

Educator’s Guide to the Assembly Program: Ecosystems Alive!

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INTRODUCTION

The Ecosystems Alive! Assembly program is designed to introduce students to the concepts presented in this teacher’s guide. Teachers can use this guide to expand and reinforce students’ knowledge of the topics introduced in the show. You will find web links to lesson plans, worksheets, videos, websites, and more written by experts and teachers in the second half of this guide.

ANIMALS YOU MAY MEET

For detailed information about each animal, visit our website: HYPERLINK "http://www.ReptilesAlive.com" www.ReptilesAlive.com and click on “Animals.” You will find a picture album of our animals. Move your arrow over the pictures for the animal’s species name and click on the picture for more information.

Box turtle – Deciduous Forest
Black rat snake – Deciduous Forest
Snapping Turtle – Wetlands
Corn snake – Grassland
Arizona mountain kingsnake – Taiga and Alpine
Polar bear (toy) – Tundra
Bearded dragon – Deserts
Schneider’s skink – Chaparral
Savanna Monitor lizard – Savanna

Iguana – Tropical forest
Boa Constrictor – Tropical forest

OVERVIEW OF THE EARTH'S BIOMES

What is a biome?

A biome is a large area that has distinctive plants and animals. A biome is typically named for the types of plants that are found there. Biomes have unique climates and geography. Animals and plants live within the biomes in **communities**. These communities have many different kinds of living things found within them from the tiniest one-celled organism to giant trees and animals.

Everything living (**biotic**) and non-living (**abiotic**) affect one another. The tiniest change in the weather, geography, or chemistry in an area can have an effect on everything else.

Biomes

Deciduous Forest

Trees and shrubs in this biome have leaves that change color and fall off. These are known as **deciduous** plants. Most of the eastern coast of the United States is a deciduous forest. Here you will experience four seasons; fall, winter, spring, and summer. Temperatures in the summer range from 100 degrees F to several degrees below freezing in the winter. Average annual amount of rainfall is about 30 inches.

Plants that you may find in the deciduous forest include: beech, oak, birch, ash, ferns, mushrooms and wild flowers.

Animals that may be found here are: deer, fox, squirrels, songbirds, turtles, snakes, raccoons, salamanders, frogs, and insects.

Animals have adapted to the cold winters by storing food, **migrating**, growing thicker fur, or **hibernating**.

Forests are threatened by logging for wood to make products or to clear the land for new homes and farms. The poaching of plants and animals, the introduction of exotic species, erosion, and pollution also threaten forests. Most of the world's currently existing deciduous forests have been re-planted by humans because the original trees had been cut down. Replanting trees does not bring the forest back to its original health. It takes hundreds of years for a forest to regrow completely and many times humans have not planted the same types of trees that were originally in the forest. Many animals and other plants cannot survive without the kinds of plants and trees that were there before.

Wetlands

Water is everywhere. Over 70 percent of the Earth's surface is covered in water. Water is very important to life on earth. All animals and plants need it to survive.

A **watershed** is the land that water flows across or through on its way to a stream, lake, wetland, or other body of water. In Northern Virginia the watershed is known as the Potomac/Shenandoah Watershed and water from it flows into the Chesapeake Bay Watershed. What happens to the land in the watershed affects what happens to the water. This in turn affects the animals and plants that live on the land. Your actions may affect animals hundreds of miles away!

Wetlands form the transition zone between dry land and bodies of water such as rivers, lakes, or bays. Both tidal and non-tidal wetlands perform important water quality functions, including: regulating runoff by storing flood waters; reducing **erosion** by slowing down runoff; maintaining water quality by filtering **sediments**; trapping **nutrients**; breaking down **pollutants**; and recharging **groundwater**. Wetlands also provide food and shelter for wildlife and fish and nesting and resting areas for **migratory** birds. Rivers generally have wide, flat border areas called **flood plains**, onto which water spills out at times of flooding.

Pollution happens when the natural environment is contaminated with harmful substances because of human activities. When garbage, household chemicals, and fertilizers end up in the water, it causes the water to become polluted. Pollution can make plants, animals, and even people sick. How does pollution end up in the water? Rain washes fertilizers, chemicals, and garbage left on dry land into storm drains and streams. Storm drains and streams flow into bigger streams, then rivers, and then into lakes, bays, or the ocean. This is why it is important to pick up trash, put only a little fertilizer on your lawn, and properly dispose of household chemicals.

Healthy wetlands such as swamps, bogs, streams, ponds, and floodplains are filled with important plants, animals, algae, and bacteria. These special organisms break down harmful chemicals and waste and turn them into harmless or even beneficial substances! Scientists test the water to find out if the area is healthy. They test for PH, temperature, salinity, dissolved oxygen, turbidity, and the presence of organisms.

Erosion is another threat to the wetlands. Erosion happens when soil is washed into the water. Silt (small particles of soil) makes the water muddy. Most plants cannot grow in muddy water because most of the sunlight cannot shine through. Animals cannot live in water filled with silt; it makes it hard to breathe. Do the banks of the stream near your home look like little cliffs? This is erosion at work. Nearly all streams in our area suffer from erosion caused by runoff from construction, roads, and parking lots. When houses and other buildings are built, all of the trees in the area are chopped down and the soil is

dug up. The roots of trees are what keep the silt from washing into the streams. Roots act like little fingers that hold the dirt to the ground. Natural plants and trees are replaced with buildings, roads, driveways, and parking lots which cannot help hold the dirt where it belongs.

Plants prevent erosion and help keep the water clean by filtering pollutants. Plants trap chemicals in the dirt where they break down and turn them into harmless substances.

You can help stop both pollution and erosion. Plant native plants and trees in your yard instead of a lawn, or plant a native tree somewhere else. Ask adults to help by not using too much fertilizer on their lawns and gardens. Pick up trash when you see it even if it isn't yours.

Grassland

When settlers from Europe began to travel west from their towns on the east coast of North America, they found a place that amazed them. What they saw was a never-ending ocean of tall grass called the prairie. Grasslands are usually found on the interiors of continents. The Great Prairie of the United States, the Pampas of South America, and the Steppes of Europe and Asia are all grassland.

What stops trees from growing in the grasslands? The answer is fire and **drought**. Grasses, flowers, and herbs can survive by growing from their roots rather than from the top like most other plants. Where does new growth on deciduous trees in the spring appear? Buds of new growth appear on the ends of branches and the tops of woody plants. If the part of a tree or plant above ground is burned or dies from **drought**, the whole plant dies. Grassland plants may be burned or cut to the ground and still survive. This is why mowing your lawn does not kill the grass; it grows from the roots which are safe underground.

One thing you may notice about the grasslands is that it is very windy. The weather is unique here. Only two seasons exist in the grasslands: dormant season and growing season. It does get cold during one part of the year and warmer the other. During the growing season, plants grow very fast, turn green, and flower. Plants stop growing during the dormant season because it is too cold outside. The temperature on the prairie ranges from -40 degrees F in the dormant season to over 100 degrees F during the growing season.

Many animals call the grasslands their home. American Bison, eagles, antelope geese, crickets, and prairie chickens call it their home. The larger animals such as the bison, horses, and rheas constantly roam the grasslands to find the best food to eat.

Underground in a network of burrows live: snakes, coyote, fox, prairie dogs, badgers, and

rabbits. Here they are sheltered from the heat, constant drying winds and grassland wild fires.

Grasslands are in danger. The grasslands of the United States are almost completely gone. Farming has replaced the native grasses with water thirsty crops. Most grassland animals cannot live among these strange plants. The farmer's crops need much more water than the grasses and plants that used to live there. Farmers must take water from lakes, rivers, and streams to water these plants.

Ranching has also changed grasslands forever. Remember the animals that need to roam the grasslands? Bison and other animals can no longer walk the hundreds of miles they used to do because of the fences ranchers built for their cows. Animals such as bison and antelope do not need a constant supply of fresh grass and water like the rancher's cows. More crops and water must be taken from nature to feed and water these cows.

Taiga

Most of the Taiga is found in an area just south of the Arctic Circle such as in Canada, Alaska, and Siberia. Taiga biomes may also be found in high mountains including: the Rockies, Sierra Nevadas, Andes, and Himalayas.

The trees and shrubs in the taiga are much different than those you see in a deciduous forest. Taiga trees are **evergreen**, and do not change color in the fall. The leaves are thick or pointy like needles and are covered in wax. The wax on the leaves slows down **decomposition** (breaking down into soil). When the leaves do eventually dry out and fall to the ground, they do not quickly turn into food for plants like they do in the deciduous forest so the ground in the taiga is not covered in vines and small plants like in a deciduous forest.

Some of the plants found in the taiga include: spruce, birch, fir, pines, cedar, balsam fir, bristle cone pine, moss, bitterroot, and wild potato.

Some of the animals in the Taiga include: mountain goats, llamas, condors, snow leopards, fence lizards, chinchillas, songbirds, wolves, grizzly bears, owls, fox, kingsnakes, and rabbits.

Winter makes it difficult for plants and animals in the taiga. Winters are very long and cold. The average temperature is below freezing for six months out of the year! Temperatures range from -65 to 30° F during the winter. The wax on the evergreens protects the leaves from freezing and killing the plant. This allows the plant to soak up sun and make food all year long (**photosynthesis**).

Animals have found their own way to survive the winter. Many birds **migrate** and fly to

the warmer south or lower elevations for the winter. Not only is it very cold for the birds, but there is no food for them to eat - most of the plants, seeds, and berries are frozen.

Animals that cannot leave the harsh environment sleep through winter. **Hibernation** means much more than just a long nap. The animal does not eat or even go to the bathroom for months. Their breathing becomes very slow and the heart may beat only one time a minute (your heart beats a little more than one time a second!)

The weasel and snowshoe hare have found a way to survive in the winter by shedding their darker brown fur and growing thick warm white fur, which helps them hide from predators in the snow. Animals find places to hide in the cold through tunnels in the snow, holes in trees, in caves, or underground below the snow and frozen ground. Animals that stay awake during this time usually have to change the type of food that they eat. The red fox eats berries, fruit, and insects during the warmer months. In the winter it can only find rodents to eat. Deer and rabbits have learned to eat moss, twigs, and even bark. Beavers and squirrels gather large amounts of food during the warmer months, and then store it in a safe place to eat during the winter. Cold blooded or **ectothermic** animals like reptiles and amphibians must hibernate. Frogs and turtles can hibernate under water. These animals can get oxygen out of the water by breathing through their skin!

Logging is an enormous threat to the taiga. Trees are cut down to make furniture, pencils, paper, houses and other things. In some places people cut down all of the trees in an area in what is called clear cutting. Animals lose their homes, hiding places, and food. Forests take hundreds of years to grow back. People can help save the taiga by recycling products made from wood, cutting down only some of the trees in an area, and replanting native trees where there has been logging.

Tundra

The tundra is a very cold and windy place. The average temperature is negative 70 degrees F. The world's coldest and driest biome covers 20% of the earth's surface. It may be found above the Arctic Circle and at the tops of high mountains. There are no trees here because the ground is frozen year round with **permafrost**. Only short plants like lichen, caribou moss, heath, bearberry, Labrador tea, and saxifrage can grow here. Tree roots cannot grow through the hard frozen ground. Plants in the tundra are adapted to living in the constant cold. Some of them like the bearberry have tiny waxy leaves and hairs all over them to help keep them from freezing. Antarctica is not a true tundra because it is too cold for any plants to grow.

Only a few animals can survive in the frozen tundra. Animals that eat plants include caribou, lemmings, rabbits, musk ox, mice and insects. Mosquitoes can survive because they have antifreeze in their blood! **Predators** found in the tundra include: the arctic fox, puffins, wolverines, weasels, snowy owls, birds, and wolves. Sea mammals also call the

tundra their home because there are plenty of fish to eat in the cold oceans of the north. Killer whales or orca, polar bears, and fur seals need the ocean to survive.

In the spring, as the tundra warms up, millions of insects wake up or hatch out of eggs. Birds migrate north to eat the berries and insects. For only a few short months the tundra is teeming with life. The average temperature during the summer is below 60 degrees F. The arctic is called land of the midnight sun because the sun shines all day and night.

Desert

The desert is a place with very hot days, cold nights and very little rain. All of the plants and animals here have adapted to surviving in the heat with very little water. The average year round temperature is about 65 degrees F. A few deserts you may know are the Sahara, Sonora, Thar, Kalahari and the Great Australian.

Desert plants have a special ability to collect and conserve water. They are usually covered in a waxy substance like plants from the taiga and tundra. This wax protects the plant from drying out and burning in the sun. It rains less than one inch per year in some deserts. To prevent animals from chewing on desert plants, many are covered in sharp spines rather than leaves. More about desert plant adaptation at: HYPERLINK "http://www.desertusa.com/du_plantsurv.html" http://www.desertusa.com/du_plantsurv.html

Plants found in the desert include the barrel cactus, prickly pear, yucca, palo verde tree, saguaro (pronounced sah-war-oh), brittlebush, cholla (pronounced choy- ya), ironwood, and creosote (cre-oh-soat-teh). Find out more at: HYPERLINK "http://www.desertusa.com/flora.html" <http://www.desertusa.com/flora.html>

Desert animals have found amazing ways to adapt to harsh environments. Some of them do not drink water but get all the moisture they need from the food they eat. Others sleep during the day and are awake only at night when it is cooler outside. These animals are known as **nocturnal**. A few animals that may be found in the desert are rattlesnakes, roadrunners, peccaries, cactus wrens, horned lizards, bearded dragons, scorpions, kangaroo rats, Harris hawks, tarantulas, tortoises, and Gila monsters (pronounced Hee-law).

Deserts need help. Many people are moving to the deserts building houses, farms, factories, and ranches. People need lots of water and so they take it to drink, wash their cars, take showers, water their crops, and water for their cattle. Even if you do not live in the desert, it helps to conserve water. You can do this by turning the faucet off while brushing your teeth, take short showers instead of baths, and use the dishwasher only when filled. Find out additional ways to save water at: HYPERLINK "http://www.americanwater.com/49ways.htm" <http://www.americanwater.com/49ways.htm>

Chaparral

If you have ever watched a movie that took place in the “Wild West” then you have probably seen the Chaparral. This dry biome is a bit wetter than the deserts with an average annual rainfall of 14 inches of rain per year. Most of the rain falls in the wintertime. The temperature here ranges from 30 to 100 degrees F.

The chaparral landscape is covered in sandy soil, rocks, and dry plants. Many of these plants are used for seasonings and perfumes. Lavender, sage, rosemary, thyme, and oregano grow in the chaparral. Other plants include the olive tree, cedar tree, fairy duster, cactus, king sugar bush, and Torrey pines. Plants have adapted to the chaparral by becoming **drought resistant**. They have thick leaves that can store water. Many plants are evergreen and have small waxy leaves to protect them from drying out. Hairs on the leaves and branches of some plants help to trap moisture from fog and rain and insulate them from the heat. They also have a unique combination of long roots and short roots near the surface. The long roots can grow very deep underground to find water while the short roots near the surface can quickly soak up water when it rains. Plants do not grow much during the dry summer to save water and energy.

Animals in the chaparral are adapted to the dry, hot weather. Many are nocturnal, spend most of their time in burrows, can eat tough plants, can travel long distances foraging for food and do not need much water. Animals found here include: jackrabbits, spotted skunks, skinks, tortoises, whiptail lizards, wrens, armadillo, jackal, fox, puma, and goats.

Fires are common in the chaparral. The chaparral cannot survive without fire. Many plants, such as lavender and sage, have oils that help fires burn. Other plants need fire to melt wax off their seeds so they may grow like the Sumac. Fires enrich the soil by adding nutrients that plants need to grow. They burn away dead brush to make room for new plants to grow. Trees and shrubs in the chaparral are fire resistant; the outside of the plant may burn but a new plant can grow out of its protected unburned center.

Humans have hurt the chaparral by hunting the animals that live there, cutting down trees for wood and pasture, and by damming and diverting water to other places far away.

Savanna

The savanna is grassland with scattered drought resistant shrubs and trees located between a desert and tropical forest. Only two seasons exist in the savanna - the wet and the dry season. It is warm year round, the average annual temperature is 70 degrees F. During the dry season the grasses turn brown, water dries up, and many plants die. Just like plants that grow in the chaparral and desert, plants stop growing this time of year. This dry air comes from the nearby deserts during the winter. One day, storm clouds form and fierce thunderstorms bring daily rain. The storm clouds come from the hot summertime sun heating up the wet rainforests. This heating causes water to evaporate and form

thunderclouds. The clouds move from the wet tropical forests to the savanna. These huge storms or monsoons bring rain for hours each day. Green plants began to grow everywhere. This is a **weather cycle** that repeats each winter and summer every year in the savanna. The Serengeti Plains of Africa are the most famous of savannas. Savannas may also be found in South America, India, Australia, and Asia.

Plants of the savanna are adapted to going a long time without water. Many of them become **dormant**; they do not grow during the dry season. Other adaptations are long roots to find water, the ability to store water in their trunk, and thick bark to protect from dehydration and fire. Trees in the savanna are typically covered in thorns or hairs to help collect water and protect them from being eaten. Acacias, eucalyptus, baobab, jackalberry, candelabra, and jarrah trees dot the savanna. Nearly all of the plants are grasses; Bermuda grass, elephant grass, kangaroo paws, and other grasses. Grasses can survive fires and are more drought resistant than trees are.

Animals in the savanna have either learned to follow food and water by migrating or by being able to conserve water and energy during the hard dry season. Savanna animals include lions, zebra, water buffalo, crocodiles, monitors, secretary birds, mambas, giraffe, emu, koalas, elephants, baboons, anteaters, termites, and leaf-cutter ants.

Large areas of savanna are lost every year because of over grazing and farming. People let their animals eat all the grass in an area and the area soon turns into a desert.

Tropical Forest

The tropical forest is filled with life. There are more species of plants and animals here than any other biome. The sun shines warm all year round. The trees grow huge and are covered in vines and other plants. Tropical forests are located near the earth's **equator** where the sun's rays fall straight down rather than an angle year round. The average temperature is 80 degrees F. It is very hot and humid in tropical forests because they are near oceans or other large bodies of water. It rains nearly every day in tropical forests. Another name for the tropical forest is the tropical rainforest since it rains so much (60 to 100 inches per year!)

A few plants you may find in a tropical forest include: bamboo, kapok trees, mangrove trees, bougainvillea, durian, coconut trees, jambu, strangler figs, orchids, fruit trees, and vanilla. The trees in the tropical forests grow so large that they create five different zones or layers. Most of the trees grow to about the same height. They grow so close together that the branches of all the trees overlap and weave a carpet of leaves, vines, and branches in the sky. This layer is called the canopy. The emergent layer consists of trees that rise above the canopy. Below the canopy are smaller, shorter trees. The canopy is so thick that it blocks out most of the sunlight to the layers below it. Many trees in the understory may be very old, but they cannot grow big because they are not getting very much sunlight. The

forest floor is dark and relatively bare of plant life. Only shade loving plants are able to grow in this very wet and dark place. Fed by the constant rains, many large rivers flow constantly through the forest and are filled with many plants and animals.

The animals in the tropical forests are typically adapted to living in only one zone of the rainforest. Many live their entire lives without ever entering another forest zone. Some animals only venture into another zone to lay eggs. A small sample of animals you may find in the tropical forest include: iguanas, birds of paradise, harpy eagles, pythons, boas, tree frogs, monkeys, caiman, jaguars, kinkajou, sloths, lorries, parrots, toucans, lemurs, turtles, tortoises, ants, and roaches. Many of the animals in the forest are excellent climbers. They are able to run, jump, or swing through the thick plants and branches high in the trees.

Rainforests are in great danger. Humans are cutting down or burning large amounts of rainforest every day to farm and ranch. Sadly, once a tropical forest is cut down, it almost never returns. Pollution, poaching (illegally taking or hunting animals), introducing exotic animals and diseases, and erosion are also killing the rainforests. A few things you can do to help the rainforest is to never buy products made from rainforest wood or from rainforest animals. You can even give money to conservation organizations that will buy and protect a piece of the rainforest in your name.

ECOSYSTEMS ALIVE! VOCABULARY

Abiotic - refers to nonliving objects or processes. These factors determine ecosystem type and its distribution of plants and animals as well and the usage of land by people. Abiotic factors include water supply, topography, landforms, geology, soils, sunlight, and air quality.

Adaptation - change in an organism or its parts that fits it better for the conditions of its environment

Aquatic - growing or living in or often found in water

Biome - regional group of distinct plant and animal communities adapted for the regions physical environment.

Carnivore - an animal that eats meat

Community - all the organisms that live in a particular area.

Competition - the active seeking after and use of an environmental resource (as food) in limited supply by two or more plants or animals or kinds of plants and animals

Conservation - the preservation and careful management of the environment and of natural resources

Consumer - a plant or animal that eats other organisms

Cooperation – working together

Deciduous – Refers to a plant (usually a tree or shrub) that sheds its leaves at the end of the growing season

Decompose - The breakdown of remains of dead animals and plants by bacteria, animals or fungus into the substances that soil is made up

Decomposer - an organism (as a bacterium or a fungus) that feeds on and breaks down dead plant or animal matter

Dormant – to sleep, a time when plants do not grow because conditions are not right

Drought – a long period without rain

Ecology – the study of the interactions between living things and non-living things

Ecosystem – is all non-living things (soil, water, weather, recycling of chemicals, and energy flow) in relation to a community of species in an area.

Environment – conditions affecting the life, growth and survival of an organism where it lives

Erosion – the wearing away of the land surface

Estuary – a place where fresh and saltwater meet and are mixed by tides.

Evergreen - having leaves that remain green and functional through more than one growing season

Extinct - an organism that no longer exists

Flood plain – A wide, flat border area next to rivers where water goes at times of high flow.

Food Web - the whole group of interacting food chains in an ecological community

Herbivore - a plant-eating animal

Hibernation – going into a deep sleep to pass the winter or other season that may have extreme temperatures or lack of food

Migration – Animals that travel to other places where the weather is warmer or they can find food.

Migration- when living things move from one biome to another.

Niche - a habitat that contains the necessary requirements for a particular plant or animal to live **or** the part that a particular organism plays in an ecological community

Omnivore – an animal that eats both plants and animals

Organic – From or part of a living thing

Organism – An animal or plant

Organismal ecology - the way individual organisms adapt to the environment.

Overfishing – when people have taken too many fish out of the water. This usually means that if fishing of a specific type of fish is not stopped or slowed down it will become extinct.

Pollution - undesirable state of the natural environment being contaminated (made sick or dirty) with harmful substances as a because of human activities

Population - a group of one or more species of organisms living in a particular area or habitat

Population – a group of the same species in an area.

Predator - an animal that lives by killing and eating other animals

Prey - an animal hunted or killed by another animal for food

Producer - a living thing (as a green plant) that makes its food from simple inorganic substances (as carbon dioxide and nitrogen) and many of which are food sources for other organisms.

Recycle – to use again, sometimes in a different form

Renewable – 1. To be able to make or become new, fresh, or strong again 2: capable of being replaced by natural cycles or sound management procedures

Resource - a new or reserve supply that can be drawn upon when needed

Scavenger - an organism (as a vulture or hyena) that usually feeds on dead or decaying matter (plants or animals)

Species – living organisms of the same kind that can have babies or young of the same kind

Terrestrial - living on or in or growing from land

Territory – an area an animal or group of animals defends against others of its species

Watershed – The area that drains into a river or lake or the area of land that catches rain

CONCEPT SUMMERY & WEB LINKS

The web links listed at the end of each summary connect to lesson plans, worksheets, activities, videos, and more.

Adaptation

Adaptation is a physical characteristic or behavior that allows animals to respond to life needs. Key concepts include methods of gathering and storing food, finding shelter, defense, rearing young, hibernation, migration, camouflage, mimicry, instinct, and learned behavior.

Animal Adaptation Lesson:

A favorite adaptation lesson for students that combines science, art, critical thinking, and imagination:

HYPERLINK "http://www.lessonplanspage.com/ScienceAnimalAdaptations58.htm" <http://www.lessonplanspage.com/ScienceAnimalAdaptations58.htm>

You may use HYPERLINK "http://www.reptilesalive.com/animals.html" <http://www.reptilesalive.com/animals.html> for information about animals used in the ecosystem program to complete the activity sheet

Animal birth and growth

Some animals are born looking exactly like their parents, except they are smaller of course. Other animals look different than their parents when they are born. One example is the black rat snake. Babies are born grey with black blotches on their backs. As the snakes grow, they become darker and eventually become black.

This is a lesson plan that includes wonderful videos and worksheets. (The site is free, but to protect the rights of the content you must register. You will not be sent junk mail and your information will be kept private)

HYPERLINK "http://www.teachersdomain.org/K-2/sci/life/cyc/lp_lifestages/index.html"
http://www.teachersdomain.org/K-2/sci/life/cyc/lp_lifestages/index.html

Ecosystem

An ecosystem is made up of the living community and the nonliving factors that affect it. The health of an ecosystem is directly related to water quality.

A fun web page for kids K-5 that teaches about the environment

Eddy the Eco-dog:

HYPERLINK "http://www.eddytheeco-dog.com/" <http://www.eddytheeco-dog.com/>

Estuary

The Chesapeake Bay is an estuary where fresh and salt water meet and are mixed by tides. It is the largest estuary in the lower 48 states and one of the most productive estuaries in the world. Estuaries perform important functions such as providing habitat for many organisms and serving as nurseries for their young.

Environmental Protection Agency's Estuary Page for Kids:

HYPERLINK "http://www.epa.gov/owow/estuaries/kids/" <http://www.epa.gov/owow/estuaries/kids/>

Food Webs and Chains

A food web shows a food relationship among plants and animals in a specific area or environment. A green plant makes its own food from sunlight, air, and water (**photosynthesis**). Green plants are **producers**. A **consumer** is an animal or plant that eats living organisms. (Two consumer plants are the Venus flytrap, and pitcher plant.) Food can be plants or animals. **Decomposers** are animals that break down dead and decaying organisms into smaller pieces that can be used again by living things. Worms, roaches, and termites are decomposers.

A **food chain** is a part of a **food web**. Food chains may consist of **herbivores** (animals that eat plants), **carnivores** (animals that eat meat), or **omnivores** (animals that eat meat and

plants). A simple food chain may be an insect that eats plants, a box turtle that eats insects, and an eagle that eats box turtles.

Predators are animals that hunt other animals for food. **Prey** are animals that are hunted.

Activity:

Have students design their own food web or chain using diet information of animals living in the area. Animal clues you may include are: Box turtles are omnivores they eat worms, fruit, and berries. An osprey is a predator. The field mouse is an herbivore. The raspberry bush is a producer. Earthworms are decomposers.

A brief explanation of a food web and a great example for kids from the Bureau of Land Management:

HYPERLINK "<http://www.blm.gov/nstc/soil/Kids/incred.html>" <http://www.blm.gov/nstc/soil/Kids/incred.html>

Habitats

The habitats of living things, such as forests, grasslands, rivers and streams, change due to many influences. Habitats change from season to season and throughout time. Animals respond to changes in seasons and other changes in their surroundings.

Living things are dependent on other living things and their nonliving surroundings for survival. All of the interactions between and among living things and their nonliving surroundings are referred to as a system. Shelter in a habitat may be living (coral, tree) or non-living (caves, burrows, rocks, houses)

Habitats from Idaho Public Television:

HYPERLINK "<http://idahoptv.org/dialogue4kids/season5/habitat/facts.html>" <http://idahoptv.org/dialogue4kids/season5/habitat/facts.html>

Create your own schoolyard habitat with instructions from the National Wildlife Foundation:

HYPERLINK "<http://www.nwf.org/backyardwildlifehabitat/programoverview.cfm>" <http://www.nwf.org/backyardwildlifehabitat/programoverview.cfm>

Hibernation

Some animals go into a very deep sleep when times are tough such as during the dry season or in the winter. During hibernation an animal's heart rate slows down, sometimes body temperature changes and they don't eat or drink.

A scientific study about artificially inducing hibernation in animals:

HYPERLINK "<http://www.sciencenewsforkids.org/articles/20050427/Note2.asp>" <http://www.sciencenewsforkids.org/articles/20050427/Note2.asp>

Natural Resources

Natural resources are plants, animals, water, air, land, minerals, forests, and soil. They provide the raw material for our daily lives and sustain our economy. Some natural resources provide food, clothing, water, air, shelter, land and energy. Animals need natural resources too some need trees to live in, fruit from the trees to eat and water from the ground. Natural resources are finite and must be used wisely to insure their continued availability. Many natural resources are limited and cannot be renewed. Other resources are limited and cannot be renewed, but may last for a very long time. What we put into the air, especially the products of fuels we burn, affects the quality of the air. Animal, including human, and factory wastes can affect the quality of water. Some pollution washes from yards, streets, and farms

Resources for students from the Washington State Department of Natural Resources:

HYPERLINK "<http://www.metrokc.gov/dnr/kidsweb/>" <http://www.metrokc.gov/dnr/kidsweb/>

Photosynthesis

Green plants make their own food. They use energy from the sun to make sugar, which they use as food. Cells in the plant leaves known as chloroplasts, contain a green pigment called chlorophyll. Carbon dioxide gas and water are used by the plant to change stored sun energy in chloroplasts to sugar.

Information on photosynthesis:

HYPERLINK "http://www.biology4kids.com/files/plants_photosynthesis.html" http://www.biology4kids.com/files/plants_photosynthesis.html

Plants

Plants are made of different parts including roots, stems, leaves, blossoms, and fruits. Roots are how a plant gets nutrients and water and is what anchors them in the ground. Roots also prevent soil from washing away in a hard rain. Plants have needs such as water, air (carbon dioxide), nutrients, sunlight, soil, and room to grow. Plants are **producers**; they make their own food through **photosynthesis**. Plants produce things that both plants and animals may use including homes, oxygen, clothing, and food. Plants also prevent the soil washing away, **erosion**. A few plant products you use every day include fiber, cotton, cooking oil, spices, lumber, rubber, medicines, and paper, wood, fruit, and vegetables. Some plants stay green all year long, evergreens, while some have leaves that change colors and fall off in the autumn (deciduous.) Plants that grow in one particular biome cannot survive in others. Cacti that get too much water will begin to rot and die. Tropical forest trees cannot live in the desert

or savanna because they do not get enough rain or nutrients from the soil.

Student projects:

Construct and interpret a chart illustrating the plant foods consumed by different animals.

Construct and interpret a model that demonstrates how plants prevent soil erosion.

Plant website for kids with lots of lesson plans:

HYPERLINK "http://www.kathimitchell.com/plants.html" <http://www.kathimitchell.com/plants.html>

Pollution

Pollution is made up of chemicals and garbage that people put into the environment.

Pollution comes from things like lawn fertilizer, soap, paint, bleach, gasoline, and garbage.

Learn about the world's pollution with Tiki the Penguin:

HYPERLINK "http://tiki.oneworld.net/penguin/pollution/pollution_home.html" http://tiki.oneworld.net/penguin/pollution/pollution_home.html

An article for older kids on the affects of pollution on the environment:

Seabirds Deliver Arctic Pollutants:

HYPERLINK "http://www.sciencenewsforkids.org/articles/20050727/Note2.asp" <http://www.sciencenewsforkids.org/articles/20050727/Note2.asp>

Population

A population is a group of organisms of the same kind that lives in the same place.

Examples are mice in a field, swans on a lake, salmon in a stream, a herd of deer in the forest.

Population growth exercise from PBS (NOVA):

HYPERLINK "http://www.pbs.org/wgbh/nova/teachers/activities/3108_worldbal_01.html" http://www.pbs.org/wgbh/nova/teachers/activities/3108_worldbal_01.html

A list of other population growth resources and stories from NOVA you may use in the classroom:

HYPERLINK "http://www.pbs.org/wgbh/nova/teachers/overviews/3108_worldbal.html" http://www.pbs.org/wgbh/nova/teachers/overviews/3108_worldbal.html

Recycling

Recycling is using something again, sometimes in a different way. Recycling helps to save

our natural resources by recovering used materials that would otherwise be thrown away. Newspapers are recycled into writing tablets and plastic soda bottles are melted down and made into plastic chairs. You may be sitting in a chair made of used soda bottles right now. What would happen if things like paper, oil, aluminum, glass, and plastics were not recycled?

Visit the Environmental Protection Agency's Site for games and great information on how things are recycled. Click on "Activities" for a great classroom activity about recycling:

HYPERLINK "<http://www.epa.gov/recyclecity/>" <http://www.epa.gov/recyclecity/>

Reuse

To use something more than once is to reuse. An example would be to wash plastic plates and utensils rather than throwing them in the trash. Some items that may be used again are plastic bottles, glass containers, and paper. Can you think of more?

An article about what happens to ocean animals when you throw trash in to the ocean:

HYPERLINK "<http://www.sciencenewsforkids.org/articles/20031112/Note3.asp>" <http://www.sciencenewsforkids.org/articles/20031112/Note3.asp>

Seasons

The seasons change because of the tilt of the earth and how the rays of the sun hit the earth. Day and night happen because the earth spins on an axis. The earth also circles around the sun. One full circle happens once a year. The earth is tilted at an angle. At the equator, the sun's rays hit the earth almost directly straight on throughout the entire year. This makes it warm and sunny all year round here. As you move away from the equator, the rays of the sun hit the earth at an angle. During its trip around the sun, parts of the earth may be tilted towards or away from the sun. When one part of the earth is pointed towards the sun the rays fall more directly on the surface of the earth, its summer. At the same time another part of the earth is tilted away from the sun, and its winter. During the summer in Fairfax, Virginia in North America, it is winter in Buenos Aires, Argentina in South America.

A great NASA mini movie explaining what causes the seasons:

HYPERLINK "<http://kids.msfc.nasa.gov/earth/seasons/EarthSeasons.asp>" <http://kids.msfc.nasa.gov/earth/seasons/EarthSeasons.asp>

A class room activity about the seasons:

HYPERLINK "http://faldo.atmos.uiuc.edu/w_unit/LESSONS/seasons.html" http://faldo.atmos.uiuc.edu/w_unit/LESSONS/seasons.html

Soil

Most plants grow in soil. People and many other animals are dependent on plants for food. The nutrients in soil are materials that plants and animals need to live and grow. Soil takes a long time to form; therefore it should be conserved.

Soil is made up of humus, silt, rock, and sand. Humus is decayed, dead plants and animals that have been broken down by **decomposers**. The more humus found in soil, the richer it is in nutrients. Plants need these nutrients in order to grow. This is part of the reason that there are more plants in a deciduous forest than there are in a desert. The desert is mostly made of rock and sand with very little humus in it. Over many years, weather, water, and living things help break down rocks and create soil (**weathering**).

Soil has many layers. Topsoil is the upper soil surface and a natural product of subsoil and bedrock. Humus and most of the nutrients for plants is found in the topsoil. Subsoil and bedrock are layers of soil under the topsoil that are formed over a long period of time by the action of water. There are not as many nutrients found in subsoil or bedrock. Subsoil is not the best soil for plants to grow in. Clay contains tiny particles of soil that hold water well and provides nutrients. Sand is made up of small grains of worn down rock, has few nutrients, and does not hold water well. Silt is made up of very small broken pieces of rock. Its particles are larger than clay and smaller than sand.

Student project: Get out your shovels and dig into the ground! Have the students identify the different layers. Soil activity from Bureau of Land Management:

HYPERLINK "http://www.blm.gov/nstc/soil/Kids/texture.html" <http://www.blm.gov/nstc/soil/Kids/texture.html>

A fabulous web page all about soil filled with activities, projects, and information for kids from the Bureau of Land Management:

HYPERLINK "http://www.blm.gov/nstc/soil/Kids/" <http://www.blm.gov/nstc/soil/Kids/>

Sun as a source of heat

Day and night occur because Earth turns or rotates on an imaginary line called an axis. Earth completes one full turn once a 24-hour period. The sun provides both light and heat, which warms the land, air, and water. A rock in the sun gets warm. If you put the rock in the shade, it will cool off. Reptiles sit on rocks that are in the sun to warm up. They hide in the shade to cool off. In the desert, the sun affects the temperature greatly. During the day, the sun can heat the desert to over 120 degrees on some days. At night, after the sun has gone down, the desert becomes very cold. The sun always rises in the East and sets in the West.

A classroom activity about day and night: HYPERLINK "http://faldo.atmos.uiuc.edu/w_unit/LESSONS/day.night.html" http://faldo.atmos.uiuc.edu/w_unit/LESSONS/day.night.html

Watershed

A watershed is the land that water flows across or through on its way to a stream, lake, wetland, or other body of water. Areas of higher elevations, such as ridgelines or divides, separate watersheds. The three major regional watershed systems in Virginia lead to the Chesapeake Bay, the North Carolina sounds, or the Gulf of Mexico.

Information and activities for teachers to support interdisciplinary and problem-based teaching about watersheds, water quality, stewardship, and management issues:

HYPERLINK "<http://www.longwood.edu/cleanva/teachersvawatercurriculum.htm>" <http://www.longwood.edu/cleanva/teachersvawatercurriculum.htm>

Water projects and supplies:

HYPERLINK "<http://www.watercenter.net/>" <http://www.watercenter.net/>

Water Cycle

The water cycle is the movement of water on the earth by evaporation, condensation and precipitation. The sun is the power that drives the water cycle. All of the water on earth is part of the water cycle. Water is stored in ponds, lakes, streams, rivers, ground water, and oceans. Did you know that most of your body is made of water? Water is essential to life and earth and needs to be protected and conserved.

An excellent explanation of the water cycle for kids includes pictures of definitions and concepts. This page also includes activities about the water cycle to do in class:

HYPERLINK "<http://www.kidzone.ws/water/>" <http://www.kidzone.ws/water/>

Weather

Changes in the weather are characterized by daily differences in wind, temperature, and precipitation. Different types of precipitation are snow, rain, and sleet.

Some biomes go through long periods of weather such as drought and floods. Droughts are long periods without rain. Floods happen when it rains so much that rivers and streams flow over their banks and the ground can no longer soak up water. Water begins to flow over land. This happens every year in the savanna. In other biomes, severe storms including hurricanes, tornadoes, blizzards, and thunderstorms are common.

The change in seasonal weather affects plants. In places such as the grasslands, savanna, and chaparral the time that plants grow depend entirely on the weather. In times of plentiful rain, plants grow well in biomes, but when it becomes dry as in a drought, many plants

stop growing and become **dormant**. During plant **dormancy** periods, animals often need to change their lifestyles. Plants provide animals with food that they need, and when the plants are **dormant** food may be scarce. Animals must **migrate**, **hibernate**, or eat different things to deal with plant dormancy.

MORE TEACHER RESOURCES

Science News for Kids: HYPERLINK "<http://www.sciencenewsforkids.org/articles/TeacherZone.asp>" <http://www.sciencenewsforkids.org/articles/TeacherZone.asp>

Children's Environmental Literature List in Adobe PDF from Virginia Naturally

This is an easy to use list of educational books. It's huge!

HYPERLINK "<http://dnr.wi.gov/org/caer/ce/cek/teacher/pdf/Literaturelist.pdf>"
<http://dnr.wi.gov/org/caer/ce/cek/teacher/pdf/Literaturelist.pdf>

Curriculum from the National Park Service

Shenandoah National Park is pleased to announce the release of a new curriculum supplement for elementary school teachers in Virginia. **Good Character, Good Stewards: Caring for the World Around Us** is designed to help teachers integrate character education with science, math, history, and English.

HYPERLINK "http://www.nps.gov/shen/edcurric/ed_curric.htm" http://www.nps.gov/shen/edcurric/ed_curric.htm

Virtual Forests Activity Site from 4-H

Topics include urban sprawl, tree growth, photosynthesis, and more:

HYPERLINK "<http://www.ext.vt.edu/resources/4h/virtualforest/>" <http://www.ext.vt.edu/resources/4h/virtualforest/>

Virginia's Natural Resource Education Guide

A huge collection of classroom projects, games, and curriculum from agriculture and air to Waste Management and Wildlife From the Virginia Resource – Use Education Council:

HYPERLINK "<http://www.vanaturally.com/guide.html>" <http://www.vanaturally.com/guide.html>

Earth Matters 4 Kids

Bringing science education, environmental principals and the natural world into the classroom. Colorful, interactive and fun with games, mini movies, and activities:

HYPERLINK "<http://www.earthmatters4kids.com/main.html>" <http://www.earthmatters4kids.com/main.html>

Real Trees 4 Kids

Good descriptions of the different cycles carbon, nitrogen, water cycles:

HYPERLINK "<http://www.realtrees4kids.org/sixeight/cycles.htm>" <http://www.realtrees4kids.org/sixeight/cycles.htm>

www.realtrees4kids.org/sixeight/cycles.htm

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