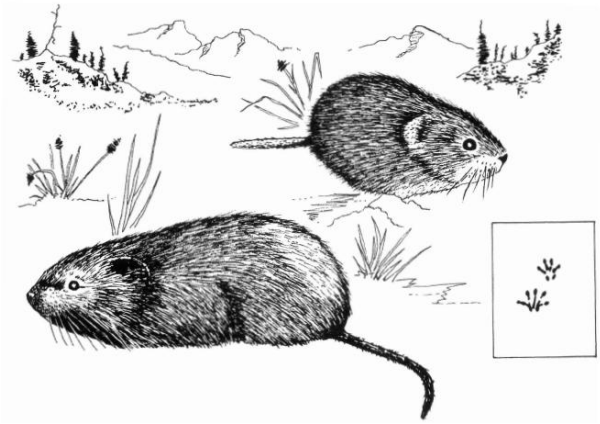
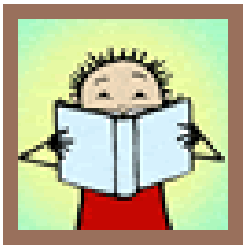
BIOLOGY, LEGAL STATUS, CONTROL MATERIALS, AND DIRECTIONS FOR USE

Meadow Voles

Microtus californicus, M. montanus

Family: Cricetidae

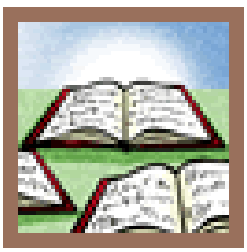




Introduction: Meadow voles are intriguing small mammals. Their population growth often fluctuates dramatically, causing sudden increases. This Often catches landowners by surprise which is when their presence usually becomes problematic whether to the individual or commercial landowner. After vole populations peak they generally subside even if no control has taken place. A low population may exist for 4 – 8 years before another resurgence.

Six species of Meadow voles of the genus *Microtus* occur in California. Two species of voles are responsible for the majority of damage in California. The California vole (*Microtus californicus*) and the Montane vole (*M. montanus*). Voles do not normally invade homes and should not be confused with the common house mouse.

Identification: Meadow voles are small rodents with stocky bodies, short legs and tails, and short rounded ears. Their long, coarse fur is black-brown- to gray. Adults are 4 to 5 inches long. They are larger than a house mouse but smaller than a rat. Meadow voles are active night and day, all year, and are found in areas of dense, grassy ground cover. They are relatively poor climbers and do not usually enter buildings. They dig short, shallow burrows with numerous openings about 2 inches across.



Legal Status: Meadow voles are classified as nongame mammals by the California

Fish and Game Code. Nongame mammals which are found to be injuring growing crops or other property may be taken at any time or in any manner by the owner or tenant of the premises. They may also be taken by officers or employees of the Department of Food and Agriculture or by federal or county officers or employees when acting in their official capacities pursuant to the provisions of the Food and Agricultural Code pertaining to pests.

Damage: Permanent pasture, alfalfa, artichokes, brussel sprouts, carrots, cauliflower, potatoes, sugar beets, tomatoes, grains, nursery stock the bark of apple, avocado, citrus, cherry and olive trees.

hay,

and

Range: Of the five species of *Microtus* found in California, only *M. californicus* and *M. montanus* are economically important. *M. californicus* is found in the Owens and lowland valleys and the Coast Range areas; *M. montanus* inhabits northeastern California and the eastern Sierra slope. *M. longicaudus*' range approximates montanus' range plus an extension into northwestern California; *M. oregoni* and *M. townsendi* are found only in northwestern California.

California Vole

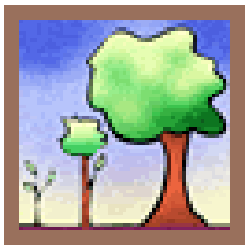
Creeping Vole

Long-Tailed Vole

Montane Vole

Townsend's Vole

Habitat: Meadow voles are likely to be found where there is good vegetative cover. They generally do not invade cultivated crops until the crop is tall enough to provide food and shelter. *M. californicus*: marshy ground, saltwater and fresh wet meadows, and dry grassy hillsides. *M. montanus*: near springs and in wet grassy meadows of the yellow pine, red fir, Engelman spruce, hemlock and lodgepole forests. *M. longicaudus*: stream banks and mountain meadows, occasionally in dry situations, brushy areas in winter. *M. oregoni*: Forests, brush, grassy areas, usually on dry slopes. *M. townsendi*: moist fields, sedges, tules and meadows, usually near water.



Biology: Meadow voles are active all year round, irrespective of weather. They forage at any time during the day or night but are chiefly diurnal. They are usually found in colonies marked by numerous 1 to 2 inch wide surface runways through matted grass. Small piles of brownish feces and short pieces of grass stems along the runways are evidence of activity. In areas of winter snow, their round burrow openings to the surface of the snow also reveal their presence. The burrows consist of shallow underground tunnels, nest chambers, and storage chambers. *Microtus montanus* females are territorial and, except during the short period of heat, all strangers of either sex are driven away from the home range around the burrow. Home range is small, less than a 60-foot radius in the case of *M. californicus*. All meadow voles swim well.

There has been disagreement as to feeding habits, but observations of *M. montanus* indicate that meadow voles do forage beyond the sheltered runways. Food consists of tubers, roots, seeds, grain, and succulent stems and leaves; *M. californicus* subsists largely on grasses and sedges, whereas *M. montanus* prefers forbs.

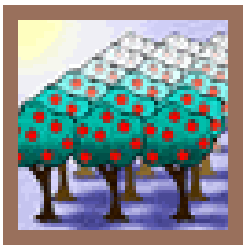
Females of *M. californicus* were reported to have bred at 22 days of age, but males attain sexual maturity at 6 weeks (Hall, 1959). White concluded that females breed at from 4 to 6 weeks of age. The average litter size for *M. californicus* is 4.2 (range 1 to 9), and the litter size is usually 5 to 8 for *M. montanus* and *M. townsendi*. Size of the litter correlates directly with protein content of the food eaten, i.e., the largest litters are born in the spring (Hoffman, 1958). The gestation period is 21 days and the young are weaned at about 2 weeks of age.

Under natural conditions, a female *Microtus* may produce from 5 to 10 litters a year. Within 15 hours after the young are born, breeding may occur again. White states that it is unlikely that many individuals survive an entire breeding season. Though a few individuals will breed in any season, the major breeding season corresponds with the season of forage growth. In *M. californicus*, there is a major peak in late winter and early spring, and a lull in summer. *M. montanus* ordinarily ceases breeding during the cold winter months and resumes with the return of warm weather in the spring.

Meadow vole populations generally build up to a peak every 3 or 4 years, followed by a rapid decline during the next breeding season. When an anticipated peak occurs in a dry year, it may be barely noticeable, but if it occurs during a wet year, it can be of serious proportions. The exact causes of the cycle of buildup and decline are not known, though disease, food shortages, physiological stress from overcrowding, and other factors may be involved.

It may be assumed that in cultivated areas meadow vole populations are permanently based in favorable habitat such as roadsides, canal banks, or adjacent non-cultivated land. Invasion into cultivated cropland occurs when the population builds up or when the wild habitat becomes unfavorable, as when range grasses dry up in summer. Serious invasions may be detected early by the use of strategically located drift fence pit traps or lines of snap traps.

Coyotes, badgers, weasels, snakes, hawks, owls, herons, and gulls are among the principal vole predators. It is generally believed that predators can neither prevent a population eruption nor control it after it occurs because the birth rate of the predators is too low to keep pace with the fast-breeding voles.



Damage Prevention and Control Methods

Exclusion: Plastic, wire, or metal barriers that are at least 1 foot high, mesh size – ¼ inch will exclude meadow voles. Meadow voles rarely climb but they may dig beneath. To reduce this possibility, bury the bottom edge 6 to 10 inches below the soil surface. Plastic or hardware cloth cylinders surrounding the trunks can protect young trees, vines, or garden ornamentals. Again bury the bottom at least 6 inches in the soil.

Habitat Modification

Habitat modification can be very effective in deterring voles. Grassy weeds, heavy mulch, and other dense covers encourage voles by providing food and protection from predators. By removing the protection the area will be much less suitable to voles. For example, clearing grassy areas adjacent to gardens or crops can help reduce voles by removing their cover. A minimum width of 15 feet is recommended, but even that may not be enough if vole numbers are high. Clearing vegetation 2 feet from young trees or vines reduces damages because voles do not like to feed in the open. Voles often damage plants beneath thick mulches or bark chips.

Frightening

Frightening methods are ineffective and not recommended for vole control.

Fumigants

Fumigants are not usually effective because of the complexity and shallowness of vole burrow systems; the fumigant escapes. Aluminum phosphide can be effective in situations where the burrow openings are quite visible such as immediately after discing.

Repellents

Not recommended. Several commercial repellents are available, utilizing Thiram or capsaicin (the hot in chile) as an active ingredient are registered for protecting plants from meadow voles, although they have not been proven to be effective or practical in California. Voles usually damage plants at or just beneath the soil surface. This makes the use of repellents difficult as rain, sprinklers, or even heavy dew often washes repellents away. Repellents should not be applied to food crops unless this use is specified on the product label.

Toxic Bait

CDFA labels	0.005% Chlorophacinone grain bait
	0.005% Diphacinone grain bait
	2.0% Zinc Phosphide grain bait (grain and artichoke leaves)
	2.0% Zinc Phosphide concentrate (artichoke bracht)

Whenever using poison baits always follow the product label carefully, and take care to ensure the safety of children, pets, and nontarget animals. Use only baits registered for voles.

Anticoagulant baits are slow acting and must be consumed over a period of several days to be effective. Pelleted or whole grain baits are commonly recommended. Because of the continuous feeding requirement the bait must be available to the voles until the population is controlled. Bait placement is very important. Place it in runways, next to burrows, or in burrow openings so voles will find it during their normal travel. If the label allows for broadcast baiting, follow the label instructions for application and reapplication. Remember baits are toxic so that care must be taken to prevent exposure to nontarget wildlife. Bait can be placed in bait stations, (1 foot) sections of plastic pipe 2 inch diameter which will reduce exposure to nontarget species and allows protection of the bait from weather.

Paraffin bait blocks may also be available for vole control. Place directly in runways or in tube stations. Exposed bait blocks can present a hazard to dogs if picked up and chewed. Replace bait as eaten and remove those that remain when feeding stops.

Zinc phosphide is a common vole control toxicant. It is a Restricted Use Pesticide and usually used where vole populations are high and occupy larger areas i.e. agricultural settings. Zinc phosphide is a single dose toxicant available as pellets or grain based bait. The bait is usually applied by broadcasting or spot baiting (placing small quantities close to burrow entrances). Care should be taken to always follow product label directions. Zinc phosphide baits are potentially hazardous to ground feeding birds, especially waterfowl, especially if applied to bare soil.

Trapping

Trapping is not an effective method of control where population numbers are high. Simple wooden mouse traps can be used to control low populations concentrated in small areas. Baiting can include peanut butter, oatmeal or apple slices. Often no bait is needed as voles operate the traps by passing right over them.

Trap placement is important. Meadow voles do not stray far from their 'runs'. Traps should set at right angles with the trigger directly in the path of the vole. For additional placements, look for nests, burrow openings, runways in or around mulch or grass. Traps must be set in sufficient numbers to be effective. Examine traps daily. Remove and bury dead voles or place them in plastic bags in the trash. For health and safety reasons do not directly handle voles without wearing plastic or rubber gloves.

Other

Shooting is not practical or effective in controlling voles.

Predators do feed on voles but are not usually able to keep populations below acceptable levels. This is because of voles' high reproductive rate; allowing them to increase faster than predators.

Direction For Use

Spot Baiting (ZNP also broadcasting): Lightly scatter teaspoon quantities of bait (above 80 baits per pound) in runways near active burrows.

Broadcast Baiting (Zinc phosphide): Broadcast baiting using zinc phosphide baits: Spread baits evenly by hand, mechanical spreader, or aircraft through the infested area at the rate of 5 to 10 pounds per acre, depending on the density of the infestation.

Broadcast bait will fall through most vegetation to the ground surface. Do not apply bait when trees or grass are wet, or when rain is likely to occur within 24 hours.

Anticoagulants: Lightly scatter tablespoon amounts (1/4 to 1/2 ounce) of bait near active burrows or in runways. With first generation anticoagulants, repeat treatment every day for three treatments.

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