Moles

(Dave Pehling)

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Moles are probably are number one animal pest in yards and gardens in western Washington. These animals are not rodents. They are now placed in the order *Soricomorpha*.

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There are many species of moles throughout North America; I think seven or eight species. In Washington state we have three species. At the top, we have the little Gibbs Shrew Mole which those are adult moles there. In the middle, we have the smaller Coast Mole, and at the bottom the large economy size Townsend's Mole, which is incidentally the largest mole in North America. All three of these species are confined to the west coast of the United States.

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The little Gibbs Shrew Mole is the smallest mole in North America, and is quite common here in our Pacific Northwest. This is a very small mole that pretends to be a shrew. He doesn’t do a lot of tunneling. He doesn’t raise mounds. But, he spends most of his life running through the undergrowth chasing arthropods, eating small slugs, slug eggs, and things of that sort. People who have cats often have their cats bring these in dead. And sometimes people think their cat is very good at catching baby moles when they are actually catching adult Gibb’s Shrew Moles. You can readily identify these from the other moles not only by size but the Gibb’s Shrew Mole has a black tail, whereas the other two species we will be talking about have pink tails.

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These are the two trouble-causing species: the Pacific or Coast Mole at the top and the large Townsend’s Mole at the bottom. They are very similar except for size. They have similar tunneling habits, similar breeding habits, etc.

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Both of these animals are very prolific tunnelers during the active times of year, primarily spring and fall. They’ll raise a large number of mounds in some areas. You can see that Coast Moles in particular can raise a large number of these in a relatively short time.

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Moles make their mounds very unlike pocket gophers, which we will mention a little later. Instead of acting like little bulldozers like pocket gophers do, these animals make
a chimney to the surface and then act more or less like a volcano and push the soil up in a volcano-like action. So, it makes a conical rather cloddy looking mound.

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Moles can cause damage in a number of ways. It is largely aesthetic in a lot of areas; that is people just don’t like the appearance of mounds in their lawns. But they can smother grass. In some places I have seen, where they very significantly impact pasturage by the large number of mounds. They can upset walkways and stepping stones by tunneling underneath and creating trip hazardious. If they tunnel around plant roots excessively, looking for earthworms and crane fly larvae and things, those roots can get exposed to too much air and that can stress plants. One of the worst things they do though is their tunnels are very ready runways for rodents. We'll be talking about meadow voles later.

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Populations are usually rather small. It may look like there is a whole colony of moles in an area like this. But this is probably caused by only one or maybe two moles, perhaps with contiguous territories. Average territory size for the Townsend’s Mole is only about two-fifths of an acre although that can vary a bit.

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As I mentioned, moles eat invertebrates, primarily earthworms, although they will eat other invertebrates too, perhaps even small slugs and slug eggs. The moles I have had in captivity don’t really seem to like millipedes and isopods but I suppose if they are really hungry they would feed on those animals.

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If you see damage like this, it is generally not caused by moles. There is a little bit of research that was done in Oregon a couple of decades ago that indicated that Townsend’s Moles at least would sometimes feed on some species of flower bulbs. But I have never seen that in western Washington. If you were to have mole damage to a root crop like this, moles have little insect-scrunching-up teeth rather than those big, chisel-like incisors that rodents have. So, if moles were to feed on a root crop, it would be rather shredded rather than this cleanly excavated type of damage. If you see damage like this in your carrots or tulip bulbs or Jerusalem artichokes, or on fruit tree roots, that is caused.

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by our little native voles. And we have a section on this animal later on.

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Moles are active all year around. They don’t hibernate like some species of rodents do.
So, you may find mounds almost any time of year when the soil is conducive to tunneling. If the soil is frozen solid, you won’t see this, or if it is very dry during mid-summer, moles tend to go deep and mound building is at a minimum.

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Breeding around here probably takes place February and March. Farther south probably earlier. Farther north probably a bit later. Gestation is approximately a month, although we are not sure of the exact time. And, there is generally no more than three or four per litter. The large Townsend’s Mole generally averages three, the Coast Mole averages four, but there can be up to five. The nests are in underground nest chambers usually fairly close to the surface. They are lined with grass, a dry inner core, surrounded by wet grass on the outside which actually develops some heat during decomposition. So, these little animals actually have inside heating.

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The mother takes care of her little ones for approximately a month and then kicks them out of the nest. Moles are not gregarious animals, they are rather grumpy. They don’t like to share their territory with anybody. So, once the young are mobile, after about a month they are just about full size and they have to migrate away and find their own territories. During this time, mortality is very high. They are exposed to predators, if they can’t find a good place where there is enough food they will starve to death fairly quickly. They migrate away an average of six hundred feet, sometimes up to a couple thousand feet.

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Moles are native animals and they do have some beneficial aspects. In the wild, where they belong, they do mix the soils, they aerate the soil, by defecating and urinating underground they do add to the soil fertility somewhat. Females pull vegetation underground for nesting material, so they help compost that material underground. And, they do eat a large number of invertebrates, many of which are harmful to plants.

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But we certainly don’t want them doing that in our well kept lawns. So, as Master Gardeners, people will be calling you constantly and asking what to do about moles. What are our options for this animal? Well right now we are stuck.

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Because the only effective means of eliminating moles that is consistently effective that we have found is by using lethal traps, which was outlawed in the year 2000 when citizens of Washington passed Initiative 713. They didn’t read the whole thing. Apparently they didn’t believe the Department of Fish and Wildlife when they said this would make mole trapping illegal. But the bottom line is, mole trapping is not legal in this state. It is punishable as a gross misdemeanor, which means if prosecuted and convicted, up to a year in jail and up to a five thousand dollar fine. There is no
enforcement of this law as far as mole trapping goes. But, since it is on the books and it is illegal, WSU does not recommend lethal mole trapping as a control option. There is no law against having the traps, against buying them, selling them. It is just illegal to use them to catch animals.

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Now every year there are bills submitted in Olympia to change the law but so far none of them have passed. So, perhaps in the future it will be okay for us to recommend this control method again because it is the only way to eliminate moles that we have found. There are many mole traps available. And as I mentioned it is not illegal to sell these and they are readily available in stores. These are just a few of the models you may see on the shelves of hardware stores and garden stores.

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Whatever method of control you use (and we will talk about repellents and mole baits a little bit later) but no matter what you use you need to target the areas where the moles are actually working. Moles create a lot of tunnels in their territory but unless there is sufficient prey falling into those tunnels they may not use various parts for several weeks at a time.

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So, you have to monitor your mole’s territory and just see where he’s working at any given time.

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There are a couple ways to do this. The simplest way is to simply put on your farm boots and go out and stomp all of your mole hills flat, being sure to force some soil down into the tunnel. In this way the next time the mole comes by, he’ll at least push up a little bit of soil. So, it should be fairly obvious if he’s been by.

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A more versatile and useful method is using a mole probe. And this can be nothing more than an old broomstick, or a piece of iron rod, or even a long screwdriver.

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This device can be used for monitoring the mounds by pressing the probe deep into the center of the mound and just pull it in and out at different angles. You should be able to feel it give when it hits the underground mole tunnel. At that point, rotate your probe to make this cone-shaped depression, which actually augurs soil down into the tunnel, blocking it. In that way, the next time the mole comes by, he will have to seal up this sky light.
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The probe is especially useful for finding those mole runs that are not marked by mounds. A permanent mole runs along fences, along gardens, hedge rows, things of that sort, where there are established runs. Unless those cave in, the mole often does not make mounds in those areas even though he may be very active there. So take your probe and just probe it into the soil under fences, along gardens, etc. When you feel it strike an underground tunnel, you will feel it give a couple inches. And this is usually in the top 6-8 inches of soil. When you feel your probe give, again rotate it, so you make a skylight in the tunnel and again when the mole comes by

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You should be able to see at least a little plug in the center of that skylight you have made. My feeling is that moles don’t like air and light down in their tunnels. So, if they are working in that area at all, they will hurry up to this opening and seal it up as quickly as they can.

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This is just a diagram showing the correct way to use a probe. Ideally you are supposed to force it into the soil at a slight angle. According to the literature, that makes the probe more sensitive.

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Okay, once you have found an active mole tunnel, I am going to show you how to use a scissors-jaw trap even though so far this is 2009; the use of body gripping traps other than common mouse and rat traps is not legal in this state. Every year there is legislation attempting to change that law. If it does get changed, you will need to know how to do this. So, at the point where you found the active run, dig out a square of soil just the size of your set trap. And this is just an example of setting the scissors-jaw type mole trap. So, take the sod out and remove the soil.

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And you can place the sod and soil in a bucket, keep it watered, and when you are all done with this activity you can plug it back into the ground and there will be no visible damage on your lawn. Now by using the probe we know approximately how deeply we have to dig. And again take this loose soil and place it in a bucket for replacement later on. And note how damp the soil is here. Mole trapping is most effective in the spring and in the fall when tunneling activity is at its peak and the soil is moist. If you try and trap moles during midsummer, even if they are active, if the soil is dry you can’t form an adequate soil plug unless you water the soil well first.

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Once you have dug your hole, you need to locate the tunnel openings. For this you can use a stick or even your finger. Some of the mole trapping literature says that moles
avoid human scent but in my experience they pretty much ignore it.

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Okay, you need to find the open tunnel in both sides of your hole. And at this point, make sure that the hole that you have dug is approximately half an inch deeper than the bottom of the mole’s tunnel.

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Now in this shot you can see the tunnel direction and notice the crossways in the hole we have placed a plug of soil. It kind of looks like a soil meatloaf. And again notice how moist the soil is here. This is for resting the trigger of the trap on. And you may have to adjust the height of your soil plug as you proceed with your trap placement.

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As for setting the scissors-jaw trap, if you get one brand new it comes with these handy tongs which make setting very easy. If you buy your trap at a garage sale, you will either have to make a set of tongs, or there are ways you can set the trap just by standing on those hoop parts of the trap. But it is a bit more difficult.

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So, for using the tongs, engage them around the central spring.

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Then place the trap sideways down on a firm surface, a non-skid surface preferably. And notice that the angle of the trigger is pointed up. So, you can lean down on the tongs with one hand and with the other hand very easily set this trap by placing the set wire in the treadle engagement. Hold it in place with your finger. And you can slowly let up on the tongs to see if the trap will stay set. Now it is very important to keep your fingers and your dog’s nose out of those trap jaws because this is a very powerful trap and can cause damage.

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You can use the tongs to place the trap down in the tunnel. You can use them as a handle that is. And you need to place the trap so that the trigger is very close to resting on or actually resting on that soil plug.

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And this is what your ideal set looks like. Notice that the trap is a snug fit in the hole. The points of the jaws are approximately one-half inch deeper than the bottom of the mole tunnel. And we have a firm, but not hard soil plug on which to rest the trigger.
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Now at this point some mole trappers like to backfill their hole with loose soil. And you can certainly do that but if you do that sometimes a mole will go through the trap and you won’t notice that he has been through. So, when I was trapping in the 70s and the 80s, I always left my hole open. Now notice this set, how large that hole is. A hole that large around the trap will decrease your success. You want a snug fit.

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Now if you do have trouble with moles going through a trap and not springing it, that can be caused by a population of small Pacific Moles. Or perhaps a juvenile, a smaller Townsend’s Mole. You can alleviate that problem by placing your soil plug as we already talked about; then taking the end out of a soup can. Or you can even use a square of shingle or something of that sort. Place that on the soil plug and then place your trap on top of that. In that way, you have more than doubled the surface area of the trigger and made it much more sensitive to pressure by the mole. You can also take some very fine sandpaper and carefully polish the trap engagement points. That is where the treadle and the set wire engage. You don’t want to round them, you just want to smooth them off get them nice and polished. And that should make your trap more sensitive also.

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Now as far as the legal traps go, we don’t have a lot to choose from. You can order a few kinds of live traps over the Internet; I have not seen them locally available for sale. These mostly work on the premise of a one-way swinging door. There are reports that they are effective on the Eastern Mole and the European Mole. And some reports from Canada that they have caught Coast Moles in these. I have never been successful myself though on the models I’ve built. Live traps can also be made easily at home. They are very simple for the most part. Memologists have used more complex traps that take quite a bit of ingenuity to build. Now as of 2008 there is a device that should be effective, but WSU has not tried it out yet. It is called the Mole Cat and it is powered by a 27-caliber blank cartridge. In theory it should work, I’m not sure about the safety of the device and it does cost about 100 dollars apiece.

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Now a very simple live trap you can certainly try is just a simple pitfall trap. I have just used empty three-pound coffee cans for the pitfall. You can take a posthole digger, and that makes a hole just about the right diameter. Find your active mole run as we already talked about, and take your posthole digger and sink a hole in so you can place your pitfall so that the lip is even with the bottom of the mole tunnel. At this time take your finger or a stick, lightly cave in both sides of the tunnel then place a board over it. The idea is the mole comes charging down the tunnel, hits that little plug of soil, charges through there, and falls into your pitfall. In my experience, the mole comes down, sticks his nose through, fills the pitfall with soil, or just goes around it, and continues on his business. I have tried this about a dozen times so far and I haven’t had any luck. But you can certainly try it.
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Now as far as protecting raised beds from mole damage, you can place hardware cloth, stapled as in the picture here to the bottom. And it is a good idea to paint that with several layers of Rustolium or other rust-resistant paint and that will increase the life span of the galvanized wire. As far as moles go, you could even use heavy plastic for this. But if you also have voles, which we will talk about soon, voles are capable of chewing through plastic material.

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For small areas, you can install an underground mole barrier to prevent damage. This is nothing more than an underground fence, eighteen to twenty-four inches deep with a three to six inch offset along the bottom. So, you dig a ditch the correct depth, place your wire screen down there, or quarter-inch hardware cloth, and back fill it. It is a good idea to have about six inches sticking aboveground too, because although moles are almost completely fossorial, that is live underground, they do occasionally, especially at night come aboveground to run around. And especially during the spring migration and breeding season, they can be quite active aboveground. Again for the galvanized hardware cloth it is a good idea to put several layers of anti-rust paint on it to extend the life.

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Now other controls. There are various mole baits or poisons available on the market. None of these are proven to work so Washington State University does not recommend any of these. But, we'll go through them. They come in several formulations. There are a couple new ones, fairly new ones, on the market. And we will talk about these in turn.

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There are several kinds of mole baits on the market. The pelletized baits are probably the most widely available, and these have been around for a long time. They are usually sold as combination mole and gopher baits. Most of them are grain-based and as I have mentioned, our moles at least, won't eat grain. Most of these contain the active ingredient Zinc Phosphide, which is a potent stomach poison. It has been around a long time, widely used on many species of rodents. There is one formulation in Washington State and elsewhere that contains the anticoagulant Chlorophacinone, and this is RCO Mole Patrol. Chlorophacinone is one of the older anticoagulants. Mole Patrol was tested by Dr. Glen Dutterer on the Eastern Mole, I think in Minnesota or Michigan. And his research indicated that it was somewhat effective on that species. I have used a couple pounds of this in isolated areas on particular moles and over the course of 52 days I found no change in activity. So, the testing needs replication, but my feeling is that none of these are effective on our mole species.

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Be sure to follow the label directions when applying any of these as you do with any pesticide. In a nutshell, use your probe to find the underground tunnels.
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And then according to label directions, place a measured amount of the bait down into the tunnel. And if you are baiting the deeper tunnels, it is very handy to make a funnel out of a piece of garden hose or metal conduit or something of that sort. You can duct tape the end of a pop bottle to the end of your pipe and that makes it much easier to introduce the bait down into the tunnel. Carefully remove your funnel, trying not to dislodge any soil down on top of the bait. Then just place a clod of dirt or a stone or something like that over the hole. Try and keep the bait as clean as possible down in the tunnel.

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Now there are some fairly new formulations on the market. The gel baits are fairly recent. These come in a hypodermic syringe in a material that looks kind of like Vaseline. The idea is that this has a grub or a worm scent and the moles will come by and eat it. There are several brand names available in Washington. Moletox is the one I have most widely seen. Kaput Mole Gel Bait, I think, was the first on the market. These all contain the active ingredient, Warfarin, which is actually a fairly weak first generation anticoagulant. Animals usually have to feed on it continuously for four to five days in order for it to have any effect at all. Bell labs claims that moles cannot physically ingest enough of that toxin to gain a lethal dose.

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The very latest baits on the market are the artificial worms. Talpirid was the first one that came out and this is put out by Bell labs. There are several others on the market now. You get less bait in the package so it's less expensive too. Talpirid, and Tomcat Mole Killer, and the other artificial worm and grub baits contain Bromethalin, which is a nerve poisoning. Many places claim this is very effective. Most of the testing I have read about is again done on the Eastern mole. The Bell lab folks sent me a couple packages of Talpirid so that was a total of forty worms. I used these on a population of moles over the course of several months and found no indication that they fed on the bait at all. I continually excavated the baits to inspect them for tooth scars, and the moles either just walked over them, buried them in the sides of their tunnels, or just pushed them out of their holes. So, I don't think they are very effective at all on our species of moles. Again, these are not proven effective on our species so Washington State University does not recommend these for use.

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There are several repellents on the market. Some people claim these are effective. I have not read any research that indicates efficacy in any great amount. Most of these contain the active ingredient castor oil, and on the Internet you will find several recipes for making those materials at home. But they are not recommended by Washington State University. These castor oil baits come in granular formulations. The original formulation was Mole Med which is a liquid. If you decide to use one of these or a client decides to use one of these, these must be treated exactly as we do pesticides (that is the label directions must be followed exactly). There is one formulation in Washington
state and elsewhere that is blood-based and that's Uncle Ian’s Mole and Gopher Repellent. I have read no research at all on that material and I have not used it myself.

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Now there are several other control options you'll read about. None of these are proven to be consistently effective, so Washington State does not recommend these. If we ever come across any research to support efficacy, then perhaps we can include these in our recommendations.

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The sonic repellent devices are pretty much all over the place. There are dozens of brand names. They make various different claims. None are proven consistently effective. The one I have tried on my moles has absolutely no effect on the animals’ activity.

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Clients will ask about many things concerning mole control. Just a few of them are listed here. None of them are proven to work consistently. And again you can only recommend research based legal treatments.

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You will see smoke bombs in the garden stores and hardware stores. These are supposed to kill the animal underground by the gas that is emitted, the smoke, carbon monoxide etc. These perhaps might be effective if you used enough of them in a dense soil, perhaps after a heavy rain where the soil was saturated with water so the gas would have to go down the tunnels. These are not home use materials, though so Master Gardeners may not recommend them And the ones I have tried are very inconsistent as far as control goes.

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Some of the gardening literature talks about using soil insecticides to kill grubs in the lawn as a mole management technique. This is sometimes effective on the Eastern Mole but our Western Moles feeds primarily on earthworms and there are no pesticides registered as control for those beneficial animals.

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If you are lucky, you may have a dog or a cat that likes to catch moles. In these sorts of cases, sometimes they can give pretty good control.

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Now the final thing we can talk about (as far as something that is effective) is direct removal of the animals. Since you are probably out in the garden quite a bit anyway,
just keep your eyes open. Stomp down all your mole hills. And then as you are working in the garden, you can just occasionally look around and see if any of those mounds are getting pushed back up. Our moles generally work on about a four hour on and a four hour off work schedule, so they might be out there any time of day. If you see a mound getting pushed up, you can dig them out, stab them with a shovel or garden fork, or you can use the shovel or sledge hammer as concussion. That is, as the mound is getting pushed up, and they will come back about every ten minutes to replenish that soil supply. Just wait there, as the soil is getting pushed up, you can take your shovel or sledge hammer, slam it down on the mound. And, that will usually kill the mole outright since they have very thin skull bones, very prone to concussion. If you dig the animal out with the shovel, be aware you cannot legally take that animal off the property and release it. So, you are pretty much stuck with euthanasia.

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Of course, if you live out in the country, you can always use this method. This is another method of using concussion. In most cases, you are not physically shooting the animal, but the concussion of the shotgun blast usually does a really good job on them. Again, you have to wait until the mound is physically being pushed up for this to be effective. And we do not really recommend this, especially not in urban/suburban areas.