

Annual Cycle

Moles are active throughout the year. They do not hibernate or estivate. During extremely wet or dry periods, mole activity—by external evidence—seems to be lessened. Control programs will be most successful if carried on during periods of heavy mole activity.

Food

The principal diet of moles consists of earthworms, grubs, beetles, and insect larvae. Vegetation occasionally makes up a small portion of their diet through ingestion of worms whose stomachs contain vegetation.

Moles require large quantities of food, spending perhaps half their lives searching for something to eat. The estimated yearly intake of food for a single mole is about 40 pounds. Moles travel extensively in searching for food—up to a half a mile a day. Most of this travel, luckily, is back and forth in the burrow and not in a straight line. Extensive movement contributes to the control problem, because the neighbor's moles may move right in.

Breeding Period

Moles mate from late February to early March, producing young only once a year. The young, averaging three to the litter, are born from late March to early May. Young moles spend about one month in the nest and are nearly full grown when they leave. They may sometimes be distinguished from adults by a shorter snout, slightly smaller size, and pearly-gray fur.

Nests are constructed underground in a fortress-like arrangement in fence lines and well-drained, slightly raised sections of fields. Large molehills (30 to 40 inches in diameter) or areas of intensive mound-building activity are probably nesting sites.

Nest cavities average 9 inches in diameter and about 6 inches in height. Normally, three or four runways lead into the nest. The nest is composed of grasses or moss with a dry, inner pocket surrounded by wet, coarser grasses. Nests will normally be found 5 to 18 inches under ground level.

Moles or Gophers

Moles should not be confused with pocket gophers. Pocket gophers are rodent root eaters. While molehills are built like a volcano, by upthrust of earth plugs through the center and rolling down the sides, gopher mounds are built like a mine dump, by loose dirt pushed out away from the exit at one side. Gophers are different from moles in their habits. It is important to distinguish between them because each requires special control techniques.

Control

The mole is here to stay. Extermination is impracticable, if really desirable. The very nature of its food habits makes it hard to poison, even if poisoning methods about gardens, lawns, and home

premises were really desirable. Fumigation with lethal gases is sometimes successful against the mole, but more often it is a waste of time trying to fill the porous soil of the intricate and connecting runway systems with the deadly fumes. Fumigation may also destroy beneficial bacteria and roots.

The use of deterrents, obnoxious substances placed in the mole runs, has the local and temporary advantage of driving the animal elsewhere to find new hunting grounds. This may indeed serve the purposes of the keeper of the home premises or of the kitchen gardener. Use lye, creosote, tar, carbide, sink flush, preferably in the deeper runways where the moles enter the premises from wastelands or borders—not where the substances will injure plants or contaminate the soil for long.

Other control methods that may have individual application include digging out mole nests and shooting or stunning individuals that are found working. Moles are sensitive to concussion. Smacking a shovel on the ground near a working mole often will stun or kill it.

Unless most of a population of moles is taken, no residual control is effective. Some farmers have trapped 100 or more moles annually, only to be faced with the original amount of infestation the following season.

Trapping

Successful mole trapping depends upon learning and practicing a few fundamental techniques.

Traps must be set to form an integral part of the runway system. Set them at least 1 foot away from molehills to assure trapping main runways. Probe to locate the runway, as in poison baiting, and probe again to determine the direction of the runway.

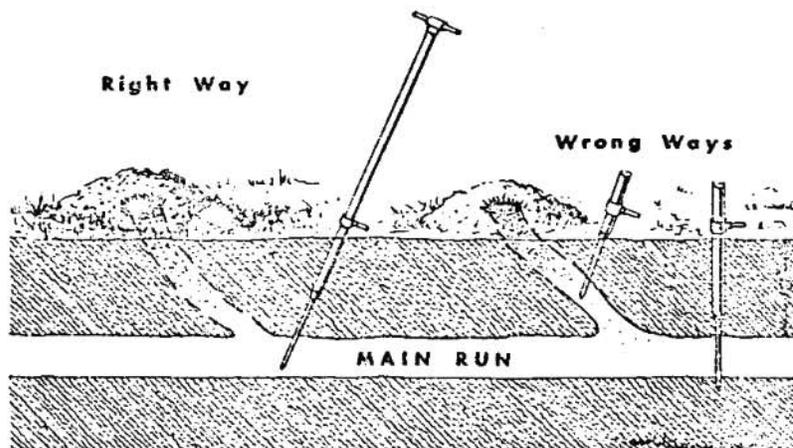


Figure 12. Cross-section of mole runway system showing how to probe.

Using a sharp, straight-edged shovel or trowel, cut out a section of runway—exactly the width of the trap. Loosen the dirt under the trap jaws to facilitate trap action. In rocky soil, remove all rocks that may bind the trap.

If you are using a scissors-jaw trap, build a firm plug of dirt for the trigger pan to rest on. Insert the trap into the hole. Make sure the trigger set wire (wire that binds trap bows) can

function. Press the trigger pan firmly on the dirt plug with the trap jaws straddling the runway. Remove the trap safety catch. Sift loose dirt onto the set to exclude light. It is advisable to reset traps daily during wet weather.

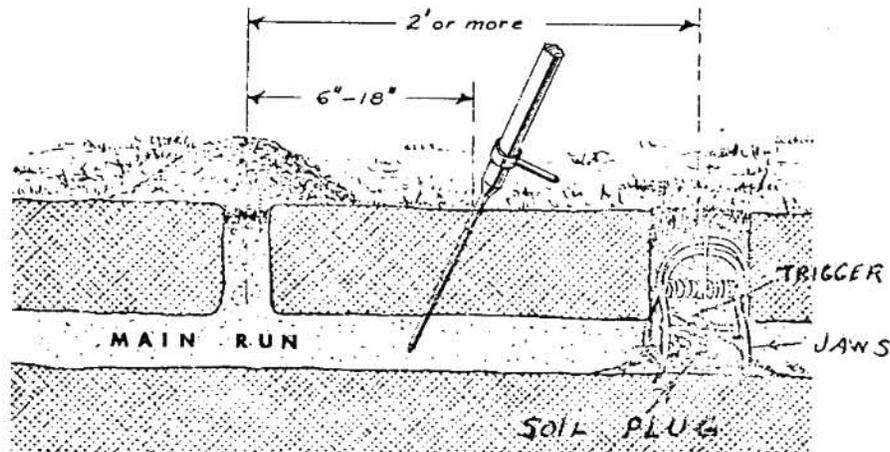


Figure 13. Cross-section of mole runway showing trap placement.

The proper way to set a scissor-jaw mole trap is shown at the right. Note the plug of soil under the trigger and the points of the trap slightly embedded in the bottom of the runway. Sift fine soil around the jaws to exclude light and mark its location.

Moles will plug, spring, heave out, or go around faulty trap sets. More than 40 moles have been caught in the same set on a major runway. If a main mole arterial is located, moles may be controlled over an area of several acres by trapping this one runway.

Trapping the smaller Coast mole sometimes requires a modified technique. The scissors-jaw trap may be used on the small Coast mole by constructing a wider bridge under the trigger or inserting a small piece of shingle under the trigger. Either adaptation effectively gives the trigger a broader working surface.

The diamond-loop trap appears to be an excellent tool for capturing the Coast mole. This trap is set in the runway with the diamond opening centered on the tunnel. Loose dirt is sifted onto the set.

Ground Squirrels

The Columbian ground squirrel is a large, heavy-bodied, short bushy-tailed, ground-dwelling squirrel. The body of an adult measures about 10 inches and the tail about 4 inches. The upper parts are grayish buff, mottled with round, white dots. The face, thighs, feet, and tail are reddish.

These squirrels are common throughout the northeastern portion and along the eastern border into the extreme southeastern part of Washington. They occupy meadows and grasslands in the valleys, openings in coniferous forests at higher altitudes, and parks and alpine meadows almost to timberline. Although preferring a rather humid climate, this squirrel is well-known in the grasslands and wheat fields of the Palouse country. Where small meadows or pastures occur, the squirrels live in dense colonies; in extensive grasslands or in the mountains, they may live in loose colonies or small groups.

The Columbian ground squirrel emerges in late February or early March. Hibernation dates vary, depending on elevation and climate conditions. In the lowlands, the squirrels begin to disappear in mid-July. In the mountains of northeastern Washington, they may be active until late August. Mating occurs in late March and an average of five young are born about the middle of April.

Most green vegetation occurring in its habitat is food for the Columbian ground squirrel. Bulbs, seeds, fruit, berries, grain, clover, alfalfa, and garden truck are eagerly eaten. The squirrels are especially fond of grain and great damage can result from their depredations.

Trapping

Use with small populations or where other methods have not completely eliminated all animals.

Recommended Procedure—Close all known openings with a shovel late in the afternoon or early in the evening. Place the trap directly over newly opened holes early the next morning. Any animal leaving or entering the burrow will be caught. Stake the trap to the ground so that it cannot be moved by the struggling animal.

Recommended Device—Conibear #110 traps (single spring).

Available from: Joseph A. Garcia & Son
3641 Fairfield Rd.
Hollister, CA 95023
(408) 637-5211

Other sources may be available within the state.

Poisonous Gasses

Use with small to medium size populations as either primary control method or where other methods have not eliminated all animals.

Recommended Procedure—Close up all burrow openings either with a drag (for large areas) or shovel early in the morning. Place the selected chemical well into each reopened burrow late the same afternoon. Add a crumpled piece of paper (to prevent the animal from pushing the pellets out of the hole) in the burrow and close by shoveling dirt into the hole and tapping it down. Repeat every day until all sign of activity has stopped.

Poisonous Baits

Recommended Procedure—Pre-bait area with untreated material two days before placing poisoned bait in the field. Place material in the middle (inside) of the 3-foot length of 4-inch perforated plastic drain pipe. Do not broadcast-apply any material in crop or forage production areas. Read individual labels for specific instructions. Place each bait station no closer than 20 feet from the entrance to an open burrow and between 50 and 200 feet apart (depending on the number of animals seen in the colony) on runs between burrows. Refill each station once a day until the bait is no longer consumed. Remove all unused bait from the area immediately after all signs of activity have stopped. Inspect the field each day for dead or dying animals. Bury or burn all animal carcasses.

Prepared by Leonard R. Askham, Vertebrate Pest Management Specialist, Washington State University, Pullman.

Baits should be placed in areas inaccessible to children, pets, and domestic animals. Read all labels before using.

Restrict all grazing animals from the pasture for at least 30 days after completing the baiting operation.

Coyotes, Foxes, Bobcats, Bears and Mountain Lions

Introduction

Coyotes and other carnivores consistently provide interest and recreation for a substantial segment of the public—a positive social value. They are also an integral part of the ecosystem and aid in management of other wild species. Individual animals, however, do cause economic loss.

Description

Coyotes are members of the dog family and resemble small German Shepherds. Both males and females are primarily gray-colored, with variations from nearly white, to reddish brown, to nearly black; the underbelly is a lighter color. Color variations seem somewhat related to the type of habitat in which they live.

Weights vary with areas and food supply, but most adults weigh from 20 to 35 pounds; males are usually slightly heavier. Individuals may be larger—a 75-pound male was reported in Wyoming in 1937. Body proportions are somewhat more slender than those of shepherd or collie dogs of similar size. Coyote tracks are similar to those of greyhounds, but are narrower and less rounded than those of common dog breeds. The coyote howl, a series of barks that ends in a wail, is distinctive and is most commonly heard during evening and early morning hours. They have other howl patterns that are not often heard.

Food Habits

As carnivores, 98 percent of the average coyote diet is animal matter and 2 percent is vegetable matter. Individuals, however, feed heavily on fruit or other vegetable matter at times. Juniper berries, prickly pear fruits, wild plums, cantaloupes, and watermelons are some of the fruits utilized. Analyses of stomach contents of 8,263 coyotes from several western states indicated that approximately 50 percent of the diet was rodents and rabbits and 25 percent was carrion. Remains of domestic animals, deer, and birds amounted to 20.5 percent and other food items, including vegetable matter, amounted to 4 percent. However, individual coyote diets often vary a great deal from the average.

Reproduction and Mortality

Coyotes usually breed in February and March and produce litters about 9 weeks later, in April and May. Females sometimes breed the winter following their birth, at less than one year of age, particularly if the food supply is plentiful. Average litter size is 5 to 7 pups, although up

From *Control of Damage by Coyotes and Some Other Carnivores*, prepared by Dale Wade, Extension Wildlife Specialist (Animal Damage Control), University of California, Davis. At the time of this publication, Mr. Wade was Extension Wildlife Specialist, Colorado State University, Fort Collins.

to 19 in a litter have been reported. More than one litter may be found in a single den—at times these may be from a single male parent. Coyotes crossbreed with dogs to produce the coy-dog hybrid. Hybrids are fertile, although their breeding seasons do not usually correspond to those of coyotes.

Distemper and mange are the most common coyote diseases. Rabies and tularemia also occur and may be transmitted to other animals and humans. Some parasites of coyotes are mites, ticks, fleas, worms, and flukes. Mortality is highest during the first year of life and few coyotes live more than 10 to 12 years in the wild. Death caused by human activity is probably the greatest single cause of mortality.

Habits

Coyotes are found in nearly all types of terrain, although populations are probably highest in the western states. Timber, brush, open prairie, and desert areas are favored habitat types, but coyotes are highly adaptable and are also found in farming areas, suburbs, and cities.

Coyotes are most active at night and during early morning hours, especially where human activity occurs, or during hot summer weather. With minimal human interference, or during cool weather, they are active throughout the day. They bed in sheltered areas, but do not utilize dens except when raising young. They may seek temporary shelter underground in severe weather or when closely pursued. Dens are found in steep banks, rock crevices, sinkholes, and underbrush, as well as open areas, but usually are in areas selected for protective concealment. Coyote dens are often holes that have been used by badgers, skunks, foxes, or other animals, with entrances enlarged to about one foot in diameter. Dens vary in depth from 4 or 5 feet to as deep as 50 feet and may have several openings.

Both parents hunt and bring food, usually regurgitating food for the pups until pups are several weeks old. Pups begin coming out of the den by 3 weeks of age, and within 2 months they follow adults on short hunting trips or to feed on large prey. Pups are normally weaned by 6 weeks of age and are frequently moved to find larger living quarters. Extensive travel is common in hunting, although coyotes hunt the same areas regularly if plenty of food is available. They occasionally bury food remains for later use. The family usually remains together until late summer or fall, when pups become independent, although occasionally they are found as groups until breeding season begins.

Their physical abilities include good eyesight and hearing and an exceptionally keen sense of smell. Documented recoveries from severe injuries give testimony to great physical endurance. Although not as fleet as greyhounds, they have been measured at speeds up to 40 miles an hour and can sustain slower speeds for several miles.

Economic Importance

Coyote predation on rodents and rabbits may not affect man's interests in wilderness areas but is beneficial in agricultural areas. Feeding on carrion can also be helpful. Coyotes adversely affect human interest by preying on domestic animals—poultry, hogs, sheep, goats, and cattle are most often the prey species. They sometimes damage domestic fruit crops, such as, cantaloupe and watermelon.

Livestock losses to coyotes are usually most serious during spring and summer months because of extra food needed for their young. Sheep on open range usually suffer the heaviest losses. The male parent generally kills more often than the female and may travel ten miles or more from the den to kill. Removal of adults doing the killing usually solves the immediate problem. Coyote predation on game animals and birds is condemned by some as being detrimental to game species and the sportsman's interest. Others support predation as being beneficial to preservation of desirable qualities in game animals. In most cases, there is probably no detrimental effect on game species, although coyote predation may conflict with attempts to introduce or reestablish game populations and may depress established populations. Depending on local conditions, initial plants of turkeys, antelope, or other species may require control of predation for an increase in game populations to occur. Coyotes usually prey on smaller animals but are capable of killing adult deer and antelope. Several coyotes often cooperate in such cases.

Appearance of Animals Killed by Predators

Coyotes normally kill smaller mammals by biting the head or neck, but on older lambs and adult sheep, kills are usually made by biting the throat just back of the jaw and ear. Small calves may be killed in a similar fashion. The major cause of death is probably damage to the trachea and/or to nerves affecting respiration, blood pressure, and heart rate, rather than loss of blood.

Coyote kills usually have clean puncture wounds in the head or throat, although coyotes, especially inexperienced pups, occasionally attack the flank or hindquarters. Dogs usually kill by attacking the hindquarters, flanks, and head and rarely kill as cleanly as coyotes. Badly torn and slashed animals with damage to the head, ears, and sides are typical of dog predation. Red foxes kill and feed on small lambs much as coyotes do, but larger sheep often show many teeth marks in the throat. Occasionally, foxes pull wool loose from flanks and hindquarters or damage the head as dogs often do.

Bobcats kill much like coyotes, but larger victims may have claw marks under the skin of the neck and/or shoulders. Kills by mountain lions will have teeth marks that are larger and further apart than those made by smaller animals. Larger animals killed by lions usually have claw marks on the neck and/or shoulders and are often left partially or entirely covered by dirt, leaves, and twigs.

Black bear kills will have large teeth marks that are further apart than those made by coyotes, foxes, and bobcats and usually are on the back of the head, neck, or shoulders. Bears also tend to "skin" the animal when feeding, leaving the inverted skin attached to the bones. Bruises to the back and flank areas would probably be caused by a bear. In addition, the udder of lactating female animals is often eaten first by black bears.

It is important to realize that appearance of the prey animal is not always adequate to determine which species is responsible. Particularly in sheep, kills by coyotes, bobcats, dogs, lions, and bears can be very similar in appearance, depending on the method of attack by the individual animal. Many animals that were not killed by predators are fed on as carrion and will not normally have marks on neck and shoulders from teeth or claws. Also, animals fed on as carrion usually do not bleed.

Feeding habits by various predators are often similar enough that it is difficult to determine the predator involved from the appearance of the carcass. Also, an animal may be killed by one species and fed on by one or more different species. Feeding by coyotes, bobcats, and foxes might be particularly difficult to separate. Heavy feeding on sheep by coyotes usually results in substantial scattering of wool. When bears feed heavily, the hide is peeled back from the legs and head, and wool is scattered less than when coyotes feed. Attempts by lions to cover the carcass also help in determining predator species.

Similar appearances in kills and feeding habits point out that additional evidence is necessary to determine predator species. Fresh tracks and droppings in the surrounding area are helpful. Coyote tracks are typically narrower and more compact than dog tracks; whereas, bobcat tracks are round and show no claw marks.

Adult lion tracks are similar to bobcat tracks, but are much larger. Bear tracks are large and distinctively different. Such evidence is necessary to help verify conclusions derived from appearance of the carcass.

Control Measures

State Regulations

It should be recognized that state statutes and regulations vary regarding methods that can be employed in controlling problem animals. Responsibility rests with the individual to become aware of laws and regulations relating to trapping, hunting, and other methods. He should also be aware of regulations relating to protected species and seasons of the year when other species may be taken.

Many states have damage-control programs conducted by state and/or federal agencies. These can often provide advisory or direct assistance in damage-control procedures. The state wildlife management agency can provide information relating to such programs and to damage control and harvest regulations.

Chemicals and Aircraft

Laws and regulations affecting the use of chemicals and aircraft in control of problem animals vary from state to state. Many states prohibit their use entirely, while others have permit systems to govern their use. Both methods can be effective and selective when employed with professional ability under suitable conditions, but are not suited for use by the amateur.

Aerial hunting is most effective in open and flat terrain with only limited amounts of brushy cover. It is rarely very useful in heavy brush and timber during summer months as a direct control measure, but may have limited use with a heavy snow cover since snow aids in observation of animals and tracks in all terrain. It is an extremely dangerous method for the individual with limited experience.

Chemical control requires licensing or registration prior to application. Check with the State Department of Agriculture for specific requirements. Formal training is helpful to insure proper chemical application to protect humans and non target species. The lack of this knowledge and nonprofessional use of chemicals has caused much of the opposition to damage control programs.

Hounds

Hunting with hounds is both a sport and a control measure. Hounds that hunt by sight are usually hauled (caged) in a vehicle until the coyote is seen and then are released to catch and kill the coyote. This is not very effective in areas with brush and timber or in heavily settled areas where there are many fences. Trail hounds have been used to aid in locating coyote dens and in conjunction with aircraft to remove individual coyotes from areas where cover prevents good visibility. They are rarely able to catch healthy adult coyotes in open country, but can be highly effective in finding coyotes in dens in heavy cover.

Calling Coyotes

Calling coyotes by simulating distress calls of a rabbit is often effective in taking the problem animal. Predator calls are available in most sporting-goods stores but require some practice to be used effectively. Records of rabbit distress calls are available. These devices, or assistance by experienced callers, should be used as a guide before one attempts to call animals that are causing damage. Electrical or electronic calls and recordings can be effective in calling coyotes and other animals, but some states prohibit their use. Other states allow them to be used under specific conditions. Check with the wildlife management agency regarding their use in your state. A good field of view is important. Animals often attempt to approach the call while remaining in cover and detect the caller before they are seen. Wind can also ruin a good opportunity by carrying the caller's scent to the animal, so it is best to call crosswind or upwind.

Suggestions for calling:

1. Early morning and evening hours are best.
2. A rifle is best for open country or long shots, while a shotgun is recommended for brushy areas or close shots.
3. The caller should be concealed by brush or other camouflage to avoid detection and should avoid movement.
4. The call should closely mimic the rabbit distress call.
5. The caller must be patient; although coyotes normally respond in 10 to 15 minutes, 30 to 40 minutes may be required to coax the animal within range.
6. If the animal does not come to the call, the caller should move at least a mile before trying again.

Calling either in the area where livestock killing occurs or near the den can be successful in taking the problem animal. It should be emphasized, however, that carelessness in calling or in approaching the area can nullify calling efforts and force use of other control measures.

Denning

Coyote denning habits are roughly similar in most areas and the same general methods of den hunting can be employed in mountains, deserts, and plains.

“Den sign” is a term used to describe physical evidence that a den exists in an area. This evidence includes “clean-out” holes (holes that have been dug out and explored by coyotes during selection of the original den where pups are born), large numbers of adult coyote tracks in a small area, or even a worn path leading to the den. Dens are usually within a mile of clean-out holes made during selection of the original den site. Loose hairs and tracks are often found in the mouth of the occupied den. Pup tracks are often present nearby in soft dirt or mud. Fecal droppings will also be present, but food remains are not commonly found at coyote dens.

Adults with pups usually return from a successful hunt by the easiest direct route; therefore, direction of travel from kills is important in determining den location. Coyote travel routes follow game and livestock trails, canyons, dry washes, woods roads, low saddles on watershed divides, or even highways in settled areas.

Frequent sightings of adult coyotes in the same general area during daylight hours are also an indication of dens. Howling near the den during evening and morning hours also occurs, especially after pups become older and more active.

Clean-out holes and coyote tracks do not always lead to a den since “dry” (barren) females often travel with a male and sometimes do clean-out holes as if preparing to raise a litter. “Dry pairs” tend to move more during denning months, however, while coyotes with pups return daily to the den. Therefore, regular appearance of adults in the same local area tends to confirm that the den exists.

Hunting dens by tracking is easiest after a rain or windstorm when tracks are more distinct. Waterholes and springs are good places to begin. Although coyotes will travel long distances to water when necessary, hot weather increases the need for frequent drinking, and pups are often moved close to watering areas. As pups become older, they usually occupy several holes and are scattered along a creek bed or dry wash, rather than being restricted to a single location.

Good binoculars are especially helpful in finding dens by allowing the hunter to watch large areas from observation points. Close watch during early morning or late evening hours in areas of coyote activity usually results in sightings of adults and/or pups. Adults are often seen returning to feed the pups during early morning hours.

When coyotes are killing domestic animals, it is best to locate dens from a distance and avoid disturbance until the adults can be trapped or otherwise removed. Human activity close to the den, especially within about one-quarter mile, will often cause coyotes to move, particularly when the pups are older, if the adults observe the hunter, or if the den is in an open area with little protective cover.

Trapping Coyotes

Coyotes have an acute sense of smell and are highly suspicious of unnatural odors. Those that have been exposed to careless trapping methods or have been trapped and have escaped are difficult to take without extra care in making trap sets. Success with these requires trapping experience and knowledge of coyote behavior.