Georgy bursaries
of Pocket gopher of Kansas.

by
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Introduction.

In the preparation of this little work the author has endeavored to set forth, in a clear and concise manner, his experiences and observations of the gopher's habits.

As to its usefulness, the author is more expect in special soils as described under that head.

The gopher's destructiveness, however, far exceeds that which generally calculated by the average tiller of the soil. This is principally due to the gopher's work is so much underground that much of its destruction are hidden from the eyes of man.

In giving the amounts, as paid in bounties in certain states, the author gives thanks to the Agricultural Department at Washington D.C. for the information given in bulletin 4 of the Division of Ornithology and mammalogy for 93.

And the author would advise everyone interested in the subject, to consult the above bulletin and see the vast amounts that have been spent in contast with against the gopher.

The author's experience in killing the gopher extends over a period of eight years, during which time all the methods herein described have been tried and this success and opinions of each method are given under each respective method.
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The Geomya bursarius, or Pocket-gopher, belongs to the subkingdom Vertebrata, class Mammalia, order Rodentia.

Description of Geomya bursarius.

The Geomya bursarius is from 8 to 8½ inches in length, exclusive of the tail, which is about 1½ inches long. The body is the size of a large rat. The color is dark reddish brown. The hair short, fine, and thick upon the pelage. The legs are short.

The hind legs resemble those of a rabbit, very closely, while the front legs are very strong, and armed with 3 long curved claws fitted for digging their excavations. The claws often measure ½ of an inch in length and are well set in their strong palms. The claws are curved downward. They are smooth and round on the upper surface and curved on the under-side.

The front legs are well supplied with fine strong muscles; the strength lies in the fore part of the animal. On the whole, the front legs closely resemble those of a mole.

The neck is so short that it is nearly imperceptible, and the animal looks as if the head were placed against the body.

The head is large and nearly cylindrical and as large at the base as the body of the animal. The skull is low and flat, but broad and heavy. The jaws are strong, firm and well splayed. The muscles of the jaws are large and very strong. The teeth are 20 in number; 4 molars,
and 1. incisor on each side of each jaw. The molars are composed of enamel, plates, and dentino. The incisors are long and curved. The canines are about 2/3 of an inch long and smooth. The upper incisors are 3/4 of an inch in length and sharp, each with a deep groove running along the center of the outer curve, while near the inner edge of the tooth is a second but small groove. The teeth have a chisel-like cutting edge and are very sharp. They are of a deep brown color.

The teeth of the genus Geomyia are very characteristic in distinguishing several of the species.

The eyes are small, black and not of much use in daylight. The ears are small and stand erect.

The fur is thick, soft and wavy, and under-feathering a pouch or pocket from where its common name "Pocket gopher." The pouches are used for collecting and conveying food to their place of abode.

The "Gopher" has a slow, irregular, jinking-like gait when on a smooth hard surface, as the fore-claws are so long and curved, they are compelled to walk on the side of the front feet, turning the claws inward. On soft ground or even their burrows, they can run quite rapidly and are very active.

The sense of sight and hearing seem to be poorly developed as they do not seem to notice a noise nor move if a stick is thrust towards them. While the sense of touch seems to be highly developed for they will snap
ferociously when tussled with the hand or a stick, white coat, they fight and bite viciously. If caught in a trap they often rake their incisors by biting the trap.

Distribution

The Geomyas burarius is found throughout the entire Eastern 1/3 of the State of Kansas. They, however, are most numerous along the streams, in the sandy soils or timbered-lands. Occasionally they are found on the high prairies. In general they follow the latter of the soil to live upon the crops which he may plant.

The soil best suited for them is a loam porous one, in which it is easy to work and at the same time is rich in vegetation as the gophers are principally vegeta-

Habitat

The "Pocket gopher" is strictly subterranean in its hab-

No. In fact no other rodent spends so much of its life underground as does the gopher. It spends by far the greater por-
tion of its life underground. In his burrows the gophers

are industrious and energetic in his work. The
gopher is at work from early spring till late into the fall
his at work about the entire time the soil is not

frozen. To work is done mostly at night, late in the

evening or early morning. The gopher is quite shy and

will not venture out if he suspects that a person
is near.

The hole excavated by the gopher is about 2½ inches in diameter and of indefinite length. The soil loosened in making its excavations is taken to the surface and deposited in small mounds commonly known as gopher hills. They vary in size from a pint to hills containing 5 to 6 bushels of dirt. On the average, however, a mound of dirt is about 3 pecks. These mounds are placed at short intervals along the main line of work. Each gopher generally has two or several main lines or channels and many short auxiliary ones. The main channel generally takes a zigzag course following vegetation or the easiest rout of work. The main channels course can generally be traced by the rows of dirt hills thrown up on either side of it.

The gopher hills are made seldom directly above the main channel; but are placed a short distance on one side, and connected with the main gangway by a short slanting hole. There are two very good reasons why this should be so.

1st. The gopher could not bring the loosened dirt to the surface if the hole of exit was directly above the main channel, for the gopher scratches and pushes the dirt to the surface, and does not carry it out in its pouch as is commonly believed. Therefore it can be readily seen that there must be an incline to one side, along
which to scratch or push the loosened soil.

2. In digging it seems that the gopher, through instinct, knows how to conceal and protect his main channel from man by placing these hills several feet to one side and then tightly pack the hole with earth. As in digging for the channel no hole can be found leading from the hill to it. If the gopher's hills are directly above the main channel, it could easily be found and obstructed, or something placed therein which would be destructive to the gopher.

This may seem plausible, but all who have ever given the matter attention or who have dug for the burrow in order to place poison therein, will readily bear me out in the statement. For the gopher will invariably fill the shot auxiliary hole up solid and tight, and when digging for the channel much labor must often be expended before finding it. However, a person who is acquainted with their habits and methods of working can readily tell about where the main channel is located, as the mounds are placed on both sides of it, and by drawing an imaginary line midway between the mounds, you can generally find the channel without much trouble.

The burrows are generally from 4 to 10 inches below the surface. In deep planting they are mostly destroyed. The place of crossing is from 3 to 5 feet under.
ground and is generally located at the meeting of several main channels. This also serves as a storehouse for food being stored therein for future use or for the winter when they are unable to obtain food outside. This is where the young are born during the early spring. Few young are generally born at a birth.

The young gophers begin to make burrows and shift for themselves about the middle of summer. During the early fall the young fellows are very busy making burrows and gathering food, later on, for the winter. During the late summer or early fall the young gophers are very destructive to the crops surrounding their place of habitation.

Usefulness of the Gopher

Generally speaking, the usefulness of the Pocket gopher is unlimited and is restricted to the soil it inhabits. If the soil is of a very tenacious sticky kind, as drainage is poor, the gopher may help materially in bettering the condition of the soil as follows:

1st. By their burrows the soil becomes disturbed much deeper than by plowing in such soil, thereby bringing soil from quite a depth to the surface and causing it to become intermingled with the top soil. This, in fact, acts as a slow process of subsoiling.

2nd. The burrows on open lands act as drainage channels through which the water passes off. Some air will also enter these channels, causing a ventilation...
and drying of the soil, which, then, becomes more friable and better adapted for agriculture.

4th. They are of some use by eating the roots and seeds of poisonous weeds. A few insects are also eaten.

5th. If the top soil is trampled and the subsoil sandy, the gophers, by bringing the sandy soil to the surface, will in time convert the loam to a good agricultural soil. It is here, where the gophers may be of the greatest benefit to man.

Destructiveness of the Gopher

That the gopher is very destructive to all kinds of crops, whenever he is at work, cannot be denied. The ways in which the gopher is destructive to crops can readily be placed under three general divisions, each of which may again be subdivided. Fig. 40. By throwing soil over growing crops. 2nd. By destroying the root of crops in making its channels. 3rd. By consuming a large amount of crops for its livelihood.

It may seem but a small item to have a few gopher hills scattered in your fields or through your meadow. But if you will give the matter a second thought or see a place where little mounds are but a few feet apart and on an area of acres or rows of hole fields you will at once realize what an inestimable amount of damage and mischief they do, in a comparatively
that time. Each little mound will contain aver-
age at least 2 square feet of surface. It is a
very small estimate to say that each gopher will
throw up at least 3 hills per week, and giving him 8
months per year to work, which is about the average
of his making, and he will have covered about 216
square feet of soil per year. This however is a very low
estimate, and in an average each gopher will cover
more than twice that area. For a gopher will about average 1
mound per day, and often more.

I once saw when a single gopher had thrown up
200 of mounds over a distance of 47 yards, in one
night. The average distance between the hills was 12 ft.
This giving us over 15 hills thrown out by one gopher
during one night. 4 of these hills were small not measur-
ing over 2 quarts of dirt while the rest were large and cov-
ered fully 2 square feet each in area.

The above, however, is quite above the average. This
also the longest distance tunnelled in such a short time,
and in a straight line, that I have as yet observed.

The channel must have been quite straight for
the hills of dirt, at least, over in a comparatively
straight line and extended from a meadow of
Clover and Timothy, through a corn field and into
a sweet potato patch, where I have since for 3 or 4
months, set a trap for him and succeeded in catching
time, the second night in his new quarters.

The above shows the amount of work or mischief
that can be done by a single gopher in so short a time
had all those hills been thrown on garden plants in-
stead of, in the corn field, the damage of this single
gopher would have been considerable.

The gopher loves to make in bunch patches and
meadows for there he finds easy work and a
plenty food to appease his greedy appetite, and
of such a few gophers are about in a garden or bunch patch
they will, in a very short time, destroy many dollars
worth of vegetables, by covering up the plant with
their excavated dirt. And to the truck grower, it is
often quite a problem; how best to rid his fields from
those destructive little rodents.

Again, in the meadow, their destructiveness is by the
means of their dirt hills ranges in value next to the vegetable
field. Here it is not only the area covered up by the hillocks
of dirt, but in cutting the grass for hay, the mowing
machine often becomes stuck and refuses to cut
the grass for several feet beyond the hill. The grass thus
left standing goes to waste. Not only is the hay wasted,
but many breaks of the machine often occur,
especially that of the sickle bar, and we all know that
a breakdown of the machine causes such delay that
many dollars worth of hay or grass is lost, with of course
Aside from break dikes, cutting through these gopher hills quickly dulls the knife, which again takes unnecessary time to sharpen. This often is of much cost to the busy farmer in hay time.

In connection with the above we must keep in mind and have in mind, and are which is of vital importance which is, that a greater or less amount of dirt will become intermingled with the hay in harvesting it from a meadow containing gopher hills, and I am confident that no wise and intelligent person desires to put dirty hay to his stock, especially if he be a raiser of fine stock.

In Timothy and clover meadows, the amount of dirt that gets into the hay, from fields infested by the gopher, is by far greater than many persons have an idea.

Clover is the worst of the tame grasses to take up dirt from this source. All who have been fed dirty clover hay know full well into ill affects upon the stock eating it.

Not only are crops destroyed by being covered with dirt, but the subsoil may only be so clayey, sandy or gravelly nature which would be detrimental to profitable agriculture. This may be carried on to such an extent that what once was a good field for the truck growing may, after being infested for years by the gopher, become utterly worthless for truck growing.
The second phase of the destructiveness is
by the channels or subterranean gangways.
Damages by burrows of the gopher. This is another
serious phase of the subject and no one can doubt the
inestimable amount of loss the farmer annually sustains
on account of the underground channels made
by the gopher beneath growing crops.

We have already the amount of dirt thrown up
by these little rodents, and as it comes from beneath the
surface some 6 to 10 inches one cannot readily see
the amount of mischief they do; but sufficient to
say that where the gopher makes in the meadow, truck-
patch, nursery, orchard or vineyard, the roots are bit off
in making his excavations, are not a few by any means.

I have seen where they made channels length-
wise of a potato row, the vines all wilted and dead for
a rod in length in a single place, not leaving a single
hill alive. This is by no means uncommon in potato-
fields.

A gopher will often follow a row for several yards, then
cross over to the next row, and so on generally destroying the
entire crop along line of work.

Again, should the gopher enter a vegetable patch,
he would in a very short time destroy vegetables, such
as carrots, lettuce, cabbage, parsnips, onions, onions and etc.,
so such an extent that their value could not be calculated
by a few dollars and cents.

The meadow and the truck-paths are not the only places where the gopher is destructive for here enters the horticulturist or fruit grower. With some horticulturist and nurserymen the problem now becomes to aid their orchards and nurseries of the gopher as one of the small impurities for the loss they sustain is often a very great one, and has cost some pomologists a considerable sum of money.

The gopher, if coming into contact with a root, in making his burrow will bite it off. The gopher is also fond of the roots of some trees, for food, and will follow them of the rows in the nursery, eating the roots.

In the vineyard they are very destructive, for it is but a part of a night work, to bite off the roots of a large grape vine, which has cost much care and several years of culture, and anyone who is a grape grower fully realizes what a loss a few vines put away amounts to when he comes to harvest his crop.

Another, but of minor importance, is a loss sustained in arid countries by draining the water off rapidly, thus drying out the soil somewhat faster than it naturally would.

The last phase that we shall consider under distinctiveness is the amount of grain and vegetables eaten and stored by the gopher.

The gopher is a very voracious eater, for it takes a
comparatively large amount of food to appease his appetite over summer. He lives on root and cereals and is very fond of nearly all kinds of tuberous vegetables, such as carrots, beets, parsnips, rutabagas and etc.

He will dig a burrow along under a vegetable row and eat off the roots few below upwards till near the surface. He will also lay in a large supply for winter consisting of grains, potatoes and burdock roots. I have found in a pack of lots of potatoes and one a gallon of corn in the store-house of a single gopher.

Methods of Destroying the Gopher.

How best to destroy the "Pocket-gopher" with the least labor and expense, is a problem of great importance. Many and various methods have been employed with a greater or less success. In some states large sums of money have been spent trying to rid the country of this depredating little rodent.

In some states or counties thousands of dollars have been paid for gopher scalps or tails, as bounties. In 1890 Kansas state spent $10,000, while Minnesota from 1887 to 1889 paid $39,000 for gopher scalps or bounties, and yet these states are overrun with the gopher.

If in the near future, the farmers will not put greater efforts to rid the country of the gophers, they will become an enemy more troublesome and harder to contend with than the chuck-leng or Armory ornithorhyncus.
When there are but a few in a field they can now be got rid of, while in certain localities, where they are abundant, a vigorous effort should be made to entirely rid the lands of them.

The methods of destroying the gopher with the least cost and labor will vary greatly with the condition of the soil and surrounding country. The Pocket gopher is not so easily destroyed as the Thermophile or striped gopher, on account of it inhabiting generally, the loose or sandy soils, whereas many of the methods are not practicable there and not worked at all, while they will work to perfection in heavy or clayey soils.

The reasons for the difference in soils, as being suited for one method of destruction and not for another will be explained under each method below.

Some of the various methods which have been tried are as follows: Shooting with fire-arms, Poisoning with arsenic, Placing snakes in their holes, Poisoning with strychnine, Fumigation, Poisoning with carbon-disulphide: and trapping.

1st method: Shooting them with fire-arms. This is a fairly good method if there are but a few in a field and a person has ample time to, patiently watch for them. This, however, a slow and tiresome method because it requires a person to watch at the open hole until the gopher makes his appearance, and if you are not a
quick and accurate shot, the gophers will have disappeared by the time you shoot, thereby wasting your time and ammunition, also causing the gophers to become more shy and cautious, and it is not likely that they will make a second appearance.

2. A method is drowning them out with water. This is also a fairly good method of destroying them if water is plentiful and the soil a loam or a clay. In our sandy river bottoms this method is entirely out of the question as the water would not fill the burms because it would sink into the soil as fast as applied.

3. A method is by placing snakes into their holes. The majority of people have a dread and horror for the serpent, but they are of great value to the farmer in many ways and this is one of them. I am speaking of non-venomous snakes, especially bull snakes commonly so called, also known as gopher snakes but scientifically known as Pituophis. These and the black snakes are very fond of young animals. They also love to live underground and will follow the channels of the gophers until he is found when the snake makes a good meal of him. The snakes have this advantage that they can so easily follow up the gopher in his excavations, and should they find the nest of young soon would be left. Therefore if you protect these snakes found in fields infested by the gophers
many of them, will gain entrance to the gopher burrow and destroy them. If you are not afraid to catch and handle these snakes, catch everyone you find and place them in a gopher hole. If, however, you cannot bear to handle the snakes protect them by all means for they destroy many rats, mice and other pests in your garden.

Method is Poisoning with Strychnine.

This is somewhat dangerous and should be done with the utmost of care and caution, and only by a very careful person, as carelessness may result in the destruction of some other and valuable animals. However, if judicious care be exercised it is a very good method and good results may be obtained. The manner of using it is as follows: Take a few apples or carrots and cut them into pieces about 3/4 inch cubes and with a toothpick or small wire, push a single crystal of strychnine into each piece till near its center. Having the pieces all prepared, place them in a small pail or large tin can with a bail attached, and with a wire hook, hang the pail on your plow handles. Also prepare yourself with a piece of fence wire some 18 or 20 inches long, sharpened at one end, and a hook bent on the other. Place this wire on your plow along with your pail. Now as you plow along and strike a gopher hole, take the wire, stick the point into a poisoned piece of apple or carrot and drive it into the hole the full length...
of the wire and go on. The object of shoving it into the hole is to poison it. The gopher soon discovers that his channel has been broken into and at once sets out to close it up. Now if the poisoned bait lies near the mouth of the opening the gopher, likely as not, will con it up in closing the hole; but if it is some distance within the chances are that he will find it and eat it and will soon die from its poisoning effect.

By this mode of using it the twice will be lost and the destruction of the gopher will go on at a slight cost. It is not necessary, however, that this method should be used only in connection with the plowing of the field for it may also be used with good results by digging for the burrows and dropping in a good lot of poisoned bait. This can easily be done in orchards, vineyards, brush patches and in meadows. In whatever way this method is used too much caution cannot be exercised as the strychnine is a very deadly poison and when the tail of poisoned bait is not killed, or when stopping to plow at noon or evening, it should be well cared for so no animals or children can get hold of it.

The third is by Fumigation.

This consists in facing the fumes of some chemical or smoke of rubbish into the gopher burrow with some apparatus made especially for the purpose. There are various kinds of fumigating appliances on the market, some
of which are cheap while others are quite expensive. After examining several different furrowing machines but finding none to suit or to be expensive I had one made as follows, which can be made cheaply by any blacksmith.

Make a cylinder of stove pipe, about 4 inches in diameter and a foot long, with tight-fitting lids at each end. Have a small tin tube cut into diameter soldered in each lid. The tube should be one foot long and the other about 2 ft. Procure a small hand-bellows and have it anvil shaped and insert the shorter tube. Also get several feet of garden hose and strip one end of it over the end of the longer tube, and your machine is complete.

To use the machine, place the lid with the long tube on the cylinder and fill the cylinder with some small pieces of charcoal, putting in a handful of sulphur. Then put in some.lit embers or a few shavings, put on the lid with the hand-bellows attached, and it is ready for use. Now find a deep furrow, insert the tin tube several feet, pack the earth about the hose and force the sulphur fumes into the furrow by means of the bellows.

If there is no outlet to the furrow and the soil hard and clayey, it will not work with good results as the air soon becomes compressed in the furrow and the fumes will not pass along. However if there is an outlet at the
other end of the burrow theophyl will either succumb to the sulphurous deadly fumes or he will come out and can be captured.

In sandy soil this method will not work as the soil is too loose and porous and will take up the fumes so they will not go to any distance and theophyl remains unharmed.


cetyl methyl carboulsulphide:

Cetyl methyl carboulsulphide has the chemical composition of CS₂. It is a highly volatile liquid and its fumes are deadly to living organisms. Its specific gravity is heavier than that of air at being 1.292 and in using it you must either make the applicative on a level with theophyl or above him. So if using it on uneven ground or hill sides, it must always be instilled at the highest point. To use it open the burrow, take a roll of cotton the size of a walnut, saturate it with the liquid and throw it into the burrow. It will at once evaporate and the fumes, following along the burrow, will take theophyl and cause his death by suffocation. This beat to cover up the hole so as to prevent the escape of the theophyl.

In the use of this liquid care must be exercised as it is highly inflammable and should never be brought near a fire nor be used while smoking. This, like fumigation does not give satisfactory
results in sandy or loamy soils. No doubt rock good in
hillsides everywhere clay or loamy soils unless you are
sure the application is made quite over the animal and
to definitely locate him is impossible.

The Method Trapping

Trapping the last method has described is the sim-
plest and safest of all methods. It is slower than number
1. 2. 4 and 6 above described; but it makes sure of the
Dopfer, because when you have him in the trap you
have him, and as bird in the hand is worth two in the
bush.

There are various forms of Dopher traps on the market
but none of them are better and easier to manipulate than
the common steel trap. For trapping Dophers use the
number ought steel rat trap with the paw about the spring
This size I have used for some years with good success.

There are several ways of setting the traps which must be
learned through experience and observations by the trapper.

One way, and the best one is to find the main channel
by digging a small hole down to it. A draw a spade the
best instrument for this kind of work as you are able,
with it, to make a small deep hole. After finding the
channel, remove all loose dirt and cut a small
nich in one side for the spring of the trap to project
into. the trap must be set flush with the bottom
of the channel. This is one of the most important
points about setting traps for if the trap is either higher or lower than the Gopher's runway he will easily detect the trap and cover it over with dirt. Rather should the hole be larger than is really necessary for the making of the trap, so that everything about the runway will remain as much as possible just as the Gopher left it, so as to avoid his suspicion of the trap. If you wish to bait the trap, stick a small piece of apple or carrot on a stick, some 3 inches long, and stick this in the side of the hole you are digging, placing it some 4 or 5 inches up the side. Having set the trap over the hole, by placing several shingles over it and short-term handfuls of dirt upon them so as to exclude the light, for the least bit of light enters the hole, the Gopher will become aware that something is wrong and he will cover up the trap with dirt and plug up the burrow both and light, and your work has come to nothing.

However, if all has been properly done as above stated you will seldom miss catching the Gopher.

Another good place to set the trap is in an auxiliary or side channel, especially where the Gopher is at work thrashing and digging late in the evening. If he be disturbed at this time of the day, he will seldom shut up the hole, but will leave it till late in the night when he generally returns to complete his work, and if a trap be then set the Gopher will seldom miss being
in setting a trap in such a place take a garden trowel and enlarge the hole some 6 or 8 inches back so the trap will have ample room to work in. Now also the trap must be set flush with the bottom of the channel. If traps are set late in the evening, they need not necessarily be covered over as stated in first method of trapping, however it is best to cover them over as it ensures better success. If, however, the traps are set during the day they must always be covered over, as above stated, in order to be successful. It is not necessary that the traps should be baited if they are properly set according to the above directions. I very seldom bait my traps and can say that I have had good success in catching the gophers.

It is often very difficult to find the gopher channel without much digging, and to avoid this, I took an end-gate set of wompoe and prodded the ground, with it, about where I thought the burrow ought to be and in this manner the burrow can easily be found, after a little practice. When the rod strikes the burrow it gives a slight plunge downward, with but little pressure of the hand, and vice versa. Strike the lower side of the hole, it makes a sudden stop and the burrow is located.

Poisoning and trapping I deem the most practical, as well as economical and successful.
methods of riding fields from the Gopher. Trapping, however, I would recommend as the best of all methods as a child could do the work required in setting and looking after the traps; moreover no serious result could follow.

The two methods just mentioned, can be used in all kinds of soil and in all kinds of fields and crops with but a very slight disturbance to the growing crops.

In conclusion I can conscientiously say that the Gopher problem is one to which every tiller of the soil should give his attention, and try to rid the infested fields before the Gopher has taken control of them, for if they are not exterminated they will, sooner or later, overrun the state to such an extent that their extermination will take much time and will cost thousands of dollars.