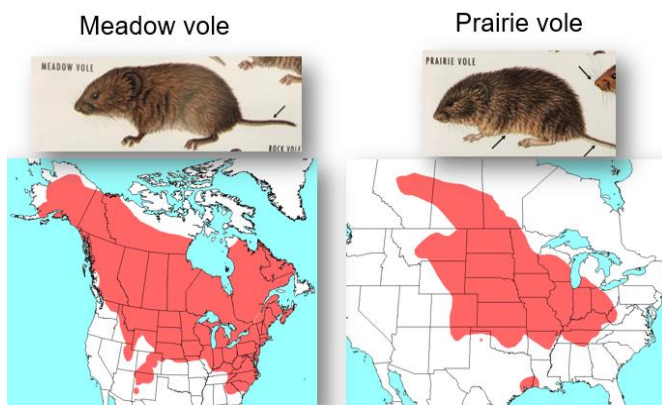


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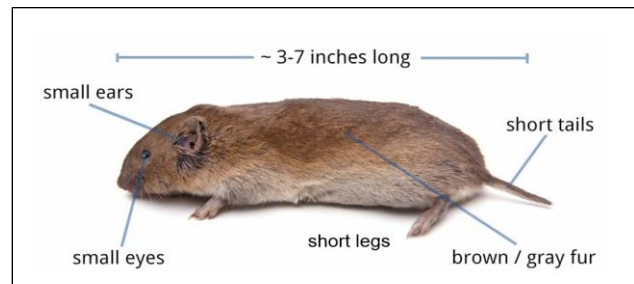
## Introduction

With over 60 species, voles (also called field mice or meadow mice) are found throughout the northern part of North America. In the Midwest, two species of voles cause a majority of the agricultural crop damage. They include *Microtus pennsylvanicus* (Meadow vole) and *M. octogaster* (Prairie Vole).



Source: <https://naturalhistory.si.edu>.

The meadow vole are more reliant on tall standing thick vegetation and lives in wetter low lying areas near streams, lakes, and marshy areas and requires free standing water. The prairie vole tolerates sparse vegetation and lives in upland grasslands, hay fields (alfalfa, red clover), fence rows and prefers more open and drier habitat. Another species, woodland or pine voles (*M. pinetorum*) live in woody/grassy areas along the edges of woodlands and cause major damage to orchards. Voles or field mice are considered a keystone species because they may comprise 40% of the mammals in an



ecosystem and are a major food source for many predators.

It is very difficult to tell one vole species from another but there are some differences. Meadow voles have high offspring numbers and very high rates of mortality. They are less social, have multiple mates, and tend to be more territorial and fight (when not mating). Females meadow voles tend to dominate males and males fight among themselves for mates. Prairie voles are more sociable, living together in colonies, mate for life, and both male and female voles tend to the young. Prairie voles tend to have fewer offspring but much lower mortality.

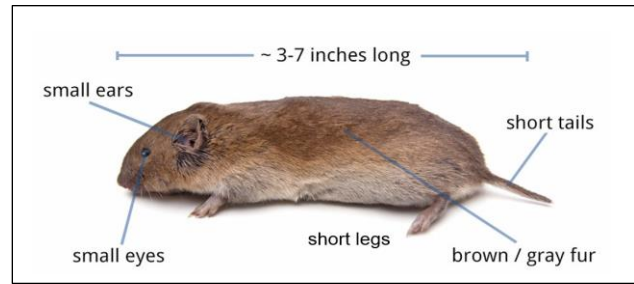
Vole have brownish, grayish, or red fur; small ears and eyes; short legs; and short tails. They tend to be 3 to 7 inches long and as adults, weigh 25-50 grams. They differ from the house mouse which is smaller, has large eyes, bigger ears, and a long tail. Voles should not be confused with moles which are larger, have a pointed snout, and eat mostly insects and earthworms.

## Vole Life Cycle

The breeding season for voles is March to September, however, under favorable conditions, they may breed anytime. Gestation is typically 20-23 days, with litter sizes ranging from 1 to 11 (3-6 average litter) and are weaned at 12 to 14 days with an average of 2.6 voles weaned per litter. Summer litters are generally larger and more successful due to



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increased food and shelter. Voles may have multiple litters per year (3-6 litters) especially with optimal food and habitat (8+ litters). Voles generally live 2 to 18 months but under normal conditions have >80% litter mortality. Female meadow voles may start breeding at 21-30 days while female prairie voles start at 35-40 days. Males start breeding in 6-8 weeks.



Source: [www.smithsonianmag.com](http://www.smithsonianmag.com) (Todd Ahren)

Under optimal conditions, voles can be quite prolific. One female vole in captivity had 83 young from 17 litters in one year. One of her daughters produced 78 young from 13 litters before she was 1 year old. Usually young voles (first time bred) have fewer young than older females. Vole populations peak in late fall and are at their lowest point in early spring; however, populations may rebound quite quickly. Vole populations and densities peak about every 2-5 years.

Prairie voles mate for life and if one mate dies,

they generally do not find a new mate. Prairie voles stay with one mate 90% of the time but about 10% have multiple mates and tend to wander. Prairie voles are used in many simulated "human" research studies. If two voles are seen foraging together, they tend to be prairie voles because the meadow voles are highly territorial and less social. Prairie voles and meadow voles are 99% genetically alike except for one gene. This gene in prairie voles associates sex, bonding, and pleasure together to make prairie voles want to mate for life with one partner.

Vole makes their nests either above ground or below ground in chambers. Nests are composed of piles of mixed grasses, sedges, and weeds. In the winter, nests are often located next to rocks, logs, or areas that offer shelter (under wood or tin boards, tarps, clumps of vegetation, etc.). Runways are about 1-2 inches wide and widely branching. Slick open holes with grass clippings or freshly clipped vegetation is an indication of an active burrow. Voles deposit their feces and urine in a common area outside the burrow. This area is often greener due to the fertilization.

## Vole Habitat

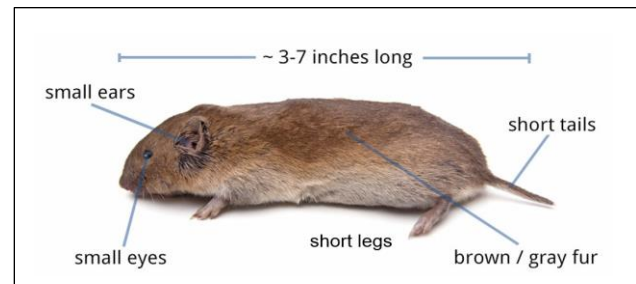
Voles do not hibernate and are active year-round. Low winter temperatures and lack of food and shelter take a toll on vole numbers. In the winter, good snow cover is important for both insulation, thermal protection, and protection from predators. Voles are more active in the winter during the day if there is

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adequate snow cover and in the summer, they are more active at night. Mild winters increase vole survival because they have difficulty keeping warm and finding food when low temperatures occur and the ground is frozen. Voles burrow beneath the snow looking for food (protected from predators) but voles also travel above the snow. After a fresh snowfall, winter is a good time to observe vole activity.

While most voles are nocturnal, they feed every 2-3 hours and are most active 2-3 hours after dawn and 2-4 hours before sunset. They prefer high protein diets (soybean seeds, soybean cotyledons, alfalfa and red clover leaves, other legumes and clovers) but also feed on grass seed (corn, oats, cereal rye, wheat) and lush grass leaves. They do not consume many highly fibrous stems which have a high C:N ratio or are highly lignified. Vole breeding success depends on weather, food sources (quality, quantity), habitat, water, predators, availability of sodium and potassium, pH, temperature, and other environmental stresses (burning, mowing, tillage).

Source: Purdue University, 2017



Prime vole habitat is anywhere with permanent herbaceous cover. Voles are commonly found in: hay fields, around hay bales, pasture and meadows, grass ditches, waterways, buffers, lanes, fence lines, edge of woods, logs, brush piles, rock piles, and no-till and cover crop fields. The habitat range for meadow voles and prairie voles overlap and they may be found in multiple areas together if food is abundant.

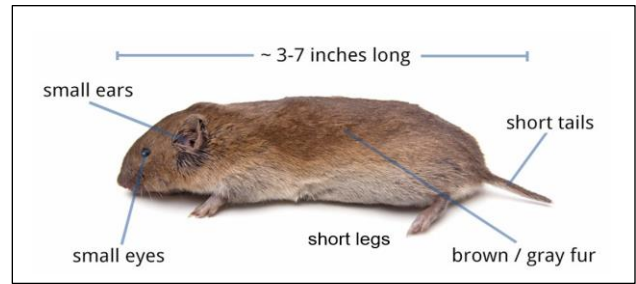
## Vole Food Sources & Vole Density

A Dejeo & Brazli, 2013 study found that prairie voles diet was composed of mainly red clover, alfalfa, dandelion, perennial ryegrass and orchard grass. Meadow voles ate a similar diet but consumed a diet higher in tall fescue than the prairie voles. Other plants found in their diet included giant ragweed, Japanese brome, curly dock, timothy, penny cress, and sedges. Velvetleaf, cheat grass, giant foxtail, meadow fescue, wild carrot, giant chickweed, field and bull thistle, goldenrod, asters, plantain, wild parsnip, sweet clover, and wild strawberry are also known vole foods. For agricultural crops, voles prefer whole soybean seeds; soybean cotyledons; grass seed like corn, wheat, oats, and cereal rye seed; and almost any broadcast seed or weed seed.

Vole density depends on the available food source and varies somewhat by vole species. Prairie voles prefer alfalfa and hay fields (40 voles/acre; peak 257 voles/acre) over bluegrass (21 voles/acre; peak 150 voles/acre) and tallgrass prairie (6 voles/acre, peak 96 voles/acre). Meadow voles prefer tallgrass



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## Fact sheets in this Series:

- 1) Vole Biology FS-1
- 2) Vole Scouting FS-2
- 3) Vole Predators FS-3
- 4) Vole Repellants & Baits FS-4
- 5) Vole Management Practices FS-5

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prairie (15-45 voles/acre; peak 600 voles/acre). Meadow voles prefer grass more than forbs while prairie voles prefer more forbs than grass and cannot survive on grass alone. Prairie voles generally consume a more diversified diet than meadow voles.

In the winter voles eat stored seeds, grain, bulbs and rhizomes, and bark from shrubs and trees when food is scarce. There are a number of cover crops that voles love to eat including cereal rye, oats, barley, wheat, Sorghum Sudan, millets, clovers, winter peas, canola or rape, sunflower, and buckwheat. One cover crop that both voles and slugs dislike is crimson clover. Voles sometime eat insects, slugs, and snails and even meat if hungry, but they prefer a vegetarian diet.

## Summary

Voles have become an economic agronomic pest, especially with fields that are no-till and/or cover cropped. With minimal soil disturbance, adequate shelter and food, vole numbers may quickly explode. Vole mortality is often >80% but vole populations may expand quickly under the right conditions, because voles have multiple litters per year and high litter sizes. Most vole populations run in 2 to 5-year cycles. Understanding the vole biology is the first step in finding agricultural practices that reduce vole numbers to an acceptable level. Scouting for voles and reducing vole food and shelter is the second step in controlling voles.



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