Temp. (ºC)	Humidity (%)	Wind Speed Estimate and Direction	TELAZOL Dose (actual (cc) / treatment dose (mg/kg))	Gas Settings (psi propane / psi oxygen)
1	Male	0915	14	80	Slight, East	0.18 / 15 [a]	30 / 15
3		1023	16	79	Slight, East	0.24 / 15 [a]	40 / 20
5		1221	13	79	Slight, South	0.09 / 5	40 / 20
7		1107	20	48	Slight, East	0.14 / 5	40 / 20
9		1139	15	68	Slight, South	0.12 / 5	40 / 20
2	Female	0953	16	89	Slight, East	0.20 / 15 [a]	40 / 20
4		1206	13	85	Slight, South	0.09 / 5	40 / 20
6		1233	15	70	Slight, South	0.10 / 5	40 / 20
8		1121	17	53	Slight, East	0.11 / 5	40 / 20
10		1152	15	65	Slight, South	0.12 / 5	40 / 20

[a] Rabbits were originally dosed with 15 mg/kg Telazol for full anesthesia and analgesic effect, yet it was discovered that a lower dose (5 mg/kg) was needed to allow the rabbit time to traverse the burrow under its own motor ability.

Table III

Dosing Events and Observations

Number	Sex	Rodenator Pro™ Gas Settings (psi propane / psi oxygen)	Rodenator Pro™ Operation Time (minute)	Animal Depth in Burrow (feet)	Burrow Extraction Time (seconds)	Heart Rate (beats / minute)	Time to No Movement (seconds)
1	Male	30 / 15	1.5	4	10	Rabbit still alive	Euthanized
3		40 / 20	2.5	3.5	10	Rabbit still alive	Euthanized
5		40 / 20	3.0	9	15	None	0
7		40 / 20	3.0	5	10	None	20
9		40 / 20	3.0	9	Unable to retrieve rabbit	Unable to retrieve rabbit	Unable to retrieve rabbit
2	Female	40 / 20	2.5	6	10	None	40
4		40 / 20	3.0	4	10	None	0
6		40 / 20	3.0	9.5	40	None	120 [a]
8		40 / 20	3.0	3	15	None	20 [a]
10		40 / 20	3.0	8	15	None	0

[a] As evidenced by muscle twitching.

Table IV

Summary of Gross Necropsy Data

Necropsy data of the seven rabbits that died from the concussion			
Site of Observation	Necropsy Observations		
	Lesions	Discolored	Hemorrhage
Nose	0	0	4
Mouth	0	0	3
Ears	0	0	3
Fur	NA	7	0
Skin	1	NA	0
Trachea	0	0	0
Lungs	5	7	7
Heart	0	0	0
Liver	0	3	0
Stomach	2	0	0
Intestines	1	0	0
Cecum	0	0	0
Pancreas	0	0	0
Kidneys	0	0	0
Spleen	0	0	0
Reproductive	0	0	0
Brain	6	0	6
Necropsy data of the two rabbits that survived the concussion			
Site of Observation	Necropsy Observations		
	Lesions	Discolored	Hemorrhage
Fur	0	2	0
Lung	0	1	0
Stomach	0	0	1

APPENDIX A

Protocol and Protocol Deviation

Montana Department of Agriculture
Agricultural Sciences Division
Technical Services Division
Helena, Montana 59620-0201

OBSERVATIONS OF THE RODENATOR DEVICE FOR CONTROLLING BLACK-TAILED PRAIRIE DOGS

By

Monty Sullins
Vertebrate Pest Specialist

ABSTRACT

A field trial was conducted to observe and record the results of a propane/oxygen activating device called Rodenator used to control black-tailed prairie dogs. Ignition of the gas mixture resulted in a reduction in activity by 85.4% and 86% on two test plots. Data on application time and cost of materials are also presented.

Technical Report 04-01

October 2004

INTRODUCTION

The use of concussion by electronically activating a mixture of propane and oxygen has been used in recent years as an alternative control method for burrowing rodents. Several technical reports by the Montana Department of Agriculture (Sullins and Sullivan, 1991,1992,199 reported on the field observations of devices such as Rodent Torch and Rodex 4000. Results were often shown to be labor intensive and yielded poor efficacy. Another device called The Rodenator (1) has recently been developed by Meyer Industries of Midvale, Idaho. This device was reportedly heavier duty, more reliable and more efficacious. Communications with Ed Meyer resulted in an agreement to conduct a field trial to observe the operation and results of using the Rodentator to control Black-tailed Prairie Dogs (*Cynomys ludovicianus*). The purpose of this report is to summarize the data and observations of that field trial.

STUDY AREA

The treated plots used in this field trial were located on privately owned land near Dean, Montana, in the foothills of the Absaroka Mountains in south central Montana. The principle agricultural use of the area is livestock production with rangeland, pasture, alfalfa, and small grains being the major crops.

METHODS AND MATERIALS

Two black-tailed prairie dog towns of approximately 20 acres each were chosen for treatment using the Rodenator propane/oxygen device. These towns were not in close proximity to each other and no other prairie dog towns were located nearby. One counting plot was set up on each town (plots A and B). These counting plots measured 3.5 and 7.5 acres, respectively. Active prairie dogs were counted on each plot using binoculars from a common vantage point for three consecutive days prior to and three consecutive days after treatment. Three counts were made each day at 5- minute intervals. An average of these nine counts provided pre-and post-treatment activity indices. These indices were used to calculate percent reduction in activity by using the formula:

$$\text{Percent Reduction In Activity} = \frac{\text{Pre-treatment AI} - \text{Post-treatment AI}}{\text{Pretreatment AI}} \times 100$$

Data regarding time and cost of application materials were also recorded.

In this trial, two Rodenator units and 4 workers were used for the application operation.

(1) Meyer Industries P.O. Box 39 Midvale, ID 83645 www.rodenator.com

Application equipment consisted of the Rodenator devices, oxygen and propane hoses on retractable reels, propane and oxygen regulators, and cylinders. This equipment was transported in the back of a pickup truck, and on a specially designed trailer, provided by Meyer Industries, which was towed by an ATV.

Applicators wore helmets and hearing protective equipment. The preset propane/oxygen mixture was injected for one minute per burrow prior to ignition. Treated holes were plugged with soil after application to help determine any post-treatment use of the burrows. A buffer zone of about 300 feet beyond the counting area was also treated with the Rodenator to help prevent reinvasion of prairie dogs onto the treated plots from immediate adjacent areas.

RESULTS

Results of this field trial are summarized in Table 1.

Table 1. Efficacy, application labor, and cost of materials using the Rodenator concussion device as a control on two Black-tailed prairie dog plots.

Plot/size	**Pre-Treat AI (1)**	**Post-Treat AI (2)**	**Percent Reduction(3)**	**Man-Hrs. for Appl.**	**Cost of Oxygen**	**Cost of Propane**	**Number of Shots**
A - 3.5 acres	22.6	3.3	85.4	12	$19	$1.00	115
B - 7.5 acres	57.3	8	86	30	$66.50	$4.00	293

(1) Pre-treatment activity index: average of 9 counts of active prairie dogs on 3 consecutive days prior to treatment.

(2) Post-treatment activity index: average of 9 counts of active prairie dogs on 3 consecutive days after treatment.

(3) Percent reduction of activity calculated by the formula:

$$\% \text{ Reduction} = \frac{\text{Pre-treatment AI} - \text{Post-treatment AI}}{\text{Pre-treatment AI}} \times 100$$

Under the conditions of this study, prairie dog activity was reduced by 85.4 percent and 86 percent for Plots A and B, respectively. Post-treatment prairie dog activity continued to increase after treatment until a maximum of 9 and 31 active prairie dogs were counted 10 days post-treatment on Plots A and B, respectively.

The application time using two Rodenator units and 4 workers was 12 man-hours for Plot A and 30 man-hours for Plot B. A total of 42 man-hours were required treat 11 acres. The number of burrow entrances treated was 115 for Plot A and 293 for Plot B.

DISCUSSION

The reduction in prairie dog activity by 86 percent obtained in this field trial was considerably higher than that obtained in previous studies with similar devices. This level approaches that of other control methods, such as baiting with rodenticides or using burrow fumigants. One of the main questions that was not answered by this and previous similar studies is the increasing numbers of prairie dogs that appear a few days after treatment. Close observations using a high-powered spotting scope did not reveal any wounded or unhealthy prairie dogs. This would tend to indicate that either these prairie dogs were somehow escaping the control method or they were new immigrants from adjacent areas. Prairie dogs are usually very territorial for most of the year but at the time that this field trial was conducted the young-of-the-year were nearing adult size. Immigration into the newly vacated burrows may occur quite rapidly at this time. If this control is used on large areas and immigration becomes a factor, control areas may have to be retreated. To determine if immigration is a factor or if the prairie dogs are surviving the control, a smaller prairie dog town (5 or 6 acres) that is isolated from any nearby prairie dog colonies should be treated using this control and observed for a couple of weeks post-treatment.

Application time using 4 workers and 2 Rodenator units in this study required 12 and 30 man-hours to treat 3.5 acres and 7.5 acres on Plots A and B, respectively (42 man-hours for 11 acres combined). This may be considered labor intensive for large acreages but it may be practical for small or medium acreages providing that efficacy is consistently good.

Cost of oxygen and propane used for treatment in this field trial was $20.00 for Plot A and $70.50 for Plot B. Cost per acre and per hole would be $5.71 per acre (17 cents per hole) and $9.40 per acre (24 cents per hole) for Plots A and B, respectively.

Observations of the Rodenator in operation indicated it to be a much more reliable device than those tested in other studies. No equipment failure occurred during the field trial.

Cost for labor and materials will vary with each application depending on acreages to be treated, hole density, and private landowner or commercial application. Initial cost of the required equipment is approximately $1800.

ACKNOWLEDGEMENTS

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Guide to Pocket Gopher Control in Montana

MONTGUIDE MT 200009
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Pocket gophers are the burrowing rodents that leave soil mounds on the surface of the ground. Often confused with ground squirrels and other small mammals, pocket gophers can be distinguished by their telltale signs as well as by their appearance.

To add to the confusion, many people in Montana call ground squirrels "gophers." Unlike ground squirrels, which have open holes leading to their tunnel system and are often seen outside their holes, pocket gophers spend almost all their time in their sealed tunnel systems. The mounds they create are usually fan shaped, and tunnel entrances are plugged, keeping intruders out of burrows.

Pocket gophers can cause considerable damage to agricultural land and underground features such as utility cables and irrigation pipe, but there are several effective ways to control and prevent the destructive results of their prolific burrowing.

Identification

Pocket gophers are burrowing rodents, so named because they have fur-lined cheek pouches outside of the mouth, one on each side of the face. These pockets, which can be turned inside out, are used to carry food. Pocket gophers are powerfully built in the forequarters and have a short neck. The head is fairly small and flattened. The forepaws are large-clawed. Gophers have small external ears, small eyes, and lips that close behind their large

Fig. 1 Pocket gophers are found throughout Montana.

incisors: all adaptations to their underground existence (figure 1).

The pocket gopher's tail is sparsely haired and serves as a sensory mechanism that guides it while moving backwards through its tunnel system. The whiskers on its face are also sensitive, and help it to travel about in its darkened tunnel.

Pocket gophers are medium-sized rodents ranging from about five to nearly 10 inches long (head and body). Adult males are larger than adult females. Their fur is fine and soft, and highly variable in color. Colors range from nearly black, to pale brown, to almost white. This great variability in size and color is attributed to adaptations to local conditions that result from a low dispersal rate which limits gene flow.

Habitat

Pocket gophers occupy a wide variety of habitats. They occur from low coastal areas to elevations above 12,000 feet. They are also found in a wide variety of soil types and conditions, reaching their greatest densities on fertile, light-textured soils with vegetation, especially when that vegetation has large, fleshy roots, bulbs, tubers or other underground structures.

Soil depth and texture are important to the presence or absence of gophers. Tunnels are deeper in sandy soils where soil moisture is sufficient to maintain the integrity of the burrow. Shallow soils may be subject to cave-ins, and will not maintain a tunnel. Light textured, porous soils with good drainage allow for good gas exchange between the tunnel and the atmosphere. Soils with a high clay content, or those that are continuously wet, diffuse gases poorly and are unsuitable for gophers.

Food Habits

Pocket gophers feed on plants in three ways. They may go to the surface, venturing only a body length or so from their tunnel opening to feed on above-ground vegetation. They may feed on roots they encounter when digging. They frequently pull vegetation into their tunnel from below. Pocket gophers eat forbs, grasses, shrubs, even small trees. They are strict herbivores and any animal material in their diet appears to be accidental. Alfalfa is apparently one of the most nutritious foods for pocket gophers.

General Characteristics

Just as cheek pouches are used to identify pocket gophers, their fan-shaped soil mounds are characteristic evidence of their presence. Typically, there is only one gopher per burrow system. Obvious exception are when mating occurs and when the female is caring for her young.

The pocket gopher digs with its claws and teeth and kicks soil, rocks and other items away from the digging area with its hind feet. Then the gopher turns over and uses its forefeet and chest to push the soil out of its burrow.

Burrow systems consist of a main burrow, generally 4 to 18 inches below ground and parallel to the surface, with a variable number of lateral burrows off the main. These laterals end at the surface with a soil mound or sometimes with only a soil plug.

Some parts of a burrow may be as deep as 5 or 6 feet. Deeper branches off the main burrow are used as nests and food caches. The diameter of a burrow is about 3 inches, but varies with the body size of the gopher. Enlargements along the main tunnel are usually feeding and resting locations. Nest chambers have dried grasses and other grasslike plants formed into a sphere. A single burrow system can contain up to 200 yards of tunnels. The poorer the habitat, the larger the burrow system required to provide sufficient forage for its occupant.

The rate of mound building is highly variable. Estimates include an average of one to three mounds per day up to 70 mounds per month. This activity brings a large amount of soil to the surface.

The tunnel system tells us much about its inhabitant. It constitutes a home range of up to 700 square yards which the inhabitant rigorously defends against intruders.

Litter sizes range from 1 to 10, but average 3 to 4. In some portions of their range where two litters are born each year, litter size is usually smaller, averaging about two. The breeding season also varies, but births typically occur from March through June. The gestation period is 18 to 19 days.

Densities reported for various pocket gophers are highly variable. Densities of 6 to 8 per acre are considered high density. Average life span of gophers appears to change inversely with population density.

Many predators eat pocket gophers. These predators include weasels, coyotes, and several snakes including bull, and rattlesnakes.

Damage

Damage caused by gophers includes destruction of underground utility cables and irrigation pipe; direct consumption and smothering of forage by earthen mounds; and change in species composition on rangelands by providing seedbeds (mounds) for invading annual plants. Gophers damage trees by stem girdling and clipping, root pruning and possibly root exposure caused by burrowing. Gopher mounds dull and plug the sickle bars used in harvesting hay or alfalfa, and soil brought to the surface as mounds is more likely to erode. In irrigated areas, gopher tunnels can divert water, causing loss of surface irrigation water. Gopher tunnels in ditch banks and earthen banks can hasten soil erosion and water loss.

Legal Status

Pocket gophers are not protected in Montana by federal or state law.

Damage Prevention and Control Methods

Exclusion

Because of the expense and limited practicality, exclusion is of little use. Fencing of highly valued ornamental shrubs or landscape trees may be justified. The fence should be buried at least 18 inches. The mesh should be small enough to exclude gophers; 1-inch hardware cloth will do. Cylindrical plastic netting placed over the entire seedling, including the bare root, reduces damage of newly planted forest seedlings significantly.

Cultural Methods and Habitat Modification

These methods take advantage of knowledge of the habitat requirements of pocket gophers, or their feeding behavior, to reduce or eliminate damage.

Crop varieties. In alfalfa, large taprooted plants may be killed or the vigor of the plant greatly reduced by pocket gophers feeding on the roots. Varieties with several large roots rather than a single taproot suffer less when gophers feed on them.

Crop rotation. When alfalfa is rotated with grain crops, the habitat is incapable of supporting pocket gophers. The annual grains do not establish large underground storage structures, and there is not enough food for pocket gophers to survive year round.

Grain buffer strips. Planting buffer strips of grain around hay fields provides unsuitable habitat around the fields and can minimize immigration of gophers.

Repellents

There are no registered repellents available for pocket gophers, other than granular formulations of moth crystals (naphthalene and paradichlorobenzene), which are not effective. Noise making devices and plants reported to repel pocket gophers have not been proven effective.

Toxicants

To poison gophers, the bait must be placed in their tunnel systems by hand or by a special machine known as a burrow builder.

When using toxicants BE SURE TO FOLLOW ALL LABEL DIRECTIONS.

The most widely used toxicant is strychnine alkaloid (0.31 to 0.5% active ingredient) on grain baits. Zinc phosphide (2%) is less effective than strychnine for gopher control. Strychnine acts rapidly and gophers sometimes die within an hour after consuming a lethal dose. If the label has directions for use with a burrow builder machine then it is a restricted-use pesticide.

Underground baiting for pocket gopher control with strychnine presents minimal hazards to nontarget wildlife, either by direct consumption of bait or by eating poisoned gophers. Poison bait spilled on the ground surface may be hazardous to ground-feeding birds such as mourning doves.

Anticoagulants are now available for pocket gopher control. The only registered product is 0.005% (active ingredient) chlorophacinone (RoZol). Follow label instructions when using. Chlorophacinone is only registered for hand baiting and it is not a restricted-use pesticide.

Hand Baiting. Bait can be placed in a burrow system by hand by using a special hand-operated bait dispenser probe, or by making an opening to the burrow system with a probe.

With a commercially made reservoir-type bait probe dispenser, a button is pushed when the probe is in a burrow, and a metered dose of bait drops into the burrow. Care should be taken to avoid pushing the probe down into the floor of the tunnel which would greatly reduce the possibility of the gopher finding it.

If you do not have a bait dispensing probe, a rod can be used to make an opening from the surface of the ground to the burrow. Place about a tablespoon of bait down each of two or three openings. This is much quicker than digging open the burrow tunnel. It is recommended, for best control, to dose each burrow system in two or three different places. Be sure to cover the probe holes with a sod clump so the pocket gophers do not cover the bait when attracted to the opening in their burrow.

Locating the Main Runway

The key to the efficient and effective use of some of these methods is locating the main burrow system. The main runway generally is found 12 to 18 inches away from the plug on the fan shaped mounds. Push a 1/4-inch solid rod into the ground to locate the main burrow, which will be 6-12 inches deep. As you push the rod into the ground, it will become easier to push when the tip enters the runway (figure 2.).

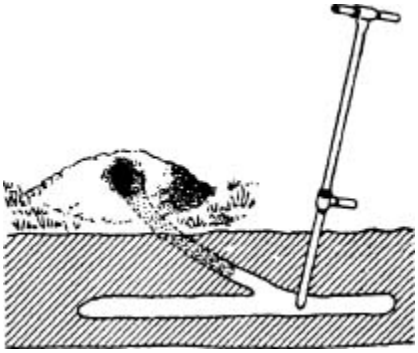

Fig. 2. Right way of using runway probe

Mechanical Burrow Building

The burrow builder delivers bait underground mechanically so large areas can be economically treated for pocket gopher control. This machine is tractor-drawn and is available in a standard hydraulically operated unit or a three-point hitch model (figure 3.).

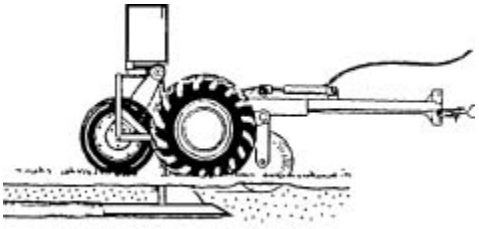

Fig. 3. A tractor-drawn mechanical burrow builder machine can be used to control pocket gophers. It automatically dispenses poison bait into the artificial burrow it creates

The device consists of a knife and torpedo assembly that makes the artificial burrow at the desired soil depth, a coulter blade that cuts roots of plants ahead of the knife, a seeder assembly for bait dispensing, and the packer wheel assembly to close the furrow behind the knife. The seeder box has a metering device for dispensing various poison baits at desired rates.

Artificial burrows should be constructed at a depth similar to those constructed by gophers in your area. The artificial burrows may intercept the gopher burrows or the gophers may inquisitively enter the artificial burrows, gather bait in the cheek pouches and return to their burrow system to eat it. It is important to follow directions provided with burrow building machines as well as the label instructions on the poison bait.

Fumigants

Federally registered fumigants include aluminum phosphide (Fumitoxin, Phostoxin), carbon disulfide, carbon tetrachloride, and gas cartridges with various active ingredients. Fumigation is successful in treating pocket gophers only when the soil is moist enough to minimize diffusion of the gas.

Traps

Trapping is usually the best way to control pocket gophers on small areas, and to remove remaining animals after a poisoning program.

If a trap has a solid trigger pan, trapping in the main runway will usually achieve greater success (figure 4.). If you trap in the lateral tunnel a gopher will often bury this type of trap without springing it.

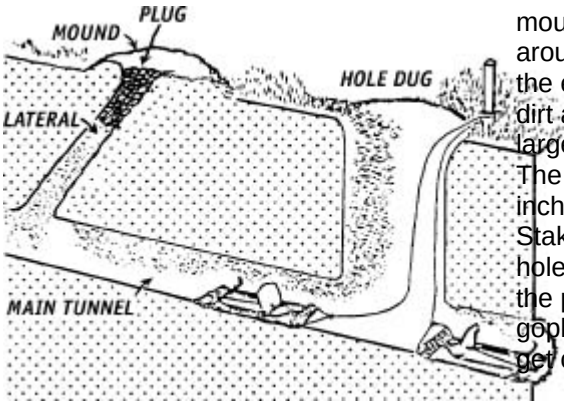

Fig. 4. Placement of a solid pan trap in main pocket gopher tunnel.

After locating the main runway, dig a small hole (a post-hole digger works fine) and remove all dirt from the tunnel. Place traps in each direction and attach them to a stake at the surface with a cord or wire.

Place a piece of plywood or cardboard over the hole and pack dirt around the edges to prevent light or air from entering the tunnel system.

A relatively new trap (figure 5.) has been developed with an open trigger pan, which is triggered by the pocket gopher attempting to plug the hole. This type of trap can by used very effectively in the lateral runway. This eliminates the need to probe and dig to access the main runway.

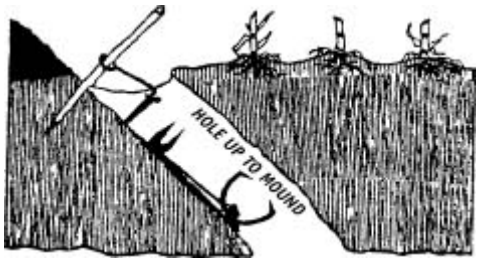

Fig. 5. An open pan trap placed in a lateral runway.

When using a trap with an open trigger pan, you must first locate and open the plug of a fresh mound. Use your finger to poke around and find the softer dirt of the entrance. Clean out the loose dirt and make the opening only large enough to insert the trap. The trap jaws should be 8-12 inches down into the lateral tunnel. Stake the trap. Do not plug the hole. The light and air will attract the pocket gopher. When the gopher tries to plug the hole he will get caught.

Check the traps daily and leave them in place for a day or two after you catch a pocket gopher. If a trap is not sprung within 48 hours, move it to a new location.

Traps are available from hardware and garden supply stores. Open pan traps are available from P-W Mfg. Co. (888-278-2186).

Other Methods

In flower gardens or other areas where landscape disturbance is not desirable, some success has been achieved by flooding pocket gophers out with a garden hose. Insert the hose into the lateral tunnel and pour water into the tunnel system until the gopher is flushed out. This method can only be used in new tunnel systems, and only where other damage from the water will not be a factor.

Fumigation of pocket gopher holes with gasoline, propane or exhaust from an automobile has been reported but is NOT RECOMMENDED because of safety hazards. These methods could result in serious explosions or the placement of toxic fumes in undesirable areas.

Benefit of Pocket Gophers

Although in many cases the damage caused by pocket gophers is the overriding factor, the benefits of pocket gophers should be recognized. Some of these are:

- Increased soil fertility by adding organic matter such as buried vegetation and fecal wastes.
- Increased soil aeration and decreased soil compaction.
- Increased rate of soil formation by bringing subsoil material to the surface of the ground, subjecting it to weatherization.
- Increased water infiltration

Acknowledgments

Much of the information presented here was adapted from S.E. Hygnstrom (1994) in Prevention and Control of Wildlife Damage, University of Nebraska, Lincoln, NE.

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