

MEYER INDUSTRIES

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Instructions for Specific BURROWING PEST ANIMALS

Pocket Gophers | Moles | Ground Squirrels |
Prairie Dogs | Ground Hogs | Voles | Badgers | Muskrats

www.RODENATOR.COM

CONTACT YOUR STATE DEPARTMENT OF AGRICULTURE OR STATE WILDLIFE OFFICE FOR COMPLETE INFORMATION
ON THREATENED OR ENDANGERED WILDLIFE SPECIES IN YOUR APPLICATION AREA.

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INTRODUCTION

Rodenator products are designed for subterranean pest control to target specific burrowing pest animals living within a den, tunnel or burrow that extend, below the surface of the soil. Determine what animals are protected under the Endangered Species Act for your State.

These subterranean application techniques vary between targeted animal species; soil composition and moisture content; altitude and the time of day or night.

The following recommended methods are designed as baseline application. Each and every application may vary in technique due to soil conditions, weather and temperature, location and construction of the tunnels, amount of time the gas mixture is injected, time of day for application and follow-up applications.

As previously discussed in the Operators Manual, safety is paramount when operating any Rodenator System. Please familiarize yourself with the safety warnings in the owner manual that you received with your Rodenator System.

If you are not clear or fully understand how to apply the safety protocols in the application of this device, **CEASE OPERATION AND CALL CUSTOMER SUPPORT. 1-208-369-4030**

To further understand the animal you are targeting, go online and do a search on the animal in question. The more you understand the nature and habits of the animal you are targeting, the more successful you will be with your Rodenator Pest Control Device.

“A Rodenator is only as good as the person operating it”.

1. POCKET GOPHERS

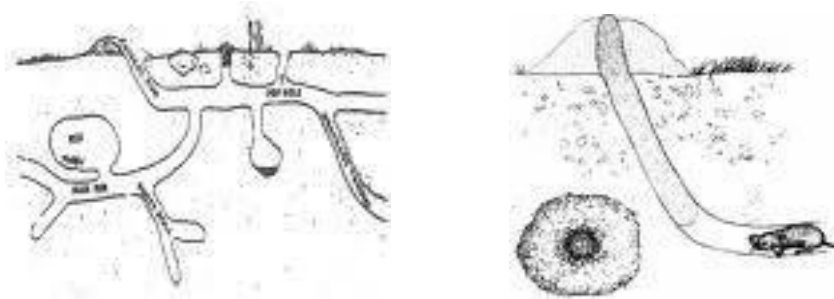
Gophers are heavily built, and most are moderately large, ranging from 12 to 30 cm (4.7 to 12 in) in length. A few species reach weights approaching 2.2 lbs. Males are always larger than the females and can be nearly double their weight. Most gophers have brown fur which often closely matches the color of the soil in which they live. Their most characteristic feature is their large cheek pouches, from which the word "pocket" in their name derives. These pouches are fur-lined, and can be turned inside out. They extend from the side of the mouth well back onto

the shoulders. Pocket Gophers have small eyes and a short, hairy tail which they use to feel around tunnels when they walk backwards.



All pocket gophers are burrowers. They are larder hoarders, and their cheek pouches are used for transporting food back to their burrows. Gophers can collect large hoards. Their presence is unambiguously announced by the appearance of mounds of fresh dirt about 8-12 inches in diameter, sometimes larger. These mounds will often appear in vegetable gardens, lawns, or farms, as gophers like moist soil. They also enjoy feeding on vegetables. For this reason, some species are considered agricultural pests. They may also damage trees in forests. Although they will attempt to flee when threatened, they may attack other animals, including cats and humans, and can inflict serious bites with their long, sharp teeth.

Pocket gophers are solitary outside of the breeding season, aggressively maintaining territories that vary in size depending on the resources available. Males and females may share some burrows and nesting chambers if their territories border each other, but in general, each pocket gopher inhabits its own individual tunnel system.



Depending on the species and local conditions, pocket gophers may have a specific annual breeding season, or may breed repeatedly through the year. Each litter typically consists of two to five young, although this may be much higher in some species. The young are weaned at around forty days.

Pocket gophers tunnel 12 to 18 inches below the surface with their dens or burrows being 6 feet deep in frost free climates and 8 to 10 feet in northern climates. Pocket gophers do not hibernate and can product up to 3 litters per year with the first litter reaching sexual maturity in nine to twelve months.

Pocket gopher mounds are vastly different from moles or ground squirrels. Gopher mounds are fan shaped which are the result of the pocket gopher excavating dirt from the main tunnel

through a lateral tunnel and up through the surface. In most cases, the tunnel entrance at the mound is located at the base of the fan at the 45 degree angle.

Pocket gophers can be active at anytime of day or night. In most cases, activity usually decreases by late morning and resumes in late afternoon due to cooler soil temperatures and increased soil moisture.

1.1 Active Hours for Optimal treatment

Scheduling time to perform your applications is important when treating pocket gophers. For best results and to obtain the highest percentage of elimination, it is recommended to conduct the application during the hours of peak *activity* only.

In most cases, the best times are early morning and late afternoon when the pocket gophers are active. By treating active tunnels, this will assure that the tunnels are open throughout their system, and down to their den sites. On cool or cloudy days or during the fall and spring, pocket gophers may be active throughout the day.

As soil temperatures begin to increase in the late morning through the mid-afternoon hours, pocket gophers will normally cease activity and den up for the remainder of the day to avoid the heat and daytime predators. When this occurs, pocket gophers will typically place a series of blocks in their tunnels to keep out predators, other gophers and water.

Remember: Pocket gophers are primarily nocturnal animals and not active during the heat of the day with the exception of cool or cloudy days and after a long period of rain. The best time to make your applications is early in the morning and late in the afternoon (early evening).

If you are treating old mounds that are not from recent activity, you will have poor results as gophers place blocks in their tunnels or may abandon old tunnels.

Please Note: One of the most common calls to Customer Support is when an application has been made on what is thought to be "active" or fresh mounds, and the next day, the pocket gopher has dug twice as many tunnels and mounds as the day before.

This is an indicator that the application was performed on old mounds and that there were blocks in the tunnel, preventing complete penetration to the gophers den site. Since this application was not successful, the gopher was simply trying to establish new tunnels to replace the destroyed older tunnels.

1.2 Determining soil composition or plasticity for Pocket Gophers

Soil composition or plasticity is the determining factor in the amount of gas mixture that is injected in the burrowing animals' tunnel system for successful results.

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If the soil is composed of a denser material such as clay with minimal moisture, the amount of gas necessary to inject into the tunnel would be considerably less compared to soil that is lighter in density as with sandy or loamy compositions.

More simply, dense dry clay soil helps contain the underground shockwave by allowing the shockwave to travel deeper into the tunnels without absorption of the shockwave by the tunnel. This type of soil composition may require the minimal amount of gas during the application process.

Pocket gopher tunnels in light sandy or moist clay soils have a tendency to absorb the shockwave and may require more gas during the application process.

1.3 Locating Mounds and Tunnels

Before starting your work, carefully plan your application. Start by sectioning the field into quadrants, (equal sections). Work one section thoroughly before starting another.

The key to successfully treating pocket gophers is **locating fresh mounds only**. Fresh mounds reveal which tunnel systems are active and will provide the best result in eliminating both the pocket gophers and the majority of their open tunnels.

Try to schedule the applications “before breakfast” and “after dinner”. In other words, early morning and late afternoon.

This technique will get you into the field when the pocket gophers are actively working to excavate their tunnels to gather grasses and roots.

1.4 Types of Mounds

Pocket gophers normally make fan shaped mounds as part of their excavation activities. There are two other mounds that are often overlooked – small dome shaped boils and larger mounds that are from the major excavation of a den site.

Fan Shaped Mounds – Granular Appearance or Composition:

These mounds are constructed by the gopher for normal excavation of soil from the gophers’ main tunnel to the surface via a lateral tunnel. The excavation of these tunnels may occur as the gopher is looking for better food sources may be cleaning tunnels that have collapsed or have been flooded.

With normal tunneling activity, the dirt excavated to the surface may appear to be a granular composition at the excavation site (mound). The application to this type of mound and tunnel will generally have good results.

Fan Shaped Mounds – Muddy Appearance or Globular Composition:

A mound that has a muddy or globular composition is the result of a gopher clearing out flooded tunnels.

An application to this type of mound may not produce effective results due to excessive moisture in the gopher tunnels, blockages and diversions placed by the gopher. The application should be delayed until normal mounding with granular soil is observed.

Large Fan Shaped Mounds or Clustered Mounds (Den Sites):

Typically in the spring or late fall, pocket gophers will excavate deep tunnel systems and prepare for winter by digging den a site deep underground or to clean out their den after weaning their offspring and preparing for another litter.

This type of excavation gives the appearance to be a group of large mounds close together or an abnormally large gopher mound. This indicates the location of a gopher den site. These den sites can go as deep as 12 feet below the surface, depending on geographic location, climate and soil.

In moderate climates, a pocket gopher will burrow a den site approximately 4 to 6 feet below the surface in a comfortable location that offers an ambient temperature of 57 degrees and is well below the saturation point of surface water and above the groundwater table.

In extreme northern climates where there is a frost line, pocket gophers will burrow a den site approximately 5 to 7 feet below the frost line, or as deep at 12 feet below the surface in order to survive the cold climates.

Small Dome Shaped Mounds:

Small dome shaped mounds or “boils” are usually created by the pocket gopher for immediate access to food at the surface. These are typically located directly above the main runway or between two mounds.

Pocket gophers use these like a hatch to quickly poke out to gather food or nesting material. A small plug is pushed back up by the gopher, creating the “boil”. These plugs are normally weak and can be opened with a finger or the gopher shovel that came with your Rodenator.

1.5 Recommended Treatment Plan

There are 3 things to remember when treating Pocket Gophers which are unique to this species. **Patience, Persistence and Understanding!**

Patience is the key when treating an invasive species like pocket gophers. Since they are migrating species, totally eliminating them from an infested area may not be possible on a long term basis. However, total control can be achieved by following the application guidelines set forth in this Manual.

Persistence is essential to maintain a treatment regimen which will reduce the gopher population considerably with each and every application. The more you keep your regimen, the fewer pocket gophers exist now and in the future.

Understanding the habits of these animals is essential. Pocket gophers can tunnel a hundred feet or more per night, excavate over a ton of soil per season, cause erosion problems and cost farmers and ranchers money in lost crops, damaged equipment, injured animals and unsightly landscape.

1.6 The Application

It is important that during your initial application that you completely work the first section without missing any fresh mounds. The following morning or evening before starting another section, go over the previous day's work to observe any overnight activity.

If fresh mounds have appeared overnight, begin your application on the new overnight holes before starting a new section.

The appearance of new mounds the following day in the treated area does not indicate poor application results. In areas of extensive gopher infestations, additional treatments to gopher tunnels are to be expected. Some applications may be less effective than others because of complex, blocked abandoned tunnel systems.

Step 1: Mark Fresh Mounds

It is important to start early in the morning before the sun dries out the mounds, making it difficult to identify the fresh mounds dug the previous night. Place flags or markers on the fresh mounds.

Step 2: Opening a Plugged Mound

Remove the plug from the mound (if plugged) with the Rodenator brand Gopher Shovel. Insert nozzle of applicator into hole and lightly press dirt around the nozzle with your foot to help seal around the nozzle. This will help you see if there is a block in the tunnel system by gas blowing back out of the tunnel moving the dirt.

Step 3: Inject the Gas Mixture

Inject the gas into the hole using the Gas Timing Chart for Pocket Gophers in the pages to come (generally 60 seconds).

Perform your application with a watch or stop watch to accurately dispense the gas into the tunnel.

Step 4: Igniting the Gas Mixture

Immediately after releasing the gas, (and closing the ball valve on R1 models) depress ignition button to detonate the oxygen/fuel mixture.

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Step 5: Survey Completed Application Area

Pocket gopher tunnels are very deep by design. A successful application will result in the concussion traveling deep underground and the operator observing a loud “thump”, a slight heaving of the surface and long radiating disruption of the gopher tunnels.

Loud bangs and short tunnel disruptions may be an indication of a blocked tunnel system. Often a gopher may place blocks in the tunnel. These blocks may prevent full penetration of the tunnel system. When this condition occurs, enter the tunnel at the point of the block and proceed to blast the remainder of the tunnel system.

Many tunnels have opposite facing tunnel runs. When this situation occurs, first blast one side of the tunnel, and then the other when necessary.

Step 6: Follow-up

Carefully examine the previous day’s work. Repeat the same application process for new mounds if they reappear. When the infestation in the area is moderate or extreme, repeated applications are often necessary to obtain control.

Note: Cold weather conditions may require follow-up applications because the gopher may have moved to deeper levels within the tunnel system and set blocks in the tunnels far below the normal sub-surface tunnels.

Step 7: Perimeter Applications

After applying the Rodenator treatment to all sectors, check all outer property areas or borders for additional tunneling activity. If any additional tunnel activity is present, re-treat the area.

Step 8: Evaluation

During the application process, when you ignite the gas mixture, a loud muffled sound (thump) in combination with a rumbling ground indicates the application has penetrated deep into the tunnel system. This is what you want!

If the sound is very loud, this indicates the application was blocked within the tunnel system. This not an effective shot and you need to find another entrance into the tunnel and re-apply process.

Note: If the application was blocked, it is necessary to find another entrance point, or wait until a fresh mound occurs.

Pocket gophers normally do not occupy wet, muddy or saturated tunnels until they have drained sufficiently to allow the pocket gopher to excavate.

If new mounding activity occurs within a day or two of the initial application, this is an indication that the tunnels may have been blocked. Simply repeat the process when fresh mounds are present.

In hayfields, male pocket gophers may travel through the hay at night from the perimeter of the adjacent fields, looking to mate with females. This is normal activity and evident during the next cutting when new mounds are discovered in a treated hay field that was previously cleared of

gophers. It is always recommended to conduct a perimeter check of the fields several times a month to reduce the chance of re-infestation.

1.7 Pocket Gopher Timing Chart

Clay Soil Composition:	30-60 seconds oxy regulator at 30 psi
Black or Heavy Soil:	30-60 seconds oxy regulator at 30 psi
Loam or Medium Soil:	30-60 seconds oxy regulator at 30 psi
Sandy or Light Soil:	60-90 seconds oxy regulator at 30 psi

***note**

Remember to always keep the outgoing pressure on your propane regulator 3-5 psi higher than the oxygen regulator psi reading.

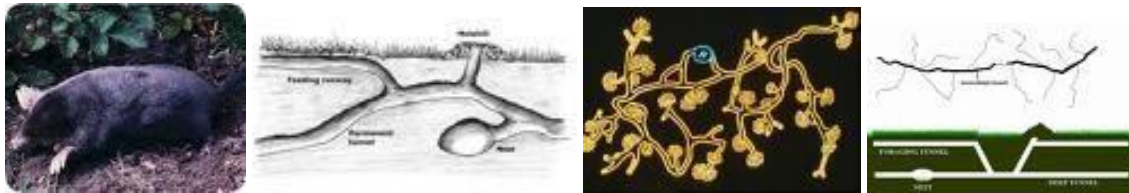
Example

Oxygen 30psi

Propane 33psi

2. MOLES

Moles live underground and inhabit the lawns of residential homes, golf courses, cemeteries, and parks, as well as fallow fields, forest edges, or pastures where moist, sandy loam soils are common and digging is easy.



Moles are approximately 4-8 inches in length from nose to tail. They have short, powerful forefeet with broad outward-turned palms and prominent digging claws, small eyes and ears, short, black or brownish-gray velvety fur, and a somewhat elongated head and snout. The snout of the star-nosed mole, as its name suggests, is characterized by a prominent fleshy protuberance with 22 short "tentacles" radiating from it. These tentacles are believed to aid the animal in sensing its environment and are found in no other mammal. Eastern and hairy-tailed moles may be distinguished by differences in their tails. The tail of an eastern mole is short (0.61-1.2 in.) and naked whereas that of the hairy-tailed is slightly longer (0.9-1.4 in.) and covered with short, stiff hairs. Male eastern and hairy-tailed moles typically are larger in size than respective females whereas both male and female star-nosed moles are approximately equal in size. Tactile hairs on the snout, forepaws, top of the head, and tail enhance a moles sense of touch; moles have a poor sense of smell and are virtually blind (but they do detect light and dark).

Although many people believe that moles are rodents, like mice or rats, they actually are members of the scientific order Insectivora, which includes animals like shrews and bats. The diet of a mole consists of earthworms, snails, slugs, and insects (both adult and larval stages),

but also may include small amounts of vegetation and seeds taken inadvertently. Moles destroy very few plants or bulbs by direct feeding, but may dislodge plants while tunneling in search of food. Because they expend a tremendous amount of energy when constructing tunnels, moles often remain active day and night year-round in their search for food. They often consume an amount of food equal to 60-100% of their body weight daily. To satisfy this almost insatiable demand for food, one mole can dig up to 150 feet of new tunnels each day. They are most active in early morning and late evening on damp, cloudy days during the spring and fall and may be seen above ground at night or when they disperse to new areas.

Moles typically are solitary creatures, although the star-nosed mole is somewhat more social than either the eastern or hairy tail mole. The only time individuals are seen together is during the spring (February-March) breeding season or when a female is rearing young. After a 4-6 week gestation period, females produce one litter of 2-5 young (up to 7 with star-nosed moles) each year. Nest chambers are constructed 12-18 inches underground, often beneath a large stone, tree, sidewalk, or roadway. Young moles leave the nest at about 5-6 weeks of age and become sexually mature by the end of their first year. Moles may live up to 4 years in the wild. Moles construct two types of tunnels-those at or near the ground surface and those deep (6-20 in.) underground. The networks of interconnecting trails visible above ground and just under the surface are feeding tunnels that often are used only once

Deep tunnels are the highways that lead between feeding areas and the living chambers and also provide cover against predators. Hairy-tailed moles have been observed using the same burrow system continuously for up to 8 years, but this is not common. Although all species of moles make feeding tunnels, eastern moles usually create the prominent ridges of heaved soil visible at the surface whereas star-nosed moles typically are responsible for the large (1-2 ft. diameter, 4-9 in. high) "mole hills" that give the appearance of a basketball being pushed up through the soil.

2.1 Determining Soil Composition or Plasticity for Moles

Soil composition or plasticity is the determining factor in the amount of gas mixture that is injected in the burrowing animals' tunnel system for successful results.

If the soil is composed of a denser material such as clay with minimal moisture, the amount of gas necessary to inject into the tunnel would be considerably less compared to soil that is lighter in density as with sandy or loamy compositions.

More simply, dense dry clay soil helps contain the underground shockwave by allowing the shockwave to travel deeper into the tunnels without absorption of the shockwave by the tunnel. This type of soil composition may require the minimal amount of gas during the application process.

Tunnels in light sandy or moist clay soils have a tendency to absorb the shockwave and may require more gas during the application process.

2.2 Locating Mounds and Tunnels

Surface Tunnels

Mole surface tunnels require a different application method compared to pocket gophers, producing mixed results that may create more surface disruption than the original tunneling made by the mole. This is because of the highly disruptive force of the Rodenator process, creating a high pressure shockwave through the tunnel system which often opens up the tunnels to the surface.

Applications to a surface tunnel will result in the shockwave traveling short distances in the tunnel, thus requiring additional applications to get to the mole's den site.

By treating the surface tunnels, the user is basically following the shockwave to its point of termination, re-opening the tunnel, and continuing the application until the shockwave is felt underground to the mole's den site.

Secondary Tunnels (Mounds)

The secondary tunnels of moles are the result of excavating deeper tunnel systems to locate food sources or to prepare for seasonal changes in the mole's habitat.

Mole tunnels directly below the mounds are normally vertical or at a very steep angle, thereby producing dome or conical shaped mounds. These vertical tunnels may go down as far as 24-30 inches below the surface before branching into the main runway.

Treating a secondary tunnel system is extremely effective with the Rodenator, resulting in a high elimination rate and very little disruption of the surface areas.

2.3 The Application

It is important that during your initial application, that you make note of the tunnels and where they are located.

Treating mole surface tunnels or mounds near foundations, walkways, patios or under buildings and sheds may not be advisable due to the radiating shockwave. Damage to foundations and concrete work, and underground tanks may occur.



When performing the application, please observe the safety protocols as detailed in the Operators Manual for Open Hole Burrows - Position and Stance, especially for R1 users.

It is recommended that you follow safety procedures when working near structures, underground and above ground storage tanks, wellheads, and debris piles.

Step 1: Opening a Surface Tunnel

With the Rodenator Gopher Shovel, start your application near the feeding tunnels (jagged ridge tunnels). Open the tunnel large enough to insert the nozzle of the Rodenator.

Step 2: Injecting the Gas Mixture

Inject the gas into the tunnel using the Gas Timing Chart for Moles.

Perform your application with a watch or stop watch to accurately dispense the gas into the tunnel.

Step 3: Igniting the Gas Mixture

Immediately after releasing the gas flow lever, (close ball valve on R1) depress the ignition button to detonate the oxy/fuel mixture.

Step 4: Continue with Application to Surface Tunnels

Continue the application on surface tunnels by proceeding to the end of the tunnel where the shockwave terminated. Open the tunnel, insert nozzle, inject gas mixture and ignite.

Note: *If your application is successful, your last application will result in the shockwave or concussion going deep underground to the mole den site.*

This will be noticed by a loud thump, followed by a slight heaving to the surface.



Treating Mole surface tunnels with the Rodenator process will result in a loud bang, similar to the sound of a shotgun or rifle. Hearing protection for the operator and bystander is required.

Treating surface tunnels may cause flying debris. Head, eye and face protection is required.

2.4 Mole Timing Chart

Mole Timing Chart:

Clay Soil Composition:	30-45 seconds oxy regulator at 30 psi
Black or Heavy Soil:	30-45 seconds oxy regulator at 30 psi
Loam or Medium Soil:	30-45 seconds oxy regulator at 30 psi
Sandy or Light Soil:	30-60 seconds oxy regulator at 30 psi

Note

Remember to always keep the outgoing pressure on your propane regulator 3-5 psi higher than the oxygen regulator psi reading.

Example

Oxygen 30psi

Propane 33psi

3. GROUND SQUIRRELS

Ground squirrels live in a wide variety of natural habitats and are called many different names including gophers, whistle pigs, sage rats, etc. They usually avoid thick chaparral, dense woods, and wet areas. Populations can be particularly high in grazed rangelands and in areas disturbed by humans such as road or ditch banks, fencerows, around buildings, and in or bordering many crops.



Ground squirrels live in a burrow system where they sleep, rest, rear young, store food, and avoid danger. The burrow openings can vary in size considerably depending on the species. The burrows can be 5 to 100 feet or more in length and can extend 2 to 4 feet below the soil surface. Often there is more than one opening in a burrow system. Ground squirrels live in colonies that can include several dozen animals in a complex of burrows.

Ground squirrels are active during the day, mainly from midmorning through late afternoon, especially on warm, sunny days. Ground squirrels have two periods of dormancy during the year. During winter months most ground squirrels hibernate, but some young can be active at this time, particularly in areas where winters aren't severe. During the hottest times of the year most adults go into a period of inactivity, called estivation that can last a few days to a week or more. During these periods, the burrow appears open at the entrance, but the squirrel plugs it with soil near the nest.

Ground squirrels breed once a year, averaging 7 to 8 per litter. Timing of breeding varies with location. In Southern California breeding begins in December, in the Central Valley the timeframe is February through April, and in the mountain ranges breeding begins somewhat later. Aboveground activity by adults is at a maximum at the height of the breeding season. The young are born in the burrow and grow rapidly. When they are about 6 weeks old, they usually emerge from the burrow. At 6 months they resemble adults.

Ground squirrels are primarily herbivorous, and their diet changes with the season. After emerging from hibernation, they feed almost exclusively on green grasses and herbaceous plants. When annual plants begin to dry and produce seed, squirrels switch to seeds, grains, and nuts and begin to store food. Ground squirrels usually forage close to their burrows. Their home range typically is within a 75-yard radius of their burrow.

Ground squirrels can harbor diseases harmful to humans, particularly when squirrel populations are numerous. A major concern is bubonic plague transmitted to humans by fleas that the squirrels carry. Ground squirrels are susceptible to plague, which has wiped out entire colonies. If you find unusual numbers of squirrels or other rodents dead for no apparent reason, notify public health officials. Do not handle dead squirrels under these circumstances.

3.1 Recommended Treatment for Ground Squirrels

Treating ground squirrels is a fairly straight forward process that can be performed anytime of the day or night. In most rural areas where combination treatments on pocket gophers are made in the early mornings, this activity may help in keeping most ground squirrels in their burrows for later applications. What makes the treatment of ground squirrels most effective is the ease of the application and the animal's natural defense mechanism of retreating to their burrows at any sign of danger.

This “flee and hide” mechanism gives the Rodenator process a higher success rate since the majority of the target animals are within their burrows at the time of the application.

When making your first application to a burrow entrance, the resulting underground shockwave will also exit through connecting tunnels that are part of the treated burrow system. The resulting smoke, steam and debris exiting these holes clearly show which burrow system have been treated.

The key to effectively maintaining control of ground squirrels with the Rodenator process is to treat every burrow system that does not appear to have been part of the initial application and immediately fill-in these holes with dirt, pack them tight and level any mounds. Keep in mind that the squirrels in adjoining tunnel systems that were not treated will aggressively try to dig into the tunnels that you have just shoveled shut. If you do not pack the holes shut tightly, the effort for the squirrels to re-open the tunnels will be minimal.

This method will reduce the chance of re-infestation by neighboring ground squirrels and will alert you at a later time if another ground squirrel has dug back into the burrow system.

When performing the application, please observe the safety protocols as detailed in the Operators Manual – Position and Stance, especially for the Rodenator R1

3.2 Determining Soil Composition or Plasticity for Ground Squirrels

Soil composition or plasticity is the determining factor in the amount of gas mixture that is injected in the burrowing animals’ tunnel system for successful results.

If the soil is composed of a denser material such as clay with minimal moisture, the amount of gas necessary to inject into the tunnel would be considerably less compared to soil that is lighter in density as with sandy or loamy compositions.

Application in a dense dry clay soil helps contain the underground shockwave by allowing the shockwave to travel deeper into the tunnels without absorption of the shockwave by the tunnel. This type of soil composition may require the minimal amount of gas during the application process.

Ground squirrel burrows that are in light sandy or moist clay soils have a tendency to absorb the shockwave and may require more gas during the application process.

3.3 The Application

Before starting your work, carefully plan your application area. Start by locating the entrance of the burrows. Place marker flags to identify the burrow entrances. Most ground squirrel burrows have multiple entrances. Some are also for escape, air or water diversion.

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It is important to know the location of all holes when performing the application in order to properly position yourself away from the exiting shockwave.

Step 1: Insert the Nozzle of R1, or Rubber Extension attachment on R2, and R3

Ground Squirrels make large burrow openings and live in deep underground den sites. To identify the main entrance, look for an opening where the entrance has been smoothed over by the animal entering and exiting many times.

The end of the Rodenator device needs to be inserted into the entrance of the burrow (the hole) as deep as possible in order to inject the gas mixture properly. This also assures that the gas mixture is not being drawn out of the hole by any slight breeze.

Note: *for maximum effectiveness, try to avoid applications to ground squirrel burrows on windy days.*

If you do perform applications on windy days, a flame proof cloth, damp towel or rag placed behind the application nozzle during the injection process will assist in preventing the gas mixture from being drawn out by a breeze.

Step 2: Inject the Gas Mixture

Inject the gas into the hole using the Gas Timing Chart for Ground Squirrels. (Refer to Timing Chart on next page) Perform your application with a watch or stop watch to accurately dispense the gas into the tunnel. **Always flow gas into the tunnel entrance for 10-15 seconds before you shovel any dirt around it. This will let you know if there is any burning debris in the tunnel that could cause a meltdown if there is a fire present underground.**

Step 3: Igniting the Gas Mixture

Immediately, after releasing the gas mixture (and closing ball valve on R1 Rodenator) depress the ignition button to detonate the oxy/fuel mixture.

Step 4: Cover the Hole after the Shot

To assure that the application was successful and to prevent re-invasion of another animal into the burrow, the hole should be buried and packed immediately after the application. Any evidence of the entrance, including mounds or depressions, should be leveled.

Step 5: Follow-up

Carefully examine the previous days work. Repeat the same application process for reopened burrows. When the infestation in the area is acute, repeated gas applications are often necessary.

Step 6: Evaluation

During the application process, the sounds coming from the burrow opening may vary. In most cases, the target may have a large opening and sound may be as loud as a shotgun blast. You may be able to reduce the sound by packing dirt around the nozzle during the injection of the gas mixture.

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Ground Squirrel timing chart

Times below are suggested with oxy regulator at 50psi and propane at 53psi.

Clay Soil Composition: 30-45 seconds oxy regulator at 30 psi

Black or Heavy Soil: 30-45 seconds oxy regulator at 30 psi

Loam or Medium Soil: 30-45 seconds oxy regulator at 30 psi

Sandy or Light Soil: 60-90 seconds oxy regulator at 30 psi

Note

Remember to always
keep the outgoing
pressure on your
propane regulator 3-5
psi higher than the
oxygen regulator psi
reading.

Example

Oxygen 40psi

Propane 43psi

4. PRAIRIE DOGS

The Prairie Dog is a small burrowing rodent native to the grasslands of North America. The highly social prairie dogs live in large colonies or "towns". Collections of prairie dog families can span many acres of land and lead more than 11 yards (10 meters) into the ground. Families tend to consist of one male and 2 to 4 females. Some consist of multiple males and females or just a single creature. Colonies are fixed. The complex tunnel system they use can sustain for dozens of years.

Prairie dogs are tough, social animals that live in and around burrows deep within the prairie soil. They grow to between 14 and 17 inches (350-425 mm) long and weigh about 2 to 3 pounds (.91-1.4 kg). They are tan with a whitish or buff-white belly. The tips of their tails are sparsely covered by black hair. They have short ears and, compared to their body size, relatively large black eyes. Prairie dogs live from 3 to 5 years.

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Prairie dogs live in complex communities, called "towns" or "colonies." The colony is an underground tunnel system leading to various chambers which are bedded with dry leaves and grass. Their burrows are approximately 10 yards apart, 3 to 14 feet deep and 10 to more than 100 feet long. A mound 3 to 10 feet across and ½ to 1 foot high at the entrance of the burrow prevents water from rushing in and serves as a lookout station, as well as ventilation shafts for the entire burrow system. Burrow systems have 1 to 3 entrances. The tunnels have separate rooms for sleeping, eating, babysitting, and just sitting. Their burrows generally contain several routes of escape.

Prairie dogs spend most hot summer days sleeping and are active above ground mornings and evenings. In cool or overcast weather, prairie dogs may remain above ground all day. They emerge shortly after sunrise, and return to the burrow around sunset. Rain will often drive them to retreat underground.

Treating prairie dogs is generally the same as other open hole burrows, and can be performed anytime of the day or night. In most rural areas where combination treatments on pocket gophers are made in the early mornings, this activity may help in keeping most prairie dogs within their burrows for later applications. Application of the Rodenator to a prairie dog burrow system has a high success rate due to the cooperation of the animal retreating to their burrow at any sign of danger.

When making your first application to a burrow entrance, the resulting underground shockwave will also exit through connecting tunnels that are part of the treated burrow system. The resulting smoke, steam and debris, exiting these holes show you what has just been treated. Upon completing the application, it is important to fill in and pack tight any holes that are connected to this burrow system, as well as leveling out the existing mounds by hand, land plane, blade or disking.

By packing shut these treated burrows and leveling out the mounds, this method will keep most prairie dogs from re-invading the treated burrows. In addition, any scent that was near the entrances of the burrows will be spread across the area, making the entrances much more difficult to locate by invading animals.

4.1 Recommended Treatment for Prairie Dogs

The key to effectively maintaining control of prairie dogs with the Rodenator process is to treat every burrow system that does not appear to have been part of the initial application and immediately fill-in these holes with dirt, pack them tight and level any mounds. This method will reduce the chance of re-infestation by migrating or neighboring prairie dogs. By filling in these holes you will be able to see if a prairie dog has dug back into the burrow system.



When performing the application, please observe the safety protocols as detailed in the Operation Manual, especially for R1 users.

4.2 The Application

Before starting your work, carefully plan your application area. Start by locating the entrance of the burrows. Place marker flags to identify the burrow entrances. Most prairie dog burrows have several large mounds for their main entrance.

Note: It is important to know the location of all holes when performing the application in order to properly position yourself away from the exiting shockwave.

Step 1: Insert Nozzle

Prairie Dogs make large burrow openings and live in deep underground den sites. To identify the main entrance, look for an opening where the entrance has been smoothed over by the animal entering and exiting many times.

The end of the Rodenator device needs to be inserted into the entrance of the burrow (the hole) as deep as possible in order to inject the gas mixture properly. This also assures that the gas mixture is not being drawn out of the hole by any slight breeze.

Note: *for maximum effectiveness, try to avoid applications to prairie dog burrows on windy days.*

If you do perform applications on windy days, a flame proof cloth, damp towel or rag placed behind the application nozzle during the injection process will assist in preventing the gas mixture from being drawn out by a breeze.

Step 2: Inject the Gas Mixture

Inject the gas into the hole using the Gas Timing Chart for prairie dogs. (Refer to Timing Chart on next few pages) Perform your application with a watch or stop watch to accurately dispense the gas into the tunnel.

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Step 3: Igniting the Gas Mixture

Immediately after releasing the gas (and closing ball valve on R1 Rodenators) depress the ignition button to detonate the oxy/fuel mixture.

Step 4: Cover the Hole after the Shot

To assure that the application was successful and to prevent re-invasion of another animal into the burrow, the hole should be buried and packed immediately after the application. Any evidence of the entrance, including mounds or depressions, should be leveled.

Step 5: Follow-up

Carefully examine the previous days work. Repeat the same application process for reopened burrows. When the infestation in the area is acute, repeated gas applications are often necessary.

Upon completing all applications, it is recommended that the treated areas be plowed or disked to further disrupt any mounds and to prepare the area of seeding to re-establish grasses or prairie pasture. The establishment of grasses – prairie or grazing – is important to keep prairie dogs from invading treated areas. Prairie dogs will avoid areas of tall grass as this limits their ability to see predators approaching the community.

Step 6: Evaluation

During the application process, the sounds coming from the burrow opening may vary. In most cases, the target may have a large opening and sound may be as loud as a shotgun blast.

You may be able to reduce the sound by packing dirt around the nozzle during the injection of the gas mixture.

4.3 Prairie Dog Timing Chart

Times below are suggested with oxy regulator at 50psi and propane at 53psi.

Clay Soil Composition:	45-60 seconds oxy regulator at 30 psi
Black or Heavy Soil:	45-60 seconds oxy regulator at 30 psi
Loam or Medium Soil:	30-45 seconds oxy regulator at 30 psi
Sandy or Light Soil:	60-90 seconds oxy regulator at 30 psi

Note

Remember to always keep the outgoing pressure on your propane regulator 3-5 psi higher than the oxygen regulator psi reading.

Example

Oxygen 40psi

Propane 43psi

5. GROUND HOGS, WOOD CHUCKS (MARMOTS)

The groundhog, or woodchuck, is one of 14 species of marmots. These rodents live a feast-or-famine lifestyle and gorge themselves all summer to build up plentiful reserves of fat. After the first frost, they retreat to their underground burrows and snooze until spring, drawing their sustenance from body fat. While hibernating, the animal's heart rate plunges, and its body temperature is not much warmer than the temperature inside its burrow.



The greater part of a woodchuck's or groundhogs day is spent in the burrow presumably sleeping. Feeding periods vary according to weather conditions and the season. During the cool days of early spring, it is most active during the warmer parts of the morning and afternoon. However, during the summer, the warmest parts of the day are spent in the cool burrow and feeding occurs during the very early morning and again at dusk. Woodchucks and groundhogs are least active on cool, rainy days.

Woodchucks enter hibernation beginning mid-October and emerge during February. They mate shortly after emergence, with a single litter of four to six young born a month later (March-April). The young leave the nest in early July to establish their own burrows and territories. Woodchucks live an average of 4-6 years.

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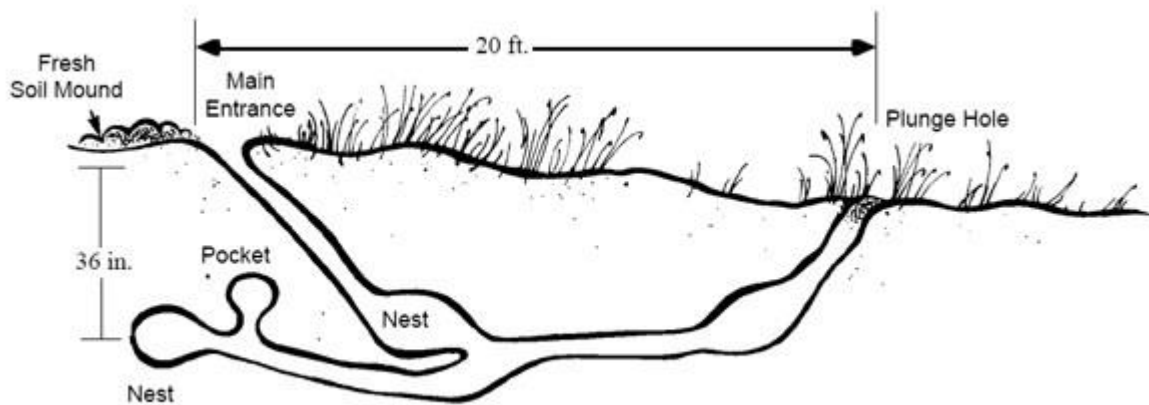
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An understanding of burrow construction and of the movement of woodchucks and groundhogs within and around crop fields is important for effective control programs. Too often, only temporary control is achieved because the number of active burrows and/or the number of woodchucks/groundhogs within a field and its surrounding area is underestimated. Woodchucks and groundhogs usually construct two types of dens: winter dens and summer dens. Winter dens are often located within wooded or brushy areas and serve as hibernation chambers, although occasionally they are used year round. These dens have only one opening, with the hibernation chamber situated below a tree or stump for protection against intruders. The winter den is abandoned by the woodchucks several weeks after they emerge from hibernation.

The animals then move into nearby grassy meadows or crop fields and construct their summer dens. Soybean, clover, alfalfa, and corn fields are particularly favored for summer den locations. Summer dens contain between one and five openings, but typically there is one main entrance and one or more escape or "plunge" holes. The plunge holes are often well concealed among vegetation and may even be plugged. If a den has been in use for several years or by several generations of woodchucks, the burrow system may be complex, lengthy and contain several openings.

It should also be noted that adult woodchucks and groundhogs often construct more than one summer burrow system within a field. Thus, there are auxiliary burrows as well as main or "home" burrows. Because the auxiliary burrows are used for refuge to escape danger during the animals' daily foraging activities, there may be constant back and forth movement between dens during the summer.

The average burrow system is located about 2-4 feet underground and extends horizontally 1525 feet (or more) (Figure 1). The main nest chamber is generally located at the end of the burrow system, but additional nests may be constructed in any part of the burrow. The main entrance to the burrow is characterized by a mound of fresh earth around the opening as well as by numerous trails leading to the feeding areas and auxiliary burrow systems. When other animals such as rabbits, skunks, foxes, or badgers are using woodchuck burrows, the fresh earth mound is absent at the entrance.



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The daily home range of woodchucks varies considerably. In favorable habitats, such as a soybean field, woodchucks may forage only 20-30 yards from their home dens. In less favorable habitats, such as woodlots, road edges, yards, etc., the woodchuck may travel several hundred yards daily to reach feeding areas. Generally, only one or two adult woodchucks will inhabit one acre, although occasionally there may be more. Woodchucks are territorial and defend their dens against other woodchucks except during the breeding season when the adult male and female will occupy the same den.

Treating woodchucks and groundhogs is generally the same as other open hole burrow animals such as ground squirrels and prairie dogs. In most rural areas where combination treatments on pocket gophers or moles are made in the early mornings, this activity may help in keeping most woodchucks and groundhogs in their burrows for later applications. Application of the Rodenator to woodchucks and groundhogs has a high success rate because the animals retreat into their burrows at any sign of danger.

When making your first application to a burrow entrance, the resulting underground shockwave will also exit through connecting tunnels that are part of the treated burrow system. The resulting smoke, steam and debris, exiting these holes show you what has just been treated.

5.1 Recommended Treatment for Woodchucks / Groundhogs

The key to effectively maintaining control of woodchucks and groundhogs with the Rodenator process is to treat every burrow system that does not appear to have been part of the initial application and immediately fill-inn these holes with dirt, pack them tight and level any mounds.

This method will reduce the chance of re-infestation by migrating or neighboring woodchucks, skunks, badgers and such. By filling in these holes, you will be able to see if the woodchuck has dug back into the burrow system.



When performing the application, please observe the safety protocols as detailed in Operators Manual, especially for R1 users.

5.2 The Application

Before starting your work, carefully plan your application area. Start by locating the entrance of the burrows. Place marker flags to identify the burrow entrances. Most woodchuck / groundhogs burrows have large mounds for their main entrance and single air or escape hole that is considerably smaller and may not have a mound.

It is important to know the location of all holes when performing the application in order to properly position yourself away from the exiting shockwave.

Step 1: Insert the Nozzle

The nozzle of the Rodenator device needs to be inserted into the entrance of the burrow (the hole) as deep as possible in order to place the gas mixture properly. This also assures that the gas mixture is not being drawn out of the hole by any slight breeze.

Note: *For maximum effectiveness, try to avoid applications to woodchuck / groundhog burrows on windy days. If you do perform applications when windy, a flame-proof cloth, damp towel or rag placed behind the applicator nozzle during the injection process will assist in preventing the gas mixture from being drawn out by a breeze.*

Step 2: Inject the Gas Mixture

Inject the gas into the hole using the Gas Timing Chart for woodchucks and groundhogs. Perform your application with a watch or stop watch to accurately dispense the gas into the tunnel. **Always flow gas into the tunnel entrance for 10-15 seconds before you shovel any dirt around it. This will let you know if there is any burning debris in the tunnel that could cause a meltdown if there is a fire present underground**

Step 3: Igniting the Gas Mixture

Immediately after releasing the gas, (close the ball valve on R1 units) depress the ignition button to detonate the oxy/fuel mixture.

Step 4: Cover the hole after the application shot

To assure that the application was successful and to prevent re-invasion of another animal into the burrow, immediately after the application, the hole should be buried and packed shut.

Step 5: Follow-up

Carefully examine the previous days work. Repeat the same application process for reopened burrows. When the infestation in the area is acute, repeated gas applications are often necessary.

Step 6: Evaluation

During the application process, the sound coming from the burrow opening may vary. In most cases, the target may have a large opening and the sound may be as loud as a shotgun blast. You may be able to reduce the sound by packing dirt around the nozzle during the injection of the gas mixture.

5.3 Woodchuck/Groundhog Timing Chart

Clay Soil Composition:	30-60 seconds oxy regulator at 30 psi
Black or Heavy Soil:	30-60 seconds oxy regulator at 30 psi
Loam or Medium Soil:	30-60 seconds oxy regulator at 30 psi
Sandy or Light Soil:	30-90 seconds oxy regulator at 30 psi

Note

Remember to always keep the outgoing pressure on your propane regulator 3-5 psi higher than the oxygen regulator psi reading.

Example

Oxygen 30psi
Propane 33psi

6. VOLES

Voles are small rodents that grow to 4-8 inches depending on species. They can have 5-10 litters per year. Gestation takes 3 weeks and the young voles reach sexual maturity in a month. Needless to say, vole populations can rapidly grow from one or two to many within a very short period of time. Since litters average 5-10 young, a single vole in the yard can become 50 or more in less than a year.

Voles are commonly mistaken for other small animals. Moles, gophers, mice, rats and even shrews have similar characteristics and behavioral tendencies. Since voles will commonly use burrows with many exit holes, they can be mistaken for gophers or some kind of ground squirrel. Voles can create and will often times utilize old abandoned mole tunnels thus confusing the land owner into thinking that moles are active. When voles find their way into the home, they are readily identified as mice or young rats. In fact, voles are unique and best described as being a little bit like all the other animals they are so commonly thought to be.

They will readily thrive on small plants. Like shrews they will eat dead animals and like mice or rats, they can live on most any nut or fruit. Additionally, voles will target plants more than most other small animals. It is here where their presence is mostly evident. Voles will readily "girdle" or eat the bark of small trees and ground cover much like a porcupine. This girdling can easily kill young plants and is not healthy for trees or other shrubs.

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Voles love to eat succulent root systems and will burrow under plants or ground cover they are particularly fond of and eat away until the plant is dead. Bulbs in the ground are another favorite target for voles; their excellent burrowing and tunneling gives them access to sensitive areas without clear or early warning. A vole problem is often only identifiable after they have destroyed a number of plants.



6.1 Recommended treatment for voles

Identification of Vole infestation: two distinct characteristics of vole infestation are the presence of clusters of small round holes approximately 1-1 1/2" in diameter and the appearance of trails/tunnels running from these holes throughout the adjoining grassy areas. Voles while living below ground in a vast but shallow network of tunnels feed and travel above ground in these "runways" which provide food sources and protection from natural predators.

Several generations of voles may at times share and occupy the same nesting chambers below ground. Voles are prolific breeders and do not hibernate.

Using the Rodenator and its process to assist in the elimination of vole infestations is very effective and the offensive approach to dealing with these highly destructive rodents. In essence, the Rodenator mixed fuel burst is delivered into one of the vole tunnel openings for 15 - 20 seconds and then detonated. The resulting concussion will quickly kill any vole within that tunnel system. You will notice that upon detonation, several of the tunnel openings within the immediate area of the blast will also "blast out". This assures you that several interconnecting tunnels have been cleared.

As a training aid, you may want to try something we do when demonstrating the Rodenator and its process. After locating a vole "colony", place old golf balls on all but one tunnel opening, apply the gas mix for the prescribed 15 - 20 seconds, push the ignition button and watch the golf balls go flying. Any balls that dislodge from the tunnels are an indication of the tunnels now clear of living voles. Repeat the process on any undisturbed holes.

In residential or turf type applications, significant reduction of visible vole infestation can be immediately reduced by using our process and following up the blasting with back filling all treated holes. This backfilling is especially important to preclude any voles that may have been

out foraging above ground while using the Rodenator. We have found that backfilling with dry builder's sand immediately upon completing a series of blasts seals the tunnels, allow the turf to regenerate quickly and make it virtually impossible for any outsiders to re-infest the treated tunnels.

7. BADGERS

Badgers are found primarily in the Great Plains region of North America. Badgers occur north through the central western Canadian provinces, in appropriate habitat throughout the western United States, and south throughout the mountainous areas of Mexico. They have expanded their range since the turn of the 20th century and are now found as far east as Ontario, Canada



Badgers prefer to live in dry, open grasslands, fields, and pastures. They are found from high alpine meadows to sea level.

Badgers measure 520 to 875 mm from head to tail, with the tail making up only 100 to 155 mm of this length. Badgers weigh 4 to 12 kg. The body is flattened, and the legs are short and stocky. The face of the badger is distinct. The throat and chin are whitish, and the face has black patches. A white dorsal stripe extends back over the head from the nose. In northern populations, this stripe ends near the shoulders. In southern populations, however, it continues over the back to the rump. Males are significantly larger than females and animals from northern populations are larger than those from southern populations.

The home ranges of both male and female badgers expand during the breeding season, indicating that males and females travel more extensively to find mates. Males have larger home ranges that are likely to overlap with the home ranges of several females

Mating occurs in late summer or early autumn. Litters of 1 to 5 offspring, with an average of 3, are born in early spring. Females are able to mate when they are 4 months old, but males do not mate until the autumn of their second year. Most females mate after their first year

Badgers are solitary animals. Typical population density is about 5 animals per square kilometer. Badgers are mainly active at night, and tend to be inactive during the winter months. They are

not true hibernators, but spend much of the winter in cycles of torpor that usually last about 29 hours. During torpor body temperatures fall to about 9 degrees Celsius and the heart beats at about half the normal rate. They emerge from their dens on warm days in the winter.

Badgers are excellent digging machines. Their powerfully built forelimbs allow them to tunnel rapidly through the soil, and apparently through other harder substances as well. There are anecdotal accounts of badgers emerging from holes they have excavated through blacktopped pavement and two inch thick concrete.

Their burrows are constructed mainly in the pursuit of prey, but they are also used for sleeping. A typical badger den may be as far as 3 meters below the surface, contain about 10 meters of tunnels, and have an enlarged chamber for sleeping. Badgers use multiple burrows within their home range, and they may not use the same burrow more than once a month. In the summer months they may dig a new burrow each day.

71. Recommended treatment for badgers

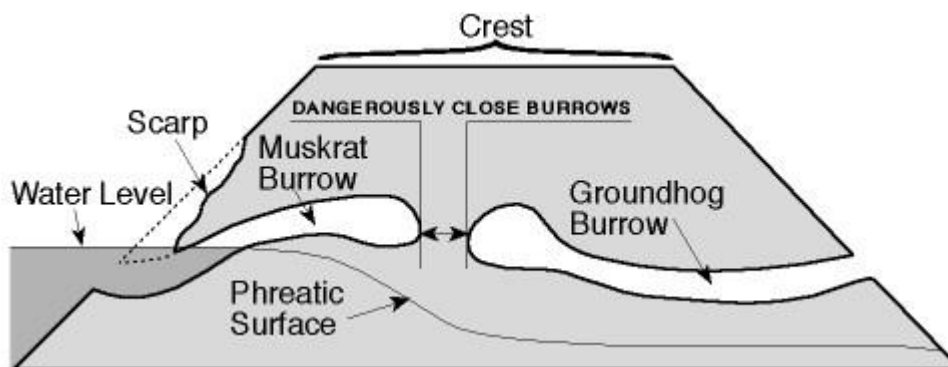
Observe the badger burrow to see if it is an active burrow, or an old abandoned tunnel. If it is an active tunnel and you can see that it is a deep tunnel, inject 90 seconds of fuel mix into the tunnel system and ignite. Many of the badger tunnels are a one way tunnel without a connecting exit allowing the blast to exit. Without an exit tunnel you can expect that when the gasses are ignited the sound as well as the concussion at the opening of the tunnel will be very strong. If you are an R1 user expect to feel more of the concussive force on your back side than if you are working on ground squirrels or pocket gophers. Stand off to the side of the tunnel before igniting the gasses allowing the blast to go past you.

Caution, if you are using the Rodenator R2 or R3, attach the 3 foot flexible extension hose to the end of the Rodenator during use on badgers. Using the extension hose will allow you to inject the gas while keeping the Rodenator out of the tunnel entrance. Do not put the Rodenator R2 or R3 in the tunnel system when you ignite the gasses, keep it outside the tunnel entrance avoiding the blunt of the blast.

8. MUSKRAT



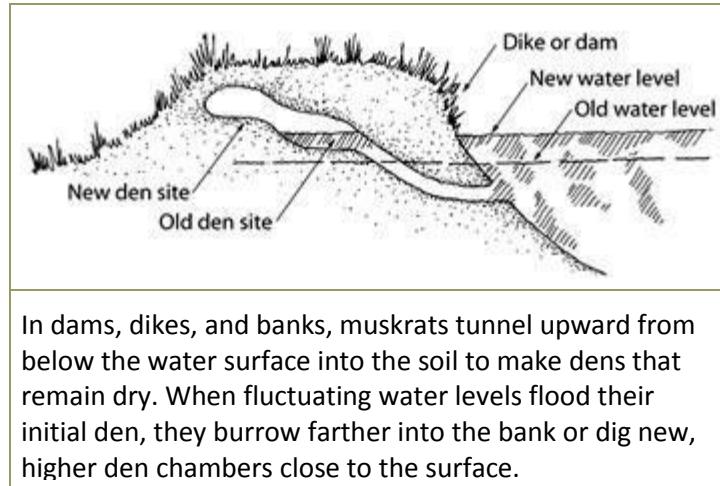
The muskrat is a stocky rodent with a broad head, short legs, small eyes, and rich dark brown fur. Muskrats are chiefly nocturnal. Their principal food includes stems, roots, bulbs, and foliage of aquatic plants. They also feed on snails, mussels, crustaceans, insects, and fish. Usually three to five litters, averaging six to eight young per litter, are produced each year. Adult muskrats average one foot in length and three pounds in weight. The life expectancy is less than two years, with a maximum of four years. Muskrats can be found wherever there are marshes, swamps, ponds, lakes and streams having calm or very slowly moving water with vegetation in the water and along the banks.



Muskrats make their homes by burrowing into the banks of lakes and streams or by building "houses" of bushes and other plants. Their burrows begin from 6 to 18 inches below the water surface and penetrate the embankment on an upward slant. At distances up to 15 feet from the entrance, a dry chamber is hollowed out above the water level. Once a muskrat den is occupied, a rise in the water level will cause the muskrat to dig farther and higher to excavate a new dry chamber. Damage (and the potential for problems) is compounded where groundhogs or other burrowing animals construct their dens in the embankment opposite muskrat dens.

Muskrats are one of our most prolific species. Adult muskrats can have up to five litters in a year's time. Muskrats in northern states seem to average about 2.5 litters a year. Muskrats in southern states often average 3 litters. Litter sizes vary, and 5 or 6 kits per litter are common.

There is evidence that muskrat populations may be somewhat cyclic. Muskrats produce fewer litters when populations are dense and more litters when populations are sparse. The quality and abundance of food also affects the number of litters as well as litter sizes. Female muskrats born in the spring are sometimes capable of raising their own litter by late summer or early autumn. An average female muskrat will raise about 15 or 16 young in a good year. One female muskrat has been known to produce 46 young in one year. The gestation period for muskrats is 29 days. Muskrats are thought to have one mate during rearing seasons. Populations can be estimated in the fall by counting lodges, and multiplying by 5.



8.1 Recommended treatment for muskrats

First find where the muskrat enters its den. Go up the bank several feet and probe down into the bank with a rod to feel for the tunnel opening underground. Once you feel the tunnel system below ground, pull the rod out of the ground and place the end of the Rodenator over the opening that you created with the rod. **Inject 60-90 seconds of gas mix** down the hole you made with the rod/probe into the tunnel system and ignite the gas. When you ignite the gas you will feel the ground under you shake and sometimes you will see a blast come out from under the water. If the Muskrat was home, you just terminated him. Move on to the next Muskrat den.