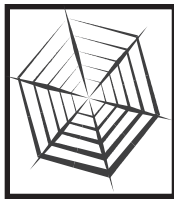




Classroom Adventures

TEACHER ENRICHMENT RESOURCE PACKET



Neighborhood Ecosystems

A Classroom Adventure for Grades K-6

Step outdoors to explore the schoolyard ecosystem. Use magnifiers and binoculars to look closely at the soil, plants and animals in the world outside the classroom.

Think it.
Try it.
Explorit.

what's inside

Welcome	1
Learning Objectives	1
Background Information	2
Vocabulary	4
Classroom Activities	5
Supplemental Resources	7
Science Standards Alignment	8

Sponsored by:





Welcome

Thank you for choosing Explorit Science Center's *Classroom Adventures* to supplement your ongoing science curriculum. Whether you use the program to kick off a new unit, wrap up a nearly completed unit, or purely to excite and interest your students in the wonderful world of science, advance preparation and follow up with your students are critical to achieving the greatest educational benefit from this unique science experience.

Explorit provides two resources to help prepare you and your students for *Classroom Adventures*. First, simple logistics of the program are detailed in the confirmation letter. Second, this **Teacher Enrichment Resource Packet** outlines appropriate science content and processes to help you:

- successfully prepare your students prior to Explorit's visit;
- participate fully in *Classroom Adventure* yourself; and
- follow-up with your students after Explorit staff leave.

Learning Objectives

Learning objectives provide a broad overall guide to what students will begin to experience and understand through participation in Explorit's **Neighborhood Ecosystems Classroom Adventure** designed for Grades K-6. During this program, students will:

- understand that an "ecosystem" is made up of various living and non-living parts (soil, water, plants, animals, etc);
- understand the importance and interconnectedness of parts of an ecosystem; and
- understand that they can study nature in their own backyard.

Science Standards

Explorit Science Center's *Classroom Adventures* programs address concepts teachers need to teach under the California Science Content Standards. The alignment of *Classroom Adventures* with the science standards allow you, the teacher, to bring exciting fun-filled science experiences to your students while at the same time fulfilling your requirements to teach particular science content and processes. For specific science standard concepts covered by **Neighborhood Ecosystems**, refer to Science Standard Alignment, page 8.

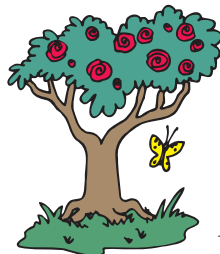
Our Mission:

To involve people in
science experiences that
touch our lives.

Background Information

WHAT IS AN ECOSYSTEM?

We are all part of an ecosystem. Ecosystems are defined as communities of living organisms: plants, animals, fungi and bacteria, that interact with each other and with their surrounding non-living environment to form a complex network of activity. The non-living environment is the source of all the energy and raw materials needed by the living organisms. The physical features of the land, and the climatic conditions, also have an important influence on the system.



One way to understand how an ecosystem works is to follow the flow of energy. The energy comes originally from the sun and is cycled among all plants and animals to power their life processes.

Plants are “self-nourishing” because they capture energy from sunlight and, with raw materials from the soil and atmosphere, manufacture foods that store the energy chemically. This stored energy is used for life processes by the plants and the animals that feed upon them.

The life processes of living inhabitants of an ecosystem include respiration, feeding, growth, and reproduction. When plants and animals die they decompose as a result of breakdown of tissues by chemical and physical processes, and through the biological activity of fungi, bacteria and other plants and animals. This returns raw materials to the system and allows the cycle of life to continue.

HOW DIVERSE IS LIFE FOUND IN DIVERSE PLACES?

Animals can be found in every ecosystem. Mammals often found in our urban areas include rats, mice, raccoons, foxes, and opossums. Birds such as pigeons, scrub jays, crows and gulls have adapted to urban life. Many smaller animals, such as spiders and insects, can be found in virtually all habitats world wide.

Animals provide many benefits to people. For example, some bats eat more than their own weight in insects each night. They save farmers thousands of dollars in crop loss and help control populations of disease-carrying insects like mosquitoes.

WHAT ARE PLANTS?

Plants are all around us, but we can forget how important they are. Animals rely on plants for shelter, but more importantly for energy as food. Humans use plants to make paper, clothing, houses, fuels, and medicines. Plants also release oxygen into the air. We use plants to make neighborhoods more beautiful and healthier.

Plants need some things to survive: nutrients, water, sunlight, and carbon dioxide (CO₂). When we garden, we help the plants get the things they need, but plants have many adaptations to help them get these things for themselves.

Ecosystems Trivia:
 It takes about 500 years to form one inch of soil.

Background Information

continued

Ecosystems Trivia:

There are over 4000 species of plants native to California and over 2000 of those species are found nowhere else in the world.

Ecosystems Trivia:

There are 28,000 species of insects in California, and 9,000 species which live nowhere else in the world.

Plants native to Northern California are adapted to survive the hot, dry summers and cool, wet winters. Some native plants have deep roots to reach water far down in the soil. Other plants go dormant during the summer, losing their leaves until the rains come in the fall. Some plants have chemicals that make them taste bad or thorns to discourage herbivores.



Many animals rely on plants for food. In addition, animals often help plants by pollinating their flowers and spreading seeds. Some seeds have spikes or hooks that make them stick to animal hair. That way seeds are carried far from the plant.

WHAT ABOUT SOIL?

Soil is an important, but sometimes neglected, part of most ecosystems. Soil is much more than just dirt. Soil supports countless plants, animals, and microbes. It is also filled with nonliving matter needed by plants, animals and microbes. Soil acts as a path between the living and non-living worlds.

Soil begins as rock. All surface rocks are slowly turning into soil through physical weathering as the rocks are exposed to wind, water and extreme temperatures. Water is a major agent of change, eroding rock into sand, silt, and microscopic particles of clay. Water also changes rocks chemically by dissolving minerals from the rocks making them available for plants to use as nutrients.

Most good soils are about half mineral. The rest is air, water, and organic matter. When dead leaves or animals fall to the ground, many kinds of burrowing creatures take advantage! They work the soil, looking for food. This loosens the soil structure, improves its ability to absorb water, and speeds up conversion of raw materials into nutrient forms usable by plants. Vegetable matter that falls to the ground forms “humus” that releases nutrients for use by plant rootlets.

WHAT ARE FOOD CHAINS AND WEBS?

Animals within a habitat are linked through the foods they eat. Animals eat plants, other animals or both plants and animals. We call the relationships between animals and the foods they eat a food chain. A food chain involves the flow of energy from the sun to green plants to animals. A simple food chain might involve a mouse eating grass and a hawk eating the mouse. Usually the relationships are not nearly so simple. Rather they are complex networks of intertwined food chains often called food webs.

CONCLUSION

Although the term ecosystem is used to describe vast areas in nature, such as oceans, seashores, woodlands, and deserts, we can define smaller versions of ecosystems in our own neighborhoods and schoolyards. Explorit Science Center’s *Classroom Adventure* program **Neighborhood Ecosystems** will help guide you and your students through some of the basic parts of your schoolyard’s ecosystem.

Vocabulary

This list includes words that may be used during *Classroom Adventures*. Specific vocabulary used depends on students' grade level and prior knowledge.

Adaptation - modification of an animal's characteristics, through natural selection, in a way that alters its chances of survival in a particular habitat.

Botany - the scientific study of plants.

Carnivore - an animal that eats other animals.

Compost - Organic matter that is undergoing decomposition or has resulted from decomposition.

Composting - controlled decomposition of organic material such as leaves, twigs, and food waste

Decomposer - An organism that feeds on and breaks down organic materials into simpler chemical compounds.

Decomposition - The process by which organic materials break down into simpler compounds.

Food Chain/Web - the transfer of food energy from one organism to another.

Habitat- an animal's immediate natural surroundings or environment, containing an arrangement of food, water, shelter, and space that meets the animal's needs.

Herbivore - an animal that eats plants.

Humus - The end product of composting. Vegetable material which is completely decomposed.

Leaf - part of a plant adapted to make food

Mineral - A chemical compound, with specific physical properties, occurring naturally in the Earth.

Microbe - An organism, such as a bacterium, that is too small to be seen without the aid of a microscope.

Nutrient - A substance that provides nourishment.

Omnivore - an animal that eats both plants and animals.

Organic matter - Derived from or produced through the biological activity of a living thing.

Root- the part of a plant (usually underground) that draws water and nutrients to the rest of the plant.

Seed- a tough package containing a plant embryo and food reserves for its use.

Stem- the main supportive part of a plant.

Ecosystems Trivia:

Over 95% of the water in the world is saltwater. Of the remaining 5% fresh water, less than 1% is available to us to drink, most of it frozen in glaciers.



Classroom Activities

Materials:

carrots
tomatoes
apples
celery
flower or plant

Science Standards:

Life Science
K: 2 c
Second: 2 f
Fourth: 2 a

Materials:

1 plastic bag per student
leaves or stem of a plant
rubber bands

Science Standards:

Life Science
K: 2 c
First: 2 a, b
Second: 2 e
Third: 3 a
Investigation & Experimentation
K - Second: 4
Third: 5
Fourth - Fifth: 6
Sixth: 7

For your convenience, the following activities can be used as you deem most appropriate to integrate Explorit's **Neighborhood Ecosystems** into your ongoing curriculum. The activities are grade-level appropriate, but please note that this program is designed for a broad grade range (K-6) and thus all activities may not be appropriate for every group of children. Choose those activities that will work well for your students.

ACTIVITY #1: "EAT TO LEARN THE PARTS OF PLANTS"

Objective: To identify the different parts of edible plants.

Procedure:

1. Talk about plants with your students. Look at a flower or other plant and as a group identify the different parts of the plant. The six basic parts of any flowering plants are the roots, stems, leaves, flowers, fruits, and seeds.
2. Now look at some vegetable and fruits. When you eat vegetables, what parts are you eating? Think of the many different parts of plants that you eat. For example, carrots and radishes are roots, celery is a stem, and tomatoes are fruits. Bring a few fruits and vegetables and have a fun and healthy snack while the children identify what part of the plant they are eating.

ACTIVITY #2: "WATCH PLANTS SWEAT"

Objective: To explain the concept of transpiration in plants.

Procedure:

1. Transpiration is the process by which plants lose water through stomata (tiny openings in their leaves and stems). Water is drawn up from the soil by the roots into the stem and leaves. Take a walk with your students and have them collect a sample of grass or other plant from outside. Make sure that their samples have leaves or stems.
2. Have each student secure a plastic bag around the leaves or stems at the end of a growing plant. Be sure to zip or rubber band the baggy tightly around the plant. Do this early in the day, and then continue with the day's activities.
3. At the end of the day have the students check their baggies. Water that has transpired from the plant can be seen condensed inside the baggy. Ask students to think about why water collected in their bags. What caused the water to appear? What is happening and why? This experiment works best when done on a sunny day, when more transpiration occurs.
4. Link discussion to plants and animals that live in the desert. How are they able to survive? What adaptations have they developed to live in this ecosystem?
5. **Extension:** For an interesting extension to this experiment, try a different number of leaves or place some leaves in the sun and some in a shaded area and make comparisons.



Classroom Activities

continued

Materials:

containers (1 per student)
other materials to be collected by students

Science Standards:

Investigation & Experimentation
K - Second: 4
Third: 5
Fourth - Fifth: 6
Sixth: 7

Materials:

at least 15 seeds
15 cups or pots for growing seeds
several soil types
water measuring equipment
space to place all samples under same light condition

Science Standards:

Life Science
K: 2 a, c
First: 2 b, e
Second: 2 e, f
Investigation & Experimentation
K - Second: 4
Third: 5
Fourth - Fifth: 6
Sixth: 7

ACTIVITY #3: "SOIL CREATION"

Objective: To explore the components of soil and to discuss the time it takes to create it.

Procedure:

1. In nature making soil takes hundreds of years. Work with your students to see if humans can make soil more quickly. Challenge your students to create soil from its component parts.
2. Give each student a small clear container in which to create the soil.
3. Students can begin by gathering some sand and rocks from the playground. Then they can add organic materials such as dead leaves and dead bugs.
4. Once students have gathered everything, ask them why their soil looks different from soil in the garden or school yard? What is the difference? How could they make their soil more like the garden soil?
5. Let the students spend some time trying to break and grind their mixtures into soil. They could shake the containers or grind the mixture between two rocks. Once they are tired, take a minute to discuss their results. Was it easy or difficult to create soil? How did their soil turn out? Do they think their soil would be good for growing plants? In an ecosystem, how is soil created?
6. **Extension:** If students are interested, they can use their 'soil' in the soil samples activity.

ACTIVITY #4: "SOIL SAMPLES"

Objective: To plant peas and observe their growth over time.

Procedure:

1. Plant identical seeds in various soils. For example, plant five peas in clay soil, five in potting soil, and five in sandy soil.
2. Measure the amount of water you give each pea, each day. Keep all the plants in the same spot with the same light and temperature. As long as all the seeds are getting the same light and temperature you can be sure that any differences you see in the growth of the seeds must be a result of the different soils. This is called controlling the variables.
3. Make observations about each seedling over a series of several weeks. Are there any differences in growth? Discuss what might cause these differences and think about why different types of plants grow in different habitats in the wild. Discuss the adaptations plants have developed to survive in certain habitats.



Supplemental Resources

BOOKS

- Cornell, Joseph. **Sharing Nature with Children**. Ananda Publications, 1979. *Good nature activities that engage children.*
- Dowden, Anee. **Wild Green Things in the City: A Book of Weeds**. Thomas Y. Crowell Company, 1972. *Text with detailed illustration regarding characteristics of common city plants throughout the year.*
- Haus, Robyn. **Make your Own Birdhouses and Feeders: Quick Starts for Kids**. Williamson Publishing, 2001. *(Grades 2-6)*
- Kneidel, Sally. **Creepy Crawlies and the Scientific Method: More Than 100 Hands-On Science Experiments for Children**. Fulcrum Publishing. *Detailed info. to create experiments from students' questions. (Grades K-12).*
- Potter, Jean. **Nature in a Nutshell: Over 100 Activities You Can Do in Ten Minutes or Less**. John Wiley & Sons, Inc., 1995. *Hands-on introduction to nature. Easy and fun activities. (Grades 2-4)*
- Reed-Jones, Carol. **Salmon Stream**. Dawn Publications, 2000. *Story tells life cycle of salmon; wonderful illustrations.*
- Seuss, Dr. **The Lorax**. Random House, 1971. *Storybook regarding nature.*
- VanCleave, Janice. **Ecology for Every Kid: Easy Activities That Make Learning Science Fun**. John Wiley & Sons, Inc., 1996. *User friendly text.*

WEB SITES

The Franklin Institute's On-Line Guide Web Site

www.fi.edu/tfi/units/life/habitat/habitat.html

Information regarding ecosystems, biomes and habitats; many activities.

Nature Shift Web Site

www.natureshift.org

Lots of activities and teacher resources regarding nature.

National Wildlife Federation Web Site

<http://www.nwf.org/schoolyardhabitats>

Excellent K-12 teacher resource; information on creating a schoolyard habitat site.

Outdoor Classroom Web Site

<http://www.outdoorclassroom.org>

Class activities and information on how to create own outdoor classroom.

Project WILD

<http://www.projectwild.org/educators.htm>

Activities, as well as links to standards including No Child Left Behind.



Science Standards Alignment

Below is the exact language of California's science standards that Explorit's **Neighborhood Ecosystems** program addresses either during our visit to your classroom or through materials in this Teacher's Packet that you may use.

CALIFORNIA SCIENCE CONTENT STANDARDS

Life Sciences

Grade K: 2. Different types of plants and animal inhabit the earth. As a basis for understanding this concept, students know: how to observe and describe similarities and differences in the appearance and behavior of plants and animals (e.g., seed-bearing plants, birds, fish, insects). c. how to identify major structures of common plants and animals (e.g., stems, leaves, roots, arms, wings, legs).

Grade 1: 2. Plants and animals meet their needs in different ways. As a basis for understanding this concept, students know: a. different plants and animals inhabit different kinds of environments and have external features that help them thrive in different kinds of places. b. both plants and animals need water, animals need food, and plants need light. c. animals eat plants or other animals for food and may also use plants or even other animals for shelter and nesting. e. roots are associated with the intake of water and soil nutrients and green leaves are associated with making food from sunlight.

Grade 2: 2. Plants and animals have predictable life cycles. As a basis for understanding this concept, students know: b. the sequential stages of life cycles are different for different animals, such as butterflies, frogs, and mice. e. light, gravity, touch, or environmental stress can affect the germination, growth, and development of plants. f. flowers and fruits are associated with reproduction in plants.

Grade 3: 3. Adaptations in physical structure or behavior may improve an organism's chance for survival. As a basis for understanding this concept, students know: a. plants and animals have structures that serve different functions in growth, survival, and reproduction.

Grade 4: 2. All organisms need energy and matter to live and grow. As a basis for understanding this concept, students know: a. are the primary source of matter and energy entering most food chains. 3. Living organisms depend on one another and on their environment for survival. As a basis for understanding this concept, students know: a. ecosystems can be characterized by their living and nonliving components. b. that in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all. c. many plants depend on animals for pollination and seed dispersal, and animals depend on plants for food and shelter.

Focus on Earth Sciences (Ecology)

Grade 6: 5. Organisms in ecosystems exchange energy and nutrients among themselves and with the environment. As a basis for understanding this concept, students know: e. the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.

Investigation and Experimentation

Grades K-2, Concept 4 / Grade 3, Concept 5 / Grade 4-5, Concept 6 / Grade 6, Concept 7: Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content in the other three strands, students should develop their own questions and perform investigations.

Explorit's Classroom Adventures involve students' use of many science process skills. For grade level specific skills, see California Science Content Standards at www.cde.ca.gov/board.

Ecosystems Trivia:

There are 37 different kinds of amphibians in California, such as frogs, toads, newts and salamanders. Seventeen of these species live only in California.

Explorit Programs for Schools and Groups

At Explorit's Site

Discovery Lessons & Labs Visit one or more of the Changing Exhibitions throughout the year
Nature Safaris & Labs Visit Explorit's outdoor spaces at Mace Park Branch

Explorit in Your Classroom

Classroom Adventures Explorit educators visit your classroom for hour-long presentations
Young Scientist Series Science investigations through multiple visits

For the Whole School

Health in Your World Learn about keeping your body and the world healthy and safe
Science in Your World The ultimate family science night
Science Assembly A multimedia presentation for the whole school

Reservations required.
For information please call
530.756.0191

Think it.
Try it.
Explorit.

HOW TO CONTACT US

The Explorit logo consists of the word "explorit" in a lowercase, sans-serif font, with a stylized swirl graphic behind the letter "i". The logo is set against a black oval background.

explorit

EXPLORIT SCIENCE CENTER

Location: 2801 2nd St, Davis
Phone: 530.756.0191
Fax: 530.756.1227
E-mail: explorit@explorit.org
Web: www.explorit.org