



# WILDLIFE NOTES

Volume 2

# MAMMALS







# INDEX

American Marten . . . . .	Page 1
Bats . . . . .	3
Beaver . . . . .	9
Black Bear . . . . .	12
Bobcat . . . . .	14
Chipmunk . . . . .	16
Cottontail Rabbit (see also, Snowshoe Hare) . . . . .	18
Coyote, Eastern . . . . .	20
Elk . . . . .	22
Fisher . . . . .	24
Foxes . . . . .	26
Groundhog (see Woodchuck) . . . . .	72
Mice and Voles . . . . .	30
Mink . . . . .	36
Muskrat . . . . .	38
Opossum . . . . .	40
Porcupine . . . . .	43
Raccoon . . . . .	46
River Otter . . . . .	49
Shrews . . . . .	51
Skunk, Striped . . . . .	55
Snowshoe Hare . . . . .	58
Squirrels . . . . .	61
Voles (see Mice and Voles) . . . . .	30
Weasels . . . . .	64
White-tailed Deer . . . . .	68
Woodchuck . . . . .	72
Woodrat, Allegheny . . . . .	75



## American Marten

Formerly known as the “Pine” marten, this agile climber was a long-time native resident to Pennsylvania prior to extirpation soon after the turn of the 20th century. During 2022 the Pennsylvania Game Commission started discussions about returning this iconic species of the forest to Penn’s Woods.

### Biology

Measuring between 19 and 27 inches from nose to tip of tail, martens weigh between 1 and 3 pounds. Males are generally heavier than females, sometimes by 65%. Both sexes have dense brownish-black hair covering their tails, running up their backs and sides, and onto the tops of their heads. A yellowish-orange bib covers the throat and can stretch down to the chest. In winter, a pale, whitish-gray color stretches from the ears down under the chin whereas in the summer this area is chocolate brown. Relatively large feet allow for even transfer of weight over snowy conditions while short legs and a narrow body allow the marten to access holes, cavities and crevices on the ground and within the trees for hunting, denning or protection. Martens are swift tree climbers and spend a fair amount of time above ground foraging and exploring cavities.

Marten range is vast, extending from Alaska, across Canada and down into Maine. New Hampshire, Vermont and New York all have marten populations while many states within the upper Midwest also have martens. Historically, marten would have ranged down through Pennsylvania, West Virginia, Maryland into Virginia, Tennessee and North Carolina.

Breeding occurs within July and August and marten, like fisher, exhibit delayed implantation. Fertilized eggs do not immediately implant on the uterine wall and remain unattached until close to 200 days. Gestation after implantation lasts 27 days and 1 to 5 kits are born altricial in March, April or May. By day 46, young martens are moving out of the den, and by 15 months are considered adults. Some females will produce their first litter at 24 months, although this isn’t always the case. Once young martens separate from the female, dispersal can vary between 2.5 and 25 miles with some rare instances more than 120 miles. Home range is also variable, and often depends on both habitat suitability and



prey abundance but is consistently larger with males than females. Home ranges between sexes within the upper mid-west average 3.2 square miles.

Martens are considered a true facultative generalist, meaning they are opportunistic when it comes to their diet. This leads to a very broad range of diet items including mammals, birds, vegetation, insects, reptiles, amphibians and fish. Fortunately, a large amount of research is available from across the range when it comes to diet for American martens. The largest proportion of diet is made up of small mammals such as voles, shrews and mice. The next largest group is plants such as soft mast, grasses and other vegetation. Insects make up a large proportion of the marten diet, and is followed by birds, squirrels and rabbits. Martens, like fishers, exhibit intraspecific consumption, or what would be considered cannibalism, eating other martens in some instances.

Sources of mortality for marten are like many other wildlife species with a variety of disease and parasites, exposure as well as starvation. In locations where martens are abundant and seasons exist, trapping is a source of mortality and when in relation with human development, roadkill can occur. Mammalian species preying on marten include bobcat, fisher, coyote, red fox and other martens. Raptor species that prey on marten include the great-horned owl, eagles and the northern goshawk. Predation increases within areas of poor to non-existent habitat in comparison to relatively low predation in areas of suitable, contiguous habitat. Martens live from 1.5 to 5.5 years with occasional individuals making it to 14.5 years of age.

## Habitat

The American marten can inhabit a large variety of forested habitat types depending on available prey and cover despite many believing this species was strictly tied to 'old-growth' coniferous forests. In Pennsylvania, historic records point to marten preferring deciduous, hardwood timber. Across the current range, marten live everywhere from the boreal forests of northern Canada to the high-elevation peaks of the Adirondacks, from the snow packed Rockies to the lower Peninsula of Michigan and the arid Black Hills of South Dakota. This variation of landscapes where marten persist have one thing in common that is critical to the species, structural complexity. Good marten habitat provides structure from the forest floor, through the understory and mid-story to the canopy. Important structure for a marten includes downed woody debris, rock piles, standing or leaning snags, and cavities. Structure on the ground also provides a way to access what is called 'the subnivean' or the world under the snow. Martens hunt and find shelter under the snow during the winter providing for a safe area with little competition. This species can withstand some forest fragmentation, primarily through timber harvest, but does not respond well to human development. Canopy cover is an important factor and protects the marten from predators such as the great-horned owl.

## Population

Martens were once a common part of the forest ecosystem within Pennsylvania. Prehistoric records show that marten, at one time, inhabited the forests of the East down into North Carolina and Tennessee. Historic records within Pennsylvania point towards the northern tier of the state, with highest densities found within the counties of Warren, McKean, Potter, Forest, Elk, Cameron and Clinton. Deforestation of the state occurring in the 18th and 19th centuries paired with unregulated harvest led to the eventual extirpation of the American marten within the Commonwealth. The last remnants of the population likely blinked out by the 1920s. There have been several occurrences since this time but they are thought to be from dispersing martens traveling south from New York.

Several assessments focusing on feasibility of reintroduction have been completed for this species, with the most recent coming in 2022. This assessment focused on available habitat, impacts to and from other species, climatic changes in the future, and a variety of other important factors. This review found that there is suitable marten habitat within the historic range of Pennsylvania, and that there is little negative impact in relation to other species within the state. It was recommended that marten be reintroduced into the Commonwealth following a reintroduction and management plan being drafted. The Pennsylvania Game Commission Board of Commissioners voted to move forward with the development of a reintroduction and management plan for marten that will be reviewed by the public and provided to the Board for their review and approval.





## Bats

Bats are the only mammals that fly. Their wings are thin membranes of skin stretched from fore to hind legs, and from hind legs to tail. The name of their order, *Chiroptera*, means “hand-winged.” Their long, slender finger bones act as wing struts, stretching the skin taut for flying; closed, they fold the wings alongside the body.

### Biology

Pennsylvania bats range in size from the hoary bat (length, 5.1 to 5.9 inches; wingspread, 14.6 to 16.4 inches; weight, 0.88 to 1.58 ounces) to the tricolored bat (length, 2.9 to 3.5 inches; wingspread, 8.1 to 10.1 inches; weight, 0.14 to 0.25 ounces). Nine species of bats regularly occur in Pennsylvania; six hibernate in Pennsylvania and three primarily migrate south for the winter. Two additional species, evening bats and Seminole bats, are rare visitors from the South.

All Pennsylvania bats belong to family *Vespertilionidae*. They are insect eaters, taking prey on the wing. Some species specialize in feeding over water, while others specialize in gleaning insects off leaves or even occasionally landing on the ground to seize prey. A bat consumes up to 25 percent of its weight at a single feeding, with the smaller, hibernating species estimated to consume nearly a million insects per bat per year.

The eyes of our bats are relatively small, but their ears are large and well-developed. Bats can see quite well, but unique adaptations help them fly and catch prey in total darkness. While in flight, a bat utters a series of high-pitched squeaks (so high, in fact, they are almost always inaudible to humans), which echo off nearby objects – bushes, fences, branches, insects – and bounce back to the bat’s ears. These sound pulses might only be 2.5 milliseconds in duration. Split-second reflexes help the creature change flight direction to dodge obstructions or intercept prey.

### big brown bat



While in flight, a bat may use the skin between its legs to scoop a small insect out of the air and transfer it to its mouth. Larger bats may grab an insect with their mouth, often disabling it with a quick bite, then carry it to the ground or to a perch for eating. If an insect takes last second evasive action, the bat may flick out a wing, nab its prey, and draw the insect back to its mouth. Bats have sharp teeth to chew their food into tiny, easily digested pieces.

Most bats mate in late summer or early fall, although some breed in winter. The male’s sperm is stored in the female’s reproductive system until spring, when fertilization occurs. The young, born in summer, are naked, blind, and helpless. They are nursed by their mothers as are other mammals, and by six weeks of age, most are self-sufficient and nearly adult size.

The reproductive potential of bats is low. Most bats, including the smaller species, usually bear a single young per year; the larger species may have up to four. There is only one litter per year.



**little brown bat**

None of Pennsylvania's bats routinely fly during the brighter hours of daylight, preferring to make their feeding flights in late afternoon, evening and early morning. However, it's not unusual to see a bat flying during the day. Roost disturbance and heat stress might cause bats to take wing during daylight hours. During the day, they roost singly, in pairs, in small groups, or in large concentrations, depending on the species. They seek out dark, secluded spots such as caves, hollow trees and rock crevices. They may also congregate in vacant buildings, barns, church steeples and attics; some hide among the leaves of trees. They hang upside down, by their feet when roosting.

In fall, winter and early spring, insects are not readily available to bats in Pennsylvania and other northern states. At this time, three species migrate south; six others hibernate underground, usually in caves.

Excepting the three that migrate, our cave bats are true hibernators. Throughout winter, they eat nothing, surviving by slowly burning fat accumulated during summer. A hibernating bat's body temperature drops close to the air temperature; respiration and heartbeat slow; and certain changes occur in the blood. Bats can be roused fairly easily from hibernation, and often are able to fly 10 to 15 minutes after being handled. Most favor cave zones having the lowest stable temperature above freezing. During winter, bats might awaken and move about within a cave to zones of more optimum temperature. In many caves, bats of several species hibernate together.

Perhaps because of their nocturnal nature, secretive habits and unique appearance – not to mention superstitions – bats long have been misunderstood and sometimes feared. A number of misconceptions exist about them. They include: Bats are prone to rabies; their droppings are a dangerous source of tuberculosis and other diseases; they are aggressive and often attack people; they are dirty and ridden with lice.

Bats are no more apt to contract rabies than other warm-blooded animals. (People should not, however, handle bats, especially those found on the ground or in the open during the day.) There is no evidence to suggest that bats – or their droppings, called “guano” – transmit tuberculosis to man. A host of scientific studies indicate that healthy bats do not attack people, and even rabid bats rarely become aggressive. Bats need to keep themselves extremely clean to fly. They host no more parasites than other animals, and parasites that do afflict bats are very specialized and rarely pose problems to humans. Histoplasmosis, caused by a soil fungus that can grow in accumulated bird and bat droppings, does not, as a rule, survive in hot dry attics. However, as a precaution, it's recommended that you wear a respirator when stirring up dust in bat quarters or cleaning out large accumulations of droppings.

Colonial bats might congregate at favorite roosting sites, often in buildings. While these bats do no real harm to human occupants, their droppings, odor and noise may become a nuisance. To exclude bats correctly might take two years. The first summer you should watch the home at dusk to see where the bats are exiting. Try to get a count of the number of bats. If possible, erect a well-placed bat box of good design before August. The box should be large enough to accommodate the bats you plan to evict. When the bats leave in the fall, seal all entrances. Next spring, when they return, they are likely to move into the bat box, rather than search for a new way into your home, or your neighbor's. Do not seal bats out during June or July because you will trap flightless young inside.

Exterminating is a questionable practice. Poisons used on bats can be dangerous to humans, and may cause sickened bats to scatter and fall to the ground, where they are more likely to come into contact with people and pets. Currently no pesticides are approved for use on bats. Reputable pest-control operators use bat-exclusion techniques.

To counterbalance their low reproductive rates, bats are relatively long-lived. Some have been banded, released and recaptured more than 30 years later.

Because they feed in mid-air and are active at dusk and at night, bats are not often caught by predators. Owls and hawks take some, as do house cats, raccoons and foxes. Rat snakes occasionally eat roosting bats. Other causes of mortality include cave floodings and accidents.

The greatest threat to bats comes from humans in the form of highway mortalities, wind farms, introduced disease, and disturbances while hibernating. Highway mortality can occur when bats are crossing or foraging near highways in forest habitats, particularly where forested streams cross under roads. The recent addition of large windmills across many ridgetops and high plateaus is also killing bats, with about

75 percent of the bat mortality from wind turbines affecting migratory bats. Estimates of bat mortality below wind turbines are difficult to obtain; some wind facilities have claimed an average greater than 50 bats per turbine, per year. The majority of the mortality occurs during a short time period from late July through September. In the fall, the migratory bats that spent the summer north of Pennsylvania begin to migrate south for the winter. Recent research has clearly shown that a small restriction for operating the turbines during this time period under very low wind speed conditions can significantly decrease bat mortality due to windmills.

The biggest threat to our bats during hibernation is a relatively new disease called white-nose syndrome. This is an exotic fungus that causes fungal infections on the wing membranes and other exposed skin, eventually leading to death in most bats that encounter it. It has been shown that infected bats arouse too frequently and burn through their winter fat supply too fast, and also suffer from dehydration. Mortality has been severe, with an overall decline of 99 percent for all six species that are found to hibernate in Pennsylvania. The three species that do not hibernate, often referred to as migratory bats, have not been confirmed to contract white-nose syndrome.

In winter, hibernating bats may be aroused by people exploring caves; repeated disturbances force bats to squander precious calories needed for overwintering. Cave disturbances during the winter season are now even more problematic due to the cumulative effects with White-nose Syndrome. Hibernacula might also be closed or modified to become less suitable for bats.

Some scientists suspect that widespread use of pesticides also harms bat populations.

## Little Brown Bat (*Myotis lucifugus*)

The little brown, is found statewide. Length, including the tail, is 3.1 to 3.7 inches; wingspread, 8.6 to 10.5 inches; weight ranges from 0.25 to 0.35 ounces, and is greatest just before hibernation. Females are slightly larger than males. Color: a rich brown approaching bronze, usually with a dark spot on the shoulders. The fur is dense, fine and glossy; the wings are black and bare.

This bat eats a wide variety of flying insects, including nocturnal moths, bugs, beetles, flies and mosquitoes. Insects are regularly caught with the wing or tail membrane, and transferred to the mouth. An individual emerges from its day roost at dusk, and usually seeks a body of water, where it skims the surface for a drink, and then hunts insects. Bats examined within an hour of taking flight often have full stomachs weighing one-fifth of their body weight. The little brown bat makes several feeding flights each night, and is capable of catching 1,200 insects per hour. A nursing female may eat her own weight in insects nightly.

In October and November, little brown bats leave their summer roosts and move to tunnels, mine shafts and caves. Here, clinging to the ceilings and clustered against one another, they hibernate. In spring, they emerge in April and May. They return to the same hibernation and summer roost sites year after year.

Females disperse from the hibernation roosts, and gather in summer nursery colonies of 10 to 1,000 individuals in attics, barns and other dark, hot retreats. Males are solitary, roosting in hollow trees, under loose bark, behind loose siding and shingles and in rock crevices.

A single young is born to each female in June or early July. After four weeks, the young bat is fully grown, and ready to leave the colony. Females mature sexually at about eight months of age, while males mature in their second summer. Little brown bats might live more than 30 years.



**northern long-eared bat**



## Northern Long-eared Bat

### (*Myotis septentrionalis*)

Similar in size and color to the little brown bat, the northern long-eared bat can be distinguished by its longer tail and narrower and longer ears. It ranges in forested areas throughout the state, but is much less common than the little brown bat; its distribution is considered local and irregular. Length, 3 to 3.7 inches; wingspread, 9 to 10.7 inches; weight, 0.25 to 0.32 ounces.

Biologists have learned little of the ecology and behavior of the northern long-eared bat, although they suspect feeding habits are similar to those of the little brown. Long-eared bats roost singly or in small colonies in caves, behind window shutters, under loose tree bark and in cliff crevices. Female long-eareds gather in nursery colonies in attics, barns and in the cavities or beneath the bark of trees. Probably, a single young is born in July. Long-eared bats return to caves in fall, often sharing space with little brown bats, big brown bats and tricolored bats.

When all of Pennsylvania's main hibernation sites became contaminated with white-nose syndrome, 99 percent of the long-eared bats using those locations died. Long-eareds being seen on summer landscapes are believed to have survived due to an individual preference for solitary, non-traditional hibernation sites.

## Indiana Bat (*Myotis sodalis*)

The Indiana bat resembles the little brown bat, but has a pinkish cast to its fur, giving it a light purple-brown coloration. Length, 2.9 to 3.7 inches; wingspread, 9.4 to 10.3 inches; weight, 0.18 to 0.28 ounces. Sexes are equal in size.

Indiana bats roost in trees in summer; and rarely are found to roost in buildings. In winter, some 97 percent of the total species population hibernates in certain large caves in Missouri, Kentucky, Indiana and Illinois. Pennsylvania is on the fringe of the species' range. In our state in recent years, Indiana bats have been found wintering in 19 sites (limestone caves, abandoned mines and tunnels). Populations of *Myotis sodalis* are dwindling throughout its range, and it is on the federal endangered-species list. Following major declines due

to white-nose syndrome, there were as few as 25 known left hibernating in the state in late 2015.

The Indiana bat hibernates in clusters of about 250 bats per square foot on the ceilings and side walls of caves. In this formation, the bats are vulnerable to disturbance by cave explorers: when a bat on the edge of the cluster is awakened, it moves about, starting a ripple of activity that spreads throughout the group. A winter of repeated disturbances causes bats to burn vital fat stores, and they might run out of energy before spring.

Females of this species are believed to bear a single young in late June. Feeding habits are probably similar to those of the little brown bat.

## Small-footed Bat (*Myotis leibii*)

This species is one of the smallest in North America: length, 2.8 to 3.3 inches; wingspread, 8.3 to 9.7 inches; weight, 0.18 to 0.28 ounces. As the name implies, it has a very small foot when compared with other bats. When viewed from the front, the bat has a distinct black mask that stretches from ear tip to ear tip. In Pennsylvania, this bat is rare, and the population is thought to be decreasing. It is included on Pennsylvania's threatened-species list. Summer roosts are primarily rock cliffs, boulder fields, rock-strewn abandoned mine lands and even rocky road cuts. On rare occasions, they might be found in buildings or tree cavities.

The small-footed bat resembles the little brown bat, but has a golden tint to its fur. Feeding and breeding habits probably



small-footed bat

parallel those of the other small, closely related bats. The small-footed bat waits until November to enter caves for hibernating, and emerges in March. It hibernates in narrow cracks in the wall, floor or roof, singly and in groups of up to 50 or more. It usually stays close to entrances where the temperature is just above freezing.

### Silver-haired Bat (*Lasionycteris noctivagans*)

A medium-sized bat: length, 3.7 to 4.5 inches; wingspread, 10.5 to 12.1 inches; weight, 0.25 to 0.35 ounces. The fur is soft and long; the sexes are colored alike, blackish-brown tipped with white, for a bright, frosted appearance.

The silver-haired bat inhabits wooded areas bordering lakes and streams. It roosts in dense foliage, behind loose bark or in a hollow tree – rarely in a cave. It begins feeding earlier than most bats, often before sunset. Silver-haired bats do not hibernate in Pennsylvania, migrating farther south. In summer, a few may breed in the cooler, mountainous sections of the state, but most go farther north.

### Tricolored Bat (*Perimyotis subflavus*)

The tricolored bat, previously known as the eastern pipistrelle, also is called the pygmy bat because of its small size: length, 2.9 to 3.5 inches; wingspread, 8.1 to 10.1 inches; weight, 0.14 to 0.25 ounces. Its fur is yellowish brown, darker on the back. The back hairs are tricolored: gray at the base, then a band of yellowish brown, and dark brown at the tip.

Tricolored bats take wing early in the evening and make short, elliptical flights at treetop level. In summer, they inhabit open woods near water, rock or cliff crevices, buildings and caves. They hibernate from September through April or early May, deep inside caves and away from the openings, in zones where the temperature is about 52 to 55 degrees. They sleep soundly, often dangling in the same spot for months.

Tricoloreds eat flies, grain moths and other insects. They breed in November, and young – usually two per litter – are born in June or July. Tricoloreds live 10 to 15 years and are found throughout Pennsylvania, except in the southeastern corner.

### Big Brown Bat (*Eptesicus fuscus*)

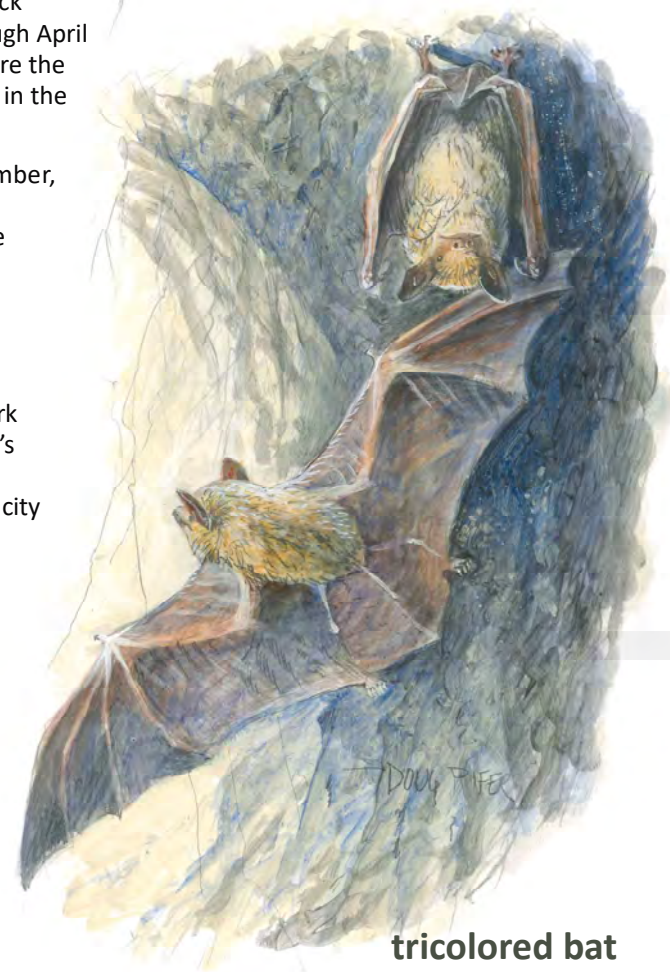
Second in size to the hoary bat, the big brown is 4.1 to 4.8 inches long; wingspread, 12.1 to 12.9 inches; weight, 0.42 to 0.56 ounces. The fur is dark brown, and the face, ears and flight membranes are blackish. Pennsylvania's most common bat, the big brown ranges throughout the state in diverse habitats: attics, belfries, barns, behind doors and shutters, hollow trees, in city and country.

Big brown bats fly at dusk, and generally use the same feeding grounds each night. They fly in a nearly straight course 20 to 30 feet in the air, often emitting an audible chatter. Major foods include beetles and true bugs (junebugs, stinkbugs and leafhoppers), many of which are major agricultural pests. A colony of 150 big brown bats can eat enough cucumber beetles during the summer to protect farmers from 18 million rootworm larvae.

Among the last bats to enter hibernation, big brown bats seek out caves, buildings, mines and storm sewers in October, November or December. They hang close to the mouths of caves. They emerge in March and April. Females bear young in June, usually two per litter. As young mature and leave the nursery colony, adult males enter and take



silver-haired bat



tricolored bat

up residence. Big brown bats have lived up to 19 years in the wild.

## hoary bat

### Red Bat (*Lasiurus borealis*)

A bright rusty coat and long, pointed wings distinguish this species. Length is 3.7 to 4.8 inches; wingspread, 11.3 to 12.9 inches; and weight, 0.28 to 0.49 ounces. Individuals roost singly in trees (except for females with young), often on forest edges, in hedgerows and shrubby borders; they seem to prefer American elms. Rarely do they use caves or buildings.

Red bats start flying early in the evening, preying on moths, flies, bugs, beetles, crickets and cicadas, which they take from air, foliage and ground. Strong fliers, red bats are considered migratory, although their patterns are little known. The sexes may migrate separately. Red bats start south in September or October, flying at night. They can withstand body temperatures as low as 23 degrees.

Females bear one to five young (usually two or three) in their treetop roosts. For the first few days, the young remain clinging to their mother when she flies out on hunts. Young are able to fly at three to four weeks, and are weaned when five to six weeks old. Longevity is about 12 years. The red bat ranges across Pennsylvania.

### Hoary Bat (*Lasiurus cinereus*)

The largest bat of the eastern forests, the hoary is 5.1 to 5.9 inches long; has a 14.6 to 16.4-inch wingspread; and weighs 0.88 to 1.58 ounces. The fur is dark brown, heavily tinged and white. The species ranges across the state, but is uncommon.

Hoary bats roost in trees. They prefer conifers, but also use deciduous trees in woodlots, forest edges and farmland. They choose protected sites 12 to 40 feet above the ground. Strong, swift fliers, they take to the air later than most other bats. They prey mostly on moths, but also take beetles and mosquitoes.

Hoary bats migrate to warmer climates in winter. In spring, they return and raise young. The young are born from mid-May to early July, usually two to a litter. Females have two pairs of breasts and sometimes have three or four pups in a litter. The female gives birth while hanging in a tree. Young grow rapidly and are able to hunt for themselves in about a month.

Note: The Seminole Bat (*Lasiurus seminolus*) and Evening Bat (*Nycticeius humeralis*) have been found a few times in Pennsylvania, but are not considered regular residents. In recent years, more than a dozen Semiole bats have been found dead underneath Pennsylvania wind turbines and three pregnant Evening bats have been captured during the mid-summer maternity season.



## red bat



## Bats and Your Home

Homeowners having problems with bats may be interested in the booklet, *A Homeowner's Guide to Northeastern Bats and Bat Problems*, by Lisa M. Williams-Witmer and Margaret C. Brittingham, Publication Distribution Center, Pennsylvania State University, 112 Agricultural Administration Building, University Park, PA 16802. It is also available at local Penn State county extension offices.



## Beaver

The beaver, *Castor canadensis*, is North America's largest rodent. Before European colonists arrived, the species was plentiful from the Mexican border to the Arctic. Beaver fur is thick and considered valuable. Raw pelts brought \$4 each in the early 1800s. Adjusting for inflation, beaver pelts back then would be about \$80 each in today's dollars. The fur was used to make top hats and to trim clothes. Tremendous demand for beaver fur sent trapping expeditions throughout the unexplored West, stimulating expansion of the new American nation.

By the end of the nineteenth century, uncontrolled trapping and habitat loss eliminated beavers in Pennsylvania and most eastern states. But, today this aquatic furbearer is back. Aided by modern wildlife management, the beaver has repopulated most of its former range.

Beavers are found throughout Pennsylvania with the highest concentration found in the glaciated northwestern and northeastern counties. Using branches, mud and rocks, beavers build dams and lodges on streams and creeks, and along the edges of lakes and rivers. Beavers are shy and mainly nocturnal, but those interested in catching a glimpse of a beaver may get lucky by staking out a beaver pond in the early morning and near sundown.

### Biology

Adult beavers weigh 40 to 60 pounds on average and grow up to 40 inches in length. Beavers weighing in excess of 70 pounds have been recorded in Pennsylvania. They have blunt heads, short necks and legs, and stocky bodies. Their coat is glossy tan to dark brown above, paler below. The pelage

consists of dense underfur covered with longer guard hairs. The thick pelt and deposits of body fat insulate the animal and allow it to remain in the water many hours at a time.

A beaver's tail is trowel-shaped, 8 to 12 inches long and five or six inches wide. It has a scaly, leathery covering. When this furbearer swims, it uses its tail as a propeller and a rudder. The tail also supports a beaver when it sits erect or gnaws a tree on dry land. A sharp slap of the tail on water is a signal warning other beavers of danger. Tail slapping is also a diving aid that gives a beaver extra propulsion to tip its body down for descent and may not always be intended to be a danger signal.

A beaver's front feet are remarkably dexterous. They have long claws and are used for digging, handling food and working on dams. The hind feet, broad and webbed between the toes, propel the animal through the water. The second claw from the inside on each hind foot is double (or split) and is used for grooming.

A beaver's vision is weak, but its hearing and sense of smell are acute. Most food is located by smell. Beavers are vulnerable to predators on land but relatively safe in water. A beaver can stay submerged up to 15 minutes. Membrane valves seal the ears and nostrils from water while it is submerged.

Both males and females possess castor glands, which produce an oily, heavily-scented substance called "castoreum," used for marking territories. Commercially, castoreum is used as an ingredient for some medicines, perfumes and trapping lures. Beavers have two other glands, one on each side of the urogenital opening, which secrete oil. The beaver rubs this oil into its fur to repel water.

A beaver's ever-growing front teeth maintain sharpness despite the animal's frequent gnawing. The teeth are self-sharpening, in part, because the enamel on the front of the teeth has a higher iron content than the enamel on the back. The front of the tooth is harder and the back wears more quickly producing a chisel-shaped tooth. The iron produces the orange-red color of the incisors. The upper and lower incisors are the primary cutters. A beaver can close its lips behind its incisors to keep from swallowing or inhaling water as they gnaw on and transport saplings while underwater.

Beavers eat vegetable matter. They prefer soft plant foods, including grasses, ferns, mushrooms, duckweed, algae, and the leaves, stems, or roots of water plants such as cattails and water lilies. When soft foods are available, beavers cut down few trees unless they are needed for dam or lodge repair.

They also eat the bark, twigs, and buds of aspen, maple, willow, birch, black alder and black cherry trees. In autumn, beavers anchor branches, twigs, or small logs, which they have cut, into the mud of their home ponds. Then when the pond freezes over in the winter, they still have access to this food cache.

Beavers fell trees to get at the higher, newer, more succulent growth that is found high up in the tree canopy. After eating, the beavers gnaw the trees into pieces which are then used in building dams or lodges. Small trees are eaten more completely than larger, woodier ones because the material is more digestible than that of older trees.

Beavers usually cut trees within 200 feet of the water's edge. They feel safest within this zone, and the trees do not need to be dragged far. They sometimes dig canals 1 to 4 feet wide and up to two feet deep from the pond inland to float logs back to the dam.

Beavers build dams on streams and creeks. This building behavior is instinctive, rather than learned and is also exhibited by beavers in captivity. Dams are made of cut tree branches packed together with mud and rocks. While a dam may hold back a sizeable pond, it also allows most of the stream flow to seep through. A dam backs up a barrier of water around the beaver's home lodge, much like a moat around a castle.

Dams require periodic maintenance, especially after heavy rains and during snow melt. Beavers may heighten the dam to raise the water level so they can reach more food without having to leave the water. They may also build additional dams upstream for the same reason.

For shelter and rearing young, beavers construct lodges where possible. These are dome-shaped islands of sticks and logs plastered with mud. A lodge's interior compartment (the den) may be up to five feet high, with a small air hole at the top. The mud freezes in winter, making the lodge impregnable to predators that might visit. The entrance to a lodge, whether it's on the bank or in the middle of a pond, is always below water level, while the den is dry and above water. Along fast, turbulent streams or creeks and rivers too wide to dam,

beavers either burrow deep into the bank or build lodges at the water's edge.

Beavers are generally congenial, although rivals fight during the January-March breeding season. Females are believed to be monogamous. A female usually drives her family out of the lodge when she nears the end of the 12-week gestation period. In April or May, she bears 3 to 6 (usually 4 or 5) young called "kits." Newborns weigh about a pound; their eyes are open, teeth erupted and they are fully furred. If an emergency arose, they could swim, but usually they nurse 5 to 7 weeks before venturing from the den.

Young remain with their parents for up to two years. When the young mature sexually at about 21 months, they leave on their own or are driven off by adults. Subadults (2-year-olds) usually travel downstream to look for their own territories. Dispersing beavers occasionally strike out across dry land – and may be found miles away from water.

Dogs and occasionally bobcats, bears and coyotes may kill some beavers, especially young ones away from the water. However, beavers typically have little to fear from predators. Some are struck by cars, and a few die when hit by trees they felled. Beavers live up to 15 years in captivity. The estimated lifespan in the wild is 10 to 12 years.

## Population

By the beginning of the twentieth century, beavers were extirpated from Pennsylvania. In 1903, the state legislature passed a law protecting the species. In 1917, the Game Commission released a pair of Wisconsin beavers in a remote Cameron county valley. Subsequent releases of 100 beavers occurred during 1918-1925. Beavers bought from Canadian agencies were live-trapped and released on refuges throughout the state. By 1934, the population was large and stable enough to allow a trapping season. That year, 6,455 beavers were harvested. In 2014 (80 years later) 17,602 beavers were harvested. Today, beavers are abundant and found throughout Pennsylvania.

Beavers live in colonies. A colony is a family group with occasional unrelated members occupying a pond or a stretch of stream, feeding from a common food supply, and maintaining a common dam or series of dams. Members of one colony may live in multiple lodges or bank burrows. Beavers within the family group maintain and defend a territory. Colony territories do not overlap.

Generally, 5 to 12 beavers occupy a colony. In the summer, a colony may include parents, young born the previous year (subadults) and kits. The following winter, kits, now 1-year old, are allowed to remain in the colony. The adults drive any residing subadults from the colony before the birth of a new litter. The 2-year-old subadults move to new sections of stream, find mates, and build their own dams and lodges. This disperses the population and establishes colonies in new areas.

Beavers can and do become troublesome for some people. Water backed up by their dams floods pastures, crop fields and roads, disrupts public water supplies and kills trees. They also cut down valuable shade trees and excavate unwanted channels. Trapping has proven to be an acceptable and economical method of controlling their numbers.

## Habitat

Beavers prefer slow-moving streams and rivers narrow enough to be dammed. They also live along rivers and around forest-edged lakes and marshes. They prefer remote areas, but will live near human development if other sites are not available.

Beavers prosper in aspen and willow environments. Studies have indicated that each year an adult beaver cuts up to 300 trees (most having diameters less than three inches) and that under average conditions, one acre of aspen supports a five – or six-member colony for 1 to 2½ years.

The dam building behavior of beavers affects many other wildlife species. After a dam is built, a portion of a wooded valley is changed to an open pond. Water covers the bases of trees, preventing oxygen from reaching the roots, and kills the trees within a few years. These “snags” provide homes for many cavity-nesting birds. Ponds vary in size from

a few to many acres. They provide habitat for ducks, geese, shore birds, fish, reptiles and amphibians. Otters, raccoons, mink, herons, ospreys, hawks, owls and other predators are attracted by the rich variety of life and food.

Healthy beaver populations can support moderate levels of annual harvest, which allow managers to balance beaver populations and human concerns. Valuable beaver wetlands can be maintained for 20 to 30 years or more as long as the food requirements of the colony do not exceed available food resources. Left unchecked, beavers will exhaust their food supply in the area and will move on. Their abandoned dams may last several years longer, accumulating silt, leaves and other organic material. Finally, during the spring thaw, or after a long, hard rain, the dam gives way. Most of the pond water drains off, leaving an open area. Grass grows in the rich soil and later, berry bushes and shrubs grow. Insects and small rodents thrive in the new habitat. Deer, bears, grouse, turkeys, songbirds and insectivorous birds come to these beaver meadows, which provide edge and openings in the forest.

The stream continues to flow through the meadow, amid many standing dead trees. Aspens and willows send up shoots. In time, another beaver colony may find this valley to be good habitat.





## Black Bear

One of the largest, and among the most secretive animals living in Pennsylvania is the black bear, *Ursus americanus*. The species ranges through much of forested North America from Mexico to Alaska and from Florida to northern Canada. In different regions, black bears exhibit different life patterns, denning times, tolerance of human activity, habitat preferences, travel patterns, reproduction behavior, pelt coloration and even size and weight.

### Biology

Bears are powerfully built animals. Adults are 50 to 85 inches in length, including a 3- to 5-inch tail. They stand about 30 inches at the shoulder and weights range from 140 to 400 pounds, with rare individuals weighing more than 800 pounds. Males, sometimes called boars, tend to be considerably larger and heavier than females, or sows.

Most Pennsylvania bears are black, although a few are a cinnamon color. (In other parts of its range, *Ursus americanus* may be brown, whitish, or bluish-gray, but the majority are black.) The body is glossy black, the muzzle tinged with tan. One out of every three to four bears will have on its chest a white mark, sometimes in a prominent "V." The fur is thick, long and fairly soft. Sexes are colored alike.

Bears walk in a shuffling, flat-footed manner. Each foot has five toes, each with a curved claw. Extremely agile for their size, bears sometimes stand erect on their hind feet to see and smell better. Their top speed is 30 mph over short distances. Black bears climb easily and swim well.

Black bears have an acute sense of smell and good hearing. They occasionally growl, "woof," or click their teeth together when threatened, and females communicate with their cubs using low grunts that signal cubs to climb a tree when danger is near or to descend after it has passed.

Bears are most active at dusk and dawn, with slightly lower activity levels during the day. They can also become nocturnal to avoid human activity. Alert and wary, they tend to avoid open areas. Individuals are solitary unless with cubs or during the breeding season. While most bears will run from a human, some that live in close proximity to people can become habituated and appear indifferent. Bears that become accustomed to people can be attracted into backyards if food



is present. Bird feeders, garbage cans and backyard grills all can draw bears. Bears that learn to forage on human-provided foods often become nuisances, causing property damage and increasing the risk of a human-bear encounter. Eliminating attractants typically prevents these types of problems.

Bears find food mainly by scent. They are opportunistic feeders, with a largely vegetarian diet. Common foods are fruit (including large amounts of berries), mast (acorns, hickory nuts and beechnuts), succulent leaves, grasses, insects (including eggs and larvae), plant roots, amphibians, reptiles, small mammals, fish, carrion and garbage. Enhancing forest diversity and protecting the large component of nut-producing trees found in Pennsylvania forests is probably the single best habitat-management tool for bears.

Black bears also can prey on newborn white-tailed deer fawns, although predation typically wanes after the first few weeks of a fawn's life. An occasional bear runs afoul of humans by preying on pigs, goats, sheep, rabbits or poultry; or by eating corn, raiding campers' food stores or destroying honey-bee colonies (beekeepers with such problems should protect their



hives with electric fences). Bears drink water frequently and, in hot weather, they wallow in streams.

In autumn, bears eat heavily to fatten themselves for winter. Bears enter hibernation late in the fall, with pregnant females being the first to enter dens, typically during mid to late November. Males den several weeks later. Onset of hibernation can vary from year to year depending on the availability of fall foods, with poor food years resulting in earlier denning.

The winter den might be a hollow tree, or an excavation resembling a bear-sized groundhog hole. They also den in rock crevices, cavities under large rocks, or in a nest beneath the roots of fallen trees. Some bears, including females with newborn cubs, may simply den in an open nest on top of the ground. Bears line their dens with bark, grasses and leaves. Females tend to select more sheltered sites than males. Males den alone, as do pregnant females (they give birth in the den). Females with first-year cubs den with their young.

Hibernation in bears more closely resembles resting than the deep torpor characteristic of other species. During hibernation, bears are alert and capable of fleeing or defending the den. Body temperature is not drastically reduced, but respiration and heart rate decline some. Bears do not urinate or defecate while dormant. On warm, late-winter days, they might emerge and wander nearby.

The average annual home range for adult male bears in Pennsylvania is 20 square miles. Adult females have ranges of 6 to 8 square miles, on average. Daily and seasonal movement is affected by food availability, breeding activities and human disturbances. In some areas, bears create trails while covering the nightly circuits. Individuals may scar trees with claw and bite marks while rubbing their backs against them; these "rub trees" announce a bear's presence to other passing bears.

Bears mate from early June to mid-July. It is generally accepted that both sexes are polygamous. The male does not help rear young. Most female bears in Pennsylvania produce their first litter at age 3, although in remote areas where access to high-calorie human-related foods is absent, the initial litter might not occur until age 5.

Females give birth to cubs during early January while in the winter den. Litter sizes range from one to five, with three most frequent in Pennsylvania. Newborns are covered with fine dark hair, through which their pink skin shows. They are about 9 inches long and weigh 8 to 10 ounces. Their eyes and ears are closed.

Cubs nurse in the den. After about six weeks, their eyes open. In about two more weeks, they walk. They leave the den when 3 months old, are weaned by 7 months, and by fall usually weigh 60 to 100 pounds. Bears traveling in groups in autumn are usually females and their cubs. Cubs are playful, romping in water and wrestling with their littermates. The female protects them, sending them up trees if danger threatens. Adult male bears occasionally kill and eat cubs.

Mothers and 1-year-old cubs will den together again the winter after their birth. The family group disbands late during the following spring or early summer, when the female is ready to breed again. Consequently, a female generally raises only one litter every two years. The male cubs, now 16 months old and called yearlings, will disperse while female yearlings establish home ranges nearby.

Mortality factors include hunting, being struck by vehicles, or being killed due to damage control or nuisance activity. Natural diseases, predation or starvation are rare. Bears host ticks and internal parasites, and some become infected with mites that burrow into the skin and result in a condition called mange, which can be fatal. In the wild, a rare individual might live to 25 years. Age can be determined by examining a tooth in cross-section under a microscope and counting annual growth rings similar to how trees are aged.

## Population

In Pennsylvania, bears are found in large forested areas statewide. They currently occupy over three-quarters of the state, although sightings have been confirmed in every county. Large urban centers and agricultural areas, such as the southeastern corner of Pennsylvania, and parts of the western border, lack sufficient forest habitat and bears seen there mostly are transient. The total population currently is estimated to be 18,000. In the 1970s, there were fewer than 5,000 in Pennsylvania.

Because bear populations have the potential to further increase, which can result in more frequent human-bear conflicts, their numbers are managed using regulated hunting. The length and timing of hunting seasons is set such that populations with greater human-bear conflicts are reduced or stabilized while areas with few conflicts are allowed to increase. Population trend and harvest levels are closely monitored annually.



## Bobcat

Tawny, tireless, smooth-moving and shy, bobcats are truly beautiful animals. Spotting a bobcat in the wild is a tremendous thrill because few people ever see them. Despite the bobcat's elusiveness, many Pennsylvanians are intrigued by this predator.

### Biology

The bobcat, also known as the bay lynx, wildcat, red lynx and swamp tiger, is the state's only feline predator. Its scientific name is *Lynx rufus*. The bobcat is closely related to the Canada lynx, which is not found in Pennsylvania.

Bobcats are efficient, wary predators equipped with senses of sight, smell and hearing. They have four large canine teeth to pierce deeply into prey. Behind their canines they also have sharp cutting teeth. Five retractable, hooked claws on each front foot and four on the rear add to the armament.

Though it is a fierce fighter, a bobcat is not a large animal. A mature bobcat averages 36 inches in length, including a stubby, six-inch tail. This bobbed tail gives the bobcat its name. Adult bobcats in Pennsylvania weigh 18 to 24 pounds, with larger males as heavy as 35 pounds.

Twelve bobcat subspecies are found in the continental United States, with slightly varying pelt coloration and sizes. The bobcats in Pennsylvania have gray-brown fur with dark spots and bars, which are especially noticeable on the legs. The lips, chin and the underside of the neck and belly are white. A ruff of fur extends out and downward from the ears.

The bobcat's rangy, muscular back legs are longer than its front legs. This gives the animal a high-tailed, bobbing gait when it runs. The bobcat is a strong swimmer, although it usually jumps creeks or fords them on fallen logs. The bobcat is also an excellent climber.

Bobcats are mainly nocturnal, but they sometimes venture out in the daytime. Even though bobcats are colorblind and see only in shades of gray, their large eyes are well-adapted to see in the dark. Bobcat pupils are slit-shaped rather than round and can open wide to admit light. Two other eye adaptations that help night vision are abundant



light-sensitive rods and a reflecting layer that makes objects stand out sharply from the background.

Small animals such as mice, woodrats, shrews, squirrels, chipmunks, birds, rabbits and hares form the nucleus of the bobcat's diet. However, like most other predators, bobcats are opportunists. Porcupine, mink, muskrat, skunk, fish, frog, insect and fox remains have also been found in their stomachs. Unlike other forest predators, bobcats are strict carnivores. They do not consume mast or fruit.

Occasionally, bobcats take sick, weak or crippled deer, but predation by bobcats has little or no effect on the size of Pennsylvania's deer herd. Bobcats also scavenge on whitetails that have starved during winter or died of other causes. After feeding on a deer, a bobcat may cover the rest of the carcass with leaves.

Breeding takes place from late February to early March. Male bobcats do not become sexually mature until two years old. Females can breed in their first year, but often do not. During estrus, a male may travel up to 20 miles in a single night searching for a receptive female. Radio telemetry research indicates that the male leaves the female after mating and plays no part in rearing young.

Kittens are born following a 50- to 60-day gestation period. The average litter size is three kittens, but up to five have been observed. Females guard their litters carefully, as an adult male bobcat may try to kill and eat the young. Owls and perhaps foxes may take kittens. A mature bobcat has few enemies other than humans. Bobcats give birth in dens—rock crevices, caves and hollow logs insulated with dry leaves and mosses. Though fully furred, kittens are blind and helpless at birth. Their eyes open after eight or nine days and they are weaned within two months. Kittens stay with their mothers for several more months, learning to hunt and kill prey. They reach 60 percent of their adult weight by winter.

Most wild animals are bothered by parasites, and bobcats are no exception. Fleas, mites and stomach and intestinal worms afflict bobcats. There have been few reports of rabid bobcats.

Some individuals live up to 16 years in the wild. Researchers estimate the age of captured animals by examining their teeth. Each year teeth lay down an outer layer of cementum creating a growth ring, much like a tree, thus making age determination possible from a thin slice of tooth. Bobcats in captivity usually live longer than their wild counterparts. One 30-pound domesticated male reached age 25. Research has shown a high mortality rate among bobcats during their first and second winters, before the young cats have completely mastered hunting skills.

During bad winter weather, a bobcat may shelter under overhanging rocks or in rock crevices. As soon as the storm subsides, the bobcat will be out hunting. If you can find its

tracks in the snow, follow a bobcat on the prowl. Tracks will lead up and down mountains, cross streams (often on logs) and continue for miles. A hunting bobcat trots to a vantage point such as a rock formation, steep hillside, or a low-leaning tree and surveys its surroundings. Rock crevices, stumps, brush piles and thickets will be checked by a bobcat in search of a meal.

Individual bobcat's have territories that are marked with feces, urine and scrape marks. Territories may overlap. Size of the territory depends on availability of food. In areas where food is abundant, the range may be as small as five miles in diameter. In the Western states, a low density of prey forces bobcats to range wider.

## Habitat

In Pennsylvania, bobcats thrive in a wide variety of habitats including forested mountains, swamps, and agricultural areas, and suburban woodlots.

Obviously, bobcats will live in areas where they can find ample shelter and food. Bobcats seem to prosper in remote areas near clearcuts. Studies have shown that local small mammal populations increase following clearcutting (due to better food and cover conditions), and apparently bobcats respond to this increased prey supply. Oak leaf roller and gypsy moth caterpillars, insect pests which kill timber, may also indirectly increase small mammal populations by opening up the forest canopy, thus stimulating forest regeneration, and providing downed woody vegetation.

## Population Management

Public attitudes concerning predators and the management of the bobcat in Pennsylvania have changed dramatically during the last century. Bobcats, and other predators, were considered vermin during the early 1900s and, in 1916, a \$15 bounty was established to encourage the killing of bobcats in the Commonwealth. More than 7,000 bobcats were killed for bounty from 1916 to 1938; the majority of these were reported during the 1920s. A realization that bounties were ineffective for controlling predator populations resulted in the removal or reduction of bounties on many predators. The bounty was removed from bobcats in 1938, but they remained unprotected and were widely persecuted until classified as a furbearer in 1970. This reclassification empowered the Pennsylvania Game Commission to set regulations to manage bobcat populations. Bobcat populations have continued to expand throughout the Commonwealth since 1970, and a limited number of bobcats are harvested by hunters and trappers under a highly conservative management program.





## Chipmunk

By Chuck Fergus

The eastern chipmunk is a small, agile rodent found throughout Pennsylvania. Colloquial names include grinnny, chippie, hackle and rock squirrel. A member of the squirrel family, Sciuridae, the chipmunk, is closely related to red, gray, fox and flying squirrels and, surprisingly, the woodchuck.

The chipmunk's taxonomic name is *Tamias striatus* (*tamias* means collector and keeper of provisions, and *striatus* refers to the animal's prominent body stripes).

The species ranges from Quebec south to northern Florida and Louisiana, and from the eastern seaboard west to Oklahoma, Kansas, the Dakotas and Saskatchewan.

### Biology

Adult chipmunks are 8 to 10 inches long (including a 3- to 4-inch tail) and weigh 2½ to 4 ounces. Sexes are the same size. A chipmunk's head is blunt with rounded, erect ears. The legs are short. Each hind foot has five clawed toes, and each forefoot has four clawed toes and a fifth, thumb-like digit with a soft, rounded nail. The tail is well-furred and flattened. The front incisor teeth are broad and chisel-shaped like those of other rodents. A chipmunk has internal cheek pouches for carrying food or excavated dirt.

The short, dense body fur is colored alike for both sexes: reddish-brown sprinkled with black and white hairs, brightest on the rump and flanks. Cheeks and sides of the body are grayish-tan to tawny brown, and the underparts are whitish. The most prominent field marks are five dark brown to blackish stripes on the back and sides. The narrowest stripe centers on the backbone, while on each side from shoulder to rump two more dark stripes sandwich a cream-colored band. On the sides of the face two buffy stripes outline the eye, and a black stripe runs through it.

Adults molt in late spring or early summer and again in late fall or early winter. Winter pelage is slightly paler than summer. Albino and melanistic individuals occur.

Chipmunks are graceful and spry, quick to dart for their underground burrows when startled. They run with their bushy tails held straight up. Although largely ground-dwelling,



they sometimes climb trees, descending head first in squirrel-like leaps. Their senses of sight and hearing are keen. When eating they often perch on stumps, rocks or logs, to survey their surroundings.

*Tamias striatus* is a vocal creature. It sounds a loud, repetitive "chip" similar to a robin's note; a more rapid chipping (three or four chips per second, perhaps to warn other chipmunks away from its individual territory); and a single, sharp alarm whistle.

Chipmunks are omnivorous. They feed on nuts, (acorns, hickory nuts, beechnuts) and seeds of woody and herbaceous plants including cherry, box elder, maples, shadbush, dogwood, viburnum, ragweed, wintergreen and wild geranium. They also eat mushrooms, berries, corn, and the flesh and seeds of apples, peaches, pears and garden vegetables. Birds' eggs, insects, snails, earthworms, millipedes, salamanders, small snakes, frogs and young mice and birds supplement their vegetable diet.

Chipmunks eat food on the spot (evidenced by piles of shelled seeds or nut fragments) or carry it away for hoarding. A

chipmunk can transport large amounts of food: one observer noted 31 corn kernels, another 32 beechnuts, and a third 70 sunflower seeds in the cheek pouches. A chipmunk uses its forepaws to manipulate food for eating or transporting.

Food foraging and other above-ground activities are carried on during daylight. Chipmunks are most active in early morning and late afternoon. In hot weather they spend much time in their cool underground burrows; this mid-summer adaptation is called estivation.

A chipmunk's activities and individual territory center on its burrow, which may be simple or intricate. The entrance, about two inches wide, is usually hidden under a rock, tree stump, log, or at the base of a fencepost or stone wall. Burrows plunge straight down for several inches, then level off and extend 30 feet or more, sometimes branching into offshoot tunnels with separate entries.

Chipmunks dig their burrows, pushing or carrying excavated dirt away from the entrance. Somewhere in the system is a foot-square nest chamber lined with crumbled dry leaves and grass. A chipmunk stashes nuts, seeds, corn, etc. under the leaf bed or in a storage chamber nearby.

In autumn, chipmunks gather winter food, storing it in their burrows or in aboveground caches in their home territories. They do not enter winter with a thick layer of body fat, as do true hibernators. In late October or early November, they go underground to live on stored food until spring.

Wintering behavior varies. In one research project, 63 percent of the chipmunks studied became torpid to some degree. Another researcher cited 30 percent as becoming torpid and classified 60 percent as non-hibernating. In two studies, inactive periods lasted from 1 to 8 days.

Chipmunks plug their den entrances when they go underground. They sleep much of the winter, waking periodically to eat. On still, sunny days they may leave the den briefly. Some emerge to breed in late February or early March, but snow and cold may drive them back into dormancy.

By late March, breeding is in full swing. Gestation takes 31 days; females bear 1 to 8 (usually 4 or 5) young from mid-April to mid-May, using their nests as brood chambers. A female may bear two litters per year, the second in late July or early August. Most females mature sexually by the time they're a year old; males from spring litters can breed at age one, while those born in summer mature at 7 to 8 months.

At birth, young are blind and naked, about 2½ inches long and weigh about one-tenth of an ounce. After about one week, their body stripes are visible. Eyes open after a month, and in another 30 days the half-grown young leave the nest and begin foraging with their mother. The male plays no role in raising young.

Adults without young are solitary. Larger individuals dominate smaller ones; females in estrus or with young in the nest are more aggressive than other females and males.

Home ranges of adult males are slightly larger than those of adult females (0.37 vs. 0.26 acres); ranges of immatures of both sexes average 0.18 acres. Home ranges overlap, and each animal defends a territory around its burrow entrance.

Hawks, minks, weasels, foxes, bobcats, house cats, raccoons and snakes prey on chipmunks. Fleas, lice, mites, internal worms and botfly larvae parasitize *Tamias stratus*. Longevity is 2 to 3 years in the wild, 5 to 8 in captivity.

## Population

The eastern chipmunk is common throughout its range. The number of individuals in a given area may fluctuate from year to year, probably in relation to food supplies.

Some researchers estimate the average population at two to four chipmunks per acre of adequate habitat. Predation does not usually have a great effect on local populations.

Chipmunks can tolerate a wide range of living situations. Their population is currently holding steady. They are among our most common and easily recognized mammals.

## Habitat

Optimum chipmunk habitat is open deciduous woods with plenty of stumps and logs. Chipmunks are also found along woods borders with thick understory and briars; on rocky ledges covered with vines and brush; in and around stone walls; in fencerows; in mature forests with little understory; in farm woodlots; in brushy areas; in rubbish heaps and dumps; under camps, barns and outbuildings; and in city parks and suburban gardens. Few chipmunks inhabit swamps or marshland.

Habitat for chipmunks, and most other forms of wildlife, is constantly changing. If a beaver dam floods a wooded valley, chipmunks will move out; if a farmer lets his pasture grow into woods, chipmunks will immigrate from bordering fencerows.

Overall, habitat is shrinking as shopping centers, housing developments, second homes and highways cover once open land. Chipmunks can adapt to some change. Unfortunately, many other wildlife species—both game and nongame—cannot.





## Cottontail Rabbit

The cottontail rabbit is one of Pennsylvania's most popular small game animals. It is one of the wild animals most often seen in towns and suburban areas. Because of its popularity and conspicuousness, the rabbit arouses interest both in those who hunt and those who simply enjoy wildlife.

### Biology

The cottontail rabbit is a long-eared, small- to medium-sized mammal of the family Leporidae. It hops when running, because its hind legs are longer than its front legs. A rabbit's soft fur is brownish above and white below. It has a distinct 2-inch-diameter white tail. Some individuals have a small white blaze on the forehead. Cottontails are 15 to 18 inches long and weigh two to three pounds, with females slightly heavier than males.

Preferred habitat includes swamps, thickets, briar patches, weedy fields, brush piles, overgrown fencerows and brushy gullies. Feeding areas are rarely far from good cover. Rabbits seldom dig dens, preferring to occupy abandoned woodchuck burrows. A rabbit's home range may be a quarter-acre to 20 acres, depending on the availability of food and cover. An individual seldom leaves its home territory, where it knows food sources, cover and escape routes thoroughly.

Summer foods include leaves, herbs, legumes, fallen fruit, garden vegetables, low broad-leafed weeds, clover and grass. During the summer, some captive wild rabbits have eaten a daily amount of grass that is equivalent to 42 percent of their weight. In winter, cottontails eat blackberry and raspberry canes, bark, buds, tender twigs of bushy plants and poison ivy vines.

A rabbit has sharp hearing and a keen sense of smell. Its eyes are set well back on the sides of its head, providing a wide field of vision. Rabbits are basically nocturnal, feeding in the evening, at night, and in the early morning. Individuals shelter in thick brush or abandoned woodchuck burrows during the day. They lead solitary lives on their home ranges. Rabbits rely on a burst of speed and a zigzagging running pattern to evade predators, but they cannot run for long distances. They can swim if necessary.



Cottontail litters are usually born from March through September, with about half the total litters being born in May and June. Litter size ranges from two to nine young, with an average of five. The gestation period is about 28 days. Each mature female bears an average of four litters per year. Juvenile females born in early spring are sexually mature—and often breed—by late summer of the same year.

A cup-shaped depression about 5 inches across and 4 to 6 inches deep serves as a nest. It is lined with dried grasses and fur, which the female plucks from her chest and belly. Young are born blind, naked and helpless, but they develop rapidly and are weaned, fully furred and on their own by 16 days old. The male takes no part in raising the young. Predators, spring floods, heavy rains and farming operations are major causes of nest mortality.

Few cottontails live to be more than a year old in the wild, although their potential life span is 3 to 4 years. Rabbits are a major food source for many other types of wildlife. Like other heavily-preyed-upon species, rabbits have an extremely high reproductive rate, which maintains adequate populations.

In addition to the eastern cottontail (*Sylvilagus floridanus*), Pennsylvania is also home to the Appalachian cottontail (*S. obscurus*). Also known as woods rabbit, blue bellies, and timber hares, the Appalachian cottontail is found in the higher elevations of Pennsylvania and the Appalachian mountains. Appalachian cottontails are slightly smaller than their relatives, and reliably have a black blaze on their forehead. However research has shown that some Pennsylvanian eastern cottontails will also have black blazes. Though not much is known about this cottontail's distribution across the state, it is thought that the movement of cottontails by people and habitat fragmentation has negatively impacted the population statewide.

## Population

The rabbit population in 2019 is not as large as it was in the past. The primary reason for this decline is loss of good habitat. Today's modern equipment lets farmers clean up and cultivate fencerows, swamps and brushy slopes that once held many rabbits. Expanding cities and towns, new roads and dams also reduce habitat or impact its quality.

Around the turn of the century, many forest areas were logged off. As these areas grew into brush, new rabbit habitat was formed, accounting for the tremendous cottontail populations earlier in this century. Later, low brush vegetation, which supported the large rabbit populations, began to die as it was shaded out by growing trees. This loss of low vegetation is a result of normal forest succession.

From year to year, rabbit populations fluctuate in a given area. Changes seem to follow a smooth curve, indicating gradual population increases and decreases. Hunters usually harvest less than 30 percent of the available rabbits. Studies show that even if hunters take as many as 40 percent of the rabbits available in autumn, the next year's rabbit population will not be adversely affected because of the species' tremendous reproductive potential. Young rabbits usually comprise about 80 percent of the population, but few live to see their second winter.

In summer, when litters are being born and food is plentiful, four rabbits may inhabit a single acre. Then an apparent change takes place in early fall. The summer's surplus of young rabbits has been thinned by disease, predation, accidents and parasites. During the fall, one rabbit per acre is considered a good density. The population is at its ebb in late winter after hunters, predators and winter weather have taken many rabbits.

## Habitat

Habitat—also called environment, living conditions or food and cover—has more impact on the rabbit population than any other factor. Good rabbit habitat provides abundant food and

protective cover. Heavily cultivated land produces ample food, but often not enough protective cover.

Rocky field corners, gullies, poorly-drained woodland, outcrops and other areas not being farmed can be managed to promote robust rabbit populations. These areas may be planted with pines or shrubs. Cutting along woodland edges stimulates the growth of low vegetation that will provide food and cover for several years.

Individuals interested in creating more summer food for rabbits can plant seed mixes with forbs, wildflowers, clovers, and grasses. These plantings benefit from annual maintenance whether it's the removal of non-target species, soil amendments, or mechanical management and should be located near good cover.

Rabbits like to take shelter in brushpiles. Brushpiles are best made by placing smaller brush over several firm, large logs, which provide support. The larger logs also keep the brush off the ground, preventing its rapid deterioration.

Coniferous cover that is dense at ground level provides good cover for cottontails, however, plantings require maintenance to remain good cover areas.

Most of Pennsylvania's small game is produced on private land. The key to a larger rabbit population is habitat improvement by private landowners.





## Eastern Coyote

The eastern coyote has stirred as much interest and emotion as any other animal in Pennsylvania. Seeing a coyote or hearing the howl of this wild, wily animal is a great reward of nature to many people. Others fear this animal just knowing it is in the wild. Some sportsmen dislike coyotes because they think the predators kill too many game animals. Trappers and hunters find coyotes to be especially challenging. Some farmers lose livestock due to coyote predation. The coyote has been referred to as the brush wolf, prairie wolf, coy-dog (misnomer) and eastern coyote.

The eastern coyote, *Canis latrans*, is found throughout the northeastern United States and southeastern Canada. Recent research shows the eastern coyote is an immigrant, the origin of which likely involved interbreeding between coyotes and gray wolves. Analysis of DNA suggests coyote-wolf hybridization has occurred. Other studies indicate that the eastern coyote is intermediate in size and shape between gray wolves and western coyotes. As a result, the eastern coyote exhibits different behavior, habitat use, pelt coloration, prey preferences and home-range sizes from its western cousin. The eastern coyote is the largest canine found in Pennsylvania. The following information pertains to the coyote in Pennsylvania and throughout northeastern United States.

### History

Fossil records indicate coyotes have existed in what is today eastern North America since the Pleistocene period, a million years ago. Occurrence has been intermittent over that time, and only in the past 75 years has the animal appeared to become common. The coyote's status in Pennsylvania during the 1700s and 1800s is clouded with that of the wolf. Old bounty records indicate both coyotes and wolves from other sections of the country were fraudulently turned in as wolves here during the late 1800s.

Little is known of the wolf in Pennsylvania, or if indeed the same animal now called the "eastern coyote" in fact might have been similar to the wolf of the past. Pictures dating to



the 1930s have appeared over the years in the Pennsylvania Game Commission's magazine *Game News*. These animals look like the same coyotes being killed today. The first coyote identified as an animal similar to what we today call the "eastern coyote" was killed in Tioga County in 1940.

In the late 1960s, it appears an influx of coyotes entered northern Pennsylvania from the Catskill Mountains in New York, and from there they spread south and west across the state. In the 1970s, the highest population in Pennsylvania was in the Pocono Mountains. The coyote continued to expand its range during the late 1970s and occupied the entire state by 1990, with the highest populations across the northern half of the state.

### Biology

The eastern coyote is much larger than its western counterpart. Adult males in Pennsylvania weigh 45 to 55 pounds. Females are smaller, weighing 35 to 40 pounds. Total body lengths of eastern coyotes range from 48 to 60 inches. Their pelage colors range from light blond to reddish blond to gray, and from dark brown washed with black to black. Generally, coyotes are gray to a German shepherd coloration. Their legs are gray, tan and reddish, often with black markings or lines down the front of the front legs.

The cheeks and behind the ears are reddish or chestnut colored. Blond, reddish and black coyotes might not have any noticeable black stripes on their front legs. A coyote's ears are erect and its bottle-brush tail usually is held in a downward position. Normally, its eyes are yellow, but some with brown eyes have been found.

Coyotes are monogamous; they maintain pair bonds for several years. The social unit centers around the mated pair and its offspring. However, the delayed dispersal of some offspring might result in extended family relationships beyond a year. A social group occupying a territory might include a pair of adults (generally more than a year old), transients (ages 6 to 18 months), pre-dispersing subadults (usually less than a year old) and nonbreeding associates that are more than a year old. Observations indicate other coyotes living in a territory might help provide food to a growing litter.

Normally, females do not breed until their second winter, but there are cases of some yearling females breeding and producing litters. They have one heat period that lasts four to five days, usually in February. The litters are born from mid-April to early May, and litter sizes average five to seven pups. Coyotes compensate for unusually high mortality by having larger litters. Known denning sites range from beneath overturned trees, piles of tree stumps, rock dens, and dug-out red-fox dens. Dens usually are located on southerly exposures. The pups are moved frequently to new dens to avoid detection.



Young coyotes begin to disperse from the family group during October, when they're 6 months old. Studies in Pennsylvania indicate some juvenile coyotes dispersed up to 100 miles, but 30 to 50 miles is more common.

Coyotes use a variety of yips, barks and howls to communicate and periodically assemble into larger packs. Coyotes at times will "pack" and at other times will hunt alone or in the company of another coyote or two. They primarily are nocturnal, but often hunt during daylight hours, especially in the morning. Howling might occur at any time of day, but the highest activity usually is at night. A coyote's senses of smell, hearing and alertness are especially keen.

## Habitat

The coyote has adapted to a wide variety of habitats in Pennsylvania. The animals can be found in the heavily forested northeast and northcentral regions of the state, in dairy and cropland areas, and even around the heavily populated areas of Philadelphia, Harrisburg, Pittsburgh and Erie. Coyotes prefer heavy, brushy cover found in places such as clearcuts, and they often live along edges between forest and agricultural areas where prey is abundant.

## Food Habits

The coyote is a generalist. An analysis of 300 coyote scats collected in Pennsylvania indicates a wide array of food items in the coyote's diet. Mammals from at least 13 genera were found, ranging from small mice and voles to deer. Overall, deer was the dominant food, occurring in 57 percent of the scats. It's not surprising deer are an abundant food source, given the high deer density in many areas and the large number of deer killed on the highways, lost to starvation or dying for any number of other reasons.

Rabbits and woodchucks ranked behind small mammals and deer as important food items. Birds were found in 10 percent of the scats, and insects in 18 percent. Plant material occurred in 50 percent of the scats. Various kinds of fruits are important foods during the late summer and fall, but plant material appears important on a year-round basis. While no livestock was found in the analysis, predation on sheep, chickens, ducks, goats and domestic rabbits does occur, but at a low rate. However, depredation can be significant in localized areas or at certain farms.

## Population

Coyotes are found throughout Pennsylvania, but are most common in the northern half. Mortality from hunting and trapping approaches 60 percent for young coyotes, and only 15 percent for adults.

Coyote populations throughout North America have continued to expand, despite man's attempt to control them. If there's one thing we have learned about this intriguing animal, it's that the coyote, not man, controls the coyote's destiny.



Revised 02/2021

## Elk

Before settlers arrived in Pennsylvania, elk (*Cervus elaphus*) lived throughout the state, with concentrations in the northcentral and Pocono mountains. By 1867, the species had been extirpated. Ultimately it became extinct throughout its range, which included New York and New England.

Today, elk inhabit portions of Elk, Cameron, Clinton, Clearfield and Potter counties. The animals are descendants of elk released by the Pennsylvania Game Commission between 1913 and 1926.

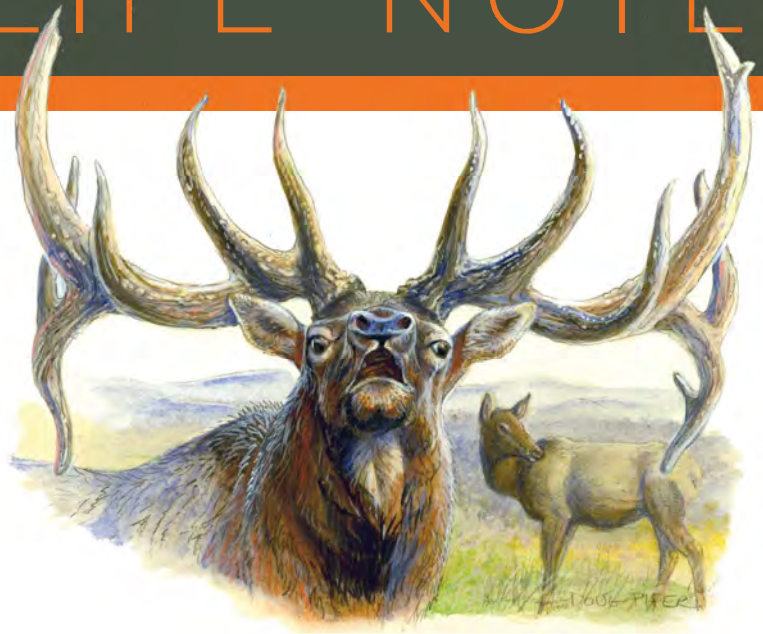
The word “elk” comes from the German “elch,” the name for the European moose. The elk is also called “wapiti,” an Indian word meaning “white deer,” probably referring to animal’s sun-bleached spring coat or its light-colored rump.

The elk is the second-largest member of the deer family in North America; only the moose is larger. Many western states, several Canadian provinces, and a few eastern states – including Pennsylvania – support thriving elk populations, and in those places the elk is a popular big-game animal.

### Biology

Elk are much larger and heavier than white-tailed deer. A mature male elk, called a bull, stands 50 to 60 inches at the shoulder and weighs 600 to 1,000 pounds. Females, or cows, weigh 500 to 600 pounds.

Elk have a summer and a winter coat. The summer pelage is short, thin and colored reddish brown. In winter, long, coarse guard hairs overlay wooly underfur. At this time, an elk’s body is tawny brown or brownish gray, with the neck, chest and legs dark brown, and the underparts darker than the back. Buffy or whitish fur covers the rump and the 4- to 5-inch tail. Sexes are colored essentially alike. Young elk, called calves, are dappled with spots.



Strong muscular animals, elk can run 30 mph for short distances, and can trot for miles. They jump well and swim readily. Their senses of smell and hearing are keen.

Cow elk often bark and grunt to communicate with their calves, and calves make a sharp squealing sound. The best known elk call, however, is the bull’s bugling. Bugling occurs primarily during the mating season. It consists of a low bellow that ascends to a high note, which is held until the animal runs out of breath, followed by guttural grunts. Cows also bugle at times.

Each year, a bull grows large branching antlers that sweep up and back from the head. In May, two bumps start to swell on the animal’s skull, pushing up about half an inch per day. The growing antlers are covered with a soft skin called velvet. This covering contains blood vessels which supply growth materials to the enlarging antlers.

Yearlings usually grow single spikes 10 to 24 inches in length, while older bulls may produce racks with main beams 4 to 5 feet in length and having five to nine tines to a side. An elk with a total of 12 antler points is called a “royal” bull; one with 14 points is an “imperial.” Before the autumn rutting season, the velvet dries and is shed or rubbed off. Bulls carry their antlers into late winter or early spring.

Elk primarily are grazers, eating a variety of grasses and forbs. In winter, they paw through snow to reach grass, or turn to twigs, buds and the bark of trees. Among trees and shrubs, early successional species such as aspen, willow, and flowering dogwood are important to

Pennsylvania elk. When available, acorns will make up a portion of elk's fall diet. They also browse oak, striped maple, black cherry, Juneberry and witch hazel. They drink from streams and springs and, if necessary, during the winter they get water by eating snow.

The mating season is September and October. Bulls bugle invitations to cows and challenges to other bulls. Bulls fight with each other, joining antlers and pushing and shoving. Battles rarely end in serious injury; the weaker bull usually breaks off the confrontation and trots away.

Like their western counterparts, Pennsylvania bull elk amass harems of 15 to 20 cows. Most harems are controlled by large mature bulls, although younger males, which hang around on the fringes of the groups, may also share in the breeding.

About 8½ months after she is bred, a cow in May or June will give birth to a single calf, rarely twins. A calf weighs about 30 pounds and can stand when only 20 minutes old. Within an hour, it starts to nurse, and it begins feeding on vegetation when less than a month old.

In spring and summer, bulls go off by themselves, living alone or in small groups. Cows and calves tend to remain in family units composed of a mature cow, her calf, and yearlings. Sometimes several families band together. An old cow will lead the group, barking out alarm calls and guiding the band away from intruders. In hot weather, elk bed in the shade of dense timber. They prefer not to move about in heavy wind.

Potential lifespan for an elk is more than 20 years. Pennsylvania elk die from hunting, old age, disease, vehicle collisions and poaching.

Brainworm is a parasitic nematode (*Parelaphostrongylus tenuis*) that sometimes kills Pennsylvania elk. The nematode is common in the eastern United States and



Canada. Its primary host is the white-tailed deer, which it does not normally harm. Elk pick up the parasite from snails – an intermediate host – which they inadvertently consume while grazing. The worm eventually reaches the brain and spinal column, causing death.

## Habitat

Elk are attracted to forest clearcuts, revegetated strip mines, grassy meadows, open stream bottoms, and agricultural lands. Shy animals, they tend to avoid contact with humans, although they will venture into settled areas to reach favored food sources.

Pennsylvania's elk live in northcentral Pennsylvania. The Game Commission and state Department of Conservation and Natural Resources (DCNR) manage public lands to make them more attractive to elk. The agencies create and maintain high-quality foraging areas and limit disturbance by humans. Elk habitat enhancement projects also benefit deer, wild turkeys, grouse and other wildlife.

## Population

From 1913 to 1926 the Game Commission released a total of 177 elk in Blair, Cameron, Carbon, Centre, Clearfield, Clinton, Elk, Forest, Monroe and Potter counties. From 1923 to 1931, hunting seasons on antlered bulls were held, and hunters took 98 of them.

However, a decline in elk numbers, due in part to the animals being killed illegally for crop damage, closed the 1932 hunting season. And by 1936, only 14 elk remained statewide – all of them in Elk and Cameron counties, which, interestingly, is the area where the last native elk was killed.

Following a reintroduction effort, the herd slowly rebounded. In the first elk survey conducted by the Game Commission and DCNR in 1971, 65 were counted by ground and aerial spotters. By 1980, the number rose to 114. In 1992, the ground spotters were eliminated from the survey and the herd was estimated to number 183.

A three-year trap-and-transfer program launched by the Game Commission in 1998 expanded the elk's range from 350 to 800 square miles.

In 2001, survey work indicated the herd contained more than 700 elk. That same year, the Game Commission once again had an open, but highly regulated elk hunt.

Today, Pennsylvania's elk herd continues to thrive and provide hunting opportunities for a limited number of hunters each year. One-hundred years after restoration efforts began, the herd numbered about 950 animals.



## Fisher

The fisher is a mid-sized carnivore, the second largest member of the weasel family in Pennsylvania; the river otter being the largest. Fisher are characterized by a well-furred long body, short legs, and a full tail that comprises about one third of its total length. While mostly dark to chocolate brown, fur on the tail, legs and rump is usually black, whereas fur on the back and shoulders is grizzled with gold and silver and enhanced by tricolored guard hairs. White areas or “patches” are common and are most frequently found in the genital areas as well as under the forelimbs. The face is triangular with wide and rounded ears. Fisher eyes have a horizontal oval pupil that produces a bright green eyeshine at night. Fishers have five toes on each paw and sharp, curved, semi-retractable claws.

The fisher is the largest member of the genus *Martes*, and males are considerably larger than females. Adult males weigh seven to 15 pounds; adult females from four to nine pounds. The heaviest fisher reported was a male from Maine that weighed 20 pounds. Males are longer than females, ranging from 35 to 48 inches; females range from 30 to 37 inches. Fisher achieve adult length within about six months, but continue to gain weight for several years.

Common names of the fisher include black cat, fisher cat, tree otter, tree fox, fisher weasel, pekan, and Oochik (Cree), which early fur traders pronounced as “wejack”. “Fisher” is the most frequently used common name and is thought to have originated from the fisher’s resemblance to a European polecat named “fichet.”

### Habitat

In the most general sense, fisher occupy forests with abundant downed woody debris or other structure on the forest floor. Fisher are generally believed to avoid areas lacking overhead cover, but the degree to which fisher will tolerate varying levels of forest fragmentation and human encroachment has not been well studied. During recent decades, fisher populations have expanded into highly fragmented, human altered forest ecosystems throughout many areas of the Northeast, including Pennsylvania.



### Food Habits

Despite its name, fisher rarely consume fish or other aquatic prey. Fisher are renowned for their ability to prey upon porcupines, and are unique among forest carnivores in that they are well adapted to forage effectively within the forest canopy as well as on the forest floor. Fisher are opportunistic and their diet is diverse, including small mammals, reptiles, insects, fruits and fungi. As consumers of fruits of shrubs and trees, primarily during summer, fisher serve as mammalian seed dispersers in forest ecosystems. Small mammals such as squirrels, chipmunks and mice are thought to be dominant prey sources for

fisher in Pennsylvania during most seasons. There is evidence of fisher predation on white-tailed deer, but the frequency and effects of such predation are thought to be limited.

## Young

Female fishers give birth to one to six cubs from late February to May, with most litters produced during late March and early April. Female fishers cycle into estrous and usually breed seven to 10 days after parturition, but embryonic development does not begin until the following January or February. The gestation period is approximately 40 days. Both males and females reach sexual maturity by one year of age. Natal den sites are generally tree cavities high above the forest floor.

Young are born completely dependent on maternal care, with their eyes and ears closed, and are immobile until about three weeks of age. Juveniles open their eyes at six to eight weeks, deciduous teeth erupt at six weeks, and canines erupt at seven to nine weeks of age. Fisher weigh less than two ounces at birth and reach one pound by 40 to 50 days of age. The pelage of juveniles has been described as silver-gray until three to four weeks of age, turning to the characteristic chocolate brown thereafter. At 10 to 12 weeks of age, kits are completely chocolate brown and exhibit the tricolored guard hairs characteristic of adults. At four months of age, fishers

are efficient at attacking the head and neck region of small prey. Juvenile fishers are generally intolerant of littermates by five months of age.

## Fisher in Pennsylvania

Historic data suggest that fishers were distributed throughout most of Pennsylvania prior to intensive deforestation during the nineteenth century, but actual distribution and relative abundance back then is largely unknown. Fisher likely occurred at varying densities throughout most forested regions, with the possible exception of the far southeastern counties. Historic accounts also suggest that fisher populations initially began to decline in southwestern Pennsylvania due to early colonial development. Subsequent declines occurred steadily as forest habitats were cleared. The last remnant populations were believed to have been in Clearfield, Elk, Cameron, Clinton, Potter and Sullivan counties. Historic reports of fur dealers and shippers suggest that prior to fisher extirpation, relatively few fisher pelts were traded. Due to the secretive nature of fisher and the scarcity of records and accounts during the last century, it is difficult to estimate the exact timing or progression of fisher extirpation in Pennsylvania.

Pennsylvania's present day fisher population is the direct result of natural expansion from adjacent states and from reintroduction programs here. In 1969, West Virginia reintroduced 23 fisher obtained from New Hampshire. Fisher populations in West Virginia have since expanded throughout that state and into western Maryland, northern Virginia, and southwestern Pennsylvania. Similarly, New York transferred 30 fishers from the Adirondacks into the Catskills Region during 1979, and current populations in northeastern Pennsylvania may have been colonized or enhanced by natural dispersal from New York. Most recently and significantly, during 1994-1998, through a joint project between the Game Commission, the Pennsylvania State University and the Department of Conservation and Natural Resources 190 fishers (87 males, 97 females, 6 of unknown sex) were reintroduced in six sites in northern Pennsylvania.

Today, fisher populations are well established and increasing throughout southwestern, central and northern regions of the state, and fisher have become established even in some rural and suburban habitats once thought unsuitable for this adaptive forest carnivore. As fisher populations have increased, the Game Commission has adopted a scientifically based and highly conservative management plan to ensure that the fisher will remain an important forest carnivore in Pennsylvania forests.





## Foxes



red fox

Red and gray foxes are small, agile carnivores belonging to the same family (*Canidae*) as the dog, coyote and wolf. Both red and gray foxes are found throughout Pennsylvania. They are intelligent predators with extremely sharp senses of sight, smell and hearing (a fox can hear a mouse squeal from about 150 feet).

### Biology

The red fox (*Vulpes vulpes*) is 22 to 25 inches in length, with an additional 14- to 16-inch tail, and weighs 8 to 12 pounds. The gray fox (*Urocyon cinereoargenteus*) is 21 to 29 inches in length, plus an 11- to 16-inch tail, and weighs 7 to 13 pounds. Foxes look like they are heavier than these weights, this is an impression created by their full, thick fur.

The red fox has long, reddish-orange fur slightly darkened on the back, black ears, legs and feet, and a long, bushy, white-tipped tail. The gray fox has a grizzled gray coat, somewhat coarser than the red's, with buff-colored underfur. The gray's tail also is long and bushy, with a black streak running down its length and a black tip.

Dramatic color variations might occur in individual reds, although these are rare and show up more often in the

species' northern range, especially in Canada. These color variations include: the "cross fox," with a dark stripe of hair extending from the head down the center of the back and transected by another dark stripe over the shoulders, thus forming a cross-like shape; and the "silver fox," simply a black individual with white-tipped guard hairs giving a frosted appearance. The red fox typically has a white tail tip, no matter the color phase or shade of red fur (which also varies slightly in individual animals).

Foxes are swift runners and can swim if they have to. Both reds and grays are mainly nocturnal. The gray can climb trees – it is the only member of the canid family with this ability.

Foxes are opportunists when it comes to feeding. This means they will eat whatever is most easily obtained. Foods include mice, rats, rabbits, woodchucks, opossums, porcupines, domestic cats, chickens, insects, squirrels, game birds, songbirds, bird eggs, fruits and grasses.

Foxes also are scavengers, feeding on road-killed animals and winter kills. Diets of both reds and grays are essentially the same, but different food preferences, behavior patterns and preferred habitat often result in different types and amounts

of food eaten. Both species cache uneaten food by burying it in loose earth.

Males are called “dog” foxes and females “vixens.” In late winter, foxes can be heard barking at night, making their presence known to members of the opposite sex. Breeding usually takes place in February.

Young are born following a 51-day gestation period for red foxes and a 63-day period for grays. Litters range from four to 10 young, with six the average. Young are born in dens. The red fox usually enlarges a woodchuck burrow or might den in a hollow log. The gray might also den beneath the ground or in crevices in rocky ledges. Underground dens for both species usually have several entrances.

Fox pups weigh about 8 ounces at birth, and their eyes are closed for the first eight to 10 days. They are nursed by the female in the den for around a month. When the pups emerge, both mother and father keep them supplied with solid food until they are completely weaned after two or three months.

They leave the den area in mid-July or August and might forage with their parents for another month until the family disbands. Foxes trapped in the fall are often young ones, on their own for the first time and establishing new territories. Both males and females are sexually mature at 10 months and might breed during their first winter.

Red foxes seldom seek shelter in holes or dens during winter, preferring to sleep in the open with their bushy, well-insulated tails curled over their noses to keep them warm. Gray foxes often hole up for three or four days at a time during severe weather.

Foxes may be afflicted with many parasites, including ticks, fleas, lice, mites, flukes and worms. Red foxes seem to be more susceptible to mange than gray foxes. Both species can contract rabies. Diseases and parasites strike foxes the hardest when they overpopulate an area. This is nature’s way of managing an excessive population.

Wildlife researchers have live-trapped foxes, tagged and released them. These studies have shown that foxes, especially young adults, are susceptible to many limiting factors, including trapping, hunting, highway mortality and coyote predation. A life span of 10 to 12 years is possible, however.

## Habitat

Red and gray foxes generally favor different types of habitat. The red prefers sparsely settled, rolling farm areas with wooded tracts, marshes and streams. The gray fox is more commonly found in brushy areas, swampy lands and rugged, mountainous terrain. But both species are very adaptable and can be found throughout the state, sometimes in areas not considered prime habitat.

Red foxes seem less bothered by people than are grays and often inhabit heavily populated areas, although they are rarely seen due to their nocturnal habits. There are countless stories of reds rearing young in suburban settings. Generally, if the area can provide food and shelter, foxes will consider it, especially since coyotes continue to push out, or displace, reds from their historic habitats.

Gray foxes are usually more aggressive than reds and where the ranges of the two overlap, the gray is typically the dominant species.

## Population

Fox populations are affected by availability of food, habitat suitability, coyote predation and hunting and trapping pressure. Pennsylvania studies have documented that some high-use agricultural areas – with little cover for either prey or predators – had only one fox per 300 acres, or 2.1 foxes per square mile. Wooded and less heavily farmed areas had one fox per 50 acres or 12.8 per square mile, a high concentration.

Fox populations can be measured by different methods, including counting droppings on the snow, den reconnaissance and tracking studies. The gray fox has much larger toe pads and a smaller foot than the red, so the two can often be distinguished by their tracks.

Movements in gray and red fox populations are basically of two types. The first is dispersal, or the movement of young in late summer or early fall. Dispersal spreads the population out, with each young fox moving several miles – occasionally 50 miles or more – to set up its own home territory. The second type of movement is displacement, which is caused by habitat changes and predation. There are also localized movements, the travels of individual within their home territory or range. From tracking studies, biologists estimate that a fox travels an average of 5 miles in search of food on a winter night.

Populations fluctuate and shift, often as a result of human activities such as logging, farming or development. Disease also plays a role. In areas where mange outbreaks occur, red-fox populations are often severely impacted. But foxes are very resilient. Both species seem to readily rebound from disease and other limiting factors, so long as the area they inhabit can provide food, escape cover and safe havens.

Foxes weathered decades upon decades of persecution through bounties in Pennsylvania. People were paid a fee for each fox they killed. Bounties were abolished in 1966 after it was determined the money used to pay them was better spent on habitat enhancements.

Foxes often are blamed for decreasing game populations. Most of the time the number of game birds and animals taken by foxes and other predators is insignificant compared to other natural losses. Habitat change is most often found to be the main contributor to lower small-game populations.

It's true that foxes take grouse, pheasants, rabbits and other game, but these are usually "surplus" individuals, those animals that would likely die from other causes – accidents, disease, starvation, etc. – before the next breeding season.

More and more people are accepting predators as valuable members of our natural world. Foxes are no exception. Their presence in Pennsylvania provides recreation and wildlife diversity, two important facets of any wildlife management program.



**gray fox**



red fox pups



## Mice and Voles

Mice and voles are small, unobtrusive creatures at the base of nature's food chain. Though rarely seen in multitude, in terms of biomass—the total mass of living matter in each area—they greatly outweigh the many predators that depend on them for food. This is because they are extremely prolific breeders, despite their short lifespans. Pennsylvania has two native species of mice, four voles, a bog lemming, two types of jumping mouse, and two imported European species. All are rodents, with two pairs of constantly growing, chisel-shaped incisor teeth, one pair on the upper jaw opposing another pair on the lower jaw.

Mice and voles mainly eat vegetation—nuts, seeds, fruits, leaves, and grasses. Most species collect and hoard foodstuffs to eat later and to subsist on throughout winter. Most are predators, in a small way, on insects and their larvae, as well as snails, slugs, spiders, and, in some cases, bird eggs and even other mammals. In turn, mice and voles are fodder for a vast assortment of creatures including snakes, shrews, weasels, raccoons, skunks, bobcats, foxes, coyotes, domestic dogs and cats, and even creatures as large as black bears. Many of the hawks and owls prey mainly on mice and voles, and the larger heron species take these rodents occasionally.

Mice and voles live in nearly every available habitat, from rocky slopes in forested mountains to low boggy meadows to urban streets and inside people's houses. Some move about on the surface of the ground, while others keep to thick vegetation, rock crevices, or tunnels. Most feed at night and remain active yearround. Only the two species of jumping mice hibernate in winter; during bitter cold, the other mice and voles become torpid and sleep for a time in their nests, which are round masses of leaves and grasses whose inside chambers are lined with soft plant matter. Some species are social in winter when small groups huddle together for warmth.



deer mouse

The gestation period for most mice and voles is around three weeks. Young are born without fur and with their eyes closed. The mother nurses them, and they grow rapidly; litters are weaned and on their own within a month, and the mother—who has already ovulated and bred again—gives birth within a few weeks. Young from early litters can reproduce during their first year. In one of the most prolific species, the meadow vole, a single female can potentially give birth to nine litters with a total of 72 offspring per year: it's not hard to see how quickly a population might explode were it not for constant attrition from predators, parasites, disease, and accidents such as fires and floods.

**Deer mouse** (*Peromyscus maniculatus*)—A small mouse with a huge range (the Northeast, Midwest, and the West from Alaska to Mexico), the deer mouse occurs statewide in Pennsylvania. It is six and a half to eight inches long, including the tail, which is three to four inches. A deer mouse weighs 0.4 to 1 ounce. For the first month of its life, an individual is colored gray; then it molts into its brownish gray adult pelt. In both juveniles and adults, the undersides are white. The deer mouse has large dark eyes well adapted to night vision.

Deer mice inhabit nearly every type of land habitat in Pennsylvania: farm fields, fencerows, grassy berms of roads, brushland, and deep woods, both dry and damp, pine, and hardwood. Some taxonomists recognize two forms of

*Peromyscus maniculatus*, the “woodland deer mouse” and “prairie deer mouse.” Deer mice eat seeds of many plants, cultivated grains, soybeans, corn, berries, buds, nuts, and mushrooms. They consume beetles, grasshoppers, crickets, caterpillars (including those of the gypsy moth), other invertebrates such as earthworms, centipedes, slugs, spiders, and even carrion.

Deer mice have sharp hearing and good eyesight. They locate most of their food by smell. They can swim if necessary and even run at nearly five miles per hour for short distances. The tail, covered with fur, acts as a tactile organ and a balancing aid; when climbing, a deer mouse wraps its tail around twigs or branches to gain steadiness.

The species weaves ball-shaped nests, six to eight inches in diameter, out of leaves, grasses, and other plants, lined with fur, feathers, and shredded plant matter. Deer mice nest in hollow logs, stumps, fenceposts, beneath rocks, in root channels underground, and rather frequently in abandoned squirrels’ and birds’ nests in trees up to 50 feet above ground. Deer mice rest in their nests during the day, and there they

rear their young. Nests at ground level may have a nearby burrow with a latrine area for waste and a chamber for storing food.

In winter, if snow covers the ground, deer mice spend most of their time beneath the white blanket, where the temperature is warmer than in the open air. Here, they eat stored food. In extreme cold, deer mice cut down on their activity, sometimes sleeping for several days, perhaps huddled in a communal nest with two to four other mice (some of which may be white-footed mice, a different, although closely related, species).

Deer mice breed from March to October. Females raise three or four litters per year, each with three to seven young. In one year, a single female can produce nearly 30 young, although few survive long enough to do so. Young mice, called pups, utter high-pitched squeaking sounds. Males do not help females raise the litters. Deer mice are preyed on by foxes, cats, short-tailed shrews, mink, weasels, hawks, owls, and snakes. Home ranges vary in size from 0.05 to 2.5 acres, with 3 to 36 mice per acre of habitat. Like most other small mammals, deer mice are very abundant in some years and rather scarce in others, depending on environmental conditions.

**White-footed Mouse** (*Peromyscus leucopus*)—Found statewide, this nocturnal mouse may be the most abundant rodent in Pennsylvania. It looks much like a deer mouse, except that its tail is shorter in relation to its body. The coat is reddish brown above, white on the belly and feet. Length is 6 to 7½ inches, including a 2½- to 3½-inch tail. Weight: 0.6 to 1 ounce.

White-footed mice live in shrubby areas, woods, cultivated fields, pastures, rhododendron thickets, fencerows, stream margins, ravines, revegetated strip mines, and in farm buildings and houses. Some authorities believe the white-footed mouse prefers a slightly drier habitat than the deer mouse. White-footed mice nest in stone walls and rock crevices, under old boards, and in woodchuck burrows, tree cavities, and the abandoned nests of squirrels and birds. Like deer mice, white-footed mice do not dig burrows but use the runways of other small mammals. They are very agile and can climb trees. Individual home ranges vary from 0.11 to 0.86 acres, with ranges being slightly larger for males. From 1 to 13 white-footed mice may inhabit one acre.

White-footed mice eat about a third of their body weight daily, or around 0.2 ounces: seeds, nuts, berries, fungi, green plant matter, insects (chiefly caterpillars and ground beetles), centipedes, snails, and even small birds and other mice. They cache food in autumn, carrying seeds in their cheek pouches to chambers beneath logs and stumps. They breed from March through October; the three or four annual litters have three to seven young apiece. Females can mate when two months old. Males sometimes help females rear the young.

**Meadow Vole** (*Microtus pennsylvanicus*)—The meadow vole is a stocky mouselike creature with a blunt head, beady eyes, and a short, scantily-furred tail. Its upper parts are a dull chestnut brown, with a darker area along the middle



**white-footed mouse**

## meadow vole



of the back, and its underparts are grayish or buffy white. The meadow vole is 6 to 7.6 inches long, including a 1.3- to 2.5-inch tail; weight is 0.7 to 2.3 ounces. The species, often called a “field mouse,” lives across northern North America and is the most common vole in the East. In Pennsylvania it is abundant statewide.

Meadow voles thrive in moist meadows and fields thick with grasses and sedges. They do not live in forests but may inhabit small clearings, bogs, and grassy openings in the woods. They are good swimmers and can run at five miles per hour. Meadow voles move about in low, thick grass and weeds that screen them from hawks and owls

Meadow voles eat grasses and sedges (cut stalks with seedheads are stored in small piles in the runways to be eaten later), tubers, roots, grains, and the inner bark of shrubs and trees; voles sometimes girdle small trees, killing them. Meadow voles are active all year, by night and by day, especially around dawn and dusk. Voles nest in shallow

burrows three to four inches underground or hidden in grass. During winter, voles huddle together in the nests or move about and feed in runways beneath the snow.

In breeding season, meadow voles vigorously defend individual territories of 0.1 to 0.8 acres, which fluctuate from larger in summer to smaller during peak population years—when up to 166 voles may live on a single acre. Usually, a high population crashes to a low level, then builds up again to another high. Females produce from eight to ten litters in a high population year and five or six litters in a year when food is scarce, with each litter averaging four to seven young. Among the myriad of predators that attend to the vole population are herons, crows, gulls, foxes, house cats, weasels, opossums, skunks, shrews, bears, bass, pickerel, and snakes. Many voles are snatched up by hawks and owls, particularly barn owls. Maximum longevity is around a year and a half in the wild.

**Southern Red-backed Vole (*Clethrionomys gapperi*)**—This rodent is 4.7 to 6.2 inches long, including a 1.2- to 2-inch tail, and weighs 0.6 to 1.3 ounces. A reddish band down the back and a pale gray belly distinguish the species, found in much of upland Pennsylvania. A woods dweller, the red-backed vole favors cool, damp forests with hemlocks, mossy rocks, stumps, and rotten logs. It also inhabits deciduous and mixed woodlands with mosses and ferns, rocky outcrops, stone walls, reverting fields, and grassy clearings. When traveling, it uses the burrows of moles and shrews and casts about beneath the fallen leaves. It also climbs into low trees. This species breeds from late March through November, nesting in cavities or appropriating abandoned nests of other species. It feeds on nuts, seeds, berries, green vegetation, roots, and fungi.

**Rock vole (*Microtus chrotorrhinus*)**—This species of New England and Canada inhabits a limited area of northeastern Pennsylvania. It closely resembles the more common meadow vole, except that the rock vole has a yellowish orange nose.

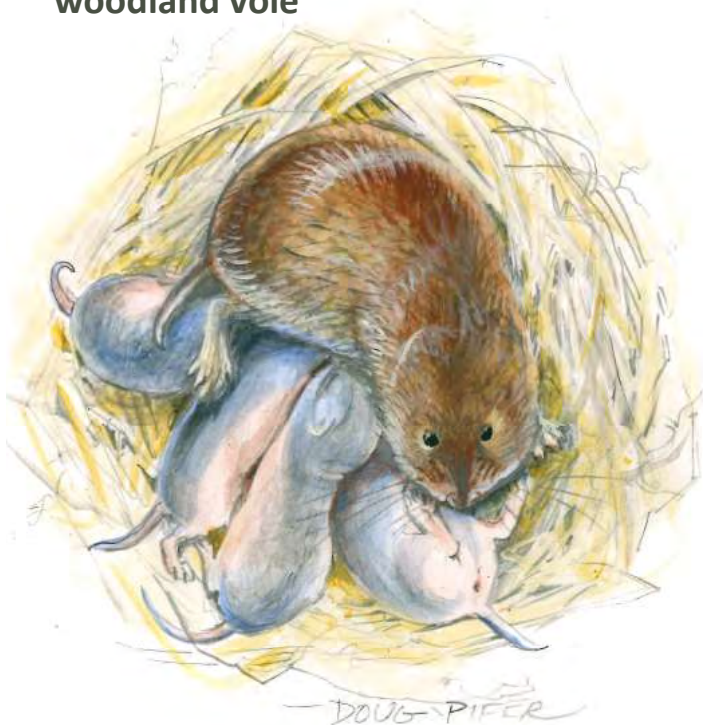


**southern  
red-backed vole**



rock vole

woodland vole



The rock vole inhabits forests. In Pennsylvania it lives in cool, damp woods of maple, yellow birch, and hemlock, among boulders and lush ground cover, mainly ferns. Foods include green plants, seeds, leaves, stems, fungi, and insect larvae. Weasels, foxes, timber rattlesnakes, and copperheads prey on rock voles. Females bear two or three litters of one to seven young each year. Considered rare in Pennsylvania, *Microtus chrotorrhinus* was classified as a “vulnerable” species by the Pennsylvania Biological Survey in 1985.

**Woodland Vole (*Microtus pinetorum*)**—Also called the pine vole, this species is found in the Midwest, the East, and New England. In Pennsylvania it is statewide, with the greatest numbers in the southeastern lowlands. *Microtus pinetorum* is Pennsylvania’s smallest vole: length, 4.3 to 5.5 inches; tail, 0.7 to 1 inch; weight, 0.9 to 1.3 ounces. Its soft, glossy fur is chestnut brown on the upper parts and gray on the belly. Preferred habitats include wooded bottomlands, hemlock and hardwood forests, old fields, thickets, fencerows, farmland edges, and orchards.

The woodland vole is a molelike species that burrows into the soil just below the leaf litter. It breaks up the dirt with its head, incisors, and forefeet, turns around, and shoves the dirt out the tunnel’s entry, forming a cone-shaped pile two or three inches high. Meadow voles, hairy-tailed moles, and shrews use the burrows of *Microtus pinetorum*. Woodland voles seldom leave their burrows, and an individual’s home range is small, around a hundred feet in diameter. Foods include roots, stems, leaves, seeds, fruits, and tree bark. In gardens, these voles eat potatoes and flower bulbs. Woodland voles kill fruit trees by girdling the bark or damaging the roots. They cache food in storage chambers as deep as 18 inches underground, and they rear their young in nests under rocks, logs, and stumps. Woodland voles breed less prolifically than other voles, bearing one to four litters per year, each with one to five young.

**Southern Bog Lemming (*Synaptomys cooperi*)**—The southern bog lemming looks much like the meadow vole, with chestnut brown upper parts and silver-gray sides and belly. Length is 4.5 to 5.7 inches, including a tail of 0.6 to 1 inch; weight is 0.9 to 1.6 ounces. The species is found in scattered pockets across Pennsylvania, mainly in old fields grown up with poverty grass, timothy, broom sedge, hawthorns, crab apples, and locust. Bog lemmings live beneath matted dead grass in surface runways created by their cutting of, and feeding on, low-growing plants. They eat stems and seeds of grasses and sedges, along with berries, fungi, and mosses. The species breeds from early spring to late autumn, with three to five young per litter and several litters each year. Southern bog lemmings often share a habitat with red-backed voles, meadow voles, white-footed mice, and deer mice.

**Meadow Jumping Mouse (*Zapus hudsonius*)**—The meadow jumping mouse has big feet, long hind legs, and a skinny, tapering, sparsely furred tail that is longer than the head and body combined. Length is eight to nine inches, including a five- to six-inch tail; weight is around 0.6 ounces. Found in the East, Midwest, Canada, and Alaska, *Zapus hudsonius* is

statewide in Pennsylvania. The fur is yellowish brown, with a dark stripe on the back, and orangish sides; the belly and feet are white.

Meadow jumping mice inhabit moist grassy and brushy fields, thick vegetation, and woodland edges. The home range is usually less than an acre. The name “jumping mouse” is something of a misnomer, as these animals do not normally travel by jumping, rather, they prefer taking short hops of a foot or two. Active at night, they eat seeds, grasses, berries, nuts, roots, fungi, earthworms, insects, spiders, and slugs.

The species breeds from May to October, with two litters of three to six young born yearly, in nests beneath boards, in hollow logs, and in grass tussocks. *Zapus hudsonius* hibernates in winter; after adding up to 0.2 ounces of body fat (a third of its body weight). In October or November, the meadow jumping mouse retires to a nest about 18 inches below the ground. The creature curls into a tight ball, buries its nose in its belly, coils its tail around itself, and sleeps. Its breathing lags, its temperature falls to a few degrees above freezing,

and its heart rate slows to a few beats per minute. After six months’ suspended animation, the meadow jumping mouse emerges in late April or early May.

**Woodland Jumping Mouse (*Napaeozapus insignis*)**—Found in the Northeast, New England, and Canada, the woodland jumping mouse lives throughout Pennsylvania except for the southeastern lowlands. It is 8.4 to 9.8 inches long, including a 5½-inch tail. It has a bright yellowish-brown back and sides and a white belly; the tail is tipped with a prominent white tuft. *Napaeozapus insignis* prefers cool, moist hemlock forests in the mountains; it lives near streams, rarely in open fields or meadows, occasionally in dry oak and maple woods.

Woodland jumping mice eat seeds, berries, nuts, green plants, fungi (particularly subterranean fungi of genus *Endogone*), insects, worms, and millipedes. An individual home range is 1.2 to 8 acres. Although mainly nocturnal, woodland jumping mice venture out on cloudy days. They use burrows and trails made by moles and shrews. Normally they travel on all four feet, but for greater speed they hop with their long hind legs and can leap up to ten feet. They evade predators by taking several bounds, then stopping suddenly under cover. Screech owls, weasels, skunks, minks, bobcats, and snakes prey on woodland jumping mice. Like its cousin the meadow jumping mouse, the woodland species hibernates from October to late April or early May (about half the year) in an underground nest, singly or in pairs. Females bear three to six young in late June or early July; a second litter may be born in August.

meadow jumping mouse



woodland jumping mouse



## house mouse



**Norway Rat (*Rattus norvegicus*)**—The Norway rat is 12 to 18 inches in length, including a naked, scaly six to nine-inch tail. Weights range from ten ounces to more than a pound. This rodent's fur is thin, coarse, reddish to grayish brown above and paler below. The species arrived from Europe aboard ships around 1775. Today it is found statewide, and it ranges across North America and Central America.

Norway rats have poor vision, but their senses of smell, taste, hearing, and touch are well developed. Extremely adaptable, they live in and under barns and farm buildings, in city sewers and dumps, along streams and rivers, and in marshes and open fields. They dig burrows about three feet long with several escape holes lightly plugged with weeds or dirt and hidden in grass or under rubbish. *Rattus norvegicus* lives in colonies composed of several family groups that share feeding and nesting areas. Although they're mainly nocturnal, rats also move about and feed during the day. Rats eat anything they can find or subdue, including fish, eggs, vegetables,

grain, fruits, nuts, garden crops, carrion, and garbage. They kill poultry, snakes, young rats from neighboring colonies, and wild birds. In local areas, rats may suppress or wipe out native birds and mammals, especially ground-nesting birds. In turn, rats are preyed on by dogs, cats, minks, snakes, and large hawks and owls.

Norway rats breed throughout the year, with peak activity in spring and autumn; a female may bear six to eight litters per year, with an average of six to nine young per litter. Rats carry many diseases, including rabies, tularemia, typhus, and bubonic plague. Another introduced Old World rat, the black rat (*Rattus rattus*) is found in small numbers in southeastern Pennsylvania.

**House Mouse (*Mus musculus*)**—Like Norway and black rats, the house mouse is an Old World species inadvertently brought to North America by European settlers. It inhabits Pennsylvania statewide, living in and near houses and on farms. Six to eight inches long, it has a three-inch, scaly, nearly hairless tail; its weight is one half to one ounce. House mice come in various shades of gray. Omnivorous, they eat everything from grain and seeds (their preferred foods) to paper, glue, and household soap. *Mus musculus* is agile and quick, able to run at eight miles per hour. An adult female produces five to eight litters annually, each with an average of five to seven young. The species is active the year around.



## Mink

One of Pennsylvania's most efficient predators, mink (*Mustela vison*) are semi-aquatic members of the weasel family (*Mustelidae*). Other mustelids include weasels, martens, fishers, wolverines, badgers, skunks and otters. Mink are found throughout most of the northern hemisphere in both Europe and North America. They live on the edges of lakes, streams and rivers. Adult males average two feet in length, including an 8-inch tail. They weigh 1½ to two pounds. Females are 10 to 15 percent smaller than males and up to half a pound lighter. Body configuration resembles that of a weasel: short legs; long, bushy tail; long, sinuous neck and body; short head; and pointed muzzle. A mink's coat is thick, full and soft. A short, tight layer of underfur is covered with longer guard hairs,

which give the pelt its luster. Colors range from russet to a deep, chocolate brown. Unlike some weasels, the mink does not turn white in winter.

Mink have excellent hearing and sight, and a good sense of smell. They rely on sight when foraging. A mink's vision is clearer out of water than underwater. Acute hearing is also used to detect prey when foraging. Mink are able to hear ultrasonic vocalizations emitted by rodent prey. On land, they travel at a slow, arch-backed walk or a bounding lope, which they can keep up for miles. They swim and dive with ease; a webbing of stiff hairs between the toes of their hind feet helps propel them through water. Mink are most active at night and early morning, although they sometimes venture out during the day.

Active year-round, mink may curl up and sleep for several days during winter cold spells. Like most mustelids, they are agile and fierce fighters, killing prey with a hard bite to the back of the skull. Mice, voles and muskrats rank as most important foods of mink during all seasons. Other prey include rabbits, shrews, fish, frogs, crayfish, insects, snakes, waterfowl and other birds, eggs, domestic poultry, earthworms and snails. Generally, a mink is an opportunist, feeding on whatever is most easily caught or found. Thus, it might avoid fighting to kill a healthy adult muskrat if crayfish were abundant and easily captured. Mink occasionally kill more than they can eat. In winter, they cache carcasses and revisit them to feed.

Mink den in abandoned woodchuck tunnels, hollow logs, vacant muskrat lodges, holes in stone piles and beneath large tree roots. Dens are usually near water and may have more than one entrance. Mink line their nests with dried grass, leaves and feathers; bones and scraps of kills often litter the nest area.

Mink are basically solitary, except during mating season, when they use a powerful scent from their anal glands to attract mates. Males fight over receptive females and are believed to mate with several females. Mating occurs from February to April, with most activity in March. After mating, the fertilized eggs develop slightly, then 13 to 50 days may pass before the embryos attach to the female's uterine wall and continue developing. This is called delayed implantation and is common among mustelids. Females

30 days after embryo implantation. Thus, total time from mating to birth may be 40 to 80 days.

At birth, young are 3½ inches in length, blind and hairless, and they weigh only a fifth of an ounce. Litters include two to seven young, with an average of four. In two weeks, young are furred; their eyes open after five weeks; and after six or seven weeks they are out foraging with their mother and learning how to hunt. The family disperses by late summer. Mink are sexually mature at 10 months.

Mink are best suited for areas that hold the greatest concentrations and varieties of prey. A male covers a range up to three miles in diameter, while a female's range is much less. Individual home ranges overlap. There is very weak evidence that mink are territorial. The same den may be used by several animals in succession. One mink may have several dens along its hunting route.

Mink are extremely sensitive to environmental pollutants. At the top of the food chain in aquatic environments, they accumulate many chemical compounds and heavy metals in their tissue including polychlorinated biphenyls and mercury. Mink are often used as bioindicators of pollution in aquatic systems.

Mink live up to 10 years in captivity, and a wild one would be fortunate to survive two or three winters. Disease, road accidents, and regulated harvest are mortality factors. Mink are preyed on by foxes, bobcats and great horned owls.





## Muskrat

Why the name “muskrat?”

“Musk” refers to a strong smelling substance released from the animal’s perineal glands. “Rat” describes its rat-like appearance.

### Biology

The muskrat (*Ondatra zibethicus*) is a rodent related not only to rats, but also to mice, voles, and beavers. The nation’s most abundant furbearer, the muskrat lives on or near the still or slow-moving water of ponds, marshes, streams, and rivers and, to a lesser extent, faster streams. The species is found throughout most of North America north of the Rio Grande, including the coastal tidal marshes. Muskrats are common in Pennsylvania, though not nearly as abundant as they used to be.

Adult muskrats are 22 to 25 inches in length, including the tail. They weigh 2 to 3 pounds; have a stout body; short legs; and an 8- to 12-inch tail that is flattened vertically, scaly, and practically hairless. Ears and eyes are small and well developed. In appearance, muskrats resemble small beavers with long, rat-like tails.

The tail functions as a prop when the animal stands on its hind feet, and as a rudder and propulsion-aid when it swims. The muskrat’s large, broad, partially-webbed hind feet power it through water. Its forefeet are small and agile, with well-developed claws for burrowing.

To insulate against cold water, a muskrat’s underfur is dense, silky, and soft, overlain with long, dark brown guard hairs shading to gray-brown on the throat and belly. Overall pelt color can be chestnut brown to almost black, or any color in between.

Muskrats feed on roots and stems of aquatic plants. The cattail is often an important item, as are bullrushes, water lilies, pickerelweed, and others. When they grow near water,



legumes, grasses, grains, garden crops, and fruits also are consumed. Muskrats eat a small amount of animal protein, including crayfish, freshwater mussels, fish, and frogs (often as carrion) and even carcasses of other muskrats. They don’t hibernate; during winter they subsist on roots and shoots dug from marsh bottoms and the twigs, buds, and bark of various trees, including willows, cottonwoods, ash, and box elders.

### Habitat

Muskrats build houses called lodges or huts, or burrow into stream banks, earthen dikes, and dams, often causing considerable damage. Both houses and burrows have underwater entrances and above-water living quarters. Houses are built of cattail stalks or other vegetation, chinked with mud and weeds above the waterline. They may be 8 to 10 feet across and 2 to 3 feet above water, with a single living chamber plus offshoots, or several chambers. Muskrats do not dam streams.

### Population

Muskrats have a high reproductive potential, giving birth to large litters and breeding from spring to fall. In breeding season, muskrats leave musk, or scent, in likely places

around their territories to attract potential mates. Males may impregnate several females, and play no part in raising young. Mature females have two, three, or even four litters each year, depending on the length of the warm season. Muskrats in southern Pennsylvania often have more litters than those further north. After a 30-day gestation period, the female bears five to eight naked, blind, and helpless young. In a month they are weaned and fully furred, and the female drives them off, especially if she is about to bear another litter. A female may overwinter with her final litter of the year, breaking up the family in the spring. Young disperse along streams or colonize new sections of marsh.

Muskrats are sexually mature the year following their birth, though few survive long enough to breed. Young muskrats and dispersing immatures are especially vulnerable to minks, hawks, owls, foxes, snapping turtles, and snakes. Often, there are too many individuals for optimal habitat to support in good health through winter and animals occupying less-optimal habitat are often lost to predators, taken by trappers, or forced to move to new areas.

Some prey populations may limit their own numbers by failing to breed in crowded conditions, or by aggressively defending a territory in overpopulated areas.

Minks seldom have much effect on local muskrat populations. Only if the habitat should change, such as a drought that dries up the marsh, would formerly-secure muskrats be vulnerable to minks. Muskrats are tenacious fighters. Minks prefer to tackle young or sick muskrats, because a mature adult puts up a brisk defense. Females defending young will drive off attacking minks.

A bad winter, an outbreak of tularemia or Tyzzer's disease, or a flood during the height of breeding season might also cut muskrat numbers. Muskrats are parasitized by mites, fleas, flatworms, roundworms, and tapeworms. While the average lifespan is less than 12 months, some individuals may live five or six years. Population size can vary widely from year to year, and tends to peak about every 10 years.

Through their feeding, muskrats open up areas of densely vegetated marsh; this can change local habitats to benefit waterfowl and other aquatic wildlife. Muskrats also damage agricultural and ornamental crops near water and their tunnels riddle dams, dikes, and canal banks. This is a serious problem for which trapping is the most effective and least expensive solution.





## Opossum

The opossum, *Didelphis virginiana*, is the only marsupial in North America. Marsupials are born before they are well developed, compared to other mammals, and continue their growth and development in a pouch on their mother's abdomen. Most members of the order Marsupialia are native to Australia and South America. Structurally, they have changed little for millions of years. The opossum's relatives date back to the Cretaceous Period, 90 million years ago. However, the opossum didn't appear in North America until the Pleistocene Epoch, less than a million years ago.

"Opossum" is derived from the Algonquin Indian word *apasum*, meaning "white animal." A creature without specialized body structure or food preference, the opossum thrives in many settings. It is found throughout Pennsylvania, where it is classified as a furbearer.

### Biology

Mature opossums are 24 to 40 inches long, including a 10- to 12-inch tail. They weigh 4 to 12 pounds. Males are larger and heavier than females. The average adult is about the size of a large house cat.

An opossum has a long, pointed snout with 50 teeth — the most of any North American mammal. They have small, dark eyes and rounded, bare ears. The tapering tail is naked and scaly. Their feet have five toes, each with a claw, except the first toe of each hind foot, which is long and capable of grasping, like a thumb.

Their long, coarse body fur is light gray. Outer hairs may be tipped yellow-brown. Legs and feet are dark brown or black. Males and females are colored alike, although fur and skin color may vary in different geographic areas.

Opossums walk with an ungainly shuffle, averaging 0.7 miles per hour. Their running speed is a little more than 4 miles per hour. Excellent climbers, they ascend hand-over-hand, using their prehensile tails for gripping and balancing. They are good, but slow, swimmers.

An opossum's brain is relatively small and of primitive structure. Senses of smell and touch are well-developed, but hearing is not especially keen and eyesight is weak. When walking, an opossum sniffs the air and occasionally stops and



stands on its hind feet to look around. Although normally silent, it may growl, hiss or click its teeth when annoyed.

If an opossum is threatened and cannot climb a tree or hide in rocks or brush, it may crouch and defend itself, or, if struck, may feign death.

When feigning death, also called "playing possum," an individual lies limp and motionless, usually on its side. Its eyes and mouth remain open, its tongue protrudes, its forefeet clench, and its breathing becomes shallow. This state may last from a few minutes to several hours. Feigning may help an opossum survive an attack, because some predators ignore dead prey. Opossums also exude a musky odor that may repel some enemies. Wildlife biologists have yet to determine whether feigning death is deliberate or an involuntarily response, but the behavior is thought to have been maintained because it increases survival.

Opossums are omnivorous and opportunistic — they eat whatever they can find. Animal food includes terrestrial and aquatic invertebrates (mainly insects), lizards, snakes, toads,

the young of small mammals, bird eggs and young birds. Plant foods include berries (grapes, pokeberries, blackberries, etc.), mushrooms, acorns, and cultivated plants. Opossums eat more animal than plant food. They consume garbage and carrion, including animals killed on highways. Sometimes opossums forage by day, but they are mostly nocturnal. They shelter in hollow logs, woodchuck burrows, rock crevices, tree cavities, the abandoned leaf nests of squirrels and beneath porches and old buildings. They seldom spend two successive nights in the same den. Opossums do not dig their burrows, but they will occupy abandoned burrows.

Opossums are solitary. Females and unweaned offspring stay together. The sexes come in contact during breeding season in late February and March in Pennsylvania and then after mating, the female drives off the male. The male plays no part in raising young.

The opossum's gestation is short — 12 or 13 days. Newborn young are hairless, pink-skinned, blind and scarcely past the embryonic stage. They are about one-half inch in length and weigh 0.005 ounces. Hind limbs are rudimentary, but the front limbs and feet are well-developed and equipped with claws. The young crawl upward, with overhand strokes as if swimming, through the mother's fur to a pouch in the skin of her belly.

Litters vary from 5 to 13 young. The average litter size is 8, although as many as 21 have been reported. The pouch is lined with fur and contains mammary glands. When a young opossum attaches and begins to nurse, the nipple enlarges, forming a bulb on the end which swells in the baby's mouth and helps it stay attached. The female usually has 13 mammary glands, so offspring in excess of this number die. The mother can close her pouch to keep the young from falling out.



Young grow rapidly, increasing their weight 10 times and doubling their length in 7 to 10 days. By seven weeks, they are 2¾ inches long. After eight to nine weeks, their eyes open, and they let go of the mammary glands for the first time. They begin leaving the pouch for short periods, riding atop their mother's back, gripping her fur with their claws.

When they are three to four months old, young opossums begin to look for their own food and care for themselves. Soon they stop nursing, but they may stay with the female a few weeks longer. Six to nine young usually survive to fend for themselves.

Females may bear a second litter, breeding again from mid-May to early July. At least two weeks pass between weaning of the first litter and birth of the second, as the female is not sexually receptive while still nursing. Females can breed when they are a year old.

In fall and winter, opossums devote almost twice as much time to feeding and improving their nests as they do the rest of the year. Opossums do not hibernate, but may den up during cold or snowy periods. Although they add a layer of fat, they do not grow a winter pelt, and their fur is poor insulation. Pennsylvania is near the species' northern limit, and many opossums lose the tips of their ears and tails to frostbite.

Ticks, fleas, cestodes and nematodes parasitize opossums. The species is preyed on by foxes, bobcats, hawks and owls.

Trappers also take some opossums. Many opossums are killed by vehicles while feeding on other highway-killed animals. An opossum's life expectancy in the wild is about 1½ years, with a few reaching age 5.

## Population

The opossum is common in wooded areas throughout Pennsylvania. On a continental scale, it ranges from southeastern Canada south through New England to Florida, west to Minnesota, Nebraska and Texas, and south to middle America. It has been introduced in several western states.

Opossums are considered a generalist species that can utilize a wide variety of foods and habitats. The species has expanded its range north and west during the past century. Their population is stable.

## Habitat

Opossums are at home in farmland and woodlots, reverting fields, brushy woods, open woods, in dry or wet terrain and at varying elevations. They inhabit suburbs and the edges of towns where food and cover are available. Ideal habitat is bottomland woods surrounding streams.

An opossum's range depends on food availability and the individual's tendency to wander. In one study, biologists found that opossums had followed waterways and expanded their range in an elongated pattern instead of the circular pattern of most other land-based wildlife.

The average home range was 0.6 miles, the study determined. Where food is plentiful, an opossum may range only a few hundred yards. In intensely cultivated areas, where fencerows, rocky field corners and reverting fields have been cleared for crops, an opossum would have to range farther (up to two miles) to find food.

Habitat management aimed at helping other wildlife often benefits opossums. Forest thinning and edge planting stimulates the growth of low, food-producing plants (blackberries, wild grapes, etc.) and creates thick cover for escape or daytime loafing. When managing a woodlot, sparing old wolf trees (wide-spreading trees with little timber value) preserves the hollow limbs used by opossums. Well-managed game habitat, such as a state game lands, provides many wildlife species ample food and cover.





## Porcupine

The porcupine is a blackish, quill-armed, slow-moving rodent with an appetite for tree bark and salt. It lives in forests and often can be seen hunched into what appears to be a black ball high in a tree. While it does not occur in all parts of Pennsylvania, the porcupine is one of Pennsylvania's best-known and most easily identified wild animals.

Its taxonomic name is *Erethizon dorsatum*. The word "porcupine" comes from two Latin words, *porcus* ("swine") and *spina* ("thorn"), which also reflects the species' colloquial name, quill pig. In the East, porcupines inhabit Canada and New England south into Pennsylvania; they range through the northern Midwest and the Pacific Northwest, south in the forested Rocky Mountains nearly to Mexico, and north to Alaska. They live at all elevations from sea level to timberline.

### Biology

Adult porcupines are about 30 inches in length, including a 6- to 10-inch tail. They weigh 9 to 15 pounds, with bigger, older adults weighing up to 20 pounds. Males are larger than females. The porcupine is North America's second largest rodent; only the beaver is bigger. Porcupines have four incisors—two above and two below that are bright orange, strong and adapted to gnawing.

Short-legged and stout, a porcupine has a pronounced arch to its back. Its skull is heavily constructed; the small, rounded head has a blunt muzzle, ears almost hidden in fur, and dull black eyes. The front and back feet bear long, curved claws, and the soles of the hind limbs are thick-skinned and callused. The tail is short and club-shaped.

Porcupines vary in color from salty-black to brownish-black, sprinkled on the sides and belly with yellow- or white-tipped hairs. The summer sun bleaches the guard hairs of some, giving them a grizzled appearance. Albinism sometimes occurs.

The most distinctive aspect of a porcupine's appearance is its coat of quills. Quills cover the animal's upper parts and sides from the crown of its head to the tip of its tail. They're 1 to 4 inches long (those on the animal's back are longest), yellow or



white tipped with black, and lined with a foam-like material composed of many tiny air cells. An individual may have up to 30,000 quills.

When a porcupine is relaxed, the quills lie smoothly along its body, but when it feels threatened, muscle contractions cause the shafts to rise. In reality, quills are specialized hairs. The rest of the pelt consists of long, stiff guard hairs and soft, woolly underfur. Two molts occur each year: in spring, short hairs replace winter underfur; and in fall, the long, insulating underfur grows back. At all times, quills are present and are replaced as they fall out.

When threatened, a porcupine will first try to escape to safety in a tree or den. Failing this, it puts its head under some object or simply tucks it in close to its chest, erects its quills, turns its back to the enemy and, if approached, flails with its muscular tail. It may back toward an adversary, chattering its teeth.

Porcupines cannot throw their quills, but because the quills are loosely attached, they dislodge easily on contact and stick in a victim's flesh. A single quill has a needle-shaped tip covered with hundreds of minute, overlapping, diamond-shaped scales. The scales slant backward and act as barbs. When a quill lodges in tissue, actions of the victim's muscle fibers engage the tips of the scales, drawing the quill or quill fragment inward up to an inch a day. A wild animal badly impaled in the body will suffer intensely; quills may pierce its heart, arteries, or lungs and cause death, or they may sever the optic nerves and cause blindness. The best treatment for embedded quills is to pull the quills as quickly as possible, before they penetrate deeper into the flesh. Infections rarely occur from quills if they are quickly removed.

Slow and clumsy on the ground, porcupines are more at home in trees. They scale trees by digging in with their sharp claws, pressing the rough, leathery soles of their feet against the bark, and bracing with their sturdy tails. They descend tail first.

On the ground, a porcupine can muster a top speed of about 2 mph over short distances. It waddles along in plantigrade fashion on the soles of its feet with its heels touching the ground. Sensitive facial whiskers help it maneuver through thick underbrush.

A porcupine can see moving objects only at short range and is almost blind to stationary objects. Its hearing is probably inferior to that of most other mammals, but it has a keen sense of smell. A porcupine can swim, its air-filled quills helping to keep it afloat.

Porcupines are very dependent on trees for food and cover, and therefore rarely are found far from woody vegetation. Most of their feeding and movement on the ground occurs at night or at dawn or dusk. Porcupines are vegetarians. During the summer, they usually spend their days asleep in large deciduous trees. The porcupine's diet is most varied in the summer when it eats a variety of herbaceous vegetation including grasses, sedges, and the flowers, leaves, twigs, roots, buds, catkins and seeds of many other plants. In winter, much of their diet consists of needles, twigs and small limbs of evergreens, especially hemlocks. They also eat the inner bark of trees: hemlock, spruce, white and pitch pine, basswood, sugar and striped maple, beech, birch, aspen, ash, cherry, apple and other species. As a porcupine strips a tree of bark or foliage, small branches frequently fall to the ground. These trimmings play a minor role in providing food for other animals during winter. In wild areas, porcupines gnaw on shed deer antlers. Closer to civilization, their chewing damages wooden buildings, telephone poles and ornamental trees.

The porcupine's feeding and gnawing habits can leave negative impressions. Winter feeding on the inner bark of trees can result in timber losses, usually confined to specific areas such as stands adjacent to large denning populations or where porcupines invade young even-age conifers. Winter denning concentrations often occur in rocky and steep terrain where site conditions and access for logging are poor; therefore, trees killed in such areas are relatively unimportant to timber production. Porcupines occasionally cause damage in sugar maple stands, apple orchards, and cultivated crops. If a porcupine chews off an isolated section on a tree's trunk, the bark will, in time, close over the wound. If a porcupine girdles the trunk, however, the tree will die. Trees with upper branches freshly "barked" (the newly exposed wood shows light against the bark) show that a porcupine is in the area. Beech trees are often damaged only at their bases, perhaps because individuals have a hard time climbing this smooth-barked species. Although porcupines kill a few trees by girdling, most authorities agree the damage they cause over large areas is generally insignificant. Damage also occurs when porcupines gnaw on buildings, tool handles, signs, and tubing



for collecting sugar maple sap. These types of damage are localized and specific measures can be taken to eliminate or reduce the problem.

Porcupines may have a seasonal craving for sodium that peaks in May and June. In sodium-depleted environments, porcupines seek salt sources such as road salt. Materials such as plywood and rubber are often attacked because they contain sodium ions derived from the manufacturing process. Salt craving behavior in females is often the result of hormone changes during pregnancy and lactation. Where manmade sources cannot be found, porcupines rely on natural sources of sodium such as aquatic vegetation and carrion.

Porcupines grunt, groan, shriek, bark and whine; their calls may carry up to a quarter-mile. In breeding season, they are especially vocal.

Breeding takes place in September, October and into November, after a courtship that often lasts several days. Courting porcupines rub noses, chatter their teeth, walk on their hind feet or perform stylized, weaving body movements. Males are polygamous and play no part in rearing young. In females, estrus (the period when they are sexually receptive) repeats every 30 days until mating occurs or the breeding season ends.

Unlike most rodents, porcupines are not prolific reproducers. Wildlife biologists have estimated that up to half of all adult females go unmated each year. Females that do become impregnated almost always produce just one offspring. The survival rate of young porcupines is high. After a gestation period of 205 to 217 days, the female gives birth in April, May or June. Birth may occur in a ground den, although the female does not generally select a particular site.

The young porcupine is called a “pup” or “porcupette.” As might be expected after such a long gestation, it is precocial—it weighs about a pound, its eyes are open and it is about 10 inches long and fully furred. The quills are soft and hairlike, about a quarter-inch long, but they become hard and functional as they dry. Pups are able to climb trees and eat solid food within a few days. They nurse for about 50 days.

After weaning, pups receive little attention from their mothers. Females and young separate for good after about six months. Young are sexually mature at 15 to 16 months and breed in their second autumn.

Porcupines den in caves, rock crevices, hollow logs and trees, deserted fox dens, brushpiles and abandoned buildings. They have a habit of defecating at their den’s entrance, and the resulting pile of droppings is a good indicator of the animal’s presence.

In winter, porcupines take to their dens for protection from snow, wind and predators. Several individuals may use the same den site, together or at different times. An individual generally becomes resident at a den in November and uses it off and on until May. During winter, a porcupine may spend its days asleep in the den or in the top of a conifer in which it has been feeding. They do not hibernate.

Winter dens are rarely used in summer. During the warm months, a porcupine may choose a large deciduous tree—often an oak—as a daytime rest site. Porcupines are solitary in summer.

In Pennsylvania, porcupines are preyed upon by fishers, and to a lesser extent, foxes, coyotes, bobcats, dogs and owls. The fisher, reintroduced in Pennsylvania in the mid-1990s, will kill porcupines with repeated bites to the face and head. Porcupines try to defend themselves, and are relatively invulnerable to fishers, when they can put their face in a den or other protected area. They are more likely to be killed when fishers find them in open areas or other situations where they can get at the porcupine’s face. Battles between fishers and porcupines may last for up to an hour before the fisher has created sufficient wounds to incapacitate and kill its prey. Also, coyotes have been known to work in pairs to maneuver a porcupine onto its back.

Porcupines have a 10 to 12-year life expectancy in the wild. Mortality factors include predation (primarily by man or fishers), highway accidents and disease. Porcupines are parasitized by lice, ticks and mites, some are afflicted with mange, and many have tapeworms and other internal parasites.

## Population

In Pennsylvania, most porcupines live in areas of extensive forests. They inhabit the rugged mountains of northcentral Pennsylvania, the timbered land in the northwest and northeast corners, and the wooded sections of the ridge-and-valley region. Fewer porcupines live in the southwestern or southeastern parts of the state.

Porcupines seem to be holding their own. The species thrives in a variety of forest, terrain and climate types across the continent and has few enemies in the wild.

## Habitat

Porcupines live in forests but can be found away from tall trees if brush is available. They do well in mixed hardwood and conifer woodlands with suitable den sites, which include rock crevices, caves, and hollow trees. They live in wooded valleys as well as on the mountaintops.

The winter range of a porcupine is usually less than 20 acres and includes its den, coniferous feeding areas (primarily hemlocks), and the travel lanes linking them. A single animal may spend several months feeding on only one or two trees and using the land between them and its den. Summer ranges are larger, between 15 and 65 acres, with an average of 45 acres in deciduous woods. The summer ranges may be a half-mile or farther from the winter ranges, as den sites and conifers are not important components of summer territories. In summer, porcupines favor deciduous forests, especially areas with high concentrations of oaks.



## Raccoon

The raccoon is a medium-sized woods mammal with the scientific name *Procyon lotor*. *Procyon* means “before dog,” *lotor* refers to the species’ habit of dunking food in water before consumption. The common names “raccoon” and “coon” are anglicized versions of the Native American word “arocoun.” It’s fitting that the common names evolved from a Native American word, as the raccoon is strictly a New World animal found in North America and Central America.

As with many wildlife species, humans view the raccoon with mixed emotions. While an individual raccoon may be destructive, damaging crops and gardens and raiding nests of game and domestic birds, they are valuable in many ways, too: a prime pelt is prized on the fur market, and hunting raccoons with hounds is a traditional, exciting, unique sport. But in the end, the true value of any life form cannot be measured by human terms. Raccoons have worth simply because they are one of the many fascinating and interlocking segments of nature.

### Biology

Raccoons range in length from 28 to 38 inches, which includes a 10-inch tail, and weigh 10 to 30 pounds. Males are generally larger and heavier than females. Records exist of raccoons weighing up to 40 pounds. However, individuals this heavy are extremely rare in the wild.

A raccoon’s fur is long, soft and colored a grizzled black-brown. The bushy tail is marked with alternating rings of light and dark fur. Broad cheeks, a long slender muzzle, erect rounded ears and a black strip or mask across the cheeks



and eyes give the raccoon a masked bandit-like appearance. Albinism (a lack of pigment which produces a white individual with pink eyes) and melanism (which produces a totally black animal) occur infrequently. The fur on raccoon feet is light gray in color, and the soles of the paws are hairless. Raccoons shed in April, producing coats with thinner, lighter guard hairs than their winter coats, which begin filling in during autumn. Usually by late November the winter coat has replaced the shorter summer fur. At that time the hairs reach their maximum length and density.

Raccoons are found throughout Pennsylvania, often near water—lakes, streams, rivers, but also on ridges and in suburban areas. They adapt well to people and human activities. Some raccoons live in cities, where they den in storm drains and attics and raid garbage cans and pet dishes.

Raccoons are omnivorous. They eat a wide variety of food, both vegetable and animal matter, including wild cherries and grapes, raspberries, blackberries, persimmons, apples, beechnuts, acorns, melons, corn, grass, leaves, earthworms, crickets, grasshoppers, beetles, grubs, fish, frogs, crayfish, mice, carrion and eggs.

Raccoons have excellent senses of hearing, sight and smell. They also possess an acute sense of touch in their forefeet, enabling them to catch fish and other small, quick prey. Long, sharp claws anchor slippery food items.

Myths have led people to believe that raccoons wash their food before they eat it because they do not have salivary glands. This washing behavior has nothing to do with cleanliness or moistening of food. Research has shown that this food-dousing behavior only occurs in raccoons raised in captivity. In the wild, raccoons do not exhibit food-washing behavior, but search for aquatic prey by dabbling and feeling along the stream or pond bottom. Their paws contain highly developed nerves, and the water actually makes their paws more sensitive. Dabbling behavior in water is a fixed motor pattern in raccoons. Since only captive raccoons exhibit food-dousing behavior, scientists believe that washing food is simply a substitute for normal dabbling behavior, which has no other outlet in captivity. Raccoons have well-developed salivary glands and have no need to wet their food before eating it.

Raccoons are adept climbers, and, being nocturnal, they spend most of their daylight hours in trees. On warm, bright days they like to sun themselves while lying flat on horizontal limbs, in squirrel leaf nests or curled up in the crotches of trees. At night, they descend in search of food. They travel, feed and hunt almost exclusively on the ground. Most raccoons have central home dens as well as others scattered about their feeding ranges. Adult home ranges are about a mile in diameter, greater when food is scarce. An ideal den or nesting site is a hollow in a large tree trunk or limb, but raccoons also use old woodchuck burrows, caves, rock crevices and abandoned farm buildings.

Raccoons have short, stout builds. Like bears, they are plantigrade (flat-footed), walking on the sole of the foot with the heel touching the ground. They are relatively slow runners but fierce fighters—especially females with young. Humans and dogs are the adults' main enemies, although owls, foxes, fishers and bobcats may take young that stray from their mothers' protection. Raccoons are strong swimmers.

A raccoon makes a variety of sounds, including barks, hisses, a wailing tremolo, a *churr-churr* noise often given while the animal is feeding, and a piercing scream of alarm or fear.

By late autumn, raccoons have eaten enough to produce a heavy layer of fat that helps sustain them until spring, although they eat whatever food they can find in winter. They do not store food. Unlike woodchucks, raccoons are not true hibernators; they den up and sleep soundly when temperatures fall below about 25 degrees Fahrenheit, but

emerge at different times throughout the winter during warm spells. They are considerably leaner by spring, having burned up much fat.

Breeding takes place in January or February. Following a two-month gestation period, young are born in March and April. Usual litter size is three to five young, with four the average. Cubs weigh about three ounces at birth, are covered with yellow-gray fur and have faintly banded tails. After about 19 days their eyes open, and when four weeks old they begin to accompany the female on short feeding forays. Weaning starts at about eight weeks. By the time they are three or four months old, cub raccoons are large and independent enough to be on their own. The male usually stays with the female after mating and until babies are born and may help rear the young. By the time the young mature, however, the father has usually gone on his own.

Many family groups (mother and offspring) stay together through the young raccoons' first winter. Most yearling females breed at this time, but males of the same age may not breed for another year. If for some reason a female doesn't breed in winter, she may become receptive later in the spring and bear young in the summer. Small raccoons found in the fall are the result of this late breeding. By late fall, young raccoons follow their mother away from the den nightly in search of food.

In spring, juveniles disperse from the areas in which they were born. Young raccoons may move only a mile or two or may travel long distances. Records exist of young males apparently dispersing up to 150 miles.

Raccoons exhibit some social hierarchy; most dominant are older males and females with young. However, individuals do not defend fixed territories or ranges against other raccoons.

Captive raccoons have lived up to 18 years, but their life expectancy in the wild is about 10 years. Important mortality factors are lack of food in a hard, long-lasting winter, parasitism, overharvest and disease. Many raccoons are also killed on highways.

## Population

Although it experiences occasional setbacks, Pennsylvania's raccoon population is stable. Nationwide, it occurs in all of the "lower 48" states and into Central America, but is not found in the higher reaches of the Rocky Mountains or some of the western deserts.

Local populations may fluctuate because of severe weather, food scarcities, development of rural land, hunting and trapping pressures, outbreaks of rabies and distemper and habitat changes. Population concentrations vary with habitat; researchers have estimated one raccoon per 0.63 acres of excellent habitat and one raccoon per two acres of good habitat.

Raccoons become more susceptible to disease if they overpopulate an area, because they encounter one another

more often. However, as long as fur prices provide an impetus for hunters and trappers to harvest raccoons, disease will only minimally impact populations.

## Habitat

Raccoons are adaptable. Many types of terrain provide suitable areas for them to live. As a rule, they prefer forested areas offering plenty of den sites. They favor hardwood over coniferous forests, because hardwoods provide more food (nuts, fruits) and are more apt to develop cavities and hollow limbs suitable for shelter. Swamps and fertile bottomlands are good habitat. Raccoons often thrive near water courses, where good hunting opportunities exist. A raccoon will wade up a small spring run in search of crayfish, aquatic insects, minnows and other food.

The Game Commission has never had to improve habitat specifically for the raccoon because the species manages well

on its own. In managing forests on state game lands, however, the Commission tries to protect mature hardwoods, which are used as den trees by raccoons and other wildlife species.

A varied habitat (trees of different ages and types, brush, herbaceous vegetation) is ideal because it provides food during all seasons. In general, habitat improvement for turkeys, squirrels or deer also benefits raccoons. Grassy openings are excellent sources for insect food. Food-producers such as grapevines, blackberry, raspberry and green briar patches, black cherry trees, oaks and beeches should be encouraged and maintained. Beaver dams benefit raccoons as well as many other wildlife species by producing plentiful aquatic food.





## River Otter

The river otter, *Lontra canadensis*, is the most elusive aquatic mammal in Pennsylvania. It belongs to the mustelid or weasel family.

Otters are extremely curious and playful and often slide on ice or snow, shoot down slick muddy banks into creeks, play with food, sticks and stones, and wrestle each other. Few people are lucky enough to see otters in the wild, but those who do, rarely forget the experience.

### Biology

A mature male otter weighs 10 to 25 pounds and is 30 to 40 inches in length, plus a 12- to 15-inch tail. Females are about 25 percent smaller than males. An otter is muscular, streamlined and solidly built. Its height at the shoulder is about 10 inches. An otter's tail is long and tapered, thickest where it joins the body and furred its entire length. The face is broad, and the eyes protrude slightly.

Otter fur is a rich, dark brown and is lighter on the underparts. The throat and chin are grayish and the nose black and bare. Two fur layers – short dense underfur and longer guard hairs – combine with a subcutaneous layer of fat to insulate the body. In autumn, the normally thick fur grows in even thicker for extra cold resistance. All four feet are wide and webbed between the toes. The hind pair is used more than the front pair in swimming. Like other members of the weasel family, otters have anal musk glands that release a pungent odor when they are frightened.

Otters obtain most of their food from the water. Fish, including minnows, sunfish, suckers, carp and trout, are favorites. Other foods are frogs, turtles, snails, mussels, crayfish, snakes and snake eggs, worms, insects, aquatic plants, roots and, on occasion, birds and small mammals.

An otter's hearing is acute. Its eyesight is adequate above water, but superb below. It has a keen sense of smell and a set of long, stiff, sensitive whiskers just behind and below the nose. These serve as sense organs when the animal is searching for food in murky or turbid water.



An otter is a fast, graceful swimmer, the most adept in water of all the land mammals. It can travel underwater a quarter-mile without coming up for air, dive 35 to 50 feet and, if necessary, stay submerged up to four minutes. While underwater, valve-like structures seal an otter's ears and nose, and its pulse rate drops, slowing blood and oxygen circulation and making possible long submersion.

Underwater locomotion is mainly by body movement, with the feet and tail used for steering; propulsion comes from up-and-down body flexing, as opposed to the side-to-side movement of a swimming fish. An otter's top swimming speed is about 7 mph.

Otters den on the edges of lakes, rivers or streams, or occasionally on islands or patches of high ground in marshes. Dens might be excavations under tree roots or rock piles, abandoned beaver, muskrat or woodchuck burrows, or unused beaver lodges. A typical den has an underwater entrance hole, a living space above water level and several air or exit-entry holes to dry ground.

Otters mature sexually by 2 years of age. They breed sometime between January and May, with mating taking place in the water. As with many other mustelids,

otters have delayed implantation. This means that after fertilization, eggs remain dormant in the female's uterus until the following December, January or February, when they attach to the uterine wall and start to develop. Approximately two months later, from February to April, one to five (most often two to four) young are born. Females usually have their first litter at age 3.

Pups weigh 4 to 6 ounces and are blind and toothless at birth. They do not open their eyes for two to three weeks, and their mother keeps them in the den until they are 2 to 3 months old. The female might breed shortly after giving birth, but she will not allow a male near her young for several months. Males are polygamous.

By autumn, the growing pups are nearly adult size. Siblings may remain with their mother until they disperse at 12 to 13 months of age.

Adults and young both display curiosity and playful behavior. Otters romp and wrestle with each other or play by themselves. On snow, they take three or four running steps, launch themselves and slide on their bellies. While playing, they make a variety of sounds: chirps, chattering noises and low chucklings and grumblings. A scream is the danger call. Otters are mainly nocturnal, but occasionally venture out during the day.

Otter predation is not common, because few predators can catch an otter. Females go to great lengths to protect their young. Otters are generally too swift and agile to be caught in the water, but are able fighters if cornered on land. They have tremendous strength, reflexes and endurance, sturdy teeth and powerful muscles.

Otters do not store food for winter, nor do they hibernate. If lakes or rivers freeze, they swim under the ice to find food. They breathe on the surface of open water, in their dens or from air pockets lodged against the underside of the ice. In winter, they spend much time in the water, which is often warmer than the air. Otters are more sedentary in winter than in summer, especially during extreme cold spells. Winter food shortages might force individuals to cover as much as 50 miles of stream over the season.

Otters groom themselves frequently and are in the water much of the time. External parasites include ticks, lice and fleas. A variety of intestinal roundworms and flukes are the most common internal parasites affecting otters. Although uncommon, diseases including canine distemper, feline panleukopenia, hepatitis, jaundice and rabies can impact otters. In the wild, an otter's lifespan is less than 15 years. Otters in captivity might live for 25 years.

## Habitat

Otters range throughout most of North America, north of Mexico. In Pennsylvania, otters occur in every major river system and are absent only in watersheds with significant

water-quality problems. Clean water supporting fish and other aquatic life is the foundation of good otter habitat. Water pollution, including strip mine runoff, industrial waste and sewage, has made some Pennsylvania streams, lakes and rivers unfit for aquatic life. Much progress has been made in cleaning up the state's polluted waterways. Tough anti-pollution laws now protect these waters from returning to the crippled state they were in not long ago. Otter populations have benefited from these efforts and have responded positively to these habitat improvements. While otters sometimes live near towns and cities, they prefer wilder territory. Water quality, more than any other factor, will determine where otters will live.



## Population

The story of the resurgence of river otters in North America is one of the greatest success stories of modern wildlife conservation. Prior to 1900, degradation of water quality and habitat, human encroachment, and unregulated harvest led to a 75 percent decline in North American otter populations. As a result of dedicated efforts of concerned biologists and state wildlife agencies, reintroduction efforts, legal protection, improved habitat quality and regulated harvest, otter populations rebounded during the mid- to late 1900s.

Otters were never extirpated from Pennsylvania, but their numbers were vastly reduced. Beginning in the 1970s, Pennsylvania otter restoration efforts and similar efforts in neighboring states resulted in significant range expansion. Today, otter populations in Pennsylvania are increasing or stable across their range. The most dense otter populations occur in the northwestern and northeastern counties.

Currently, river otters are protected in Pennsylvania with no hunting or trapping allowed. In all surrounding states, river otters are harvested annually. As Pennsylvania otter populations continue to increase and expand, monitoring efforts have determined a regulated harvest is feasible. Sound management will safeguard Pennsylvania's healthy otter population for future generations to enjoy.



## Shrews

Although most people never see one, shrews are plentiful animals that play an important role in nature. Shrews belong to order Insectivora, a diverse group considered the most primitive of true placental mammals. As their name suggests, Insectivores feed mainly on insects. Shrews do most of their feeding above ground or in tunnels in the leaf litter and other debris at the ground's surface. They are related to moles, insect-eaters that live deeper in the soil.

Shrews range in size from the pygmy shrew (a little over three inches long, weighing 0.08 to 0.13 ounces) to the short-tailed shrew (four to five inches long, 0.44 to 0.82 ounces). In each of the seven shrew species inhabiting Pennsylvania, the sexes are equal in size and weight.

Shrews have long, pointed noses, beady eyes and slender skulls. Their small ears are covered (or nearly so) by short, velvety fur. Here's how to tell one from a mouse: shrews have five toes on each foot (most mice have four toes on their front feet); shrews' teeth are sharp and pointed, and often stained dark (mice have chisel-like cutting incisors typical of rodents, without the dark staining); and shrews' eyes are beadier and their noses more pointed than those of mice. Most Pennsylvania shrews look fairly similar, and it often takes an expert to tell them apart.

Active year-round, shrews have terrific metabolic rates and must eat almost continuously. They are quick and aggressive and may attack animals larger than themselves. At least one species of shrew has poisonous saliva, a rare example of toxicity in mammals. Delivered with a bite, the toxin slows down or kills prey, and can cause soreness and swelling in humans.

Shrews are short-lived. They die from floods, starvation, rapid temperature changes, accidents, fights with other shrews and even from shock due to fright. Many predators catch and kill them, perhaps in mistake for mice, but since shrews secrete a repelling musky odor, predators often do not eat them.

Shrews raise several litters each year. Gestation is about three weeks. Newborn young are helpless and unfurred, but grow rapidly and reach adult size when 4 to 6 weeks old. For more specific life history information, see listings under each species.



masked shrew

### Masked Shrew (*Sorex cinereus*)

The masked shrew is the most widely distributed shrew in North America, ranging over almost all of the continent's northern half. It occurs throughout Pennsylvania. Overall length, 3.3 to 4.3 inches; tail, 1.4 to 1.8 inches; weight, 0.12 to 0.2 ounces (less than a dime).

Masked shrews molt twice a year. In winter, they are dark brown to almost black on their upperparts, lighter brown or grayish on their underparts. Summer coloration is lighter and

browner. *Sorex cinereus* closely resembles the slightly smaller pygmy shrew.

Masked shrews inhabit wooded areas, living under rocks logs and in the leaf litter, often in swamps or along stream banks or spring runs. Rarely found in dry fields, they occasionally inhabit hedgerows and stone walls in open country. Masked shrews spend most of their lives in underground runways they construct, or in the tunnels of mice or other small mammals.

Masked shrews sometimes climb into low bushes or fallen trees. They are good swimmers but rarely enter the water. Their ability to see and smell are poor, but their sense of touch is well-developed.

Masked shrews eat insects, worms, centipedes, slugs, snails, mollusks and spiders, vegetable matter such as moss and seeds, and carrion. They probably do not store food. One observer reported that a captive ate more than three times its body weight daily.

The species nests under logs, stumps, or rocks, in fist-size nests of leaves, grass and fine rootlets. Breeding runs from March to September. After an 18-day gestation, 2 to 10 (usually about 7) young are born. They are blind and helpless but grow quickly and are on their own after about a month. They mature sexually at 20 to 26 weeks of age. An adult female may raise three litters; the male remains with the family during the early life of the young.

Masked shrews are active day and night, but especially at dusk. An individual's heart beats 1,200 times per minute, evidencing its rapid metabolism. Owls, hawks, herons, shrikes, weasels, foxes, cats and the larger shrews kill masked shrews, few of which reach their maximum lifespan is about 18 months.

## Smoky Shrew (*Sorex fumeus*)

The smoky shrew occurs throughout the Northeast from Nova Scotia to North Carolina. It inhabits most of Pennsylvania but is scarce in southwestern and southeastern counties.

Coloration is a uniform dull brown, except for the bicolored tail, brown above and yellowish below, and pale buffy feet. In summer, the fur is slightly darker and browner. The smoky shrew resembles the masked shrew but is larger, stouter and darker. Overall length, 3.7 to 5 inches; tail, 1.4 to 2 inches; weight, 0.21 to 0.35 ounces, about one-third the weight of a house mouse.

The smoky shrew prefers cool, damp woods with deep leaf litter. Prime habitats include deep, shaded hemlock ravines, northern hardwood forests, spruce and sphagnum bogs, and stream borders with moss-covered boulders and loess.

Smoky shrews may be active at all hours. They burrow through the leaf mold or travel in other animals' tunnels. They eat insects, salamanders, snails, worms, spiders and small birds either alive or as carrion.

These shrews build baseball-sized nests of dry vegetation deep within rocky crevices or stone piles, or under rotting logs,

stumps or boards. They breed from late March into August. Females bear up to three litters annually, of 2 to 8 (usually 5 to 6) young. Offspring are independent by one month of age.

Smoky shrews appear to be social animals, with populations fluctuating from year to year. They fall prey to short-tailed shrews, weasels, foxes, bobcats, hawks and owls. Maximum lifespan is about 17 months.

## Long-tailed Shrew (*Sorex dispar*)

The long-tailed shrew inhabits the Appalachian Mountains from Maine to North Carolina. It occurs throughout Pennsylvania, except in the extreme southeast and west.

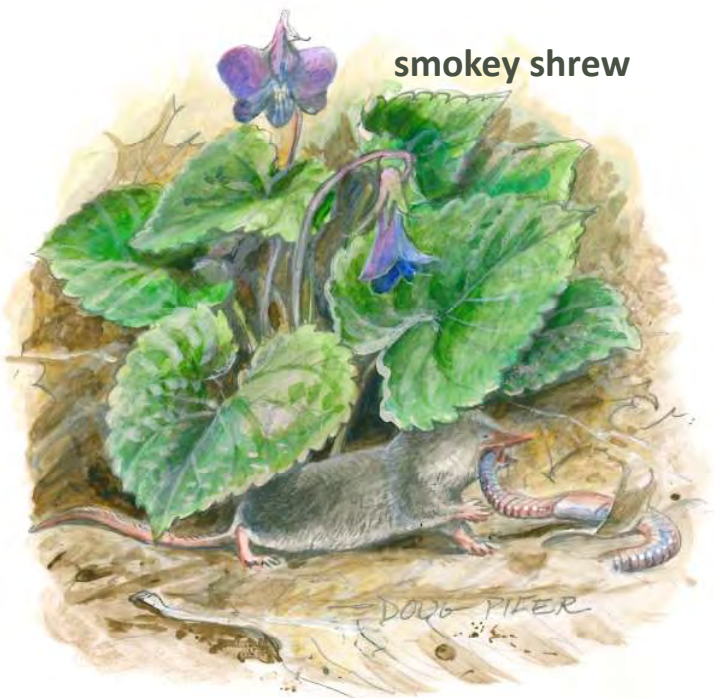
*Sorex dispar* likes cool, damp forests, deciduous or mixed. It is also called the rock shrew, since its preferred habitat is rock-slides, where it lives in natural tunnels among the jumbled boulders. In Pennsylvania, the species prefers mountain slopes.

Long-tailed shrews are dark gray with slightly paler underparts in summer, and are overall slate gray in winter. Total length, 3.9 to 5.3 inches: tail, 2 to 2.3 inches: weight, 0.14 to 0.21 ounces.

Foods include small invertebrates and plant materials. Little is known of the life history of this shy species, but it is probably similar to those of the masked shrew and smoky shrew, which often share the same habitat.

## Pygmy Shrew (*Sorex hoyi*)

The pygmy shrew ranges across much of northern North America. It occurs in northern and western Pennsylvania, but records are sparse.



This is the smallest mammal in Pennsylvania and one of the smallest in the world. Overall length, 3.2 to 3.8 inches; tail, 1.1 to 1.3 inches; weight, 0.08 to 0.13 ounces—about half that of a large earthworm. In the field, the pygmy shrew is almost impossible to distinguish from a small masked shrew.

Pygmy shrews often live in wet or closely mingled wet and dry habitats. They live under old stumps and rotting logs, among the litter in sedges, ferns, aspen clumps, and hardwood forests, and in heavy conifer stands bordering water.

We know almost nothing about the species' life history, but it is probably similar to those of other long-tailed shrews (long-tailed, smoky and masked shrews).

### Short-tailed Shrew (*Blarina brevicauda*)

The short-tail is one of the commonest shrews and most abundant small mammals in its range. It inhabits the eastern United States from southern Canada to Florida, and occurs statewide in Pennsylvania.

This shrew is dark slate above and paler below, slightly lighter in summer than in winter. It is the largest and most robust of Pennsylvania shrews. Overall length, 4.1 to 5.2 inches; tail 0.7 to 1.2 inches; weight 0.44 to 0.82 ounces.

Short-tailed shrews live in almost all habitats: woods, banks of small streams, tall grass and brush. They frequent the top few inches of soil and leaf litter, digging their own tunnels or using those of mice, voles and other small mammals. They burrow through the snow in winter. Home range is a half-acre to an acre. Active day and night, short-tailed shrews eat insects, worms, snails, salamanders, small snakes, songbirds, mice, voles, other shrews, carrion and vegetable matter. Individuals cache food in small chambers in their burrows.

The short-tailed shrew has poor eyesight, a fair sense of smell and keen hearing and touch. It possesses poisonous saliva but lacks an efficient injection system, so the toxin must get into a prey animal through cuts caused by the shrew's sharp teeth. The toxin slows down or kills warm-blooded prey.

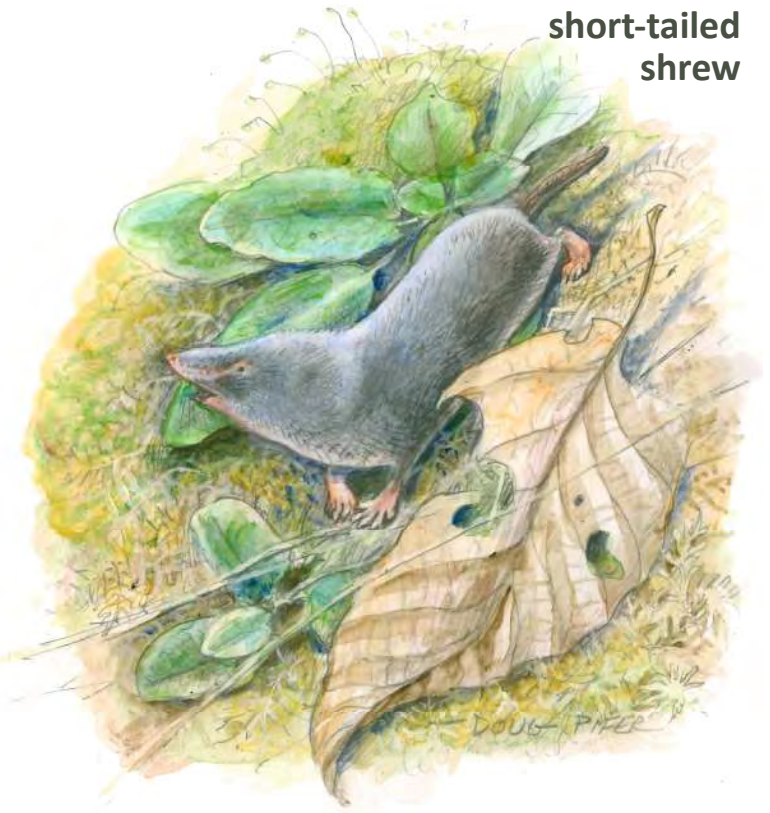
*Blarina brevicauda* weaves dry plant materials and hairs into two types of nests, a resting nest and a larger mating structure, beneath logs, stumps, rocks and debris. Breeding may begin as early as January; 3 to 10 young (usually 5 to 7) are born 21 days later and are on their own at 25 days of age. Two or three litters may be raised per year.

Foxes, dogs, bobcats, cats, skunks, weasels, hawks, owls, shrikes and snakes kill short-tailed shrews. The average lifespan is 18 to 20 months.

### Least Shrew (*Cryptotis parva*)

The least shrew lives in the southeastern and central United States, north and east into New York. It's found statewide in Pennsylvania. Coloration is cinnamon to brown above, ashy gray below, darker in winter than in summer. Overall length, 2.7 to 3.5 inches; tail, 0.47 to 0.78 inches; weight, 0.14 to 0.2 ounces.

### short-tailed shrew



### least shrew



Favored habitats are open, dry situations, such as old pastures or meadows, or along woodland edges. Least shrews are scattered in local colonies throughout suitable habitat. More convivial than most other shrews, which tend to be belligerent toward others of their own species, least shrews may nest in groups of a dozen or more, especially in winter.

Least shrews are active at all hours, but mainly at night. They travel their own or other small mammals' runways

and burrows. They eat insects, earthworms, centipedes, millipedes, snails, mollusks, frogs and carrion, and they drink water freely.

Least shrews build nests of dried grass or leaves, either underground or beneath logs, stumps or debris. They breed from March through November. Three to six blind, hairless young are born following a gestation period variously reported as 15 to 23 days. Several litters may be raised each year. Both parents care for the young, which are weaned at 21 days. Longevity is less than two years.

### Water Shrew (*Sorex palustris*)

The water shrew inhabits much of northern North America. In the East, it ranges from New England to North Carolina. It is found across Pennsylvania's northern half, and south through the Appalachians.

*Sorex palustris* is the second largest Pennsylvania shrew (the short-tailed shrew is more robust). Overall length, 5.3 to 6.1 inches; tail, 2.4 to 3.5 inches; weight, 0.35 to 0.6 ounces. In winter, the pelt is brownish-black above (sometimes faintly grizzled with silver) and light gray below. In summer, the upperparts are browner and the underparts paler. The long tail is brownish-black above, paler below.

The water shrew inhabits heavily wooded areas and is adapted to a semi-aquatic life. The banks of cold, clear streams provide optimum habitat. Water shrews occupy small surface runways under bank overhangs, fallen logs and brushpiles. They also

live in bogs and springs, and may shelter in a beaver lodge or muskrat house in winter. Nests are usually made of dry moss.

This shrew uses its big hind feet, fringed with short, stiff hairs, to paddle about under water. It can stay submerged about 15 seconds. Water cannot penetrate the shrew's dense pelage, so the animal itself never gets wet. A water shrew can run short distances across the water's surface, buoyed up by globules of air like a water bug.

Water shrews locate aquatic prey by touch. They eat insects and other small invertebrates (both aquatic and terrestrial), small fish and fish eggs.

Little is known about the breeding habits of this secretive species. The gestation period is about three weeks, with 4 to 8 young born from late February to June. Females probably bear more than one litter each year.

Water shrews tend to be nocturnal but are also active at dusk, on cloudy days, and in the shade on sunny days. Predators include weasels, mink, otters, hawks, owls, snakes and fish (smallmouth bass, trout and pickerel). Longevity is about 18 months.



water shrew



## Striped Skunk

The striped skunk (*Mephitis mephitis*) belongs to the Mephitidae family, which includes badgers. Three other skunk species live in the United States: hooded and hognose skunks, which inhabit the Southwest, and the spotted skunk, which is found throughout much of the country. In the eastern United States however, the spotted skunk extends north only to southwestern Pennsylvania.

The species commonly found in Pennsylvania is the striped skunk. Widespread, it is found in suitable habitat from sea level to timberline in all 48 contiguous states, southern Canada, and northern Mexico. The word “skunk” comes from the Algonquin Indian name for the animal, seganku. Other names include polecat and the French Canadian *enfant du diable*, or “child of the devil.”

### Biology

Adult skunks are about two feet long, including a 7- to 10-inch tail. They weigh 3 to 12 pounds, depending on age, sex, physical condition and time of year. Males are, on average, 15 percent larger and heavier than females.

Skunks have small heads, with small eyes and ears and a pointed nose. They have short legs and wide rear ends. The bottoms of their feet are hairless, like those of bears or raccoons. And, like these two other mammals, skunks walk in a plantigrade manner—on the soles of their feet with heels touching the ground. The long and sharp claws of a skunk’s forefeet are well-adapted to digging.

A skunk is colored black and white. Its body is often mostly black, with white occurring in a narrow blaze up the middle of its forehead. It typically has a broad patch on the back of its head, and a V-shaped mark over its shoulders, which forms stripes that continue along the animal’s back and often unite at the base of its tail. Stripes vary in length and width among individuals. The tail is bushy and black and usually has a white tip. Sexes are colored and marked alike.



A skunk’s pelt is composed of soft, wavy underfur overlain with long, coarse guard hairs. Skunks molt yearly, beginning in April and ending in September. Skunks make a variety of sounds, including hisses, growls, squeals, soft coos and churrings.

Skunks are placid and sluggish. They move at a deliberate walk, slow trot or clumsy gallop. Their top speed is about 10 miles per hour. They can swim, but are poor climbers. Their senses of sight, smell and hearing have been judged poor to fair compared with those of other wild mammals. Their sense of touch, however, is acute.

Skunks are armed with a potent defensive weapon: a pair of large scent glands found beneath the skin on either side of the rectum. These glands have nozzle-like ducts, which protrude through the anus. Skunks discharge their scent, or musk, through these nozzles, powering the stream with a strong hip muscle contraction.

Musk is an oily liquid, creamy or yellowish in color. Its active ingredient is a sulphide called mercaptan. Field guides refer

to the musk as “highly repellent to all mammals.” In short, it stinks. Musk can make a predator sick or, if the skunk has been able to direct the substance into the animal’s eyes, temporarily blind.

A skunk can shoot musk about twelve feet, but will use it as only a last resort, preferring, instead, to bluff an enemy. If threatened, a skunk drums its forefeet on the ground, snarls, arches its back and raises its tail. It can spray in any direction by twisting its rump toward the target. And, contrary to popular opinion, it can discharge when hoisted by the tail.

Striped skunks are omnivorous. What they eat depends on where they live and what is available. In summer, they feed heavily on insects (adult and larval form) including grasshoppers, crickets, beetles and wasps. They eat pests including potato bugs, tobacco worms and Japanese beetles.

Skunks dig out bumblebee nests and scratch at the entrances of beehives, catching and eating any honeybees that fly out. Frequently they leave evidence of their feeding: small, cone-shaped holes in the soil, pine needles, leaf duff or suburban lawns mark where they have dug for grubs. Other summer foods include spiders, toads, frogs, lizards, snakes, mice, chipmunks and the eggs of turtles and ground-nesting birds.

In fall and winter, skunks eat fruit such as wild grapes and cherries; small mammals such as moles, mice, voles and shrews; plant items such as grasses, leaves and buds; mast and carrion. Skunks are chiefly nocturnal, hunting from dusk until dawn, except during the breeding season when they are frequently observed during daylight hours.

They den in ground burrows, stumps, wood and rock piles, overhanging creek banks and beneath buildings. Often, a skunk will use an abandoned woodchuck burrow, although if none are available it will dig its own. The burrow has a central chamber (12 to 15 inches in diameter) about three feet underground, connected to the surface by one or more tunnels 5 to 15 feet long. The central chamber is lined with dry grass and leaves. Skunks seem to prefer slopes for den sites, probably because these areas drain well. In spring, summer and early fall, a skunk may den in several different burrows; in winter, it tends to use just one.

Normally solitary, males and females get together for breeding in February and March. Males fight with each other, although they rarely discharge musk during these conflicts. They travel widely in search of mates and breed with several females if possible.

A mated female drives off males shortly after her three-day estrus period ends. After 60 days gestation, she bears 2 to 10 young (usually 5 to 7). Skunks are capable of breeding in their first year. Younger females may bear fewer young and give birth later in the year than older females.

At birth, striped skunks weigh less than an ounce. Although they are blind and unfurred, the pattern of their future black-and-white pelage shows on their pinkish, wrinkled skin. They develop quickly. After three weeks, their scent glands become

functional; at four weeks, their eyes open; and at about two months the young are weaned and ready to leave the den for nighttime hunting forays.

By November, young of the year are as large as adults. While family ties are usually broken in August or September, some mothers over-winter with their offspring. Community dens have been found containing 12 or more skunks, mostly females and young.

Skunks do not hibernate, although they may remain dormant underground all winter. Their body temperature remains near normal. Females usually lose 10 to 30 percent of their body weight by spring; males lose only about 10 percent, as they are more inclined to leave their dens and feed during mild spells.

The great horned owl, which lacks a well-developed sense of smell and apparently is not bothered by the skunk’s musk, is a predator. Dogs, foxes, coyotes and bobcats take an occasional skunk, but the skunk’s potent musk warns off most predators.

Other mortality factors are diseases such as pneumonia, distemper, pulmonary aspergillosis, tularemia, brucellosis and rabies; highway kills, starvation and trapping. Skunks are host to fleas, lice, mites, ticks and various internal parasites. Most skunks live two to three years in the wild; in captivity, they have lived 10 years.

## Population

Striped skunks can be found throughout Pennsylvania, but the highest densities are associated with agricultural areas. Wildlife researchers have estimated an average of one skunk per 10 acres of prime habitat and 13.5 skunks per square mile of agricultural land.

*Mephitis mephitis* has proven highly adaptable. Along with the woodchuck, raccoon, Canada goose, mourning dove, several species of blackbirds and other wildlife, the skunk prospers wherever humans clear land for farming and remove or drive out larger predators.

Skunks can live in an area for years and, because of their nocturnal habits, remain unseen, although perhaps not “unsmelled,” by most people. Some farmers welcome their presence, realizing that these small predators eat many pest insects and rodents.

Skunks are susceptible to distemper and rabies. Trapping may help minimize the impacts of disease on a skunk population. Local populations are also affected by severe weather, food scarcities and habitat change.

## Habitat

Skunks live in a variety of habitats. They favor mixed woods and brushland, rolling weedy fields, fencerows, wooded ravines and rocky outcrops in or near agricultural areas. For day retreats (resting cover), they use hayfields, pastures, fencerows and brushy borders of waterways. Cornfields are

good feeding areas, where skunks forage for grasshoppers, grubs and beetles. High corn plants also protect young skunks from airborne and land predators without impeding their movements.

Although they may cover several miles each night while hunting, established individuals rarely wander more than a half-mile from their home burrows. In general, adults range more widely than juveniles, males more widely than females.





## Snowshoe Hare

Varying hare – snowshoe rabbit. Both names describe physical properties of *Lepus americanus*, the big hare of Pennsylvania’s North Woods. “Varying” refers to its twice-a-year changes in pelt coloration; “hare” identifies it as a member of the genus *Lepus*, related to rabbits but different in several important ways; and “snowshoe” aptly describes the animal’s huge, furry hind feet, which help it travel over deep snow.

### Biology

Although closely related to the more abundant cottontail, the snowshoe is not a true rabbit. A hare’s digestive tract differs structurally from that of a rabbit, and newborn hares are precocial (fairly well developed) in contrast to the hairless, blind cottontail young.

Snowshoes are about 19 inches in length and weigh 3 to 5 pounds, with males generally 10 percent heavier than females. Their body configuration is similar to the

cottontail’s, although the snowshoe has longer ears, larger feet and a rangier build. In summer, a snowshoe is dark – in winter, white.

In the dark phase, its fur is gray-brown, darker on the rump and down the middle of the back, the throat buffy and the tail dark brown above and white beneath. In autumn, the dark hairs gradually fall out and white hairs replace them. This molt is irregular and might occur in patchwork fashion, but it usually begins on the feet and ears and works upward and toward the rear until the entire pelt is white (except the ear tips, which stay black). A complete change takes about 10 weeks. In spring, another molt occurs. This time, brown hairs replace white, starting with the head and back and ending with the ears and feet by late spring.

Cold temperatures and ground color have nothing to do with the pelt’s color change. It results totally from phototropism—in other words, it depends on light. As

days get shorter in fall, for instance, a hare's eyes receive light for shorter and shorter periods; this stimulates the pituitary gland, located at the base of the brain. During molt, the pituitary shuts off pigment production in the new fur, which therefore grows in white. In spring, lengthening days trigger the reverse of this process.

Snowshoes have excellent hearing and big ears to catch sounds. Eyes are located on the sides of the skull, providing limited depth perception but covering a wide field of view. A hare may stand erect on its hind legs to see or hear better.

Should a predator threaten, a hare can burst out of a relaxed, sitting position into a dead run. It can race up to 30 mph over ground or snow, leap 10 feet in one bound, dodge with agility and swim if forced into water. A hare circles like a cottontail when chased — although making a larger circle — as it's reluctant to leave its home range. A Wisconsin biologist once tracked a hare in snow for more than an hour; despite continuous, noisy pursuit, the animal stayed within about 10 acres. Unlike cottontails, hares rarely hole up when running before hounds. A snowshoe's four toes are large and positioned wide apart. The bottoms of the toes and the soles of the big feet are covered with coarse hair that grows long in winter, making "snowshoes" that support the hare in deep snow and give it traction on icy crusts.

A hare's home range might be five to 30 acres, depending on density of food and cover. Some individuals probably spend months without moving 100 yards from one central location. Hares do not build nests or dens, although they might shelter from hard rain or snow in hollow logs or rock crevices. Primarily nocturnal, they feed at dusk, night or early morning.

During the day, a hare stays in a "form" — a small depression in the leaf litter or ground, either natural or made by the weight of the animal's body resting there. A form is often on a slight rise, providing drainage to keep the bed dry and allowing the occupant to see its surroundings. For protection from predators, a hare locates its form under overhanging branches, in a clump of shrubs or tall weeds, or at the base of a tree or stump. A hare might have several forms within its territory, but will use the same one most of the time. While resting, it sits with head, neck and body drawn together compactly and all four feet gathered beneath it. Ears may be kept erect or laid back on the neck and shoulders.

In summer, snowshoes eat green vegetation including leaves, clover, jewelweed, dandelions and tender buds and the growing twigs of low woody plants. After frosts kill herbaceous growth, hares may feed on the dried remains until these are used up or snow-covered.

However, snowshoes depend mainly on woody plants for winter food, eating twigs and bark as high as they can reach by standing on their hind legs. Deep snow actually helps hares get food by making a platform that lets them reach higher food sources. They feed on aspens, willows, birch, alders, maples and blackberry canes. They eat bark, twigs and often the needles of conifers — firs, cedars, pines, spruces and hemlocks.

Except in breeding season, snowshoes aren't strongly territorial. Many might use the same general feeding area. Through habit and convenience, they use a network of trails and runways, which become conspicuous in the snow.

Courtship begins in early March, when males (also called bucks) fight furiously for females (does), kicking each other with their powerful hind feet. The females become receptive later in the month. Both sexes are promiscuous.

One to six young (usually two or three) are born after a 36-day gestation period. The mother does not build a nest and gives birth while sitting in her form or wherever she happens to be. Young are delivered within a half-hour and start to nurse almost immediately. After the initial feeding, the mother nurses the young mainly at night and remains a short distance away during the day.

Young hares are called leverets. They weigh 2½ ounces at birth, their eyes are open and they're capable of walking and hopping soon after they are dry. Their fine brown fur blends with the surroundings. Young start eating green vegetation when a week to 10 days old and usually are weaned and on their own at six or seven weeks of age.

Hares have potential lifespans of eight or nine years, but only an estimated 30 percent live one year and perhaps 15 percent reach age 2. Snowshoes fall to hunters, disease, parasites and predators. Species that prey on snowshoes include foxes, coyotes, bobcats, weasels and some hawks and owls.

## Population

As with many Pennsylvania small-game species, habitat change has caused varying hare populations to decline in recent years. After the nearly total logging of our state's forests in the late 1800s and early 1900s, brushy growth and saplings provided perfect hare habitat, and the population boomed. Today, maturing forests and a large number of deer — which compete for many of the same food sources — combine to restrict the snowshoe population.

Canada, part of the northern United States and Alaska are present strongholds of the varying hare. Its range extends into the northeastern U.S. in mountainous areas. In the

Rockies, varying hares range south to central New Mexico. Hares are found in Pennsylvania in parts of the Allegheny Mountains, and on high plateaus in the northwest and the Pocono region. As Pennsylvania is the southernmost part of the species' eastern range, the varying hare is not abundant in our state; even if habitat were excellent, it's unlikely that snowshoes would become as abundant here as they are in New England and Canada.

Pennsylvania's hare population is valuable to maintaining genetic flow of snowshoe hares between West Virginia and New York through our higher elevation habitats in the Laurel Mountains. The maintenance of this link requires continuous management for suitable hare habitat.

In the far north, hare populations fluctuate dramatically. At times, snowshoes become very abundant, with as many as 500 to 1,000 individuals per square mile in primary range. Then the population goes down rapidly for three to five years, hits bottom and starts to climb gradually toward another peak. When hares are abundant for several years, predators increase. Should hares decline over a large area, goshawks and snowy owls range much farther south, while land predators starve or go hungry. It's unknown whether Pennsylvania's snowshoes go through population cycles similar to hare populations in Canada. Concerns about declining hare populations have resulted in shorter seasons and reduced bag limits in recent years.

## Habitat

Snowshoes in Pennsylvania inhabit mixed deciduous forests with conifers and escape cover, such as rhododendron and mountain laurel. They favor younger brushy areas, those logged or burned seven to 10 years ago. Hares also live in swamps where cedar, spruce or tamarack grow. Dense stands of aspen or poplar, interspersed with pines, might support hares. In Pennsylvania, high country such as ridge tops, mountains, high swamps and plateaus harbor most hares.

As do cottontail rabbits, snowshoes move into forestland opened up by fires, high winds, ice storms and clear-cutting. While cottontails build up good populations in clear-cut areas in one or two years, snowshoes — with a lower reproductive rate and different food and cover requirements — need up to seven years to take hold.

Browse cutting can help snowshoes by bringing edible twigs within reach and encouraging the growth of shrubs, sprouts and seedlings. Planting conifers, particularly spruce, and cutting tall trees to keep them from shading out mountain laurel and shrubs will provide good cover.

## Special Concerns

The timing of color change and the response of hares to climate change is a concern for Pennsylvania's hare populations. When a hare has a white coat and the habitat around it is brown, it is described as a hare in mismatch. In recent years, warmer weather has reduced the duration of snow cover thereby reducing the ability of a white hare to blend into its brown habitat. Mismatched hares are likely subject to increased predation rates.

The hemlock woolly adelgid is causing significant decline of Pennsylvania's hemlock groves. Hemlock groves are thought to be valuable hare habitat because they provide nutritional value and important thermal cover in winter. As hemlock groves decline, hare populations may be detrimentally impacted.





## Squirrels

Most Pennsylvanians are familiar with the gray squirrel, which lives both in towns and rural areas. The gray is Pennsylvania's most common squirrel; the fox, red and flying squirrels are three other species native to the state. Squirrels are fast and agile, scaling trees and jumping from treetop to treetop with great speed. When jumping, they use their large tails to help keep balanced.

Squirrels see only in shades of black and white, but their eyes are sharp and detect movement well. They have keen senses of hearing and smell. They are most active in early mornings and late afternoons, except the nocturnal flying squirrels. Squirrels are rodents and the four species do not interbreed. Born blind and hairless, young are dependent upon their mother for up to two months.

### Biology

**Gray Squirrel:** Adult gray squirrels (*Sciurus carolinensis*) weigh 1 to 1½ pounds and are 18 to 20 inches in length; about half this length is broad, bushy tail. Most grays are colored silvery-gray above and off-white below, often with rusty or brownish markings on the sides or tail. Albinism is rare, but melanism (black coloration) is fairly common. Once, black-phase gray squirrels were found throughout Pennsylvania. Today, they occur most often in the northcentral counties. "Black squirrels" may be any shade from dark gray to nearly jet black, often with a brownish tinge.

Gray squirrels eat mast—acorns, hickory nuts, walnuts and beechnuts. Other foods include berries, mushrooms, pine seeds, corn (only the germ at the base of the kernel is eaten), and dogwood, wild cherry and black gum fruits.

In early spring, squirrels eat buds, a high-energy food. They eat the buds and flowers of red and sugar maples in April, and later may feed on the winged fruits of red maple. These foods have a high moisture content that supplies squirrels' water needs, although grays will drink from available ground water sources. Grays smell out nuts which they bury for winter food. Unrecovered nuts may sprout and grow into trees. In this way, squirrels help ensure continual forest growth.

gray squirrel



Grays are probably the wariest of Pennsylvania's squirrels. They're quicker than fox squirrels and less vocal than reds, although they sound warning barks and assorted "chucks." Hawks, owls, foxes and tree-climbing snakes occasionally kill young squirrels, but adults are not easily taken. Predators do not appreciably affect squirrel populations on good ranges. Availability of food is the key to population size.

A maximum life span for a wild gray squirrel could be 10 years or even longer, but few live more than two or three years. Grays live in nests and dens. They build leaf nests in trees near good food supplies in both summer and fall, the leaf nests are cooler than tree dens, they're about 12 by 16 inches and are built of twigs, leaves, grass, bark and other plant materials. Tree dens are often in cavities where limbs have broken off or in deserted woodpecker holes, usually 40 to 60 feet off the ground. Resident squirrels gnaw back the outer tree bark that, in time, would otherwise seal off den holes.

Peaks in summer breeding activity are thought to occur from May to July, whereas peaks in winter breeding may occur in January and February. Although peaks in breeding activity occur, squirrels can be reproductively active throughout much of the year.

Following a 44-day gestation period, females bear litters of 4 to 5 young. The young are usually raised in tree dens and nursed by their mother for 5 to 7 weeks. Some gray squirrels bear a second litter in July or August. Small grays seen in autumn are from summer litters. Grays are gregarious and do not seem to demonstrate territoriality. Three or four individuals may feed side by side where food is plentiful.

**Fox Squirrel:** There are two subspecies of fox squirrel extant in Pennsylvania. The more common western subspecies, *Sciurus niger rufiventer*, has a rusty red underbelly and was historically more common in southern and western Pennsylvania Counties. The more rare eastern subspecies, *S. n. vulpinus*, has a white underbelly and has historically occurred in southern and eastern counties. The western subspecies is thought to have expanded its distribution to the east in recent years causing concern that they may be outcompeting or hybridizing with the eastern subspecies. The eastern subspecies is currently listed on the State Wildlife Action Plan as Species of Greatest Conservation Need due to the concerns listed previously in addition to a decline in habitat.

Unlike gray squirrels, fox squirrels prefer open, park-like woods with sparse ground cover, usually avoiding mountains and extensive forests. Their nesting, denning and feeding habits are much like those of gray squirrels. Fox squirrels have gray to reddish-gray upper parts and buff to pale orange-brown or white undersides. Larger than grays, weighing nearly two pounds, they are slower, more sluggish and less vocal. They are about 21 inches in length, including a 10-inch tail.

Like the other Pennsylvania tree squirrels, fox squirrels never actually hibernate in winter but will hole up and sleep soundly through several days of snowstorms or extreme cold.

Mating season is in January, and young are born in late February or early March. The average litter size is 2 to 4 young. Only one litter is raised per year.

Fleas, chiggers and mosquitoes may bother squirrels, and tapeworms have been found in some specimens. Fox and gray squirrels seem to get along together wherever their ranges overlap.

**Red Squirrel:** The red squirrel (*Tamiasciurus hudsonicus*) is alert, raucous and energetic. About half the size of the gray, the red measures about a foot from nose to tail-tip



red squirrel

and weighs about 5½ ounces. In summer its fur is a rich, rusty brown, turning grayer in winter, when this squirrel also develops prominent ear tufts. The undersides are off-white.

The red squirrel is sometimes called a chickaree or a pine squirrel, reflecting its preference for nesting in conifers. Behavior, feeding habits and denning practices are generally similar to those of gray and fox squirrels, although reds sometimes nest in holes at the base of trees. They enjoy eating the immature, green cones of white pine. Unlike fox and gray squirrels, reds do not bury nuts singly, preferring a large cache, often in a hollow log, for storing food.

The breeding season for red squirrels begins in late winter, with 3 to 6 young born in April, May or June after a 40-day gestation period. Reds have strong territorial instincts, often defending food sources and den trees against intrusion.

**Flying Squirrels:** Of the four Pennsylvania squirrels covered here, only the flying squirrels (*Glaucomys volans* and *Glaucomys sabrinus*) are nocturnal. This squirrel is about 8½ to 10½ inches in length, including a 3½- to 5-inch tail. Its large eyes are adapted for night vision. The fur of the flying squirrel is very soft and tan-brown in color, with white underparts. The so-called flying membrane is a loose flap of skin between the fore and hind legs on either side of the body; this is stretched taut when the legs are extended, allowing the animal to soar or glide but not to fly in the true sense of the word. The broad, flat tail is used as a rudder while the animal is airborne. A flying squirrel can soar in a downward direction, often from tree to tree. They generally sail 20 to 60 feet, though instances up to 300 feet have been recorded.



fox squirrel

This squirrel is primarily arboreal, but also forages on the ground for truffles. Because of their arboreal habits and nocturnal nature, flying squirrels are not often seen.

They nest in hollow tree limbs, woodpecker cavities, and stick nests called drays. One to three young are born in April or May following a 40-day gestation period, and some biologists believe a second litter may be produced in July or August. Feeding habits are like those of other Pennsylvania squirrels.

## Population

Once there were so many gray squirrels in Pennsylvania that they were considered nuisances by pioneering farmers. In fact, bounties were paid on 640,000 squirrels in 1749, and many more were doubtless taken for the table.

Settlement and development of Pennsylvania has changed the habitat, and squirrel numbers have decreased since the 18th century. Even so, there is no shortage of squirrels in Pennsylvania today. Squirrels and woodchucks are the most heavily harvested small game species in Pennsylvania.

Biologists estimate that a healthy autumn squirrel population is composed of about 35 percent juveniles, 30 percent sub-adults and 35 percent adults. One gray squirrel per acre of woodland is a good density and three per acre is excellent and only occurs on prime habitat. Although a hundred or more squirrels may thrive in a park or campus, these situations do not occur in the wild. If food becomes scarce in the wild, large segments of the gray squirrel population may leave their home locales to travel in search of food and concentrate where they find it.

Squirrel populations fluctuate. Good reproduction—with most females bearing two litters—follows autumns in which large mast crops were produced. Severe winters, on the other hand, may reduce squirrel numbers, especially if they follow a mast failure.

## Habitat

Woodland areas can be managed to favor squirrels. Of the two main forest types found in Pennsylvania—oak-hickory in the south and beech-birch-maple in the north—the oak-hickory forest is better squirrel habitat, mainly because it has a greater variety of vegetation types.

Gray squirrels prefer a deciduous forest with a variety of tree species that provide a diverse food supply. A forest of mixed maples, oaks, hickories and beech, for instance, would support more grays than would a ridge-top stand of walnut and chestnut oaks. The fox squirrel needs woodland edge—places where the trees border corn or other crop fields.

A good squirrel woods should contain many mature mast-producing trees, a mixture of other tree and shrub species to provide seasonal food variety, natural den trees and hollow tree cavities for escape

purposes. Diverse tree and shrub species ensure adequate food supplies even though weather, tree characteristics or tree vigor may cause food crop failure of some types of vegetation.

Red, black and scarlet oaks regularly produce mast, while white and chestnut oaks are less reliable. Although white oak makes better sawtimber, landowners favor the red oak group if they wish to support a large, stable squirrel population. In selective logging operations, four to six hickories should be left per acre (if they are available), as they are heavy mast producers.

Old, hollow trees with many openings are rarely used for dens, although they provide temporary shelter from predators and hunters. A good den site is usually a tree nearing maturity with one or two openings into a cavity. Entrance holes are round and seldom over three inches in diameter. If you want to manage a timber tract for squirrels, keep at least four or five active den trees on each acre. In forests where trees have reached a mast-producing stage but are not mature enough to serve as good den sites, artificial nesting boxes may be used.





## Weasels

Weasels are mammals belonging to the family Mustelidae. The mustelids, which are characterized by strong musk, vary in size, color, behavior and habitat. They are found worldwide, except for Antarctica and most oceanic islands. Other Pennsylvania mustelids are the fisher, mink and otter. The ferret, marten, badger and wolverine also belong to the family.

Three weasel species occur in Pennsylvania: the short-tailed weasel (*Mustela erminea*), also called the ermine, Bonaparte's weasel, and stoat; the long-tailed weasel (*M. frenata*), also known as the New York weasel; and the least weasel (*M. nivalis*), or mouse weasel. Ranges of the three species overlap in Pennsylvania, the Great Lakes states and parts of Canada. In Pennsylvania, the ermine is found mostly in the northern and eastern parts, the long-tailed is common throughout the state, and the least is found in greatest numbers in the southcentral and northwest.

Weasels have long, slim bodies. Their short legs have five small-clawed toes on each foot. Their necks are long and their heads are small and triangular. Their eyes are small in relation to head size, and the ears, set low on the skull, are rounded and well-furred. Weasels travel with a loping gait, stopping occasionally to sit on their haunches or stand on their back legs to look around.

Weasels are consummate predators. Their senses of sight, smell and hearing are acute. Their hunting instinct is keen, and they are active, aggressive and quick. They kill and consume a wide variety of prey, including animals larger than themselves. Small rodents form the bulk of most weasels' diets. Although mainly nocturnal, weasels may hunt during the day.

They find prey mainly by scent, darting in and out of rodent burrows, checking brushpiles and rock crevices. A weasel pounces on its prey and bites it at the base of the skull. The weasel's forelegs hug the prey, and the hind legs kick and scratch.

A weasel has a fast metabolism and must eat more food in proportion to its body weight than other mammals of similar size. Males are typically larger than females. Some biologists believe this size difference may lead males to concentrate on larger prey, relieving feeding competition when prey species are scarce.



**long-tailed weasel**

Secretive and wary, weasels are difficult to study in nature, and many gaps remain in our knowledge of their reproduction. Two of the species covered in this Wildlife Note (the ermine and the long-tailed weasel) exhibit delayed implantation of the blastocyst, common in mustelids. In delayed implantation, mating takes place in summer or autumn; the fertilized eggs go through a short period of development and then lie dormant within the female until spring, when they implant themselves in the uterine wall and continue to grow. About 25 days later, young are born.

Delayed implantation may occur for several reasons, but the two most possible reasons are: It assures that all litters arrive at a time when prey is abundant and competition for food is not extreme. Additionally, it doesn't restrict mating to one short period, increasing the odds that females will come in contact with males and be bred. Female weasels give birth to 4 to 12 young, usually in underground nests. Least weasels are thought to produce several litters each year, while ermines and long-tailed weasels bear one litter in April or May. Young of all species are born blind and naked or sparsely furred. Adult males may bring food to the mother and nursing young, which develop rapidly and are on their own after weaning.

Weasels remain active year-round, seldom denning for long periods regardless of weather. During spring, summer and fall, their fur is brown with creamy or white underparts. In Pennsylvania, most ermines change from brown to white for winter, and perhaps one in six long-tailed weasels turn white. Some least weasels undergo the brown-to-white transformation, which is triggered by shortening days.

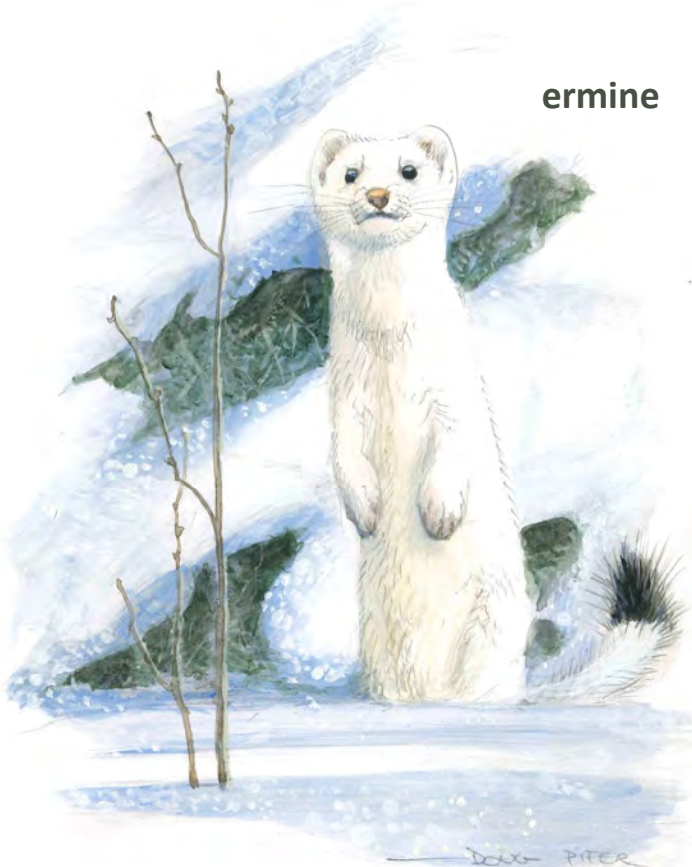
## Ermine

The ermine is found in northern regions around the world. In North America, it occurs from Pennsylvania and Maryland north to New England, west across the Great Lakes states and Canada, from western Montana south in the Rocky Mountains to New Mexico, and from northern California north to Alaska. The ermine is also known as the short-tailed weasel. Although present throughout Pennsylvania (except perhaps in the southwestern corner), the ermine is much scarcer here than the closely related long-tailed weasel.

Adults are 9 to 15 inches in length, including a 1.6 to 3.2-inch tail. Males are larger and heavier than females. Weights are from 1.6 to 3.7 ounces. Both sexes are smaller than corresponding sexes of the long-tailed weasel. A large male ermine is about the same size as a small female long-tailed weasel. The ermine's bushy tail is shorter than that of the long-tailed weasel.

An ermine's pelt consists of soft, short underfur and long, coarse, glossy guard hairs. The sexes are colored alike, and juveniles are colored similar to adults. Albinos are rare.

In summer, an ermine's upper-parts are dark brown, slightly darker on the head and legs. The chin and throat are white, and the underparts are white or cream-colored, extending down the insides of the legs and including the feet. The end third of the brown tail is black. In winter an ermine is white, tinged with yellow on the underparts and back. The tail tip remains black.



ermine

The black-tipped tail on both short and long-tailed weasels helps them to avoid being killed by predators focused on the black tail tip.

An ermine molts twice a year, in spring and autumn. The molts are triggered not by temperature but by amount of light per day, increasing in spring and decreasing in fall. Molts usually begin on the belly and spread to the sides and back, finishing with the tail. Aside from the varying hare, the weasels are the only Pennsylvania animals to turn white in winter.

The autumn molt (brown to white) begins in October and is usually complete by late November or early December. A molting ermine looks mixed brown and white. The white-to-brown spring molt runs from mid-March to late April.

Like all weasels, ermines are alert, curious and bold. They make a rapid "took-took-took" sound, hiss, purr, chatter, grunt and screech. When annoyed, they stamp their feet or emit musk from their anal scent glands.

Ermines can swim (sometimes pursuing prey in water) and climb trees, but spend most of their time on the ground. Their normal gait is a series of short bounds (about 20 inches), made with an arched back. An ermine can leap five or six feet and run about 8 mph for short distances.

Prey includes mice, voles, rats, chipmunks, shrews, cottontail rabbits, frogs, lizards, small snakes, birds, insects and earthworms. They will also eat carrion when hunting is poor. Captive ermines eat food equal to about one third of their weight every 24 hours.

Ermines consume flesh, fur, feathers and bones of small prey, but generally just the flesh of larger animals. They may lick warm blood from a kill, but do not suck blood. They often kill more than they can immediately eat and cache excess kills.

An ermine spends most of the daytime in a den beneath a stone wall, rock pile, log, fallen tree, or abandoned building. A den may have three or four tunnels leading to it.

Breeding habits are similar to those of the long-tailed weasel. Females—including young of the year, 2 to 3 months old—come into heat in summer. (Males do not mature sexually until late winter or early spring following the year they were born.) Young are born from mid-April to mid-May, after a gestation period of about nine months due to delayed implantation.

The natal nest is underground, lined with leaves, grasses, fur and feathers. The female bears four to nine young, usually six to seven. Newborns are blind, pink and weigh about half an ounce.

Young develop rapidly. Their eyes open at 35 days. They are lightly furred and play with each other inside and outside the den at 45 days. The male may help the female care for them. A seven-week-old male is larger than its mother.

Ermines are preyed on by humans, large hawks and owls, foxes, snakes and domestic cats and dogs. They are parasitized by fleas and intestinal worms. Longevity is estimated at five or six years.

An ermine's home range is thought to be about 30 to 40 acres, and 20 individuals have been found per square mile of good habitat. In winter and early spring, ermines travel long distances for food, often 2 to 3 miles per night.

In the northern part of its range, *Mustela erminea* lives in low brush and thickets along waterways in heavily forested areas. To the south, ermines inhabit open country with fencerows and rockpiles, brushy land and occasionally swamps.

## Long-tailed Weasel

The long-tailed weasel is found from sea level to timberline from Maine across the United States and southern Canada, south to Florida, Mexico, and South America, excluding the U.S. Southwest.

The long-tailed weasel is Pennsylvania's largest weasel and is fairly common statewide. During years when Pennsylvania paid a bounty on weasels, eight of every ten turned in were long-tails.

The long-tailed weasel is similar to the ermine in proportion, color, and markings, although the long-tailed species is slightly larger, and its tail is longer.

Adult males are larger and heavier than females. Length varies from 15 to 23.5 inches, including a 3.2- to 6.3-inch tail. Weights are 2.5-9.3 oz. Sexes are colored alike. In summer, upper parts are a uniform dark brown, extending onto the feet and toes (feet and toes of an ermine are white). The dark brown tail is tipped black.

The long-tailed weasel normally becomes white only in northern sections of its range; in Pennsylvania, five of every six stay brown in winter, and farther south all individuals probably remain brown.

Two molts occur each year. The fall molt is from October into November, the spring molt from mid-February or early March into April. In autumn, molting starts on the belly and moves upward; in spring, the order is reversed.

Behavior of the long-tailed weasel is similar to that of the ermine. Long-tailed weasels are good swimmers and adept climbers that will chase a squirrel up a tree. Although generally solitary, two individuals may play together. A long-tailed weasel is a persistent, efficient predator, chasing prey, pouncing on it, hugging it with the forelegs, and biting the victim at the base of the skull.

Long-tailed weasels prey on small terrestrial mammals, bats, hares, rabbits, birds and their eggs, frogs, snakes, earthworms, insects and carrion. Smaller victims are eaten whole. A weasel can drag prey much heavier than itself.

## long-tailed weasel



A long-tailed weasel seldom digs a den, preferring to modify a chipmunk burrow, enlarge a hole under a stump, or move into a hollow log or a crevice in rocks, stone walls, or beneath an abandoned building. Nests are located about 6 inches underground and 2 feet from burrow entrances. Roughly 9 inches in diameter, they are made of grass packed in layers and lined with shrew and mouse fur.

Breeding season is July and August, and young are born the following April or May after a 205- to 337-day gestation (average is 279 days). Delayed implantation occurs, with development of the eggs resuming during the last 27 days of pregnancy. One to 12 young may be born (average, 6 to 8).

Newborns are about 2.5 inches long and weigh 0.11 oz. They are blind, naked and pink-skinned, and tend to make more noise in the nest than young ermines. The male brings food to mother and young. Young develop quickly. After 21 days, their backs are well-furred; at 28 days, teeth erupt; at 36 days, their eyes open and the female begins weaning them. Soon after, the young leave the nest and disperse and by November are almost fully grown.

Females breed in their first autumn, while males do not mature sexually until the following year. Man, foxes, dogs, hawks and owls prey on long-tailed weasels. Captive specimens have lived five years, but wild individuals probably do not survive that long. *Mustela frenata* live in open woodlands and brushy fields, preferably near water. Rocky fencerows are favorite hunting grounds. Size of an individual's range varies with food availability and type and quality of cover.

## Least Weasel

The least weasel is the world's smallest carnivore. It is found in Europe, northern Asia and North America. In North America it inhabits the Appalachian Mountains from Pennsylvania

south to North Carolina, the northern Midwest, Canada and Alaska (it is absent in New England and the Pacific Northwest). In Pennsylvania, *Mustela nivalis* is most common in the Allegheny Plateau area of the northwest and in the southcentral part of the state.

Least weasels are 6 to 8.5 inches long, including a 1.5-inch tail. They weigh 1 to 2 ounces. Males are slightly larger and heavier than females. Coloration is brown above, white below. The chin and feet are white, and the brown tail has no black tip. Sexes are colored alike. In Pennsylvania, some least weasels turn white in winter. In Canada, most or all individuals change into white pelage, including the tip of the tail. Least weasels have no black tip because their small size would increase the chances of being killed by an attacking predator.

Least weasels are just as aggressive and predatory as the larger weasels and kill in the same manner. If disturbed near its nest, an adult least weasel will chirp at its enemy. The chirp is a threat cry. Least weasels also hiss when afraid or threatened and trill in friendly encounters with other least weasels. When agitated, they spray musk from their anal scent glands.

The species preys on mice, voles, small birds, insects, earthworms and small amphibians. Sometimes they kill more than they can eat and cache uneaten prey in their dens. Least weasels are nocturnal, solitary and are seldom seen; they spend most of their time hunting and consume food equaling 40 to 50 percent of their body weight each day.

Least weasels breed and reproduce year-round, with the possible exception of winter. Delayed implantation does not occur, and two or more litters may be produced each year. A female's estrus lasts four days. If bred, she bears one to six young (usually four to five) following a 35-day gestation period.

Young are blind and naked, but develop rapidly. Hair covers their bodies in four days; canine teeth erupt at 11 days; eyes open at 26-30 days; and weaning occurs between 42 to 49 days, after which they are on their own. Immatures reach adult length after about eight weeks, and adult weight when 12 to 15 weeks old. Females mature sexually in four months, males in eight.

Least weasels inhabit meadows, fields, brushy land, or woods. They may take over nests and burrows of mice, moles and voles, lining them with fine grass or fur. During winter, the fur lining may be an inch thick and matted like felt. Least weasels rarely travel more than 100 yards from their home burrows, and the average individual range is estimated at two acres.

This tiny weasel occupies a lower position in the food chain than ermines and long-tailed weasels. It is preyed on by the larger weasels, snakes, owls and cats. Longevity in the wild is not known.



least weasel



## White-tailed Deer

The white-tailed deer, *Odocoileus virginianus*, was so named because the underside of its tail is covered with white hair, and when it runs it often holds its tail erect so that the white undersurface is visible. Whitetails belong to the Cervidae family, which in North America includes the elk, moose, caribou and mule deer. Cervids are split-hoofed mammals with no incisor teeth in the front of the upper jaw. They are classed as ruminant animals, meaning they have a four-chambered stomach and frequently chew a “cud.” Adult male whitetails grow and shed a set of antlers each year. On rare occasions, females also grow antlers.

Whitetails are the most widely distributed large animal in North America. They are found throughout most of the continental United States, southern Canada, Mexico, Central America and northern portions of South America as far south as Peru. White-tailed deer are common throughout Pennsylvania. The species is absent from much of the western United States, including Nevada, Utah and California (though its close relatives, the mule deer and black-tailed deer, can be found there).

A male deer is referred to as a buck, and a female a doe. In Pennsylvania, the average adult buck weighs about 140 pounds and stands 32 to 34 inches at the shoulder. He is about 70 inches long from the tip of his nose to the base of his tail. His tail vertebrae add only about 11 inches, but the long hair makes it far more conspicuous. Does tend to be smaller compared to bucks of the same age.

Deer weights vary considerably, depending upon age, gender, diet and the time of year the weight is checked. For example, breeding-age bucks might weigh 25 to 30 percent more at the onset of the breeding season than they do at its conclusion. Hence, a 140-pound buck in December might have weighed approximately 180 pounds in September.

Adult deer share the same coat color and markings. The belly, throat, areas around the eyes, insides of the ears and the underside of the tail are white all year long. During summer, the upper parts of the body are reddish brown, and in winter they are grayish brown.



Summer coats are composed of short, thin, wiry guard hairs with no underfur. Winter coats have long, thick guard hairs that are hollow with soft, wooly, densely packed underfur. The winter coat provides excellent protection against the elements. Summer coats are shed in August and September, winter coats in April and May.

Melanistic (dark-colored) and albino (abnormally white) deer occur, but they are exceptionally rare. Partial white deer, called “piebalds” or “calico” deer, occur more frequently but are still reported to make up less than 1 percent of the population.

Fawns are born with reddish-brown coats dappled with white spots. This simple pattern is excellent camouflage. When a fawn is lying on the ground or in dry leaves, this coat looks like the sun hitting the ground after it passes through the treetops. Fawns lose their spots by taking on the same coat colors as adults in the fall.

Whitetails have many scent-producing glands: two tarsal, one inside each hind leg at the hock joint; two metatarsal, one on the outside of each hind leg between the hock and the foot; four interdigital, one between the toes of each foot; and two preorbital, one below the inside corners of each eye. The tarsal and metatarsal glands release scents conveying excitement or fear; while the interdigital glands produce odors that let deer trail each other by smell. The preorbital glands are used to personalize the prominent overhanging branch at “scrapes” – dirt areas where leaves and grass are scraped

away – that are used to communicate with other deer during the breeding season, also known as the rut.

Deer can run at 40 mph for short bursts and maintain speeds of 25 mph for longer periods. They are also good jumpers, capable of clearing obstacles up to 9 feet high or 25 feet wide. The air-filled guard hairs enable them to swim easily.

Day or night, a deer's visual acuity is excellent. Deer can distinguish among different colors, but their eyes are particularly adapted as motion detectors. Their keen senses of smell and hearing help them to detect danger.

Usually deer are silent, but they can bleat, grunt, whine, and when alarmed or suspicious, make loud *whiew* sounds by forcefully blowing air through their nostrils. Does whine to call their fawns, and fawns bleat to call their mothers.

Although antler growth is evident on male fawns, the button-like protrusions are not prominent. A buck's first set of antlers begins to grow when it's about 10 months old. From this point forward, a buck will grow and shed a new set of antlers each year. Typical antlers curve upward and outward to point forward, and consist of two main beams with individual tines growing upward from them.



If the yearling buck comes from an area with poor food conditions, his first set of antlers may be only “spikes” – antlers consisting of single main beams only. Spikes are common in yearlings because antler growth starts at a time when the young buck's body still is growing. But because antler development is tied in closely with the animal's nutritional status, older bucks may also produce spikes if they come from an area with poor food conditions.

Antler growth is a complex process driven by hormones and photoperiod (day length). Antler tissue is the fastest growing tissue known to man, having the capacity to grow an inch or more per day. Annually, antler growth begins when the days are lengthening – between the spring equinox and the summer solstice (mid-March through mid-April). Antlers grow from the tip and are full of thousands of blood vessels and are covered in velvet.

As the summer progresses and day length begins to decrease, testosterone production increases. This triggers mineralization or hardening of the antlers. The soft tissue is transformed directly into bone by the depositing of minerals within the cartilage matrix through the extensive capillary network – hardening the antlers from the base to the tip. Antler-hardening takes about a month starting in mid-July and ending in mid-August, after which time, the velvet dries up and is rubbed off.

After the breeding season, testosterone levels drop off and antlers are shed in late winter or early spring. The process then starts all over again.

While antlers are growing, they're soft and subject to injury. Bent and twisted tines and main beams often indicate the antler was injured while it was growing. Broken antlers occur after the antler has stopped growing and has hardened.

Antler shedding usually occurs earlier in northern states than southern ones. Natural variation and general health (which relates to nutrition) factor into when a buck will shed his antlers. It is typical for most bucks in an area to shed their antlers within a month or so of one another. But each buck has an individual antler cycle, and this also plays a role in when antlers are shed. This antler cycle is independent of all other bucks and is thought to be related to the animal's birth date.

## Social Organization

The social organization of the whitetail is largely matriarchal. Although large numbers of deer are sometimes seen together in feeding or wintering areas, these associations are usually temporary and do not reflect the same strong ties as family associations. The most common social group is an adult doe, her fawns and her yearling female offspring. Sometimes three or four generations of related does are present in a family group. When fawning season approaches in late May, adult does become aggressive toward their yearling offspring; temporarily severing ties with the family group. Does remain alone to bear and rear their fawns. A doe's yearling offspring are left on their own for the summer.

For both male and female yearlings, this breakdown in family bond could result in movement away from their mother's home range. This movement is called "dispersal." If siblings do not disperse, they tend to remain together throughout most of summer. Sibling groups with yearling bucks break up in September as the rut approaches. Yearling bucks tend to disperse from the mother's home range at this time. In Pennsylvania, yearling bucks travel 3 to 5 miles on average, although dispersal movements of more than 40 miles have been observed. Yearling does that do not disperse remain in the mother's home range and rejoin her, and her new fawns, between September and October.

During the breeding season adult and yearling bucks tend to stay alone except when in pursuit of a female approaching estrus. After the breeding season in late January, bucks form loose associations of usually two to four animals. These bachelor groups remain together throughout most of the winter and summer months. These associations dissolve in September when the rut starts again.

## Reproduction

The breeding season of white-tailed deer begins as early as September and can last into late January. Breeding activity reaches its peak in mid-November, and most adult females have been bred by the end of December. Some female fawns are capable of reproducing at 7 or 8 months of age and give birth at 14 or 15 months of age. Most of these animals breed a few weeks later than older does, and they usually produce a single fawn.

The age and health of a doe influence her reproductive capacity. Females from high-quality habitat produce more fawns than those from poor-quality habitat. Adult females (2½ years and older) usually produce twins, with 5 percent or less producing triplets. There is a tendency for younger females, females in poor condition, and females in poor-quality habitat to produce more male offspring.

## Food Habits

Whitetails eat a wide variety of herbaceous and woody plants. In a Pennsylvania study where biologists examined and measured the food contained in the rumens of vehicle-killed deer, about 100 different plant species were identified. More than half were tree, shrub or vine species, the remainder, herbaceous plants. A large number of ingested plants could not be identified.

Whitetail food preferences are largely dependent on plant species occurring in an area and the time of year. Green leaves, herbaceous plants and new growth on woody plants are eaten in the spring and summer. In late summer, fall and early winter, both hard and soft fruits, such as apples, pears and acorns are incorporated into their diet. In winter, evergreen leaves, hard browse and dry leaves are eaten. A

variety of natural foods at all times of the year are essential if an area is to carry a healthy deer population.

## Habitat

The age of a forest determines the number of deer it can support. Studies in Pennsylvania's northern hardwood and mixed-oak forests show that seedling/sapling stands can support the greatest number of deer, pole-timber stands support few or no deer, and saw-timber stands can support a moderate number of deer.

Vegetation that affords protection to an animal is commonly referred to as cover. Dense thickets, especially evergreens, usually jump to mind as being best for deer. This type of



cover is perfect for winter. The key word is “protection” – protection from all enemies, be they man, beast, insects or weather. Some kind of protection is needed during all seasons of the year, not just winter.

In Pennsylvania, the most essential cover component is probably winter protection within extensive hardwood stands. This kind of cover is best provided in areas protected from cold winds with southern exposures. Heavy snows can cause deer to move from high elevations to lower, protected valleys particularly into areas with conifer cover. A source of natural foods in the vicinity of good winter cover is the ideal location for deer to survive this critical time of year.

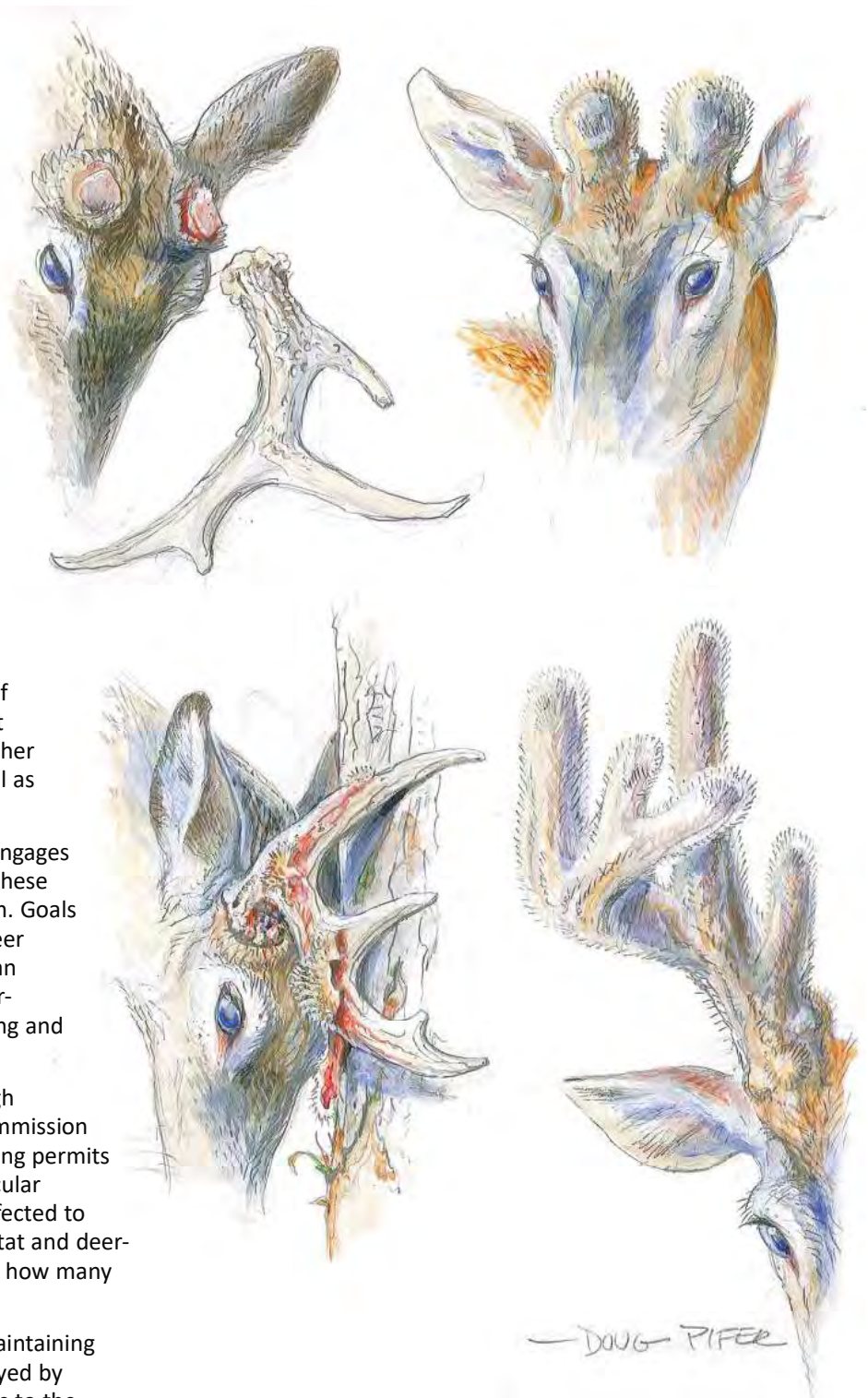
## Management

Deer are a valuable natural resource, but they must be closely managed or they’ll quickly overpopulate the range they inhabit. When overpopulation occurs, deer strip their habitat of its life-supporting qualities, not just for deer, but for many woodland wildlife species. Crop and other property damage problems also increase, as well as deer-vehicle collisions.

To balance these costs, the Game Commission engages the public to identify deer-management goals. These goals then direct the deer-management program. Goals include managing for healthy and sustainable deer populations and habitat, maintaining deer-human conflicts at acceptable levels; and providing deer-related recreational opportunities such as hunting and wildlife viewing.

Population control can only be facilitated through regulated harvest of female deer. The Game Commission uses hunting to adjust deer populations. By issuing permits entitling hunters to take antlerless deer in particular management units, population trends can be affected to meet management goals. Deer population, habitat and deer-human conflict measures are used to determine how many hunting permits should be issued.

A sound management program is essential in maintaining the deer population as a public asset to be enjoyed by future generations of Pennsylvanians and visitors to the Commonwealth.





## Woodchuck

Known by many names including groundhog, whistle pig, red monk and chuck, the woodchuck is a common Pennsylvania game animal. Its taxonomic name is *Marmota monax*. Woodchucks are rodents and members of the squirrel family (Sciuridae). They are closely related to tree and ground squirrels, chipmunks, prairie dogs and marmots. These fossorial rodents dig burrows that aerate the soil and provide excellent escape hatches for many other animals but can be dangerous to livestock and farm machinery. So the woodchuck is often thought of as a “valuable nuisance”—a contradiction in terms that illustrates well this inhabitant of field and fencerow.

### Biology

The woodchuck is a mammal about 20 to 26 inches long, including a bristly, 6-inch tail. Weights of adults range from 5 to 10 pounds, with extremely large animals as heavy as 12 to 15 pounds. The weight of an individual fluctuates in a cyclic fashion throughout the year, with the animal at its heaviest by summer’s end.

Woodchucks have yellowish-brown to blackish-brown fur. Belly fur is sparse and usually paler than the fur on the back. The pelt is coarse and has little or no commercial value. Light-colored hairs in the coat give some individuals a grizzled appearance. Albinism and melanism occur infrequently. A woodchuck’s feet are dark brown or black, and its front incisor teeth are white. These two front teeth are broad and chisel-shaped like those of rabbits and squirrels and are used primarily to nip off vegetation.

Woodchucks are found throughout Pennsylvania in open fields, meadows, pastures, fencerows and woodland edges and even deep in the woods. Adults rarely move more than a half mile within their home ranges, preferring to stick close to the safety of the burrow.

Woodchucks do not generally have to move far to find food, as they eat a wide variety of vegetation—including green grasses, weed shoots, clover, alfalfa, corn in the milk stage, dandelion greens, garden vegetables such as beans, peas and carrots and, in the fall, apples and pears. These habits often get them in trouble with farmers and gardeners.



In the summer, woodchucks feed most actively during early morning and late evening. When feeding, a woodchuck usually raises its head every ten seconds or so to check for danger. A woodchuck has keen senses of sight, hearing and smell. It’s eyes, ears and nose are located the top of the head, enabling a groundhog to check its surroundings simply by sticking its crown out of the burrow.

A muscular body, short powerful legs and sturdy claws make the woodchuck an excellent digger. It uses its strong forefeet to loosen the soil, then its hind feet to kick the earth behind them. It spends much of its time underground. It piles excavated dirt at its burrow’s main entrance and often sits on this mound to view its surroundings. The burrow descends at a sharp angle below the entry hole and then levels off into a narrower tunnel. Woodchucks often dig many side tunnels and two or three back entrances. These “drop holes” are inconspicuous (they aren’t marked with dirt mounds). Woodchucks use them as lookouts or to get underground in a hurry when danger threatens. Burrows are usually located in well-drained, sloping areas and rarely get flooded.

Even though a woodchuck has short legs, it can run fairly fast for a short distance. An adult is a fierce fighter; dogs, coyotes and foxes are its main enemies, although the young are preyed upon by owls and hawks. Woodchucks climb well, ascending and descending trees head first. They have good balance and frequently walk along wooden fence rails. They use their front paws much as people use their hands, to clutch stems of clover or hold apples while feeding.

Woodchucks can produce several sounds. They often let out a sharp whistle for an alarm call. When feeding, they may make a “chuck-chuck” sound, and when angry or cornered may chatter their teeth.

Woodchucks hibernate during winter. They eat heavily throughout summer and early fall to accumulate body fat and prepare to shelter in their burrows all winter. Woodchucks begin denning up with the hard frosts of October. Few remain active past the first of November. A hibernating animal goes into a deep sleep, or a dormant state: its body temperature, heartbeat and other metabolic processes fall off drastically as the animal lives over winter on its body fat. A woodchuck’s body temperature drops from more than 90 degrees Fahrenheit into the low 40s; its heartbeat slows from more than 100 beats a minute to only four.

In the spring, males emerge from hibernation before females, and during February and March fight aggressively. Fat left over from hibernation sustains woodchucks during mating season

(late February-March), when succulent green foods are scarce. After a 28-day gestation period, females bear young in April and early May. Litters average three to four young. Newborns are blind, naked and helpless and remain in the underground nest until about a month old. By mid-June or early July, they are ready to leave the home burrows and establish their own territories. This move is a perilous one for young woodchucks, and many are killed by vehicles or predators. The young often take up residence in abandoned dens. As fall approaches, they feed more actively than the heavier adults to accumulate enough fat to last them through the coming winter.

The potential lifespan of a woodchuck is estimated at eight or nine years. In a study conducted at the Penrose Research Laboratory, Philadelphia Zoo, observers found that captive woodchucks died of many causes, including cancer of the liver, ruptured aortas, and heart attacks and cerebral strokes resulting from hardening of the arteries. It is doubtful whether many individuals in the wild live to be 8 years old. The older an adult gets the more easily it falls prey to predators.

A few groundhogs are affected by malocclusion, which occurs when the front incisors fail to meet and, therefore, cannot continually grind each other down. A rodent’s teeth never stop growing. So, this misalignment may result in an incisor growing in a complete circle, sometimes even penetrating the skull cavity and killing the animal.



## Population

The woodchuck is native to Pennsylvania and has benefited from civilization. When Pennsylvania was almost completely forested, and there were no farms, pastures or orchards, there were far fewer woodchucks than there are today, simply because there was little suitable habitat. Probably the only places where groundhogs became abundant were on formerly-forested tracts that had been swept clear by fires and were growing up again in brush.

But as these naturally-cleared areas matured, woodchuck numbers would have dwindled; population size depends on habitat, and while woodchucks can exist in wooded territory, they do not build up sizable populations there. By cutting forests, raising crops and clearing pasture land, settlers created suitable habitat. The woodchuck population expanded and today is one of Pennsylvania's most common mammals.

Woodchuck numbers vary depending on food availability, soil type, hunting pressure and predation. Sometimes populations are extremely dense, with up to six or seven individuals per acre. However, this high density is seldom reached. A population of four per acre is considered abundant, and the average is probably closer to one per acre of farmland.

In some regions, woodchucks are under heavy hunting pressure but still produce high populations year after year. This illustrates how a game species can absorb heavy local losses if it has enough good habitat. Groundhogs can damage crops and gardens and become real pests in agricultural areas where they are overabundant.

As a species, the woodchuck has a large range, extending north and northeast from Oklahoma and Alabama, and west across Canada into Alaska. The yellow-belly marmot, closely related to the woodchuck, inhabits the high country of the Rocky Mountain states.

## Habitat

Woodchucks live in many types of terrain, from farmland and old, overgrown cemeteries to orchards and suburban areas. Ideal habitat might be a thick, almost impenetrable fencerow bordering cultivated cropland. Orchards, especially if the spaces between trees are not mowed frequently, provide good habitat; woodchucks dig burrows under dead stumps or at the bases of the trees, where the roots protect den entrances. In stony areas, dens are often dug under large rocks.

A woodchuck may dig its burrow in the center of a field or pasture. But usually, the animal chooses a more protected location such as a field edge, fence, hedgerow or under a stone wall. Woodchucks do not require ground water sources and many live far from streams, lakes, creeks, and other bodies of water. Like rabbits, they get moisture from succulent plants, dew and water left standing after rainfalls.

The tunnels woodchucks dig provide habitat for skunks, raccoons and foxes, which remodel vacant burrows and use them to bear and raise young. Foxes may claim a burrow after killing its woodchuck owner. Rabbits often seek shelter in the dens especially during winter while the woodchucks are hibernating below. Animals pursued by predators or hunters also use the burrows as escape hatches.



## Allegheny Woodrat

The Allegheny woodrat (*Neotoma magister*) lives in remote rocky habitats. In Pennsylvania, the species is found in a broad band across the state, from the northeast to the southcentral and southwest, then southwest through West Virginia and mountainous parts of Ohio, Maryland, Virginia, Kentucky, Tennessee, and North Carolina. A related species, *Neotoma floridana*, lives farther to the south, often in very different habitats, including flatlands and swamps. Until the early 1990s both rodents—which are nearly identical in appearance—were *Neotoma floridana*. Recent studies of their chromosomes and skull characteristics, however, have persuaded taxonomists that the two types are, indeed, separate species.

The name “woodrat” unfortunately causes some people to associate woodrats with the accidentally introduced Eurasian rat species. In fact, the shy, secretive Allegheny woodrat has little in common with the aggressive Norway rat, other than the fact that both are rodents. The woodrat is as rare as the Norway rat is common; the woodrat is a lover of wilderness, while the Norway rat lives cheek-to-jowl with humans in cities, towns, and farmlands. The woodrat has vegetarian food habits, and the introduced Norway rat sometimes preys on native wildlife.

**Biology**—Adult woodrats are 16 to 17 inches long, including a 7 – to 8-inch tail, and weigh 13 ounces to one pound. The coat is grayish-brown above and white below. The colors are darker in winter when the coat is also softer and longer. The fully furred tail is dusky to brown above, white below. The woodrat’s prominent rounded ears, long whiskers, and large and slightly bulging eyes all indicate its heightened senses of hearing, touch, and sight. The animal’s night vision is particularly keen.

Caves, rocky cliffs, ridge crests, overhangs and boulder fields with deep crevices and underground chambers—those are the main places where Allegheny woodrats make their homes, although occasionally they take up residence in abandoned buildings. Woodrats eat leaves; berries (including the pulp and seeds of wild grapes); nuts (acorns are a particularly important food); stalks and fruit of pokeweed; fruits of sassafras, dogwood, mountain ash, cherry, red maple, and



shadbush; ferns; other plants; and fungi. Woodrats don’t seem to rely on insect food as much as deer mice and white-footed mice do. Woodrats are nocturnal, feeding and shifting about within their home ranges—estimated at half an acre—under cover of darkness. They will forage out to 100 feet and farther from their nest sites. The woodrat hoards leafy twigs, seeds, nuts, and mushrooms in and near its expansive nest. The creature builds—or accumulates—a nest of bark scraps, twigs, sticks, leaves and moss, situated out of the weather in a crevice between boulders, on a shelf or on the floor of a cave, or beneath a rock ledge. The nest is open at the top, like a bird nest. Most nests are around 20 inches in diameter. Often there will be two living areas, each about five inches in diameter and lined with grasses, shredded bark, and fur.

A woodrat uses its nest year-round and for its entire life. At times, other creatures shelter in woodrat nests, including cottontail rabbits, opossums, white-footed mice, snakes, toads, salamanders, insects, and spiders.

As well as stockpiling food, woodrats collect treasures such as old mammal skulls, feathers, bottle caps, nails, coins, shards of china, spent rifle cartridges, rags, and leather scraps. These objects are hidden in the nest or heaped up outside, sometimes mingled with stored food items. The woodrat gets the name “pack rat” from its habit of packing off such items; it is also known as the “trade rat” because, if it comes upon an intriguing object while carrying another article, it may leave its burden behind (leafy twig, mushroom, or the like) and carry off the new item (a camper’s spoon or car keys, for instance).

Woodrats leave piles of oval-shaped droppings (each dropping is three to four times as large as a mouse scat) on rock surfaces at “latrine sites,” which may be used by several individuals. For most of the year woodrats are solitary and unsociable, guarding their territories and warning off other woodrats by chattering their teeth and thumping their hind feet and vibrating their tails against the ground. They fight over food and nest sites, rearing up on their back legs and jabbing at one another with their muzzles and their front feet. Most adults become scarred, with torn ears, skin wounds and, in some cases, a bitten-off tail.

In Pennsylvania, woodrats breed from midwinter or early spring until autumn, with young arriving from mid-March to early September. The gestation period is about 35 days. One to four young are born per litter, and two or three litters are produced each year. Woodrats are born naked, with their ears and eyes closed; they are about four inches long and weigh half an ounce. Their teeth have already erupted. The decurved incisors have an oval hole between them which, when the jaws close, fits around the mother’s nipples. The nursing young hold on tenaciously; when the mother wants them to let go, she will pinch them on the back, jaw or neck with her teeth and twist them off with her paws. A young woodrat’s eyes open in its third week, and it is weaned after about a month. By six or seven weeks, juveniles weigh around five ounces.

Allegheny woodrats live up to three years in the wild. They are preyed on by foxes, weasels, skunks, raccoons, bobcats, hawks, barred owls, great horned owls, blacksnakes, and timber rattlesnakes. Uninformed cavers sometimes harass and kill woodrats in caves.

**Habitat**—In Pennsylvania the woodrat seems to be restricted to rocky cliffs and outcroppings at high elevations on steep slopes, and to caves. A rocky habitat is important, because woodrats place their nests in fissures and deep crevices out of reach of most predators. Nearly all the known historical and current

woodrat sites in the state are on the Appalachian Plateau and on ridges in the state’s Ridge and Valley physiographic province.

**Population**—Pennsylvania is near the northern limit of the Allegheny woodrat’s range, and populations on the fringe of any species’ range are often at risk. Since the late 1960s woodrats have vanished from sites where they once occurred, particularly in eastern and northwestern Pennsylvania. During the same period *Neotoma magister* disappeared altogether from New York, where the species is now considered to be extirpated.

Biologists believe several factors may have contributed to the woodrat’s decline. Over the years, changes in forest composition resulted in fewer oaks and, by the 1940s, in the near eradication of the American chestnut, once a prime source of nuts for woodrats. More recently, gypsy moth caterpillars have defoliated wide areas of oak trees, causing periodic shortages of acorns, a key food item. Woodrats can contract a fatal parasite, the raccoon roundworm (*Bavlisascaris procyonis*), by eating undigested seeds found in raccoon droppings. Human development near woodrat sites—land cleared for farming or homes—has spurred population increases in raccoons, and in great horned owls, which prey on woodrats.

Since 1986 the Pennsylvania Game Commission has surveyed over 360 sites from which woodrats have been reported. Biologists have identified 20 metapopulations, multiple colonies linked by patches of rocky habitat through which young woodrats can migrate to set up territories of their own and to find mates. Five of these metapopulation areas no longer support woodrats, and seven of them have fewer active colonies than in the past.

The Allegheny woodrat is listed as a threatened species in Pennsylvania and has been proposed as a candidate for the federal endangered species list.



# NOTES

# NOTES

# NOTES

