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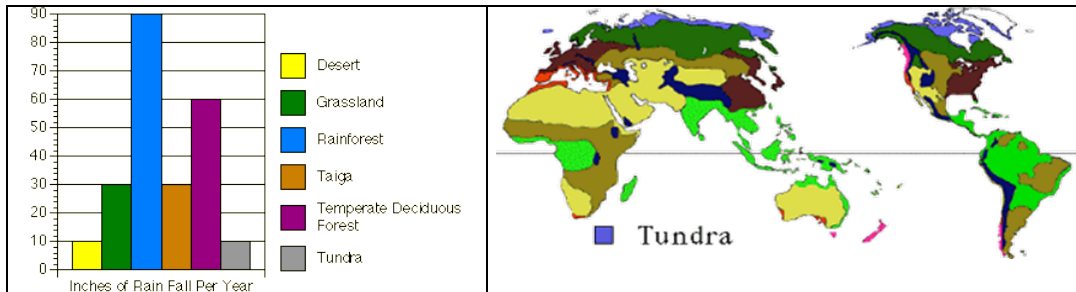
THE RELATIONSHIP BETWEEN RESOURCES AND ORGANISMS IN BIOMES

Unit Overview

In this unit we will continue our study of biomes and how the abiotic and biotic factors influence the type of organisms that live in a biome. Plants and animals will have different characteristics that allow them to live in a particular climate, which illustrates the great diversity of life on our planet. Once again, rainfall, temperature, and soil type greatly influence each biome's biodiversity.

Tundra Biome

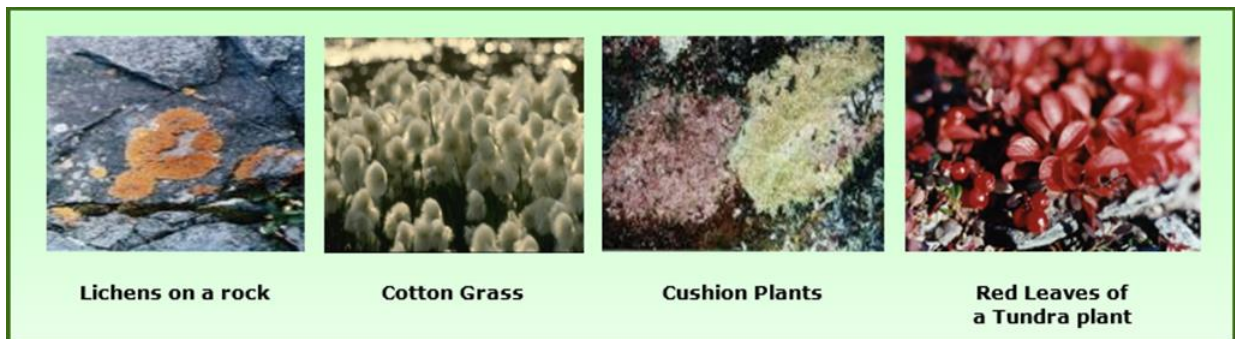
The tundra is a region around the North Pole. (See the map below.) The temperature is above freezing (32 degrees Fahrenheit) only about 55 days a year and then it only gets up to 50 degrees Fahrenheit. During the long winter it can get as cold as 60 degrees below zero. The average temperature is only 10 to 20 degrees Fahrenheit. Summer and winter are the featured seasons. In summer the sun shines nearly twenty-four hours a day and that is why the tundra is sometimes called "the land of the midnight sun". Usually very little water is available and precipitation as snow is less than ten inches a year. Below the thin layer of soil is permanently frozen ground called permafrost. In summer when the top layer of frost melts, it forms marshes and lakes since the water cannot sink into the permafrost. Because of the harsh climate, the tundra has few plants and they are often small.





This picture, taken by Janne Sinkkonen, is of Lapland, a northern region of Finland that is a tundra biome. Note the lack of vegetation and the rocky soil.

Typical plants include lichens often found on rocks, small shrubs which grow in crevices or pockets where soil accumulates, cushion plants which are small mounds, and cotton grass whose seeds are distributed by the wind. Many plants have dark red leaves so they can absorb more heat from the sun.



Lichens on a rock

Cotton Grass

Cushion Plants

Red Leaves of a Tundra plant

Although vegetation is scarce, various animals are able to survive in this harsh climate. Some have white coats of fur in the winter so they are less conspicuous while others may hibernate or migrate. Some of the tundra birds include the gyrfalcon, a very large bird of prey that feeds mainly on rock ptarmigan and willow grouse, and other birds that live here. The snowy owl stays all year round while the ruddy turnstone, tundra swan, and snow bunting fly further south in the winter.

Arctic animals include the arctic fox, caribou, musk ox, Norway lemming, and polar bear. The white arctic fox lives in a burrow and feeds mainly on rodents and birds. Caribou or reindeer eat grasses in the summer and lichens in the winter. Some migrate hundreds of miles south in the winter in search of food. The musk ox is an odd-looking animal with a very dense undercoat which is waterproof and a long coarse outer coat that hangs almost to the ground. They have broad hooves to keep them from sinking into snow and horns on both sexes for protection. These animals were once near extinction but have now made a comeback. The Norway lemming is a small animal that eats grasses, shrubs, and mosses and serves as food for other tundra inhabitants. It can produce eight litters of six within one summer. This animal is known for its dramatic population explosions every three to four years. The polar bear being a large mammal needs lots of food. It eats mammals, fish, birds, berries, and leaves. It often ranges over large areas and can swim in the ocean. Although they are large animals, they can run faster than a caribou over short distances.

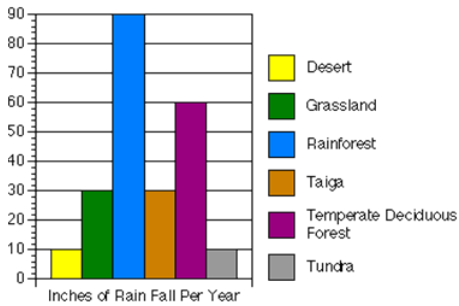


A polar bear resting in the snow



From back to forefront: musk oxen, caribou, arctic fox and snowy owl.

Desert Biome



Like the tundra, the desert has low precipitation with less than ten inches a year. Most desert areas are located 30 degrees north or south latitude from the equator. Some are located by mountains as those in the western United States where the moisture evaporated from the Pacific Ocean falls as rain on the western slopes of the mountains, leaving little to fall on the eastern slopes. The Sonoran and Mojave Deserts are found in the United States. Other well-known deserts are the Sahara in northern Africa and the Arabian on the Arabian Peninsula. These are known as hot deserts with temperatures up to 131 degrees Fahrenheit during the day and as low as 32 degrees Fahrenheit at night as the sand radiates heat into the cloudless sky.



Less well-known deserts are the Iranian in Iran, Afghanistan, and Pakistan, the Gobi in northern China and southern Mongolia, and the Great Basin in Idaho, Nevada, Oregon, and Utah. These are cold deserts.

 <p>John M. Roberts/The Stock Market</p>	 <p>Photo Researchers, Inc.</p>
<p>The coldest desert in the world, the Gobi, is very barren and has only 5% of its area covered with sand dunes which are shown here.</p>	<p>Death Valley in the U.S. Sonoran Desert is a hot desert with less than 2 inches of annual rain fall and temperatures up to 125 degrees F.</p>

Most desert soils consist of sand, gravel, and clay. Plants adapt to the harsh conditions by having very tiny leaves called spines so water cannot be lost through the leaves, as in the case of the cactus, or thick waxy leaves that can hold moisture, as in the case of succulents like the yucca plant. Since the spines of a cactus cannot carry on photosynthesis, this process is done by the stem where moisture is also stored. The barrel cactus has a stem with a pleated shape so it can expand to absorb lots of water when it rains or contract during dry spells. The large saguaro cactus has a large root system for absorbing moisture and has an average lifespan of two hundred years. Bats and insects sip the nectar from flowers that bloom on the tips of the stems and many animals eat the plant itself. The prickly pear has edible fruit for desert animals and uses its spines to repel them.

The Joshua tree, found only in the Sonoran Desert, is a valuable food source and habitat for some desert animals. It has two root systems, one which is used to store water in bulbs as far as thirty feet underground. This tree is pollinated only by the Yucca moth and to return the favor, the seeds of the Joshua tree serve as food for the larva of the moth. The desert ironwood is an important plant of the Sonoran Desert in the U.S. as are the saguaro cactus and the Joshua tree. The ironwood is a legume, a member of the pea family, but it is a tree and can grow up to thirty feet tall although it is usually a low growing shrub. Its leaves and flowers attract insects and birds and also supply shade beneath the tree that can lower the temperature as much as 15 degrees Fahrenheit. It is known as a nurse plant because, in this shade, seedlings of other plants germinate. These small plants are protected from being eaten by the low hanging thorny branches of the tree.

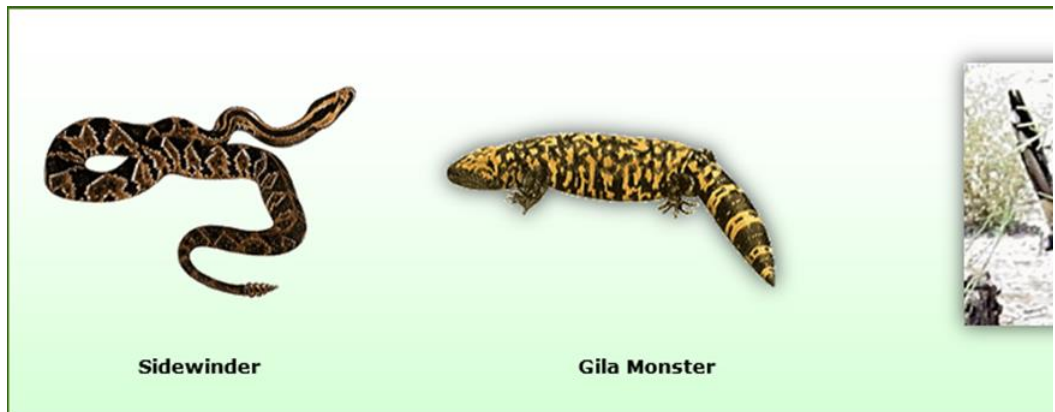
 <p>Lee Kuhn/PPG International, LLC</p>	 <p>D. Wrigglesworth/Oxford Scientific Films</p>
<p>Joshua trees in the Joshua Tree National Park.</p>	<p>A prickly pear cactus.</p>



(Above) Notice the pleated stems of the barrel cactus (center) and the saguaro cactus (left), which allows them to expand when absorbing water. The ironwood tree (right) blooms, providing nectar for bats and insects. Below it, seedlings are growing. The saguaro cactus, only found in the Sonoran desert, stands tall as shelter and food for many desert animals.

Desert animals have adaptations, which allow them to live in this dry and often hot climate. Some animals, such as the poisonous Gila monster of the southwestern United States, live in burrows to protect them from the heat and only feed at night. Another example is the spade foot toad which spends nine months of the year underground. Other animals can go long periods without water, like the camel. The fat sand rat of Africa has a layer of fat to protect it from times when food is scarce. Jackrabbits found in the desert have large ears to help cool them down as blood flows close to the skin in veins in their ears. Among the snakes living in the desert is the sidewinder, which moves sideways across the sand. This is an effective way of moving in sand and allows minimum contact between the snake's body and the hot sand. The endangered cactus ferruginous pygmy owl is a tiny owl that lives in desert scrub where the small trees and cacti offer it shelter and attract its many prey, such as birds, lizards, rodents, frogs, and earthworms. It is a ferocious hunter and can kill a dove twice its size, but unlike many owls, this one hunts during the day. Another bird, made famous by cartoons, is the roadrunner or black and white ground cuckoo. It lives in the Mojave Desert and prefers to run rather than fly. It can reach speeds of 18 miles per hour in pursuit of its prey, which includes snakes, lizards, scorpions, birds, rodents, and insects.

Smaller Desert Animals



Sidewinder

Gila Monster



Cactus ferruginous pygmy owl

Larger mammals, such as bighorn sheep, antelope, and coyote, can exist in the desert climate. Bighorn sheep once were plentiful in the deserts of United States. Today they are an endangered species. The bighorn is the largest North American sheep standing up to 40 inches at the shoulder and weighing up to 350 pounds. Both sexes have horns but the males are very large weighing up to 30 pounds. Preferring rocky hillsides with a clear view to watch for predators, these sheep were a favorite target of hunters in years gone by. They have excellent eyesight, hearing, and smell. They are able to climb rocky ledges as their feet have large, shock absorbing pads that grip hard rocky surfaces. Being ruminants, they can survive on the grasses, sedges, and flowering annuals that grow in the desert. If food is scarce, they will eat shrubs and trees. Although they get water from the food they eat, they do need to drink every three days in summer, and the competition for water, both from cattle and man, has made this difficult for the sheep. The sheep have also been hindered from wandering in search of food by highways, fences, and aqueducts.

Another endangered desert mammal found only in the U.S. is the pronghorn antelope. Though smaller than most deer, the pronghorn is the fastest North American mammal, reaching speeds of 60 mph for a short time, and can maintain a speed of 35 mph for longer periods of time. Like the bighorn sheep, it is a ruminant so it can extract some water from the sparse, coarse vegetation that it eats. Its large eyes allow it to see movement up to four miles away, which is helpful in spotting predators, such as bobcats, coyotes, and golden eagles which may attack the fawns. A characteristic which has contributed to their vulnerability is an innate curiosity leading them to return to a spot where something frightened them. Unfortunately, Indians and pioneers used this to their advantage when hunting the pronghorn antelope. To cope with the desert heat, pronghorn can raise their hair to release body heat. On the African desert, the addax, another antelope, adapts by acquiring water as it eats succulent plants, plants that store water in its thick waxy leaves.

The presence of small and big mammals attracts coyotes to the desert. Coyotes, a member of the wolf family, are very adaptable and can survive wherever they find food. They are clever hunters and usually hunt at dusk, dawn, or through the night. Their diet is varied and includes carrion (dead animals), birds, large insects, rodents, sheep, and deer.



A close-up of a bighorn sheep and a group of bighorn sheep grazing on the sparse desert grasses.



Addax (an African antelope)



Coyote

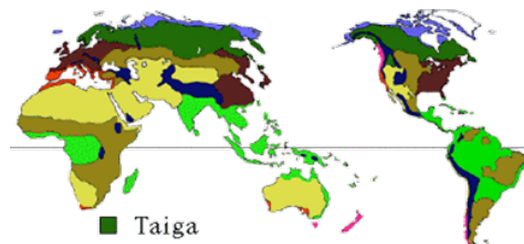


Sonoran Pronghorn Antelope

Taiga Biome

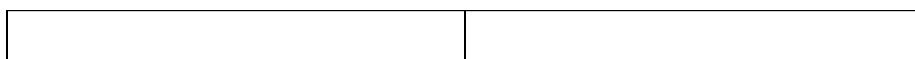
The taiga biome is the largest in the world, covering a large portion of Europe, Canada, and Asia. (See map below.) The summers are warm, but, for six months of the year, the average temperature is below freezing. The yearly precipitation is between 12 and 33 inches, most of which falls as rain in the summer.

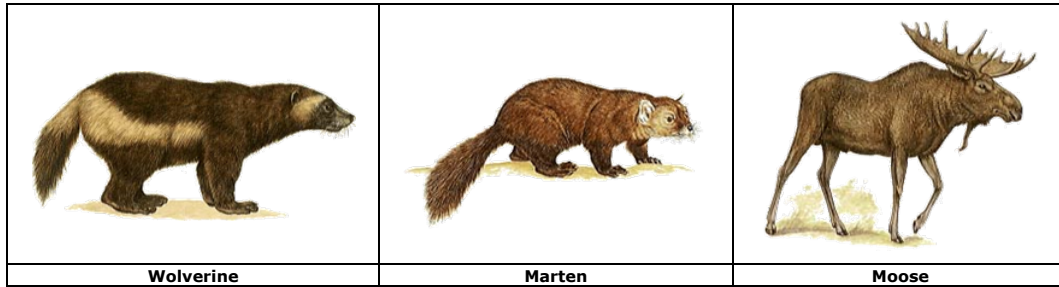
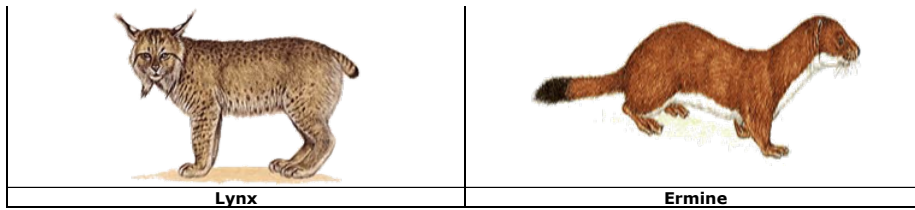
Because of the tilt of the earth, the taiga has long nights during the winter and long days during the summer. There is not a wide range of plant life here, with most of the trees being conifers, such as spruce, hemlock, and fir. These trees are cone-shaped and can shed snow easily. There are some deciduous trees, trees that lose their leaves in winter, including aspen, birch, and poplar. In the fall, the leaves of the deciduous trees are golden, while some shrubs produce leaves that are a bright red.



Because of the low temperatures, decomposition is slow. Dead needles and twigs produce a spongy surface on top of the thin soil, which is prone to wildfires. However, the thick bark of some trees does provide some protection from the fires.

Because the winters are dreary and cold, animals will hibernate, migrate, or learn to cope. Birds in the region include the Bohemian waxwing, the hawk owl, the pine grosbeaks, and red-throated lark. Plant-eating mammals include beavers, squirrel, and snowshoe rabbits. A relative of the mink, the ermine, has a white coat in winter except for the tip of its tail which is black. The fur of the ermine is often seen in children's books as the fur that kings or queens wear. The ermine eats eggs, fish, and birds, while the marten survives on small mammals, fruits, and nuts as does the wolverine, a very fierce animal that can kill animals larger than it. Large mammals in the Taiga Biome include the moose, the largest of the deer family. Moose eat water plants in the summer and woody shrubs in the winter. The lynx, although becoming scarce, feed on small to medium-sized mammals and ground birds, such as grouse.

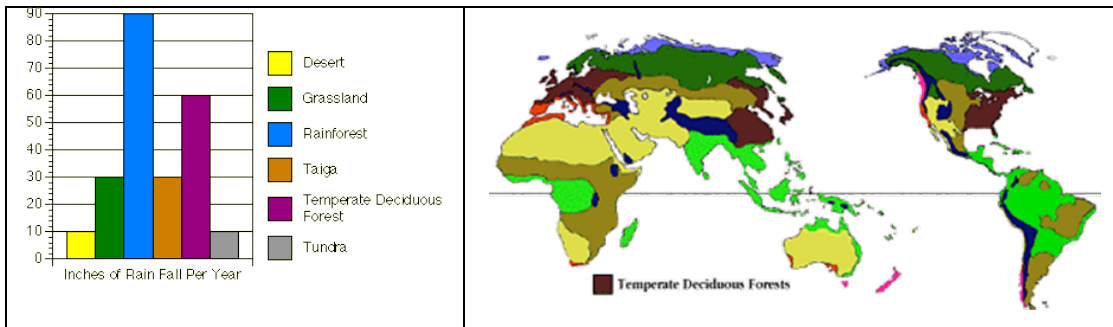




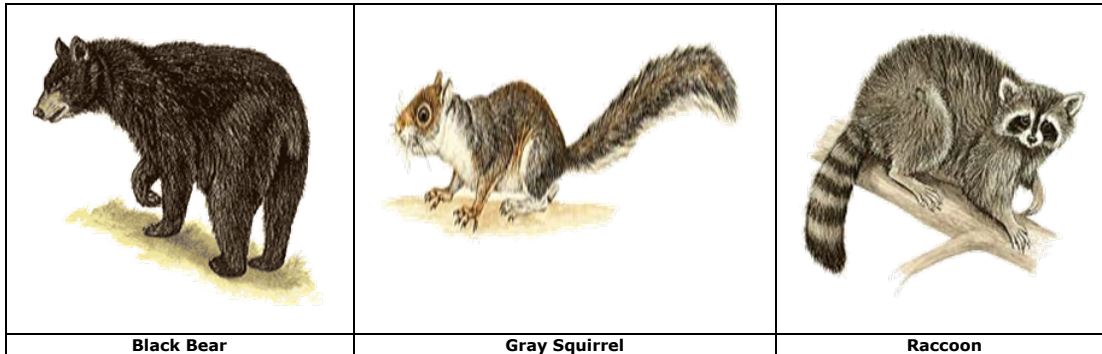
Temperate Deciduous Forests



The temperate deciduous forest biome experiences four seasons throughout the year: spring, summer, autumn, and winter. This is due to the tilt of Earth, which changes the directness of the sunlight on Earth's surface. During the hot summers, the sun is shining more directly on this part of the globe. During the cold winters the sun is slanted at an angle and therefore its energy is spread over a larger area, producing less warmth. This region includes the eastern half of the United States and parts of Europe, Canada, Russia, China, and Japan. (See the map below.) One of the most striking features of this biome is the varied colors of leaves in the fall as the deciduous trees prepare to lose their leaves for the winter. These trees include black walnut, butternut, locust, ash, red maple, dogwood, sassafras, sugar maple, sumac, oak, beech, larch, elm, hickory, sycamore, poplar, birch, tulip, and willow. If you recognize many of these names, that is because they are a part of our wooded areas around this area of Ohio. Many of these trees are also valuable hardwoods used for making fine furniture. Average rainfall is about 60 inches a year which supports the growth of these trees.

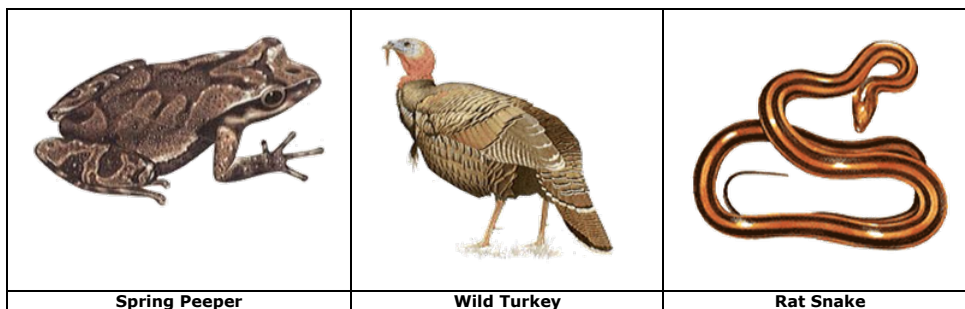


When the leaves fall and winter comes to the deciduous forest, there is little cover so animals must hibernate, migrate, or keep active. Common animals that hibernate include the gray squirrel, the black bear, and the ground hog, a type of marmot. These animals eat constantly during the fall months to fatten themselves up for their long winter of dormancy, as they search the forest and surrounding fields for berries, nuts, insects, and roots. Bears will eat young birds, fish, and small mammals as well. The raccoon, who also has a varied diet, sleeps during the coldest part of winter, coming out only on warm days. The white-tailed deer feeds on grasses, weeds, shrubs, twigs, fungi, lichens, and cornfields and is very adaptable even though it is usually shy and elusive. A more aggressive mammal is the wild boar, a relative of the domestic pig. Boars eat roots and tubers, foraging at night and during the morning hours.

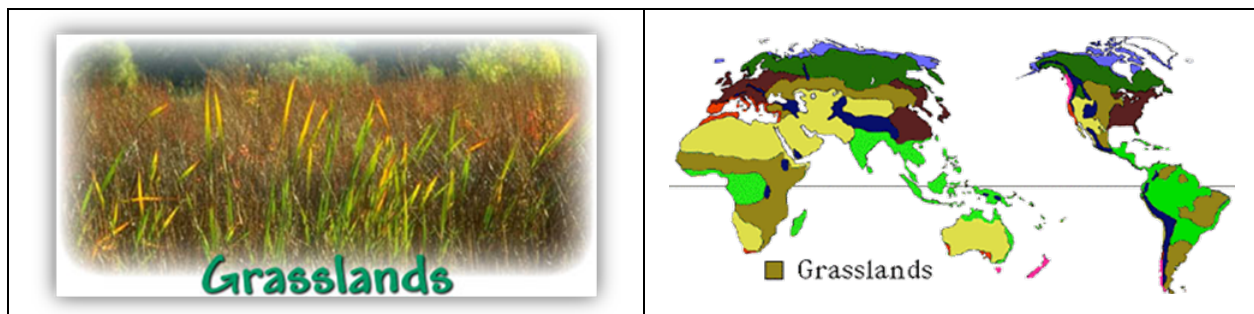


Birds found in the deciduous forests include the cardinal, turkey, goshawk, blue jay, robin, sparrows, blackbirds, and the yellow-bellied sapsucker, many of which migrate during winter to warmer climates. The sapsucker is so-called because it makes a hole in tree bark in order to suck the sap of the tree. When it returns to this hole for another meal, it often feasts on insects attracted to the hole by the sap that is oozing out of it. The wild turkey has become quite prevalent in eastern Ohio over the last decade. The large birds are good flyers over a short distance and roost in trees. Most of their food - seeds, nuts, berries, and insects - is found on the ground. Turkeys often hatch eight to fifteen chicks at a time.

A common reptile is the rat snake, exhibiting many species of various colorations. It is an agile climber, feeds during the day, and like most reptiles in this region, it hibernates in the winter. A cheerful messenger of spring is the amphibian, the spring peeper, so called because of the bell-like chorus the males create at dusk in early spring. Because of their toe pads, they can climb trees and shrubs but are often found near water. The peeper can also jump seventeen times its body length. They are mottled brown and only three-quarters of an inch in length so they are difficult to see.



The Grasslands



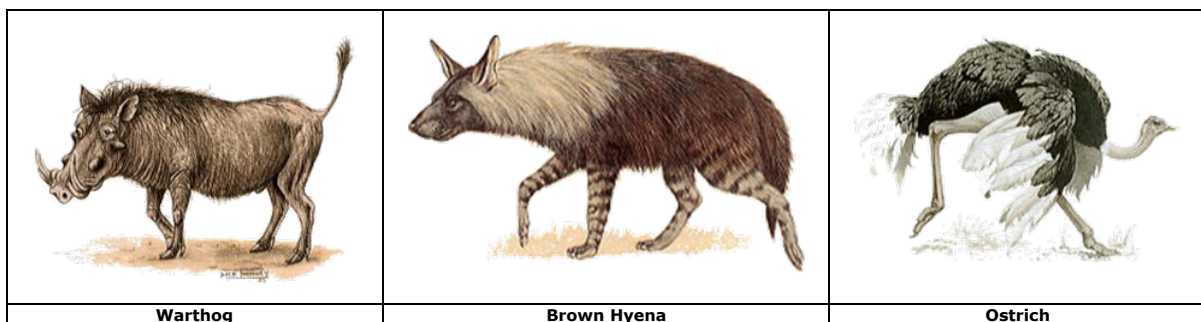
As seen in the map below, grasslands are on every continent except Antarctica. They cover one-fourth of the earth. They are characterized by huge, open spaces, few bushes, trees by rivers and streams, and soil which is very deep and fertile. The tropical grasslands have a hot climate year

round while the temperate grasslands have hot summers and harsh winters. Grasslands are known by other names: in South America, pampas; in Africa, savannahs, and in Europe, steppes. Our Great Plains are the U.S. grasslands, and are called prairies. The soil has developed from hundreds of years of vegetation decomposing. This makes the grasslands very good farm land. For this reason they are sometimes called the breadbasket of the world. In our country, much of the original prairie is gone. This is where the bison, wolves, antelope, and bears roamed. Wild prairie flowers include the prairie blazing star, which attracts butterflies, and the purple coneflower, which attracts goldfinches. Prairies were maintained naturally by wildfires caused by lightning which burned off taller plants and weeds. Now, farmers mow or burn the fields.

As the rainfall varies, so does the type of grass that grows. The tall-grass prairie in the eastern part of the U.S. has rainfall up to 30 inches a year and native grasses would grow up to five feet tall. The mixed-grass prairie further west had grasses up to three feet tall, and the driest region, with only ten inches of rainfall annually, was near the Rockies and had grasses only two feet tall. The largest native plant was big bluestem grass or turkeyfoot which grew up to eleven feet tall and was a favorite food of the bison. Common trees that grew along the streams were the boxelder (a form of maple), the silver maple, and the red bud tree.



Animals common to the U.S. plains, at least in times past, were the greater prairie chicken, the black-footed ferret, the black-tailed prairie dog, the bison, and pronghorn antelope. Animals that live in the savannahs of Africa are those we consider to be zoo animals. Among them are the zebra, African elephant, giraffe, lion, ostrich, black rhinoceros, brown hyena, and warthog.





Black-Footed Ferret



Black-Tailed Prairie Dog



Greater Prairie Chicken



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