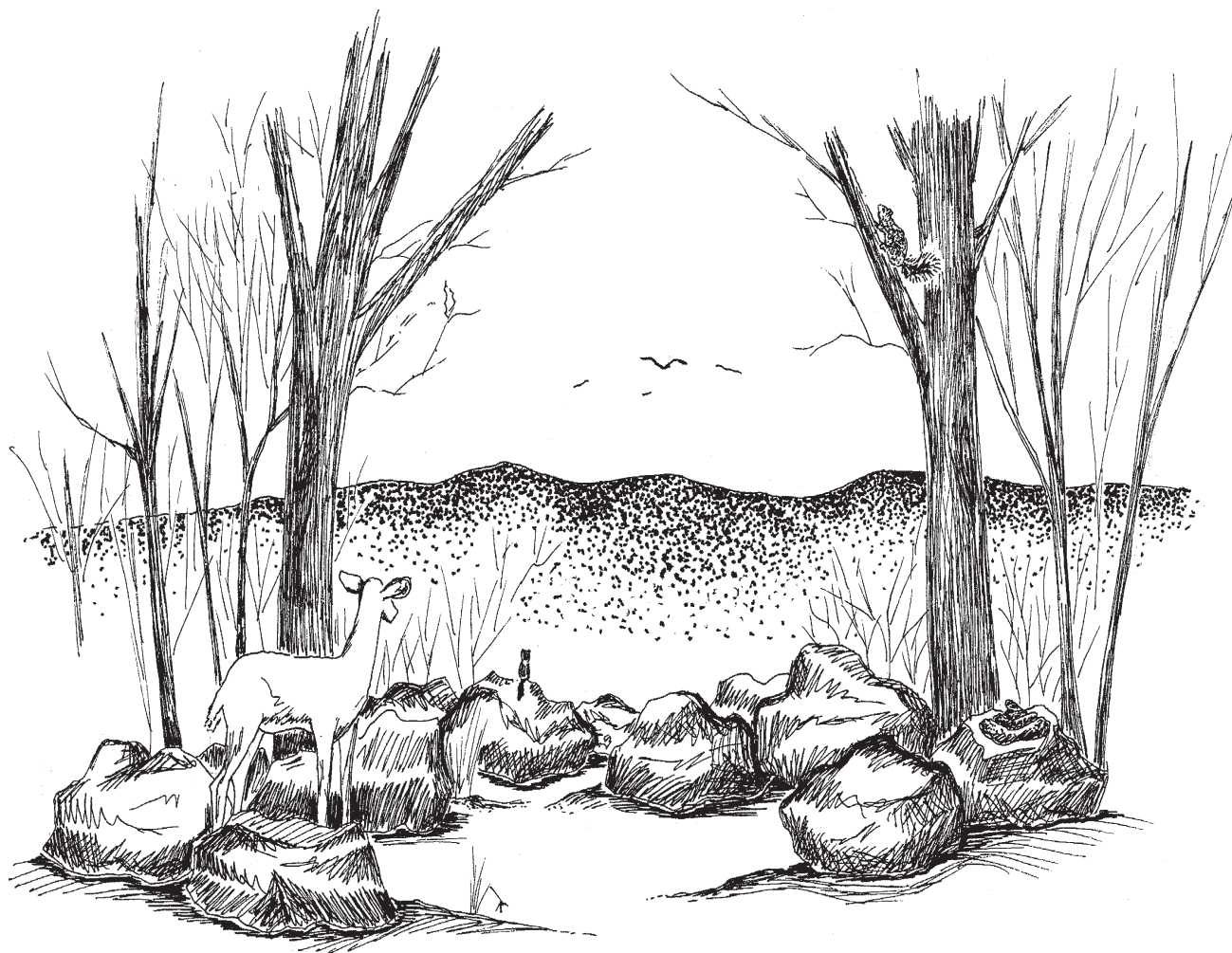


Animals in the Forest

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The central Appalachians are rich in animal life. Besides the many species that live here year round, others migrate through or visit the region. The mountains are home to more than 50 species of mammals, 390 species of resident and migrant birds, 100 species of reptiles and amphibians, 260 species of fish, and many invertebrates. This diversity of wildlife exists because of the diversity of habitats found in our region, including lakes, bogs, rivers, meadows, ponds, marshes and forests.

(See appendix for a full list of animals observed at Hawk Mountain Sanctuary and nearby.)

Animals in the Forest

continued ...

Mammals

Some of the most exciting moments during a field trip to Hawk Mountain Sanctuary are wildlife sightings. Most of the mammals common to the area are **crepuscular** or **nocturnal** and are not often observed during the day. Mammals often leave clues that help us find them, or let us know that they use an area. Of the 100 species of mammals found in Pennsylvania, 33 have been seen at Hawk Mountain. They include marsupials such as the opossum, shrews and moles, bats, rabbits, gnawing mammals, carnivores, and deer. The most commonly seen mammals are the eastern chipmunk, eastern cottontail, gray squirrel, southern red-backed vole, white-footed mouse, woodchuck, and white-tailed deer.

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Eastern Chipmunk

Tamias striatus

Chipmunks are among the Mountain's most entertaining mammals. Their playful displays can be misleading, however, since these mammals are unsocial and territorial. Chipmunks are active by day, and can be observed at birdfeeders—particularly in the fall—stuffing their cheek pouches with bird seeds. As many as 32 beechnut seeds have been found in the cheek pouches of a chipmunk. Seeds are then carried back to their burrows where they are cached for winter. The chipping call of the chipmunk, which is sometimes mistaken for a bird's call, is used to alert others to the presence of a predator as well as to announce their territory.

The back of the eastern chipmunk is grayish with five prominent brownish-black stripes separated by a cream-colored stripe running from shoulder to rump. The bushy tail of the chipmunk is red below, and brown above. Males and females are indistinguishable in the field.

Although they are found in a variety of habitats, chipmunks favor deciduous

Quick Reference

Field marks: brownish black and cream stripes on back

Length: 9-10 inches

Food: nuts, berries, mushrooms, invertebrates

Mating: February - April, June - July

Number of young per litter: 3-7 (1-2 litters per year)

Common Clues: Tracks, holes in the ground, chewed nuts or cones

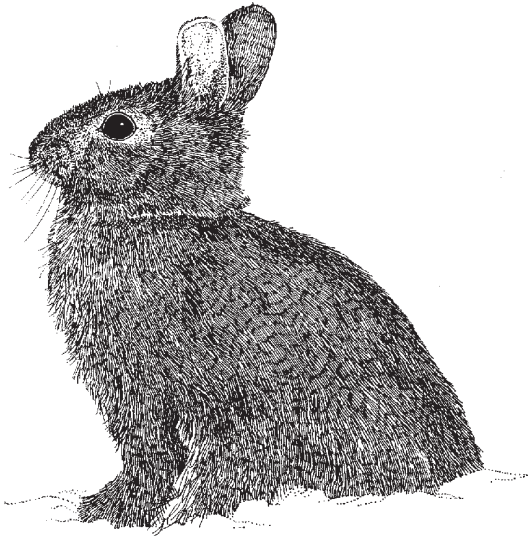
Look for them: around birdfeeders, and the forest floor

woodlands with a well-developed understory and an abundance of stumps and rocks where they forage and nest. Each chipmunk constructs and lives alone in its own burrow, which it defends aggressively. Burrows consist of several branching tunnels with many storage cavities. Material excavated from the burrow is spread about so that there is no sign that a burrow is being built. The entrance to the burrow is cleverly hidden. Burrows are used as nest sites in spring and late summer. In winter, chipmunks curl up in their burrows and, periodically, enter into a state of **torpor** or deep sleep. Torpor differs from hibernation in that the animal's body temperature and breathing rate only drops by small amounts. On sunny winter days, chipmunks awaken from their sleep and can be seen foraging for food.

The bulk of a chipmunk's diet consists of nuts, fruit, and buds. Chipmunks also feed on mushrooms and invertebrates including earthworms, snails, and butterflies. Hawks, foxes and snakes prey on chipmunks, as do domestic cats and dogs.

Animals in the Forest

continued ...



Eastern Cottontail

Sylvilagus floridanus

The eastern cottontail is often observed foraging at dusk. The cottontail has gray or brownish colored fur that is sprinkled with black on the back. A white ring encircles the eye. Females are slightly larger than males. Like all rabbits, the cottontail has a cottony tufted tail, long ears, and large hindfeet adapted for hopping. A pair of upper **incisors** covers another shorter pair that does not have a sharp cutting edge. Cottontails are **coprophagic**, meaning that they re-ingest fecal matter. Doing so permits them to obtain essential nutrients from food that passes through their alimentary canal a second time. Rabbits give birth to blind,

Quick Reference

Field marks: brownish with a white puff-ball tail

Length: 14.9 - 19 inches

Food: herbaceous plants, grasses and wildflowers, including dandelion, and the bark of woody plants

Young born: First litter, March-April

Number of young per litter: 3-8 (5-7 litters per year)

Common Clues: Tracks, scat, ends of twigs eaten off

Look for them in: bushy undergrowth with herbaceous vegetation

helpless, young in a well-defined nest.

The cottontail feasts on a variety of plant material including herbaceous plants and many garden plants. In winter, when grasses and leaves are scarce, cottontails feed off the bark of woody plants such as sumac and witch hazel. Rabbits are important game animals, and millions are harvested yearly. Rabbits are preyed upon by hawks, owls, foxes, skunk, snakes, cats and dogs.

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Gray Squirrel
Sciurus carolinensis

The gray squirrel is a common year-round visitor to bird feeders at Hawk Mountain. As its name suggests, the gray squirrel has a gray upper coat. The underside of the animal is white. The tail, which is extremely versatile, is black near the middle and tipped with white. Squirrels use their tails as a counter balance, a parachute and a sunshade.

The gray squirrel inhabits urban, suburban, and natural habitats where nut-bearing trees abound. In fall, squirrels, which feed mainly on nuts, bury their food in "**scatter hoards**" which they dig up and feed on in winter. Buried nuts, which become community food sources, are recovered by a keen sense of smell and a good memory. Nuts that are not

Quick Reference

Field marks: grayish with bushy tail

Length: 16-21 inches

Food: nuts, acorns, cones, fruit, flowers, buds, seeds

Young born: February to April; September to October

Number of young per litter: 3-5 (2 litters per year)

Common Clues: Tracks, leaf nests in trees, caches of seeds, claw marks on trees, tree holes

Look for them: around birdfeeders; foraging along forest floor

recovered become an important source of forest seedlings.

Squirrels are diurnal and are active all year round. During winter cold spells, squirrels may enter a brief state of **torpor**. Squirrels build nests of leaves in the forks of trees. The entrance to the nest usually faces the tree trunk. The nest is lined with vegetation such as moss and grass. Some squirrels remain comparatively close to their nest for most of their lives.

Hawks, great horned owls, snakes, foxes and bobcats prey on squirrels. In Pennsylvania, squirrels also are hunted and millions are shot each year. Gray squirrels have adapted well to urban habitats.

Black Bear

Ursus americanus

The black bear is the largest animal found in Pennsylvania's Appalachian forest. This powerful mammal is easily identified by its black or brownish coat. The bear's long muzzle may be tinged with tan, and a white spot may appear on the breast. Male bears are called boars, and are normally larger than female sows.

Bears are solitary and mild tempered. They select habitat based on food availability, den sites, and inaccessibility to humans. Bears avoid humans when possible but a female with cubs may attack if she feels her cubs are threatened. In the wild, bears forage opportunistically along well-worn trails used by generations of bears. Their diet, which tends to change seasonally, includes berries, seeds, roots, carrion, small mammals, birds, eggs, frogs, fish, bees, grasshopper, cricket and beetles.

Bears are primarily nocturnal, although they sometimes wander through the woods during the day. They are normally silent, but occasionally will emit a low growl or snort. Despite their size, bears are agile climbers, powerful swimmers, and, like humans, can walk upright on their hind limbs. They have an excellent sense of smell and acute hearing.

Although bears are not true **hibernators**, in winter, they often den and fall into periods of deep sleep.



Quick Reference

Field marks: black or brownish-black coat

Length: 50- 70 inches long; weight: 200-600 pounds

Food: fruits, nuts, acorns, small mammals, fish, birds, amphibians, bees

When young are born: January

Number of young per litter: 2-3 (1 litter per year)

Common Clues: Rub marks and clumps of hair on tree trunks; tracks; claw and tooth marks on trees; scat

Look for them in: wooded areas; around birdfeeders

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White-tailed deer

Odocoileus virginianus

The white-tailed deer, the state mammal, is widespread throughout Pennsylvania. In summer, the deer's coat is reddish-brown with short hairs. After shedding, the coat is gray, thicker, and longer. When alarmed, the deer flicks its tail upward to reveal a white underside. Males (bucks) are larger than females (does) and have antlers that are shed each year. Bucks clean and sharpen their antlers on the limbs of trees or shrubs, leaving evidence of their rubbing.

Deer, which are ruminants, belong to the same family as cows. Ruminants have 4-chambered stomachs adapted for digesting plant matter. In spring and summer, deer browse on leaves of herbaceous plants and trees including maples and dogwoods. Deer

also feed on farmers' corn, alfalfa and soybeans. In fall, deer eat acorns, and nuts as well as apples. In winter, deer feed on twigs and buds.

The white-tailed deer is an important game animal in America. Hundreds of thousands are harvested every year in Pennsylvania. Aside from hunters, deer have few predators, most of which prey on the young fawns. Deer can run at speeds of 40 miles per hour. They are adept swimmers and can jump fences more than 8 feet high and streams 30 feet wide.



Quick Reference

Field marks: reddish brown coat in spring and summer, gray in fall and winter. Fluffy white tail

Size: 52-80 inches

Food: leaves of herbaceous plants and trees.

Young born: April-May

Number of young per litter: 1- 3, often twins (1 litter per year)

Common Clues: tracks, scat and pellets, buck rubbings, bedding depressions

Look for them in: forest; wooded areas with dense understory

Southern Red-backed Vole

Clethrionomys gapperi



Quick Reference

Field marks: dark brown with silver white to pale underside; red band from head to rump along back

Size: 5 - 6 inches

Food: nuts, berries, mushrooms, mosses

Young born: March - November

Number of young per litter: 5 - 8 (8-9 litter per year)

Common Clues: tunnels, stripped and gnawed bark near the base of trees and shrubs

Look for them at: North and South lookouts and other rocky outcrops along the trails

This small vole is often seen hopping among rocky outcrops along the ridge tops at Hawk Mountain. Its attractive coat is brown with a broad reddish band running from forehead to rump. Red-backed voles are **semi-fossorial**. Although they do not construct their own underground runways, they often travel along natural burrows among rocks, logs and tree roots made by other animals. Voles differ from mice by having smaller eyes, shorter tails with fur, and blunt rather than pointed faces.

The red-backed vole is an **opportunistic omnivore**. Its diet includes nuts, berries,

mushrooms, and mosses. In comparison to other voles, the red-backed vole consumes relatively few insects. Some voles may store food in a cache for winter, but many are **sub-nivean**, foraging beneath the snow for fungi, seeds, roots and other plant parts.

Red-backed voles are preyed upon by birds, snakes and mammals, as well as wintering hawks and owls. The species' status in Pennsylvania is "undetermined," and little is known about its ecological requirements.

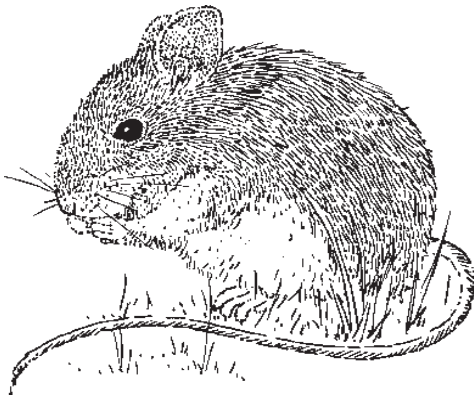
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White-footed Mouse

Peromyscus leucopus



This small rodent is the most abundant mammal in Pennsylvania. White-footed mice can be found in habitats ranging from forests to buildings. They are at home in trees or on the forest floor. Whitefoots are pioneer species in areas that have been disturbed by humans such as strip mine sites and clear cuts. These mainly nocturnal rodents are occasionally observed during the day, especially in winter as they emerge from torpor to forage for food.

The diet of this mouse changes with the seasons. In spring and summer, whitefoots feed on seeds and fruits. In late autumn and winter, they eat insects and spiders. White-footed and other mice help control insect pests such as gypsy moths. Hoarding food during fall in preparation for the winter months

Quick Reference

Field marks: reddish brown coat with midorsal stripe; long, bicolored tail

Size: 6 - 8 inches

Food: seeds and fruits

Young born: March - October

Number of young per litter: 2-6 (3-4 litters per year)

Common Clues: tracks

Look for them in: forests, fields, buildings

is common. Caches of food are hidden under logs or in cavities in trees. In order to conserve energy during the winter months, white-footed mice “huddle” in small groups of about six animals.

White-footed mice, which are in the middle of the food chain, are an important prey source for predators including hawks, owls, skunks, weasels and raccoons.

Woodchuck or Ground Hog

Marmota monax

The groundhog, the largest member of the squirrel family in Pennsylvania, has populated suburban and forested edges. This enthusiastic excavator can be a nuisance in populated areas, even though its digging helps loosen and aerate the soil, and its feces act as fertilizer.

Both sexes have similar yellow-brown coloration. Males are slightly larger than females. Multi-cavity burrows connected by a series of tunnels make up the dwellings of these fossorial animals. The entrances to their underground homes are marked by raised mounds of dirt piled during excavation of the burrow. This mound provides a strategic watchpost for intruders. The woodchuck can often be seen sunning itself on its mounds while keeping watch. Woodchucks often occupy separate summer and winter burrows.

The groundhog is a true hibernator. In winter, groundhogs enter their burrows, close the entrance with dirt, curl up, and go to sleep. Their body temperature may fall from 100 degrees to about 40°F. In order to survive for these periods without food, they build up

fat reserves. When it emerges in early spring, the woodchuck may be half its pre-hibernation size.

Woodchucks consume a variety of foods. They are mainly vegetarians, however; they will eat invertebrates such as grasshoppers and snails. In suburban areas, vegetable gardens make tasty meals. Groundhogs also feed on corn, clover and alfalfa. Apple orchards are favored in fall and in forested areas, the woodchuck feeds on leaves and buds. Unlike its close relative, the squirrel, the woodchuck does not cache food.

Because of the popular folklore of "Punxsatawny Phil," the groundhog that predicts winter's end based on whether or not it sees its shadow on February 2, woodchucks have become an important cultural symbol. Despite heavy shooting, its populations continue to increase.

Groundhogs fall prey to owls, foxes, large hawks and weasels. Human also account for a large portion of mortality.

Quick Reference

Field marks: white incisors; brown coat with paler underside

Size: 21 - 25 inches

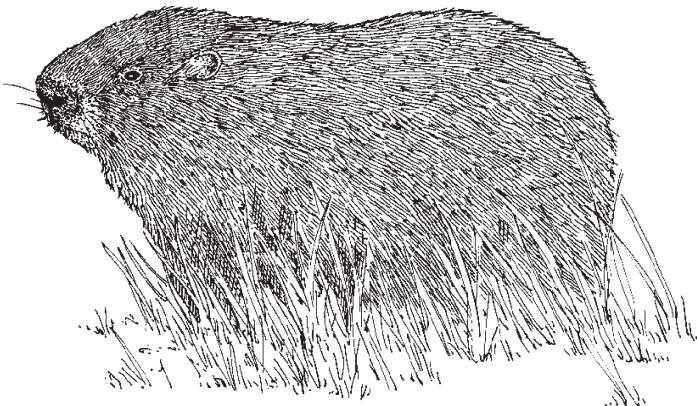
Food: grasses, vegetables, corn, apples, leaves, buds

Young born: April-May

Number of young per litter: 3 -4 (1 litter per year)

Common Clues: tracks, mound at entrance of burrow

Look for them at: open fields along roadsides and forest edges

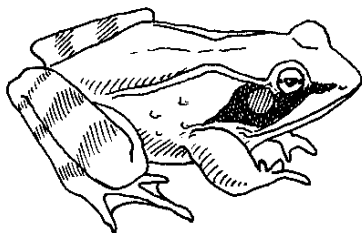


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Amphibians and Reptiles

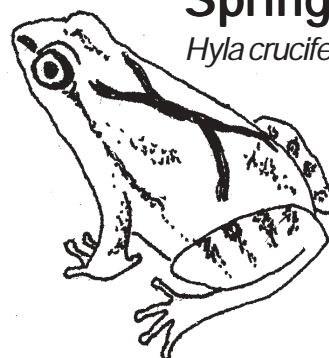


Wood Frog

Rana sylvatica

The masked appearance of this frog comes from the dark patches that extend backward from the eyes. The remainder of its body varies from light brown to dark brown. Its call resembles the quack of a duck and choruses of these calls can be heard during the mating season in late winter. After egg laying, the adults leave ponds and return to wooded areas.

The spring peeper is often heard but seldom seen. This small tree frog is particularly vocal during the spring mating season when its high-pitched calls fill the air. The frog's back has a dark, irregularly shaped **X** in the middle. The adult frog is less than two inches long. This small frog feeds on smaller worms, grubs and insects.

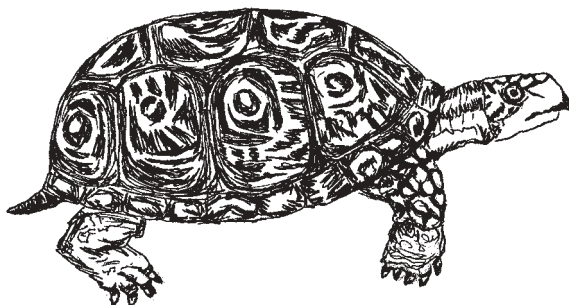


Spring peeper

Hyla crucifer

Eastern Box Turtle

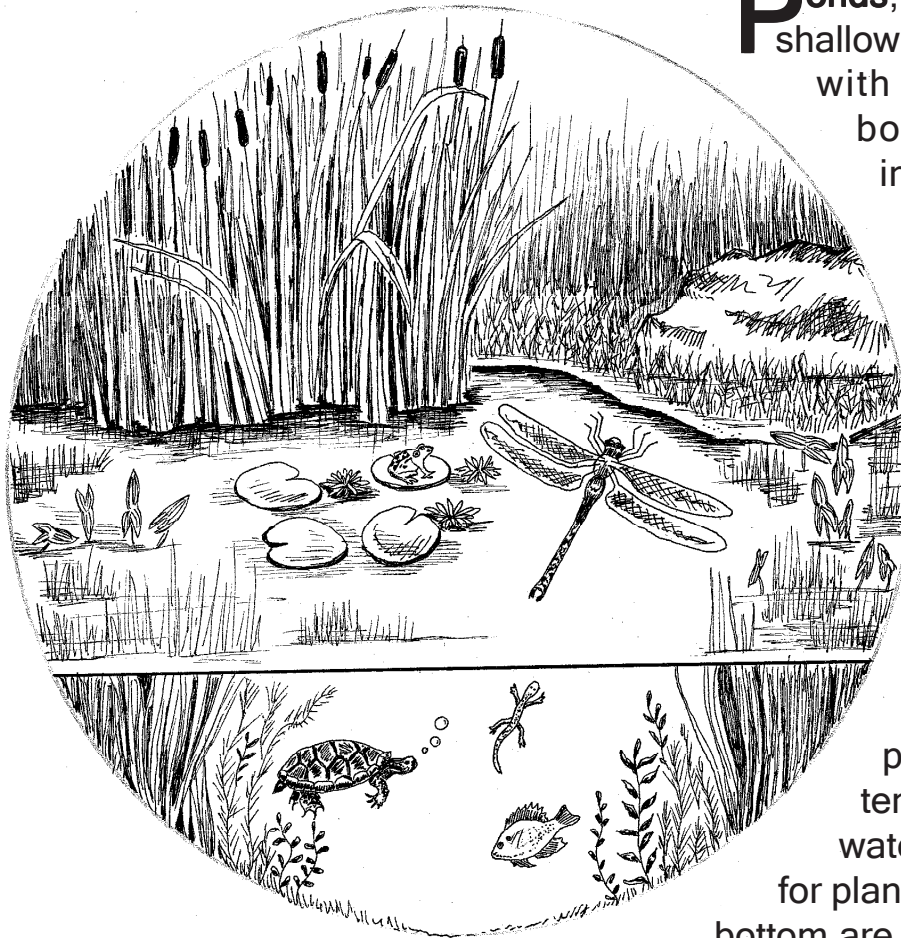
Terrapene carolina



The eastern box turtle has a high-domed black or brown carapace with yellow, orange or olive markings. The adult's shell measures 4-6 inches. Males and females can be identified by their eye color with males having red eyes while female's eyes are yellowish brown. The eastern box turtle is a highly terrestrial animal found in urban and suburban areas. The box turtle is omnivorous and feeds on a varied diet of small vertebrates, invertebrates, carrion, wild fruits, and berries.

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Ponds, which are shallow bodies of still water with muddy or silty bottoms, provide important freshwater habitats for many plants and animals. Organisms that live in ponds are said to be **aquatic**.

Many ponds are shallow enough so that rooted plants can grow on the bottom. The temperature of a pond changes with air temperature. Bodies of water that are too deep for plants to grow across the bottom are referred to as **lakes**.

Ponds come in many shapes and sizes. Bog ponds are acidic and muddy; meadow stream ponds develop where a stream widens and the speed of the current sharply decreases; farm ponds are built as a part of good farming practices and are filled from seepage rather than a stream to reduce the rate of siltation.

In spring and summer, the human-made ponds at Hawk Mountain Sanctuary are teeming with wildlife. Pickerel and green frogs can be seen sunning themselves atop water lily leaves, as dragonflies dart above. Pond activity slows down as the water cools in autumn. In winter, only a few animals survive beneath the frozen icecap of the pond. By studying the pond, many exciting discoveries can be made about the interesting plants and animals, and the relationship between these organisms and the water on which they depend. The study of freshwater environments is called **limnology**.

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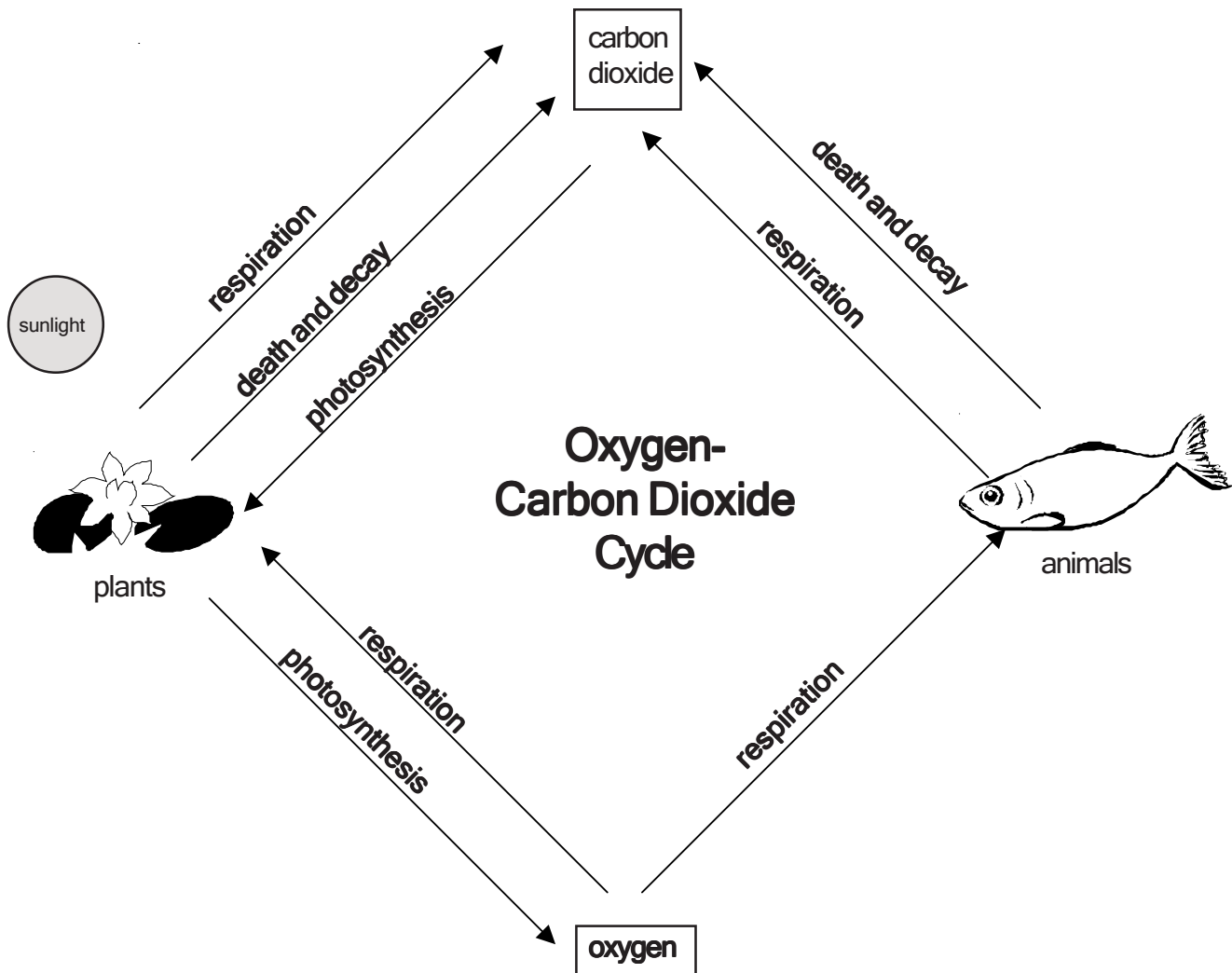
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Characteristics of Pond Water

The transparency of water allows sunlight to penetrate the pond so plants can grow below the water surface. Plant energy is then available to support other life-forms. Water also has several other properties useful to wildlife. Water is called the **universal solvent** because it dissolves most substances. Once dissolved, substances are available to many organisms.

Dissolved Substances

Gases such as oxygen and carbon dioxide are important for the survival of plants and animals. In the atmosphere, these gases occur in a relatively constant percentages of 21% oxygen and 0.03% carbon dioxide. However, in ponds, streams, and lakes this ratio may vary greatly, even on a daily basis.



The oxygen-carbon dioxide cycle in a typical pond

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Oxygen is highly soluble in water. Oxygen enters water directly from the air but this is a slow process. The rate at which oxygen mixes with water is increased by wind and wave action that disturb the water's surface. Oxygen also is released into ponds as a result of **photosynthesis** of aquatic plants. During the day, sunlight penetrates the water and allows plants to photosynthesize. Some of the oxygen produced by plants is used by the plant in **respiration**. The excess dissolves in the water.

Carbon dioxide is more soluble in water than is oxygen. Carbon dioxide is produced from the respiration of plants and animals, as well as from decayed organic matter. At the bottom of the pond where large amounts of decaying organic matter occur, carbon dioxide is concentrated, and few plants and animals survive.

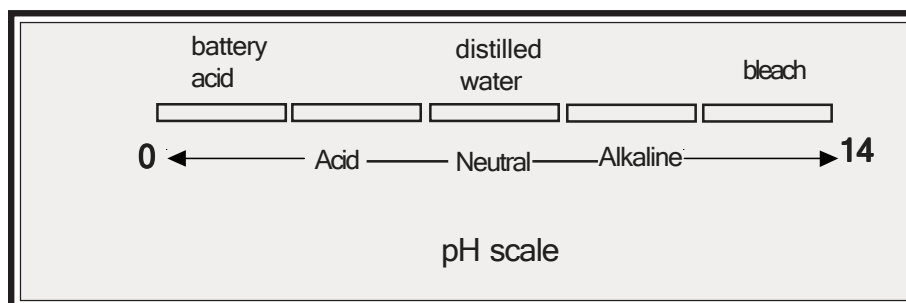
Carbon dioxide is absorbed by plants during photosynthesis, a chemical process expressed as: carbon dioxide (6CO_2) + water ($12\text{H}_2\text{O}$) + sunlight = Carbohydrates ($\text{C}_6\text{H}_{12}\text{O}_6$) + water ($6\text{H}_2\text{O}$) + oxygen (6O_2).

Because carbon dioxide molecules combine with water molecules to form a weak acid, the amount of dissolved carbon dioxide also

affects the water's pH, that is, its degree of **alkalinity** or **acidity**. The pH of water in the pond affects the kinds of plants and animals that can survive in it. pH is measured on a scale of 1-14, with 1 being very acidic, 7 neutral, and 14 very alkaline. If the rock surrounding the pond is limestone, the acid in the pond can react with the limestone to form a carbonate or bicarbonate, a solid that precipitates out of the water and can be used by plants and animals as a source of carbon. Because carbonates and bicarbonates remove dissolved carbon dioxide from water, limestone acts to buffer or stabilize a pond's pH.

Minerals

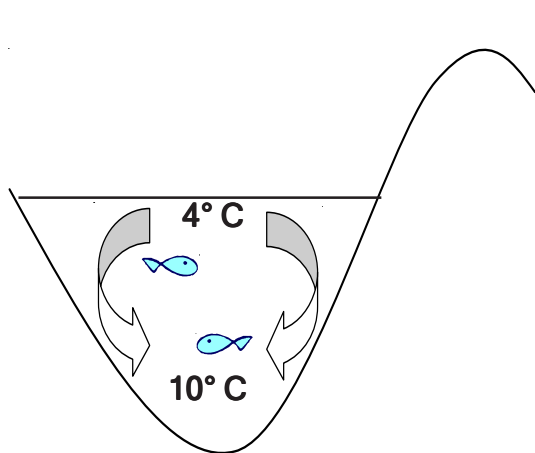
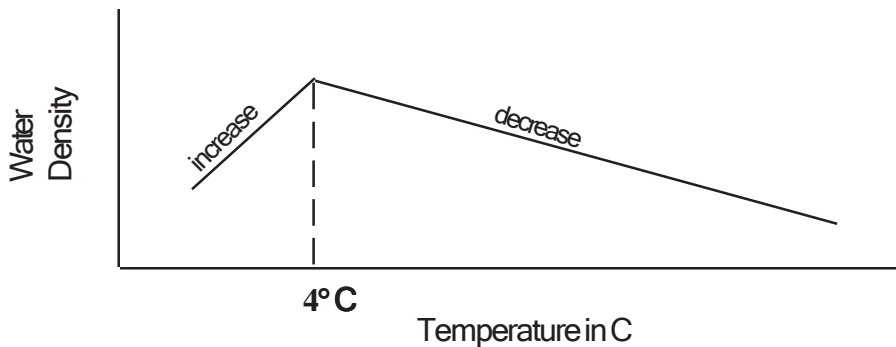
Plants and animals need minerals, including phosphates, nitrates, and chloride, to conduct life-supporting processes. Minerals also help build cell protoplasm. Many minerals exist as salts, which when dissolved in water, return to their ionic forms and more easily used by plants and animals. Surface run-off and seepage supply minerals to the pond. Floating plants absorb minerals directly from the water; while rooted plants take minerals from the pond bottom. Animals get minerals from the plants and other animals they eat. When plants and animals die, the minerals return to the water and are thus kept in the cycle.



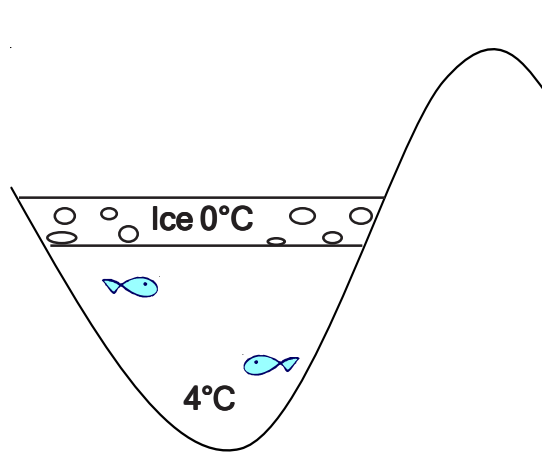
Density of Water

Most substances contract and become more dense when cooled. Water becomes more dense with decreasing temperature until it reaches 4°C (39.2° F), at which point it becomes less dense as temperatures continue to decrease. Thus, ice at 0° C (32° F) is less dense and floats on cold water. This unusual behavior of water prevents ponds from freezing from the bottom up during winter cold spells. A layer of unfrozen water

usually exists below the icy cap of the pond. This occurs because as the pond is cooled by the falling temperatures of the surrounding air, the colder, denser surface water sinks and pushes up warmer, less dense water from the bottom. Water at the bottom remains fluid as the surface continues to cool and freezes over. In Pennsylvania, only shallow ponds freeze completely in most winters.



Cooler water sinks to displace warmer water at the bottom of the pond



When water at the bottom of the pond reaches 4°C, circulation ceases

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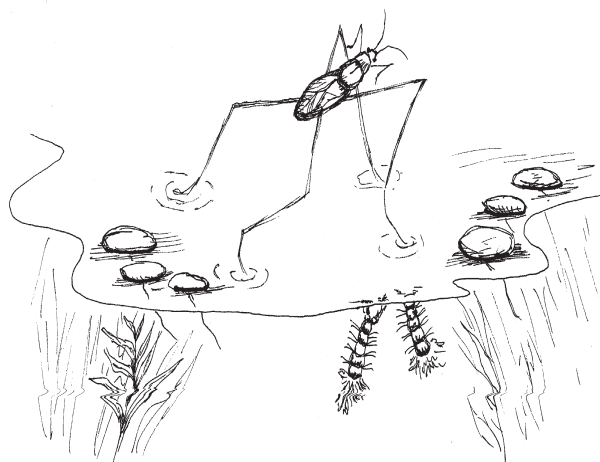
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Transparency

Because it is largely transparent, water allows light to penetrate beneath its surface. This means that plants can photosynthesize and produce food beneath the surface of a body of water. In a clear lake, light can penetrate to depths of about 20 feet, whereas in a turbid lake, light may only penetrate a few feet. Plants do not grow below the surface of especially muddy ponds because the particles in the water do not allow light to penetrate.

Surface Tension

We all have been surprised to see small insects walking across the surface of water without sinking. These insects are able to do so because water molecules are strongly attracted to each other and the attraction makes the water act as if it were a tight skin.



Many organisms live both on the upper and lower surface of this skin. For small creatures, the **surface tension** of water is a powerful force. Some insects actually may get washed up and stranded on the surface, unable to break through the water's skin to reenter the pond below.

Pond Plants

Plants are an important part of the pond ecosystem. Plants convert solar energy to chemical energy, and serve as food for animals living in the pond. Plants also oxygenate the pond and provide habitat and nesting sites for a variety of fish and other animals. Pond plants can range in size and complexity from simple single-celled algae to complex vascular plants.

Single-celled algae are the simplest plants. Algae lack roots, leaves and stems. Although individual algae often are microscopic, they can, in large enough quantities, color the water. Some algae form visible filaments that provide micro-habitats for small animals.

Vascular plants are more complex than algae. They normally have roots, stems and leaves and tube-like conducting tissue to transfer food from the leaves called **phloem**, and water and minerals from the roots called **xylem**. Some vascular plants, including ferns, have inconspicuous sexual organs and multiply by producing spores. Others bear seeds and flowers. Plants range in size from tiny pondweeds to large trees.

Water lilies grow from thick branching rootstock anchored at the bottom of the pond. Their large flat floating leaves cover the surface of the pond, and many have showy pink, yellow or white flowers. Leaves, stem and roots provide shelter, nesting areas and food for a variety of pond animals.

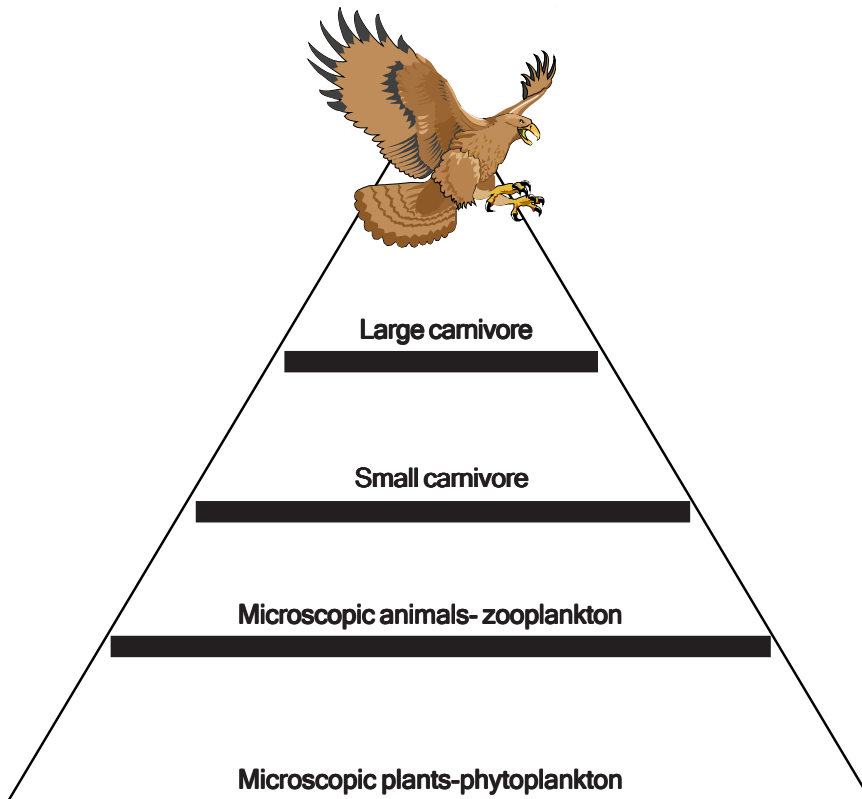
Cattails are commonly found along the shallow shores of ponds, where they form dense thickets 6-8 feet tall. The tips of the flowering stems resemble hot dogs. Cattails can spread from wind-blown seeds or underground root stock.

Food Pyramids in a Pond

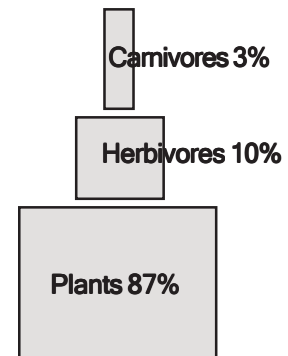
Algae and other single-celled plants are the foundation for the pond's food pyramid. Algae are called **primary producers** because they produce their own food, using energy from the sun. The next level of the pyramid is comprised of organisms (animals) that do not make their own food. Rather, they must ingest other organisms. Small animals are food for larger and larger animals, until we reach the top of the food chain. Animals like predatory birds and

humans are said to be at the tops of food chains because they are not normally eaten by anything else.

If something would cause a decrease in the abundance of algae and other small pond life, other life in the pond would be affected. The fish and insects would not get enough to eat, and their numbers would decrease. The same thing would happen all the way up the food chain, until there was a decrease in the amount of food available for all of the organisms in and around the pond.



Food pyramid in a pond



Relative amount of organic matter produced in a pond

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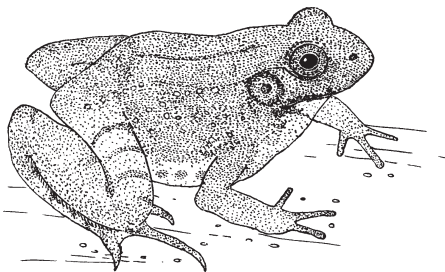
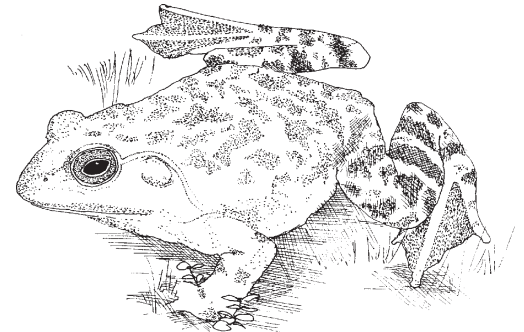
Pond Animals

Aquatic Insects are among the most numerous and easily observed aquatic animals. Adult insects have six, jointed legs. Their body, which is divided into three parts, includes a head, a thorax and an abdomen. Many insects lay their eggs in water. Most insects undergo **complete metamorphosis**, including the stages of egg, larvae, pupa, and adult. A few insects undergo incomplete metamorphosis, growing from egg through a series of nymphs or naiads to adult. Beetles (Coleoptera) and caddisflies (Trichoptera) are examples of insects that undergo complete metamorphosis. Insects found in ponds as larvae or naiads include mayflies, dragonflies, caddisflies, water striders, and mosquitoes.



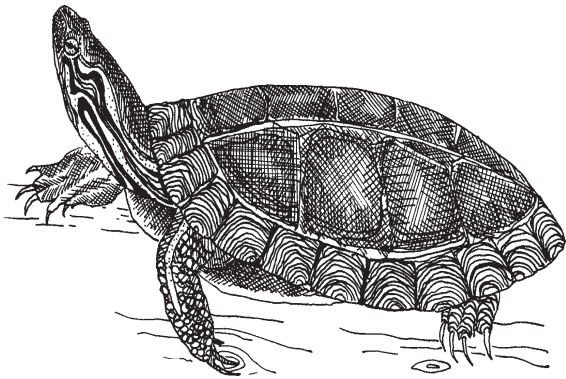
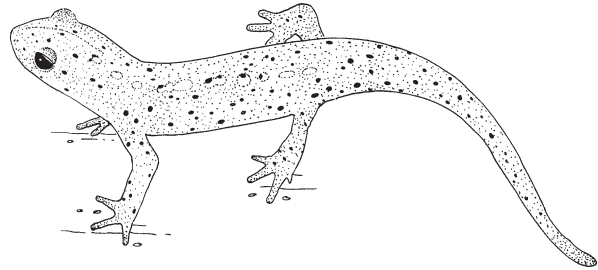
Pickerel frogs (*Rana palustris*), which range in size from 1.75 - 3 inches were used as bait by anglers fishing for pickerel—hence its name. Distinguishing characteristics are two parallel rows of squarish spots arranged down its back against a light gray to brown background and bright orange or red on the inner legs. Pickerel frogs are seldom eaten by snakes and other predators because they secrete a distasteful toxic substance. Their call is a low-pitched snore.

The **bullfrog** (*Rana catesbeiana*), is the largest frog in Pennsylvania and ranges in size from 3.5-6 inches. Its back is green to yellowish with a random mottling of gray. Its underparts are cream to white. The bullfrog's call is a coarse, base "jug-o-rum" that is not usually heard in chorus because this species tends to be solitary and highly territorial. Bullfrogs are fast and powerful swimmers. While swimming the bullfrog closes its eyes and retracts them into its head. It pauses constantly to open its eyes and view its underwater surroundings.



Green frogs (*Rana clamitans melanota*) range from 2.25-3.5 inches and have a green head and upper lip. Green frogs are greenish brown above, with numerous brown blotches covering their back. The throat of the adult male is bright yellow. This abundant species is often seen basking in the sun at the edge of a pond or stream or wherever there is shallow fresh water.

Red-spotted newts (*Notophthalmus viridescens viridescens*) are aquatic salamanders with rough skins and three life stages. Aquatic young newts are greenish yellow and have gills. The second life-stage, which is terrestrial and gillless, is called the **red eft**. Red efts are bright red-orange with black bordered red spots. Individuals are red efts for up to three years, after which they become adult red-spotted newts, and return to the water where they feed on young amphibians, fish eggs and larval red-spotted newts.



Painted turtles (*Chrysemys picta picta*), which are 4-6 inches long as adults, are found throughout North America. The carapace is olive or black, with red and black markings. The head is marked on the side with bright yellow spots and stripes while its neck, legs and tail are yellow and red striped. Painted turtles commonly sun themselves on stream and pondside rocks. Young painted turtles eat insects and crayfish. Adults feed mainly on aquatic plants.

The **northern water snake** (*Nerodia sipedon sipedon*), which is non-poisonous, can inflict a painful bite if threatened. Northern water snakes are reddish brown, gray or black on the back, with a white, yellow or gray body. Although this species hunts for most of its food—including, crayfish and salamanders and fish—in water, it also hunts on land for frogs and small mammals.



Pond Life

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Conservation of Freshwater Environments

Many ponds are **ephemeral**. If you were to watch a pond over a long period of time, you would see that the shallow edges become drier, and deeper zones fill in with silt and materials from dead plants and animals. Most ponds become wet meadows and eventually forests. The process by which an environment's plant and animal life changes over time is called **ecological succession**. This process can take hundreds and even thousands of years. Over shorter periods, ponds also are affected by regular environmental changes. Human activities can cause rapid changes.

Eutrophication, or nutrient loading occurs when people dump sewage into nearby bodies of water, or when run-off from fertilized fields drain into these bodies. The growth of plants, especially algae, is limited by the amounts of nitrogen and phosphorus in the water. Sewage contains high levels of both. Dumping sewage into bodies of water

removes natural limitations on algal growth, causing the plants to grow and reproduce quickly. The resulting **algal bloom** can have several negative effects on pond life.

A thick mat of algae on the surface of the pond can prevent sunlight from penetrating beneath the water's surface. Eventually, algae below the surface die and drop to the bottom of the pond, where they decompose. Decomposition of organic matter by single-celled organisms uses up oxygen and produces carbon dioxide. Increased carbon dioxide in the water makes it difficult for animals like fish and insect larvae to get the oxygen they need to survive. For this reason, algal blooms can cause major **fish kills**.

One solution to this problem is to stop the discharge of sewage into our waters. Sewage treatment plants remove most of the nitrogen and phosphorus from waste water before the water is dumped into the environment.

Use the names that you have learned in the previous section and label the plants and animals that live in the pond.

B

