# 4th Grade Garden Lessons
# (From the Center for Ecoliteracy Curriculum Binder)

1. Basic Transplanting Guide 4/5 (by Maria Sayles, c. The Lesson Pathway Project developed by Education Outside)

2. Soil Profiles: Make a Soil Jar (by Maria Sayles, c. The Lesson Pathway Project developed by Education Outside)

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4. California Agriculture Salad Garden (by Marika Bergsund, c. Growing Great: Inspiring Healthy Eating)

5. Mother Earth (Roberta Jaffe, Gary Appel, *The Growing Classroom*)

6. How to Make a Seed Ball (The National Gardening Association)

7. California Rancho Kitchen Garden (c. Growing Great: Inspiring Healthy Eating)

8. Power of the Circle (c. Roberta Jaffe, Gary Appel, *The Growing Classroom*)

9. You are What You Eat (c. Roberta Jaffe, Gary Appel, *The Growing Classroom*)

10. Processed or Not (c. Roberta Jaffe, Gary Appel, *The Growing Classroom*)

11. Dig Art! Cultivating Creativity in the Garden; Printmaking: Chlorophyll Prints (c. Cornell Garden Based Learning, Cornell University Department of Horticulture)

12. 4th Grade Learning Garden Lessons (c. Captain Planet's Learning Gardens)

# Basic Transplanting Guide for 4/5

Created by Marie Sayles, Garden Educator
Sunset Elementary, San Francisco Unified School District

## LESSON SUMMARY

In this lesson, students will learn how to transplant seedlings.

## LESSON OBJECTIVES

Students will be able to:

- Identify the steps necessary for transplanting a seedling.
- Understand what a plant needs to grow/germinate.

## ASSESSMENTS

Students will be able to:

- Properly plant seedlings.
- Participate in class discussion about the basic needs of growing plants.

## MATERIALS

- Seedlings (started from seed or purchased from garden store)
- Garden beds or area prepped for planting
- Trowels or garden shovels
- Watering cans
- Labels and permanent markers

## BEFORE YOU BEGIN

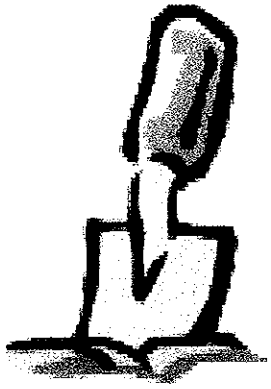
Have all materials easily accessible for students.

- SEEDLINGS: Plants are ready to be transplanted
- GARDEN BED: Prep your garden bed - before or with the students - by weeding the area, digging to loosen the soil and adding organic material (compost or soil).
- TOOLS: Hoes, spades or trowels. Set tools out so they are easy accessible to retrieve and put back.
- WATER: Set up watering station with full bucket or tub and small watering cans or cups. Or, make "seed sprinklers" by putting holes (with a push pin) into the top of plastic bottle. Fill with water and simply squeeze to water plants.
- LABELS: Get creative with labels by using popsicle sticks, cut up plastic jugs in strips, clothes pins or make "plant flags" by folding masking tape in half over a stick. Have lots of colors of sharpies on hand!

## PROCEDURES

Transplanting involves moving a plant from one place to another as well as planting seedlings that were started from seed at a different location. The secret of successful transplanting is not to disturb the roots. Have students work in teams or pairs, helping each other, but letting every student plant their own seedling.

1. Gather students together to discuss and demonstrate how to transplant a seedling.
2. Use a trowel for small plants and seedlings and a regular sized shovel for larger plants.
3. Dig a hole where the plant will grow, it should be deep enough so the transplant is at the same depth in the ground as it was in the pot.
4. Dig up the plant to be moved trying to get as much soil around the roots of the plant as your tool will allow OR unpot the seedling by turning its pot upside down, cupping the seedling with your hand and giving it a tap on the bottom, if needed. Try to keep the root mass and soil intact.
5. **Whatever you do, don't yank out a plant by its stem.**
6. Place seedlings in hole at the correct depth (so all roots are covered) and carefully push soil back into place.
7. Gently firm soil around the roots with your hands.
8. Water thoroughly and make sure the water soaks into the soil all around the plant.
9. Keep the bed moist while the seedlings get established and begin to grow strongly.



# Soil Profiles: Make a Soil Jar

Created by Marie Sayles, Garden Educator
Sunset Elementary, San Francisco Unified School District

## LESSON SUMMARY

In this lesson, students will learn about the basics of soil, soil features and then make a soil profile in a jar.

## LESSON OBJECTIVES

Students will be able to:

Identify examples of the materials that make up the 4 layers of soil.
Utilize materials from school garden to build a soil jar.

## ASSESSMENTS

Students will:

Accurately identify and describe the soil layers of the earth's surface.
Work cooperatively in a group to build a soil layer jar.

## MATERIALS

Soil profile worksheets per group
Clipboards and pencils
Clear plastic or glass jars (at least six inches tall)
Assorted garden materials (rocks, sand, soil samples)

## BEFORE YOU BEGIN

Review the information on soil layers and introduce the concept to the students.

**What is Soil?**
Have you ever stopped and looked at the soil beneath your feet? Have you ever thought of soil as a living, breathing thing? It really is! There are millions of small plants and animals in the soil, and you are walking on their homes (ouch!). Soil is made of both living and dead plants and animals (organic matter), air, water, and mineral particles such as sand, silt, and clay.

Soil features such as thickness, texture, and color can easily be observed and studied. The best way to observe how soils develop in layers is to visit a road cut, building site, or ditch. Each layer, or "horizon," looks different and has unique physical and chemical properties. A cross-section cutting down through these different horizons is called a soil profile. A layer of leaf litter (decaying leaves, bark, nuts, and twigs) is found on top of

the soil. Layered below the leaf litter are the following four horizons, which make up the soil profile.

**A Horizon**, or surface layer, is usually darker than the lower layers. It is most often loose and crumbly and contains more organic matter than deeper layers. In the A Horizon, water soaks or leaches into the soil with ease. Clay and other dense compounds are missing; they have been carried by water deeper into the soil profile.

**B Horizon** is the subsoil. Subsoils are usually light colored and dense and contain little organic matter. Materials washed or "leached" from the A Horizon collect in the B Horizon. Therefore, this horizon holds more clay, iron and other mineral compounds.

**C Horizon**, or parent material, is the layer of very little weathering. (This means that forces of weather, such as rain and wind that cause erosion, or ice that causes freezing and thawing, have little effect on this horizon.) The C Horizon has very few roots. It is usually low in clay content and often contains pieces of rock.

**R Horizon**, or bedrock, contains layers of solid rock.

## PROCEDURES

1. Ask students question: Is soil alive? Yes! Review the definition of soil. Discuss the soil layers and illustrate on a whiteboard.
2. In groups of 3-5, have students complete the worksheet.
3. Send groups out into the garden to build their own "soil jar" using whatever materials they can from the garden. Remind them that they need to see all the layers, so don't fill in sand and cover all the other materials. i.e., large rocks, gravel or bark for the bedrock, smaller rocks for the parent materials, light colored sand/rock mix for subsoil and potting soil or compost for the soil layer. Students may want to decorate the top layer with flowers and plants!

## RESOURCES

The Dirt on Soil
http://school.discoveryeducation.com/schooladventures/soil/

Soil Layers by Enchanted Learning
www.enchantedlearning.com/geology/soil/

Name(s): _____ Room ___

QuickTime™ and a
decompressor
are needed to see this picture.

| Soil Layer or Horizon | What color is it? (or colors) | What materials is it made up of? | Use 3 adjectives to describe it: |
|---|---|---|---|
| 1st Layer: Topsoil (A Horizon) | | | |
| 2nd Layer: Subsoil (B Horizon) | | | |
| 3rd Layer: Parent Material (C Horizon) | | | |
| 4th Layer: Bedrock (R Horizon) | | | |

# More SOIL facts:

* Soil makes up the outermost layer of our planet.
* Topsoil is the most productive soil layer.
* Soil has varying amounts of organic matter (living and dead organisms), minerals, and nutrients.
* Five tons of topsoil spread over an acre is only as thick as a dime.
* Natural processes can take more than 500 years to form one inch of topsoil.
* Soil scientists have identified over 70,000 kinds of soil in the United States.
* Soil is formed from rocks and decaying plants and animals.
* An average soil sample is 45 percent minerals, 25 percent water, 25 percent air, and five percent organic matter.
* Different-sized mineral particles, such as sand, silt, and clay, give soil its texture.
* Fungi and bacteria help break down organic matter in the soil.
* Plant roots and lichens break up rocks, which become part of new soil.
* Roots loosen the soil, allowing oxygen to penetrate. This benefits animals living in the soil.
* Erosion: Roots hold soil together and help prevent erosion.
* Five to 10 tons of animal life can live in an acre of soil.
* Earthworms digest organic matter, recycle nutrients, and make the surface soil richer.
* Mice take seeds and other plant materials into underground burrows, where this material eventually decays and becomes part of the soil.
* Mice, moles, and shrews dig burrows, which help aerate the soil.

# Seasonal Planting

Created by Claire Lagerwey, Garden Educator
Marshall Elementary, San Francisco Unified School District

## Lesson Summary

In this lesson, students will make a vegetable planting guide based on the time of year.

## Lesson Objectives

Students will be able to...

- Read and interpret a planting guide
- Choose what they want to grow in their garden
- Understand that seasons and weather affect different plants in different ways

## Materials

- Make copies for each student or pair of students of *Gold Gate Gardening Planting Guide* by Pam Pierce (choose the foggy or sunny microclimate guide depending on location of your school).
- Science notebooks, pencils for all students
- Optional: a season's wheel poster or drawing to show months compared to seasons (great for grades 1-2)

## Before You Begin

- Orient yourself with Pam Pierce's planting guide including the key.

## Procedures

_ Class discussion: What season is it? How do we know? What months are part of this season? Discuss that different plants grow at different times of the year/seasons because they need different things (temperatures, water, etc)
_ Introduce the planting guide. Explain how the key works.
_ In pairs, have students choose 5 things they would like to plant in the month you are currently in.

## Resources

- Pam Pierce, *Golden Gate Gardening*

## OTHER IDEAS

Digging Deeper:

- Have students create a chart for their vegetable choices that includes:
  Plant Name Months it Can be Planted Why they choose it
- Discuss what season and months are coming up after the current one. Repeat the exercise for the next seasons.

For grades 1&2:

- Show pictures or fruits and vegetables that can be grown in each season. Have students place the pictures on a giant seasons chart using tape. As a group have students choose a few things to plants for that season.

# Fourth Grade Fall Garden
# California Agriculture Salad Garden

**Objective:** Students will learn about the importance of California agriculture and farmers in their daily life and for the rest of the US and the world.

**Seeds:**
Carrots—Nante or Babette
Cabbage
Lettuce—Two to four visibly different varieties (color and shape of leaves), i.e. Red Sails, Black Seeded Simpson, Lolla Rossa, Quatre Saisons, Oak Leaf
Broccoli--DiCiccio
Onion Bulbs—red, yellow or white
Peas—Sugar Snap (Cascadia) or Snow Pea (Oregon Sugar Pod I or II)
Spinach—Bloomsdale

**Transplants (optional):**
Edible Flowers—Pansies or violas of different colors

**Lesson:**
Today we are planting a special salad garden that will teach us about California Agriculture. Everyone will get to plant one type of seed or plant today. Then, you will get to watch your garden grow for the next few months. In January or February after the Winter Holiday break, you will have a special party where you get to harvest all the vegetables from the garden and eat a delicious salad that you grew!

**California Agriculture**

1. Definition of Agriculture: practice of growing or raising plants or animals for our use or consumption—farming, raising livestock or dairy cows, forestry.
2. Two main points:
    a. Agriculture is a huge part of your life.
    b. Agriculture is a huge part of life in California.
3. Why is Agriculture important? In many ways, agriculture has touched your life today. Walk them through a day in their life and all agriculture links
    a. Morning—sleeping on cotton sheets, put on clothes of cotton, wool, leather shoes.
    b. Breakfast—all food and drink—orange juice, milk, wheat or corn in cereal, wheat toast, strawberry jam
    c. Car to school—leather or fabric seats
    d. At School--paper you write on and in books, ink in your pens, wood tables, wood in buildings.
    e. Afterschool--leather soccer balls, any snacks, etc.
    f. Yet, only 2% of U.S. population grows all these commodities for the rest of us!
4. Why is Agriculture important in California?
    a. Quiz: True or False
        i. Agriculture is one of California's leading industries--True.
        ii. California is the nation's #1 farming state--True.
            1. California produces almost double the value of crops as Texas, which is the #2 farming state
    b. If California was its own country (like France or Germany, instead of part of the United States), California would be one of the Top 5 agriculture producing countries in the whole world!!
5. Why is California such a big agricultural state? Mainly because of our weather. We can grow many vegetables all year long. In most other states, such as Ohio or Massachusetts or New York or Colorado, you can not grow vegetables in the winter because the ground freezes. Those states must import their vegetables from California or other countries.
6. Special Crops in California Agriculture.
    a. What do all of these items have in common? **California produces 99%** of all of these crops grown in US
        1. Almonds (80% of world production, Central Valley)

2. Artichokes
3. Dates
4. Figs
5. Kiwi
6. Olives
7. Pistachios (2nd Largest producer in world)
8. Pomegranates
9. Raisins
10. Prunes (70% of world production, Central Valley)
11. Walnuts (60% of world production, Central Valley)

b. **California produces 75% or more** of many crops consumed in U.S.: lettuce, broccoli, carrots, tomatoes, melons, grapes, strawberries.
c. Some fruits and vegetables **harvested year round**: lemons, artichokes, avocados, broccoli, cabbage, carrots, cauliflower, lettuce, spinach, celery, mushrooms, squash.
d. California by Agricultural Region—Each region features different crops because it has such different climates.
    i. Southern California
        1. Coastal—lettuce, strawberries, oranges, broccoli
        2. Interior—desert—cattle, alfalfa and wheat and other grains, melon, lettuce
    ii. Central Valley—grapes, poultry, cotton, tomatoes, almonds, peaches, cattle, oranges, beef, milk, pistachios, walnuts,
    iii. Central Coast—artichoke capitol, lettuce, broccoli
    iv. Northern Coast—cattle, sheep, apples, pears,
    v. Northern Interior—rice, forestry, cattle, apples, pears

7. What we are planting—we are planting some of the vegetables that grow year round in California
    a. Artichoke—grows all year long in the garden
    b. Carrots, cabbage, lettuce, spinach, peas and onions
    c. Edible flowers—great in our salads and represent an important type of agriculture right here in Southern California—nursery plants

## Garden Rules:

**1) IMPORTANT REMINDER:** Plants and flowers in the school garden are safe for eating because we plant them specially for food and do not use any chemicals or pesticides that would be harmful if eaten. Children must NEVER eat a plant or flower they find growing anywhere at school, home or in their neighborhood unless their parent or another responsible adult says it is ok!!! Many plants are VERY POISONOUS. Plants are tricky because many look alike. You may think it is a plant that is safe to eat, but it may not be. Also many people put chemical pesticides on their plants to kill bugs or give plants special food called fertilizer that is safe for the plants, but not safe for people. These chemicals are NOT SAFE for people to eat!!!

**2) Planting Directions for the Class:**

- Students will each get to plant one type of seed to plant
- We will assign each student the type of seed or plant they get to plant
- It doesn't matter what they plant today—the entire class will share the whole salad. They will get to taste everything planted today, and they will not have to eat anything they do not want to eat at the harvest party.
- Students must follow planting directions very carefully. If you plant too many seeds or don't put the seeds in correctly, your seeds will not grow.
- Please be good listeners and learners in the garden. The garden is a classroom just like all the other classrooms at school. Rules like no running, yelling, etc apply in the garden as well. Also, there are classrooms nearby so do not disturb.

**Planting Directions:**

For all seeds: Make rows a 6 inches apart and $\frac{1}{4}$ inch deep. Have students place seeds 1 inch apart in row. Easiest if you hold seeds and students pinch them from your hand/cup one at a time. Do not let students dig holes for seeds—seeds will be planted too deep and will not grow. Have student pinch dirt closed and gently pat down to cover rows after they place their seeds.

For onion bulbs: Make rows 3 inches apart and $\frac{1}{4}$ inch deep. Bulbs need to be planted 2" deep, which is the depth to the students second knuckle. Demonstrate to students how to push their finger into the soil just to the first knuckle. Remind them that if planted too deep (i.e. up to the beginning of their palm), the onions will not grow. Have students make their holes in the row. Show them the difference between the top and bottom of the onion bulb. Have them place the bulbs top side up in their holes. Once all the hole are filled, have students pinch the rows closed and pat down.

For transplants: Assign 2-3 students to each transplant. Plant transplants one foot apart. Students to take turns digging hole (remind them only as deep as potted transplant), removing transplant from pot (turn upside down and tap, catching plant as it falls out v. pulling out of pot by neck of plant), and placing in hole, adding and patting down dirt around it.

**Fourth Grade Fall Garden Planting**

This week your 4th graders will participate in the GrowingGreat Garden program. The students will work with our garden coordinator and parent volunteers to learn about our fall plantings and sow seeds in your class garden box. All activities through the GrowingGreat Garden program support California State Standards in science, language arts, or social studies.

Here are the details for your fall planting:

## California Agriculture Garden

This special garden features varieties of vegetables that are important California agricultural crops. Agriculture is important because it touches nearly every part of our lives from the clothes we wear to the food we eat. California is the most productive (and important) agricultural state in the United States. In fact, the Central Valley of California is often referred to as the "bread basket" of the U.S. Due to the moderate climate of California, we are able to plant crops year-round. Not only is California agriculture important to the U.S., but it also produces important crops that are exported to other countries. One of the reasons why California is the #5 most important economy in the world is because of our agriculture.

The 4th Graders planted a number of important vegetables that farmers all across California grow including lettuce, broccoli, carrots, spinach, artichoke, cabbage, radishes, and onions.

This garden supports social studies curriculum and the following California State Science Standard:

> 3B: Understand that for any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.

Please visit the garden throughout the fall and winter to see how your plants are doing. We will plan a harvest party in late winter.

INDOORS ❀ GRADES 4-6 ❀ FALL, WINTER, SPRING ❀ ACTIVITY

# Mother Earth

**DESCRIPTION**

The following passages are from Native American writings or speeches from the mid-1800s, and are offered here as a resource for your use.

**OBJECTIVE**

To have students relate to the Native Americans' understanding of cycles and interdependence with the earth.

**CLASS DISCUSSION**

Native Americans consider trees and other living things to be their brothers and sisters. Trees are sacred members of the natural world and deserve reverence and respect. When Native Americans need to cut down a tree, they have been known to offer prayers to its spirit both before and after harming it. They thank the tree for giving its life so that they might be able to carry on their own life.

**ACTION**

**READING I**

Read and discuss the following passage by Walking Buffalo of the Stony Tribe, Alberta, Canada:

"Hills are always more beautiful than stone buildings, you know. Living in a city is an artificial existence. Lots of people hardly ever feel real soil under their

feet, see plants grow except in flower pots, or get far enough beyond the street light to catch the enchantment of a night sky studded with stars. When people live far from scenes of the Great Spirit's making, it's easy to forget his laws.

"Did you know that trees talk? Well, they do. They talk to each other, and if you listen they'll talk to you. I have learned a lot from trees: sometimes about the weather, sometimes about animals, sometimes about the Great Spirit."

**READING 2**

Native American Indians were very aware of the significance of circles. They not only observed the cycles of nature that surrounded them and that they were dependent upon, but they also understood that they were part of the circle of life.

I HAVE KILLED THE DEER
Taos Pueblo Tribe

I have killed the deer.
I have crushed the grasshopper
And the plants he feeds upon.
I have cut through the heart
Of trees growing old and straight.
I have taken fish from water
And birds from the sky.
In my life I have needed death
So that my life can be.
When I die I must give life
To what has nourished me.
The earth receives my body
And gives it to the plants
And to the caterpillars
To the birds
And to the coyotes
Each in its own time so that
The circle of Life is never broken.

**READING 3**

The following is a translation of excerpts from a letter that is thought to have been written in 1855 to President Franklin Pierce by Chief Sealth of the Duwamish Tribe of the State of Washington. It concerned the proposed purchase of the tribe's land. The city of Seattle, a variation of the chief's name, is built in the heart of Duwamish land. The letter excerpts are printed courtesy of Dale Jones of the Seattle office of Friends of the Earth.

"The Great Chief in Washington sends word that he wishes to buy our land: The Great Chief also sends us words of friendship and good will... we will consider your offer. What Chief Sealth says, the Great Chief in Washington can count on as truly as the return of the seasons. My words are like the stars — they do not set.

"How can you buy or sell the sky or the warmth of the land? The idea is strange to us. Yet we do not own the freshness of the air or the sparkle of the water. How can you buy them from us? Every part of this earth is sacred to my people. Every shining pine needle, every sandy shore, every mist in the dark

woods, every clearing and humming insect is holy in the memory and experience of my people.

"There's no quiet place in the big cities... no place to hear the leaves of spring or the rustle of insect wings. But perhaps because I am a savage and do not understand, the clatter only seems to insult the ears. And what is there to life if a man cannot hear the lovely cry of a whippoorwill or the arguments of the frogs around a pond at night? The Indian prefers the soft sound of the wind darting over the face of the pond and the smell of the wind itself cleansed by a mid-day rain, or scented with a piñon pine. The air is precious to the Indian. For all things share the same breath — the beasts, the trees, the man.

"If I decide to accept, I will make one condition. All people must treat the beasts of this land as their brothers. I am a savage and I do not understand any other way. What are humans without the beasts? If all the beasts were gone, men would die from great loneliness of spirit, for whatever happens to the beast also happens to man. All things are connected. Whatever befalls the earth befalls the sons and daughters of the earth.

"When the last Indian has vanished from the earth and the memory is only the shadow of a cloud moving across the prairie, these shores and forest will still hold the spirits of my people, for they love this earth as the newborn loves its mother's heartbeat. If we sell you our land, love it as we've loved it. Care for it, as we've cared for it. Hold in your mind the memory of the land, as it is when you take it. And with all your strength, with all your might, and with all your heart, preserve it for your children. This earth is precious."

**WRAP UP**

What do these readings tell you about Native American culture? What do you think was happening to Native American land at the time of these writings? How was the cycle represented in Native American life? Describe how Native Americans saw themselves as part of the earth's cycle.

**DIGGING DEEPER**

Have students develop their own oral stories about how cycles are important in their lives. These could be written down and put in a "Class Cycle Book," which, of course, would be in the shape of a circle!

# How to Make a Seed Ball

**Materials**
- Clay (available from craft stores)
- Compost or Potting Soil
- Seeds (easy-to-grow or native varieties)

**Did you know...**

**What is a seed ball?**
Seed balls allow vegetation to be introduced to land by throwing (or, on a large scale, dropping from an airplane) compressed bundles of soil containing live vegetation. This gorilla gardening technique dates back to the 1930's and is still used today to treat areas burned by wildfires. On the homefront, and a much smaller scale, seed balls are fun to make and offer an inexpensive way to spread native plants and flowers.

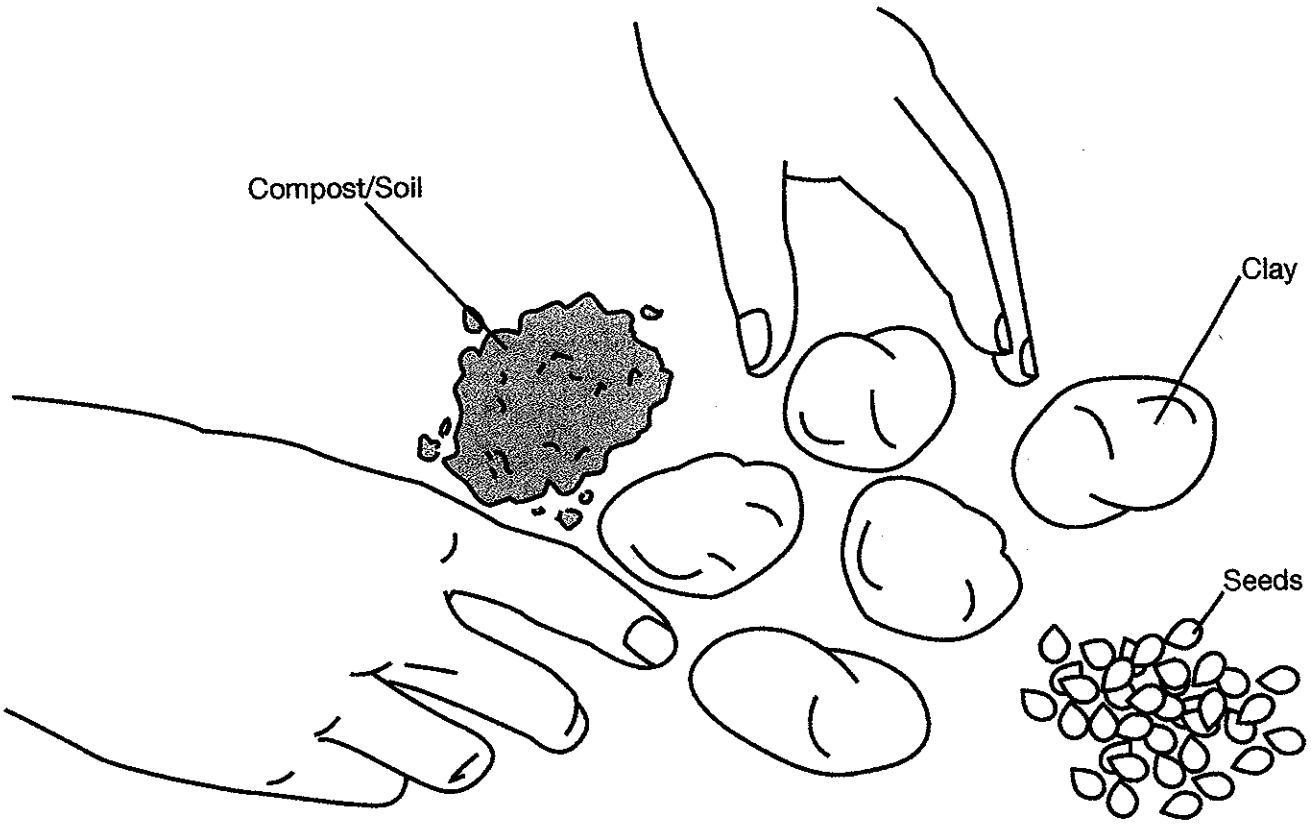
**Exploration**

Take a walk through your neighborhood or school yard, is there a vacant lot? Perhaps an abandoned space? Make that small patch of land into something nice for everyone to see by dropping a seed ball! A seed ball is a ball of seeds wrapped in compost and clay.

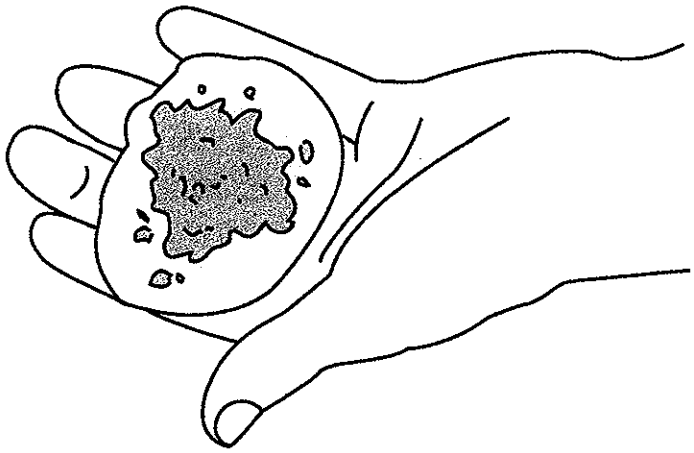
The balls can be tossed into any patch of dirt. Just add water! As a group you can easily cover a large area with seeds balls in a short period of time – in a few months time you'll see plenty or progress on your "secret garden".

**Digging Deeper**

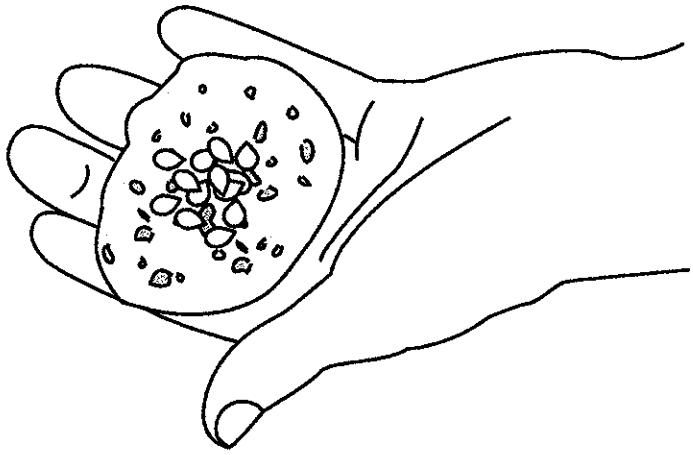
1. Divide your materials so you have:
   - 5 parts clay
   - 1 part compost/potting soil
   - 1 part seeds



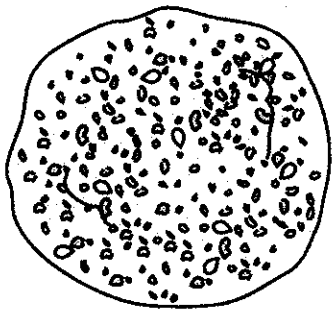
2. **Combine the clay and compost.**
   Add a little water if your mixture is dry. The mixture should be moist but not dripping wet.



3. **Add the seeds to the clay and compost.**
   Thoroughly work the materials together with your hands.



4. **Shape the mixture into a ball.**
   Your ball should be about the size of a golf ball.



5. **Plant or Air Dry**
   You can either plant your seed ball while it is still moist or allow it to dry. As long as it is watered (either manually or by rain) once it's planted, the clay will break down and the seeds will grow.

# Fourth Grade Spring Lesson

**California Rancho Kitchen Garden**

**Objective:**

Students will learn about the various plants the missionaries and Native Americans used for food, medicine and home life during the time of the California Missions and Ranchos.

**California State Content Standards:**

*1) Science—Life Science.*

**Living organisms depend on one another and on their environment for survival. As a basis for understanding this concept:**

a. Students know ecosystems can be characterized by their living and nonliving components.

b. Students know that in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.

c. Students know many plants depend on animals for pollination and seed dispersal, and animals depend on plants for food and shelter.

*2) Social Science.*

**4.2 Students describe the social, political, cultural, and economic life and interactions among people of California from the pre-Columbian societies to the Spanish mission and Mexican rancho periods.**

5. Describe the daily lives of the people, native and nonnative, who occupied the presidios, missions, ranchos, and pueblos.

6. Discuss the role of the Franciscans in changing the economy of California from a hunter-gatherer economy to an agricultural economy.

**Lesson Outline:**

A. Lesson

a. Agricultural needs of missions and ranchos—food, medicine, housewares

b. Use of a kitchen garden

c. Plants of Native Americans v. plants brought by Missionaries

B. Garden Rules

C. Planting Plans

D. Plant

**Seeds/Supplies:**

**Seeds:**
Beans-Romano, Kentucky Wonder
Carrots-Nante or other small
Corn—hybrid, short season variety
Gourds-Big Dipper, Birdhouse
Cilantro
Onion--bulbs
California poppy

**Transplants:**
Tomatos—Sweet 100s or other fast-growing varieties
Peppers
Herbs—mustard, sage, lamb's ear, yarrow, lemon balm, epazote, chia, parsley, thyme, marjoram

**Lesson:**

Students grow crops that were commonly grown in Alta California on the missions and ranchos: beans, corn, ingredients for salsa (tomatoes, peppers, cilantro, onions), and medicinal herbs. Students also grow gourds, which were grown by local Native Americans and later on the missions and ranchos for use as serving and eating utensils, decoration and musical instruments (maracas).

1) At the time of the missions and ranchos, there were no grocery stores or refrigerators so they had to grow all their own food.

2) No pharmacies and very few doctors were available so the ranchos also grew their own herbs to use for medicine—heal stomachaches, headaches, wounds, etc.

a. Priests brought seeds of important herbs with them from Europe—thyme, mustard, marjoram, lemon balm. They would sew seeds into their vestments for transport.

b. Native Americans taught the missionaries about some of the native California herbs—poppies, sage, epazote (believed to prevent stomach gas from eating beans ☺), chia.

3) Crops that take a lot of space to grow and that they ate a lot of, such as corn and beans, would be grown in big fields on the rancho.

4) Herbs and vegetables used for seasoning or medicine would be grown on plots of land very near the kitchen, so the cooks could easily grab what they needed while they were cooking. This would be especially important for medicinal herbs that might be needed in an emergency.

5) In order to have food during both the summer and winter months, many of the vegetables they grew were eaten both fresh and also dried to be eaten later. Corn could be eaten fresh off the cob AND could be dried and ground into corn meal to make tortillas. Similarly, beans could be eaten as green beans fresh off the vine AND could be dried and later cooked in liquid and eaten in soup or as mashed or refried beans. Peppers and herbs can be eaten fresh or dried as well.

6) One of the traditional foods eaten on the ranchos was Posole. It was a meat stew usually made with pork mixed with carrots, onions and corn.

**Planting Directions:**

1) Beans: Must be planted with support such as a trellis. Make two rows one foot apart and ¼ inch deep. Support fence will run between the two rows. Plant seeds 1 inch deep and 2 inches apart along each row. Have students insert finger just up to first knuckle for depth. Do not have students cover seeds until all of row is planted so they keep spacing relative to their fellow students' seeds.

2) Corn: Corn should be planted in rows 1 foot apart. Plant seeds 1 inch deep and 3 inches apart. As with beans, have students insert finger just up to first knuckle for depth and again do not cover until all are planted.

3) Onions: Onion should be planted in rows 6 inches apart. Plant onion bulbs 3 inches deep and 1 inch apart (they will be harvested as green onions). Use fingers, marked, unsharpened pencils or dowels to poke holes in ground 3 inches deep. Instruct students about the top and bottom of onion bulb, top pointy, dried roots on bottom, and make sure they are putting bulbs in hole right side up. As with beans and corn, do not cover until all are planted.

4) Cilantro and other herbs from seeds: Cilantro should be planted in rows ¼ inch deep and 6 inches apart. Students should place seeds in row (do not dig hole) 1 inch apart. Students should pinch row closed and pat to cover rows after place seeds.

5) Gourds: Gourds are planted in two foot wide circles (or mounds if not in raised beds), 2-3 feet apart, or they may be planted along a trellis like the beans. Seeds should be planted 6-8 to a mound, 1 inch deep. Have students insert finger up to first knuckle for depth and do not cover seeds until all have been planted in the circle.

6) Tomotoes, herbs and peppers: Have students transplant plants approximately 18-24 inches apart. Key for successful transplanting: (a) show kids how to gently remove plant from pot by placing hand gently around plant and overturning plant into their hand (rather than pulling out by stem), (b) have students dig hole same depth as seedling pot and 1 inch wider, and (c) have students gently pat dirt down around plant to stabilize plant in new hole. If you are using individual tomato supports, these need to be placed around plant at time of planting.

Teacher Information

# Fourth Grade Spring Lesson

**California Rancho Kitchen Garden**

Today your class will be planting a California Rancho Kitchen Garden. The students will plant vegetables and medicinal and culinary herbs that were commonly planted at the missions and ranchos. The students will learn:

1) Missions and Ranchos were isolated and had to grow all of their own food and medicines.

2) Priests brought some seeds with them for food; they also learned about and later grew Native American culinary and medicinal herbs.

3) They would grow herbs and some vegetables within the mission walls in the kitchen garden so that they were easily accessible for seasoning and health emergencies. Large crops such as corn and beans were grown outside of mission walls.

4) One of the traditional foods eaten at the Missions and Ranchos was Posole—stew of pork, carrots, onions, corn.

This lesson teaches both fourth grade Science (Life Science) and Social Science (Native American) Content Standards.

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**California State Content Standards:**

***1) Science—Life Science.***

**Living organisms depend on one another and on their environment for survival. As a basis for understanding this concept:**

a. Students know ecosystems can be characterized by their living and nonliving components.

b. Students know that in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.

c. Students know many plants depend on animals for pollination and seed dispersal, and animals depend on plants for food and shelter.

***2) Social Science.***

**4.2 Students describe the social, political, cultural, and economic life and interactions among people of California from the pre-Columbian societies to the Spanish mission and Mexican rancho periods.**

5. Describe the daily lives of the people, native and nonnative, who occupied the presidios, missions, ranchos, and pueblos.

6. Discuss the role of the Franciscans in changing the economy of California from a hunter-gatherer economy to an agricultural economy.

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Please visit the garden regularly to see your garden grow! Hold an Open House in June to talk to your students about their garden.

INDOORS ❀ GRADES 2-6 ❀ FALL, WINTER, SPRING ❀ ACTIVITY

# The Power of the Circle

**DESCRIPTION**

Students color drawings of different cycles in nature.

**OBJECTIVE**

To introduce the concept of cycles and identify cycles in nature.

**MATERIALS**

- ❀ One copy of the Nutrient Cycle, Oxygen Cycle, and Water Cycle blackline masters per student (pp. 390-392)
- ❀ Crayons or markers
- ❀ Drawing paper

**CLASS DISCUSSION**

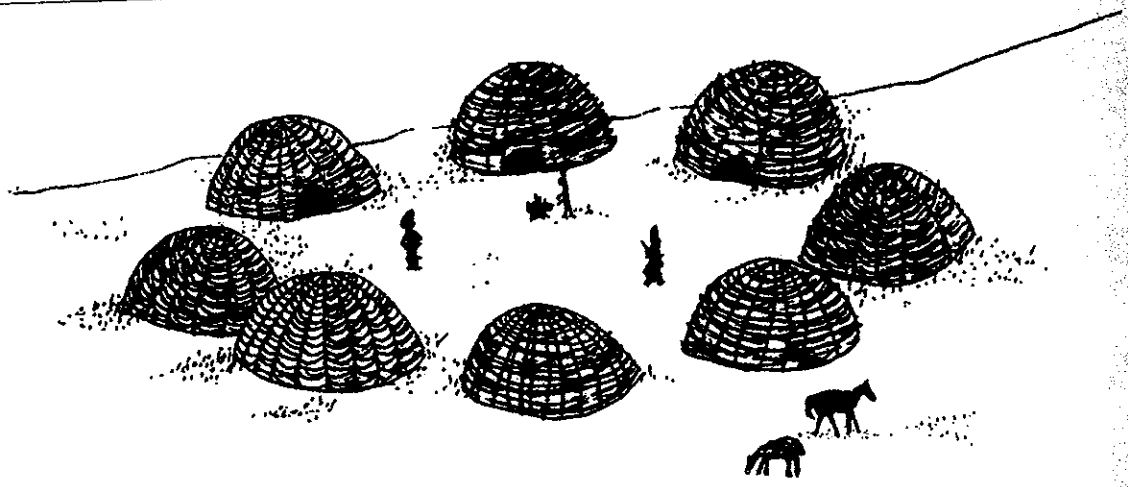
*(Write the word "circle" on the board.)* What is this word? What is a circle? *(Write the word "cycle" directly beneath it.)* What is this word? *(Replace the 'ir' in circle with a 'y.')* The word cycle comes from an old word meaning "circle." Cycles are repeating circles.

*(Draw a circle on the board and begin tracing slowly around it.)* When things happen in a cycle they continue to happen in a particular order until they are back where they started, and then *(retrace the circle)* they start around all over again. The four seasons happen in cycles. Who can name them in order? Does it make any difference where you start? Why not? *(Write the seasons around the circle.)*

What other things happen in a cycle? *(clock time, phases of the moon, tides, insect life, human life, paper and glass recycling, and so on)* Discuss how these things happen in a cycle that repeats itself.

Circles or cycles are very important in many cultures. Native Americans are very aware of the significance of circles. Black Elk was an Ogalala Indian Spiritual Man who lived in the late 1800s. This is something he wrote about the importance of circles or cycles:

> "You have noticed that everything an Indian does is in a circle, and that is because the Power of the World always works in circles, and everything tries to be round. In the old days when we were a strong and happy people, all our power came to us from the sacred hoop of the nation, and so long as the hoop was unbroken, the people flourished. The flowering tree was the living center of the hoop, and the circle of four quarters nourished it. The east gave peace and light, the south gave warmth, the west gave rain, and the north with its cold and mighty wind gave strength and endurance. This knowledge came to us from the outer world with our religion. Everything the Power of the World does is done in a circle. The Sky is round and I have heard that the earth is round like a ball and so are all the stars. The Wind, in its greatest power, whirls. Birds make their nests in circles, for theirs is the same religion as ours. The sun comes forth and



goes down again in a circle. The moon does the same, and both are round.

"Even the seasons form a great circle in their changing and always come back again to where they were. The life of a man is a circle from childhood to childhood, and so it is in everything where power moves. Our tepees were round like the nests of birds and these were always set in a circle, the nation's hoop, a nest of many nests where the Great Spirit meant for us to hatch our children."

## ACTION

1. Have students design and draw their own Seasons poster showing the repeating cycle.

2. Use the Nutrient Cycle, Oxygen Cycle, and Water Cycle blackline masters to introduce other cycles in nature. Discuss these cycles and their importance to our garden and ourselves:

   **Nutrient Cycle:** When plants die and decay, the nutrients that the plants took out of the soil are put back into the soil to be used again and again. This is another cycle. Without this cycle all the nutrients in the soil would soon be completely used up and no more plants could grow.

   **Oxygen Cycle:** People (and other animals) breathe in oxygen in order to live. We exhale carbon dioxide. Plants breathe in carbon dioxide and exhale oxygen. We make an exchange with the plants. We need the oxygen that they produce, and they need the carbon dioxide that we and other animals produce.

   **Water Cycle:** Water is part of a very important cycle. All the water that we will ever have is already part of that cycle. Moisture evaporates from the earth and accumulates in the sky as clouds. Then it falls, returning to the land where it again evaporates. Without this constant recycling, we would quickly run out of water.

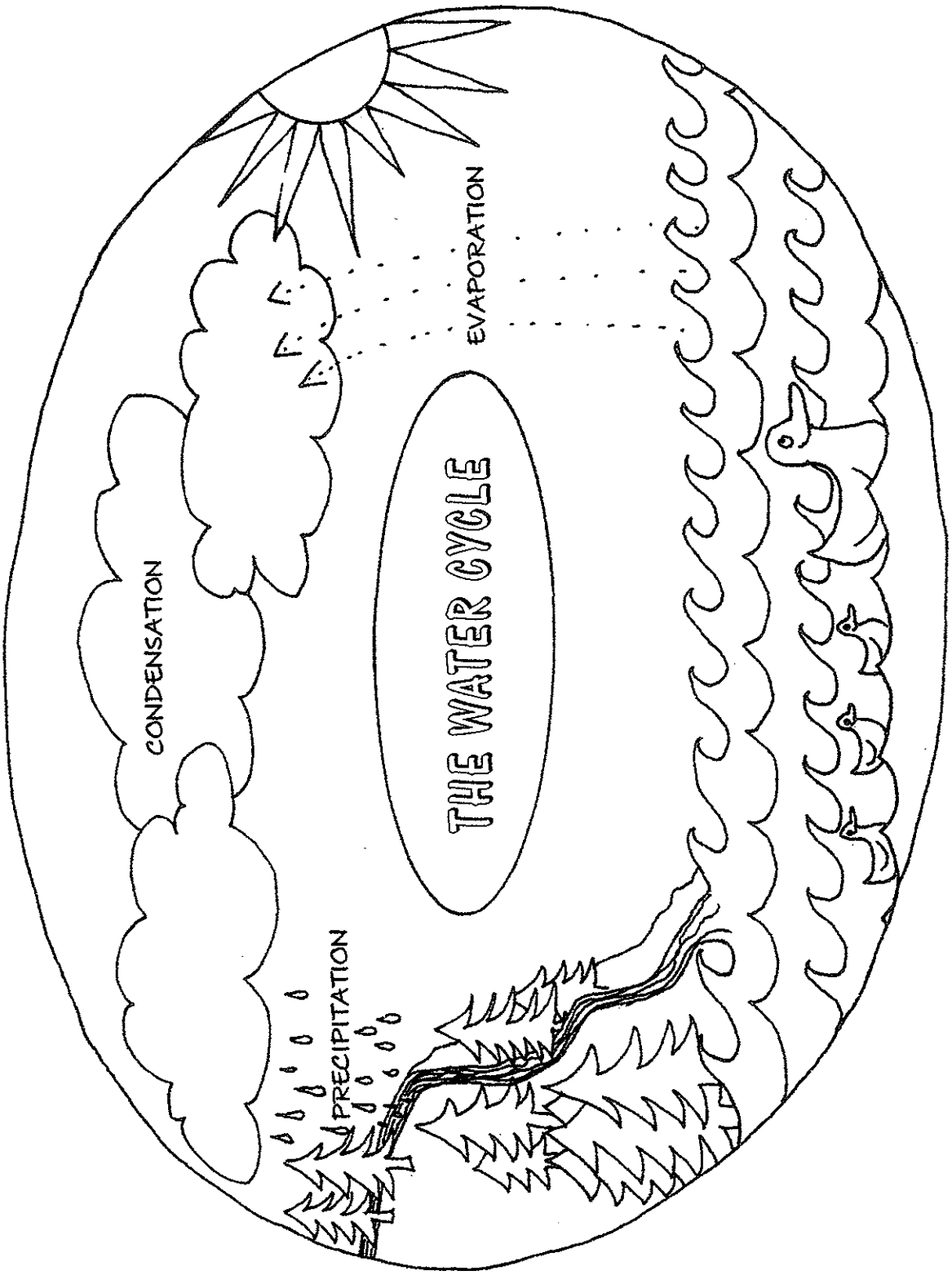
3. Have students color each of the Cycle pictures.

## WRAP UP

Name a cycle that you use everyday. Are there any cycles in nature that are important to you? What would happen to the water cycle if we were to use up too much of the water? What would happen to the oxygen cycle if the air were polluted? How can we help keep nature's cycles healthy?

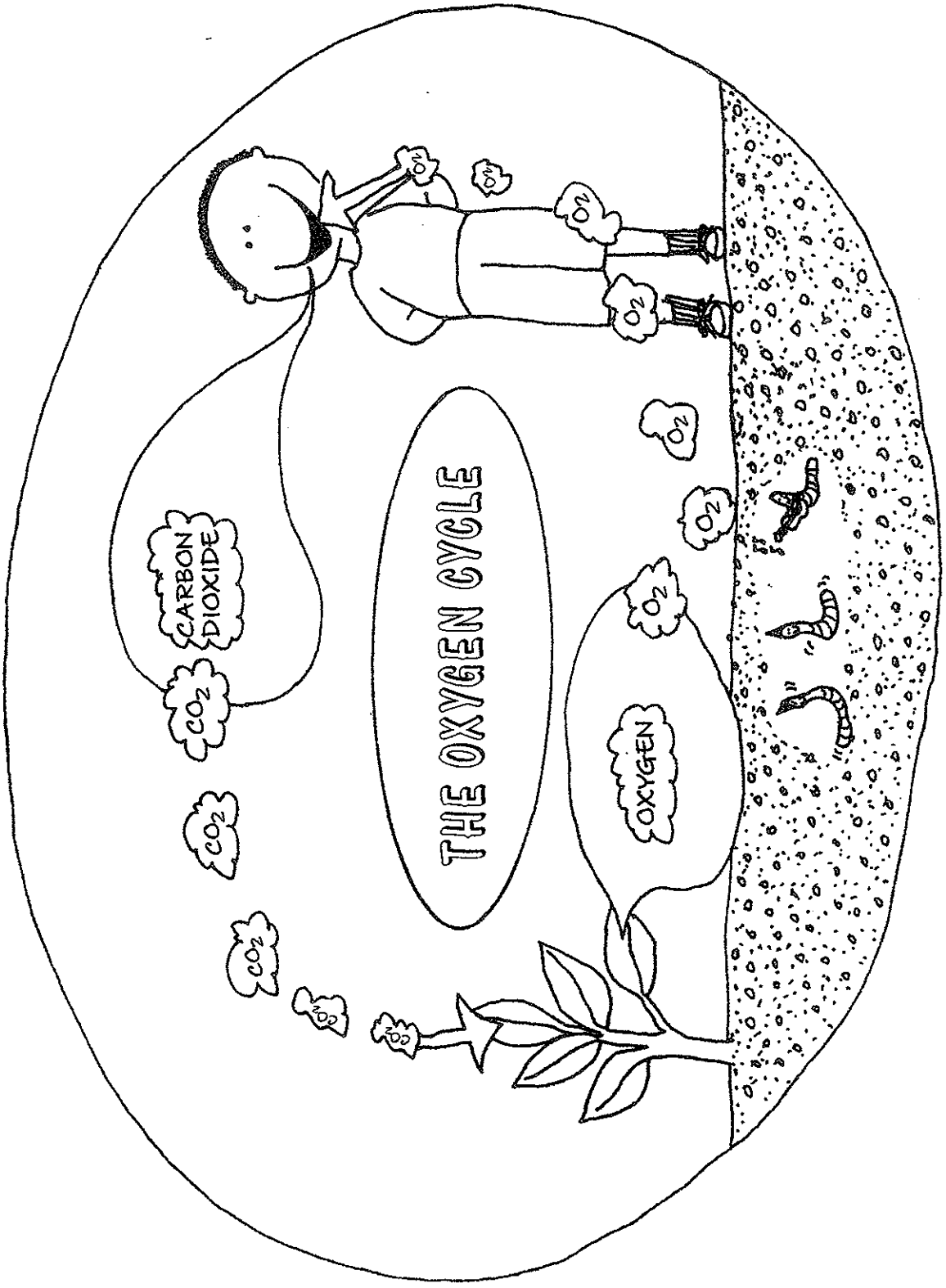
# ☼ Water Cycle

(From: The Power of the Circle, p. 181)



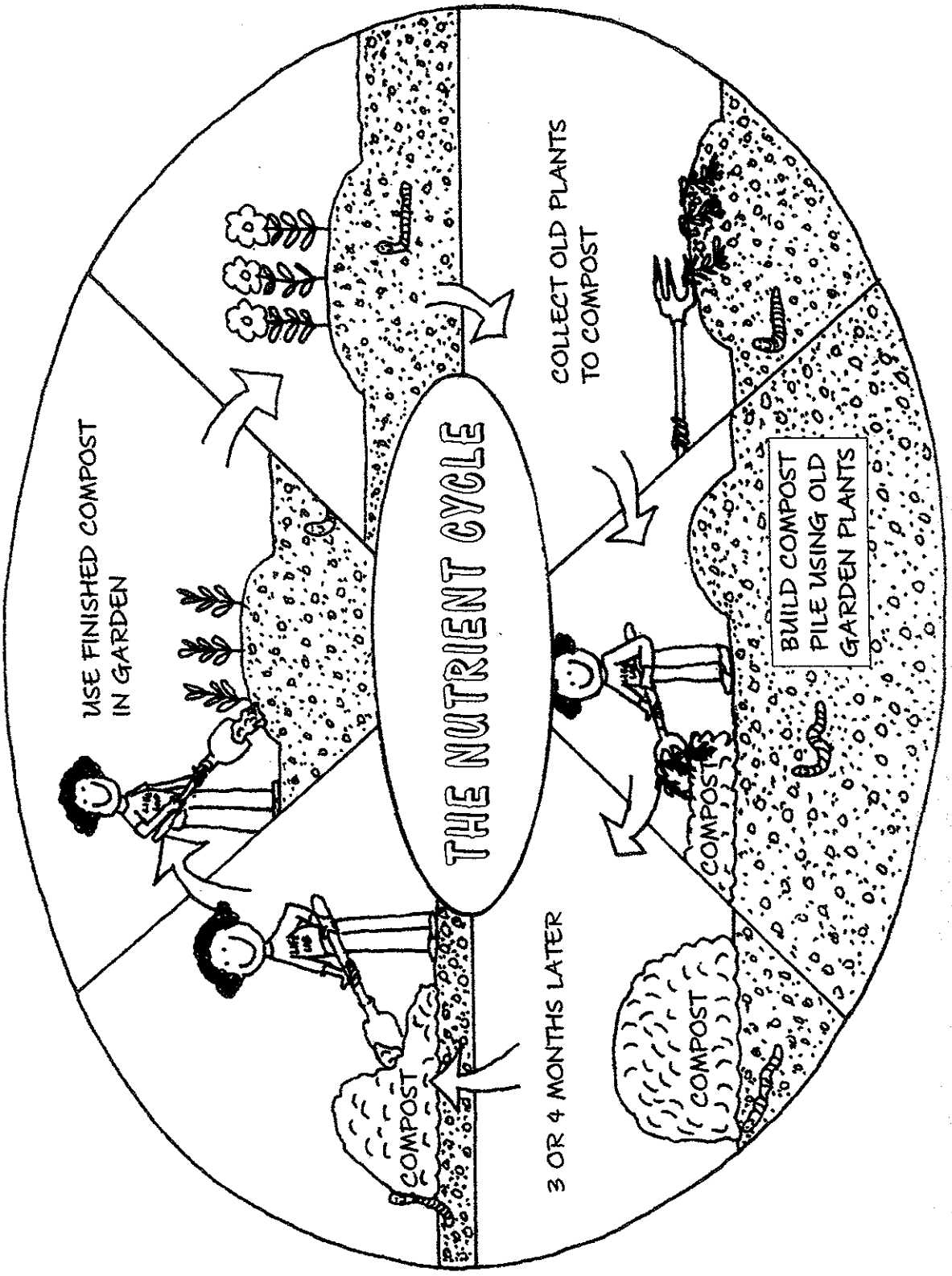
# ☼ Oxygen Cycle

(From: The Power of the Circle, p. 181)



# ☼ Nutrient Cycle

(From: The Power of the Circle, p. 181)



INDOORS ❀ GRADES 5-6 ❀ FALL, WINTER, SPRING ❀ ACTIVITY

# You Are What You Eat

**DESCRIPTION**

Students form a food web by connecting links in the food chain with string.

**OBJECTIVE**

To illustrate interdependence within a food web.

**TEACHER BACKGROUND**

Food chains are not isolated; they are interrelated, forming a complex food web. This interdependence allows for diversity in food choices to optimize chances of survival and at the same time helps to keep populations in balance with the food sources. This activity will give students the opportunity to visualize how the complexity of the food web develops from a simple food chain.

**MATERIALS**

- String
- One piece of paper per student
- Tape
- Science journals
- Reference books (optional)

**PREPARATION**

At the start of the activity each student will be assigned a different animal or plant. You may want to assign them in advance and have students research their plants and animals to learn where they live, what they eat, and who might eat them.

**CLASS DISCUSSION**

What is a food chain? Do animals always eat the same thing? Can the same type of animal be part of more than one food chain? What happens as these different food chains are brought together?

**ACTION**

1. Assign students an animal or plant from the chart on the next page. Have them make signs showing the names of their animal. Tape the signs to the front of each desk and arrange the desks in one large circle.

2. Pick any student that is not a plant or decomposer and hand that student the end of a ball of string. Then ask him or her to pick something from the circle that his or her animal depends on, such as an animal or plant it eats. Run the string from the first student to the second. Then ask the second student to pick something that he or she is dependent upon. Continue until all students have at least one part of the string in their hands. You may have to help them understand that plants use nutrients from the plants and animals that decomposers break down. Also, decomposers eat dead things. Encourage the decomposers to choose to eat animals such as mountain lions and vultures that are eaten by nothing else.

## FOOD WEB CHART

| | | |
|---|---|---|
| coyote | fish | algae |
| mouse | earthworm | oak tree |
| rabbit | sparrow | cattails |
| snake | robin | hawk |
| grass | bear | grasshopper |
| owl | salmon | duck |
| snail | mountain lion | beetle |
| deer | beaver | mite |
| raccoon | lizard | fly |
| vulture | gopher | human |

3. Continue until all students are connected to the food web and it is too complex to take any further.

4. Ask students what would happen to the food web if: air pollution kills all of the trees; new birds migrate to the area; frost wipes out the insects; the area is strip-mined; trees are planted; flooding inundates the area. Have them think of additional factors that might alter the food web. The students whose roles are directly affected by a given change can tug repeatedly on the string; anyone who feels a tag should tug too, and so on until everyone in the web feels the effect. How can one event affect everyone?

5. Ask students for a different set of plants and animals, all belonging to the same habitat. Be sure to include decomposers in the mix. Write the list on the board. Ask students to write these names in a circle in their journals and draw a food web between them. Ask for volunteers to share examples of the connections they drew.

**WRAP UP**

John Muir, a famous naturalist and writer said, "When we try to pick out anything by itself we find it hitched to everything else in the universe." Discuss what this means with the class. Ask the following questions: How are you part of the food web? What is the result of making a change in the web? Identify ways in which people are causing changes to the earth. Name an action you have taken that resulted in an unexpected change.

INDOORS ❀ GRADES 2-6 ❀ FALL, WINTER, SPRING ❀ PROJECT

# Processed or Not?

**DESCRIPTION**

In this activity, foods are first defined according to the amount of processing. Then wheat is used as an example to demonstrate how processing can affect nutritional value. Finally, students grind flour and bake bread.

**OBJECTIVE**

*To learn the nutritional value of unprocessed foods compared to processed foods.*

**MATERIALS**

- ❀ Samples of a wheat plant, wheat berries, whole grain flour, white flour
- ❀ A hand flour grinder
- ❀ Science journals
- ❀ Ingredients for making bread, see Mrs. Price's Bread recipe p. 324

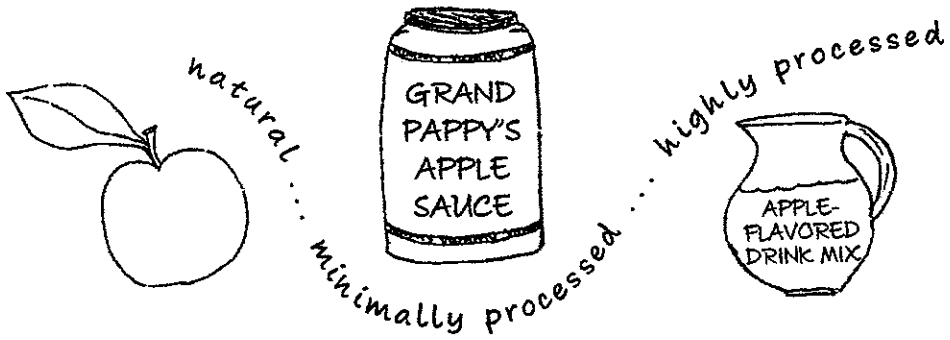
**CLASS DISCUSSION**

Introduce the following definitions:

**Unprocessed Foods** — fresh or raw foods that do not undergo any changes from their plant or animal sources when eaten other than the outer covering being removed. Examples: raw fruits, vegetables, nuts. Hold up the wheat plant and wheat berry as examples.

**Minimally Processed Foods** — raw foods that are slightly changed from their original form into one that is more usable or available. Examples: whole wheat bread, natural peanut butter, boiled eggs, baked potatoes. These foods retain most of their nutrients but can spoil quickly. Hold up the whole wheat flour as an example.

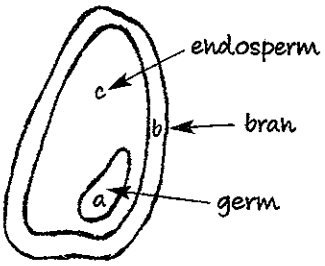
**Highly Processed Foods** — foods that undergo considerable change from their original form. These foods are generally quickly prepared and easily available but may lose nutrients in processing and often contain chemical additives. Examples: foods in packages, cured meats, pies, white bread. Hold up the white flour as an example. *Note:* Some processed foods contain added nutrients such as vitamins and minerals.



**ACTION**

1. Explain that wheat is used around the world in basic foods such as breads, cereals, and spaghetti. Depending on how it is processed or milled into flour, it may or may not lose many of its nutrients.

2. Have students draw a whole wheat berry (the seed of the plant) and label its parts.
   a) *Germ:* The embryo, which can sprout into a new plant if fertilized by pollen. It contains B vitamins, proteins, minerals, and healthy fats.
   b) *Bran:* The seed coat, designed to protect the rest of the kernel from pests, disease, light, and water. It is full of fiber, B vitamins, and antioxidants, all important for good health.
   c) *Endosperm:* The large starchy interior. It provides the food for the embryo, but contains the least nutrients for humans.




   Whole wheat flour has all parts of the wheat berry in it. White flour has only the endosperm in it. Removing the bran and the germ takes away about 25 percent of the protein, along with at least 17 key nutrients. Manufacturers may add back some vitamins and minerals, but whole grains provide more protein, fiber, and many important vitamins and minerals. Even when the white flour is enriched by added nutrients, only four or five of the 20 nutrients removed in the processing are replaced.

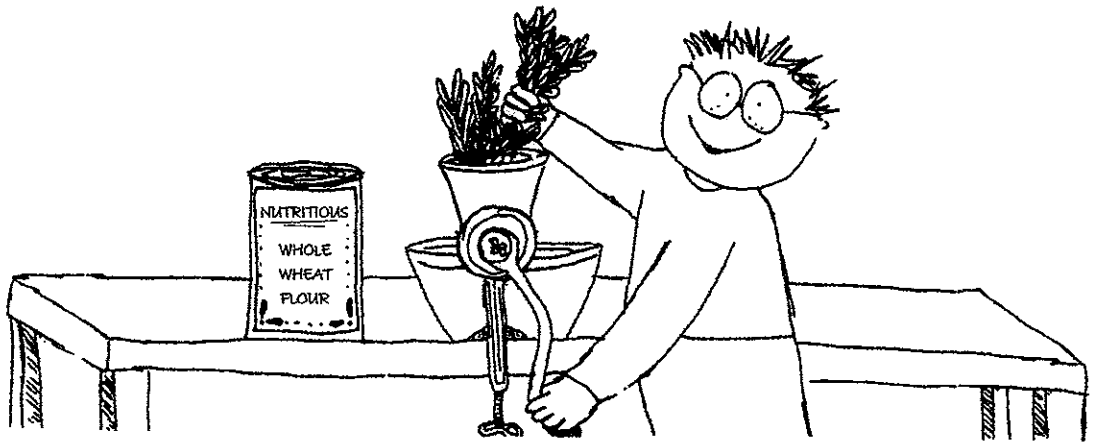
3. Use a hand grinder to mill wheat berries into whole wheat flour. Seven cups of berries will produce 10 cups of flour. Pass it through the grinder twice so that it is fine enough for baking. Use the whole wheat flour to bake Mrs. Price's Bread, p. 324.

**WRAP UP**

Why is whole wheat flour better for you than white flour? Give an example of a food in its natural form, in a minimally processed form, and in a highly processed form. List an advantage and disadvantage for the three types of food. Why are there so many highly processed foods used in our society?

**DIGGING DEEPER**

Plant a "bread garden" with different types of grain such as rye, millet, wheat, and barley. Compare how they grow and how they taste. Do a bread taste test with different types of commercial bread. Have students compare nutritional value and taste preference.



# MRS. PRICE'S BREAD

## INGREDIENTS

3 cups hot water
3 tablespoons honey
3 teaspoons salt
3 tablespoons oil
2 packets yeast
7-9+ cups whole wheat flour

## EQUIPMENT

measuring cups
sturdy wooden spoon
large bowl or pot
lid or cloth
3 bread pans
oven

## DIRECTIONS

1) Stir together hot water, honey, and salt until dissolved.

2) When lukewarm, add yeast.

3) Gradually stir in flour until you can no longer absorb any more into the mixture (you may need more than 9 cups).

4) Knead the dough until it has a satin glow and is no longer sticky (about 10 minutes).

5) Cover the dough in the bowl with a lid or cloth.

6) Put it in a warm, not hot, place (70°-75°F). Be sure it is not in a draft.

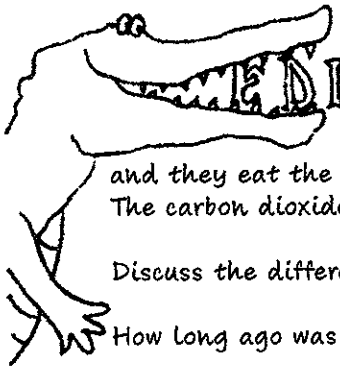
7) After a few hours, the dough will double in bulk. Punch it down and let it rise again for 30-45 minutes. Punch it down again and knead it lightly.

8) Form three loaves.

9) Put the loaves in well-greased pans.

10) Let the loaves rise again for 1 hour until they double in bulk.

11) Bake at 350°F for 1 hour. Immediately rub the tops with butter or margarine and remove from pans.



## EDIBLE THOUGHTS....

What makes bread rise? (The yeast are alive! They are fungi and they eat the honey in the dough. As a by-product they give off carbon dioxide. The carbon dioxide causes the bread to rise.)

Discuss the differences in making home-made bread versus store bought.

How long ago was it that people always baked their own breads?

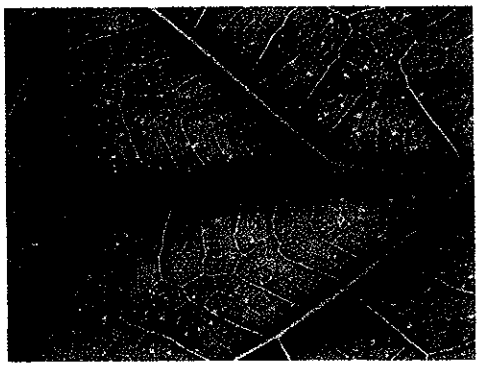
DIG ART!
CULTIVATING CREATIVITY IN THE GARDEN

# Printmaking: Chlorophyll Prints

**Overview** Students will extract chlorophyll from a plant part and create a beautiful chlorophyll print.

**Objectives** Students will:
- engage in the science concepts behind photosynthesis and chlorophyll
- extract the chlorophyll from a plant and create a print with it

**Time** 1-1.5 hours



**Materials**
- green leaves (vegetables like kale and spinach, herbs like basil and mint, green leaves from trees and shrubs)
- pieces of white fabric or watercolor paper
- metal spoons
- masking tape

**Instructions**

1. Review concepts of photosynthesis and chlorophyll with your students. Light is a form of energy. Plants need energy to develop and grow. Humans and animals get their energy from plants. Plants get their energy from the sun, which works to combine water and carbon dioxide to produce sugar. Plants contain chlorophyll, a green pigment that traps the sun's energy. Plants use the sun's energy to combine water and carbon dioxide together to make sugar. Every green part of a plant has chlorophyll and makes sugar.

2. Fold a piece of paper or fabric in half and open it up again. Place a leaf face down on half of the paper/fabric, and fold the other half over it. Tape the paper/fabric to the table so that it stays in one place.

3. Use the bottom of a spoon to press firmly and rub it across the paper/fabric.

4. Rub the spoon over the entire leaf area so that all of the leaf's chlorophyll will be transferred to paper or fabric. The chlorophyll print will be more prominent on the paper because it is thinner and will absorb the chlorophyll more easily than fabric.

5. Repeat this process as many times as you like, trying different leaves and paper or fabric materials.

**Taking it Further**

Bind the finished prints together in a garden journal or class book, laminate and frame, or hang them as special flags around the classroom.

**Resources**

How to Paint with Chlorophyll from Leaves:
http://www.ehow.com/how_4535975_paint-chlorophyll-from-leaves.html

Vietnamese artist Binh Danh has developed a process for printing photographs on leaves through using the natural process of photosynthesis. Check out his chlorophyll leaf prints here:
http://neaat.wordpress.com/category/photographer-binh-danh/

# 4th Grade Learning Garden Lessons: Student Pre- and Post-Test

Date: _____ Name: _____ School: _____

Circle one: **PRE** or **POST**

**Energy Flow in the Garden Ecosystem**

Draw and label a food chain that shows a producer, a first-level consumer, a second-level consumer, a tertiary consumer and a decomposer. Use arrows to show which direction energy flows.

What does an herbivore eat? _____ What does a carnivore eat? _____

Where do plants get energy? _____ Where do animals get energy? _____

**Predicting Whether the Weather is Good for the Garden**

Name some weather instruments — Tell what each weather instrument measures:

_____ _____

_____ _____

_____ _____

If you were a weather forecaster, which direction would you look on a weather map (north, south, east or west) to see weather conditions that might be coming towards your city? _____ Why? _____

**Frog Garden Party**

Draw a right triangle below: Draw an isosceles triangle below: Draw a scalene triangle below:

How many degrees is a right angle? _____ Which is a larger angle: acute or obtuse? _____

**Healthy Eating**

Do you 'eat healthy'? _____ How? _____

**Going Outside**

Do you like being outside at school? yes no Why? _____

**Learning**

Do you like learning outside? yes no Why? _____

When you are at school, is it easier to learn things inside the classroom or outside? _____

What do you like to learn about? _____

Do you learn more easily when you make and do things? or when you read? _____

**NOTE TO TEACHERS: Please mail this pre- or post-test to Captain Planet Foundation at 133 Lucky Street, Atlanta, GA 30303. Cobb Co. teachers may send tests to Sally Creel via CCSD mail. Include teacher name to be included in a drawing for prizes and resources. Also, we'd appreciate your tips and suggestions on Learning Garden lessons you teach:** http://captainplanetfoundation.org/learninggarden-resources/

CAPTAIN PLANET'S LEARNING GARDENS

# Garden Ecosystem

**Grade**
4

**Standards**
GPS S3P1a, b, c, d;
NGSS PS3a, b

**Time**
approx 1.5 - 2 hours over 1 or 2 days

**Supplies**
(per pair of students)
- owl pellet
- skewer or tweezers
- paper bowl
- bone chart
- mammal field guide or Web access
- Owl Pellet Dissection worksheet
- Owl Pellet Bone Chart Grid
- magnifiers

(per class)
- organism cards
- seats with role signs

## Overview

4th grade students learn about the flow of energy and matter in a garden ecosystem.

**What they will learn**
- Energy/ecological pyramid
- Roles in ecosystem
- Characteristics of predators, prey
- Hidden energy flow in the garden
- Loss of energy from one level to next
- Ways to care for the Earth

**How they will learn it**
- Make a living model
- Role-playing simulation
- Garden critter hunt and observation
- Soil food web
- Dissect an owl pellet to recreate food web and calculate energy flow
- Remove non-native species or release beneficial insects in garden

## Essential / Guiding Question

How are the organisms in the garden interrelated and where do we fit in?

## Engaging Students

Students will participate in "It's Lonely at the Top", a simulation activity, by playing the parts of organisms in an ecosystem and assigning themselves roles (producer, consumer, decomposer). Their classmates will decide if they agree or disagree with this classification.

## Exploration

Pairs of students will investigate what an owl ate by dissecting a pellet and identifying the bones, skull, and /or fur inside. Students will then research what the prey animal(s) consumed from level to level until a food chain or web can be diagrammed and labeled, including some garden inhabitants. Given the formula for energy loss from one level to the next, students will calculate how much energy was present at each level of the pyramid.

Students will screen garden soil to find soil organisms; observe their features; hypothesize whether they are predators or prey; and identify their place within a soil food web.

## Explanation

Students will articulate how energy is lost at every level of an ecological pyramid and describe roles of organisms.

### Debriefing

Teacher will draw students out in a discussion to reiterate key concepts and clear up any student misconceptions, using the Background Information provided. Roles in ecological pyramid = sun; producer; first level consumer / herbivore / prey; second level consumer / carnivore / predator and prey; third level consumer / carnivore / predator; decomposer or scavenger.

### Environmental Stewardship

Students will demonstrate mastery of key concepts by being able to diagram and label a garden food chain, identify roles, and accurately calculate energy at each level of the ecological pyramid. Completion of the lab report is expected.

### Evaluation

Students will demonstrate mastery of key concepts by being able to diagram and label a garden food chain, identify roles, and accurately calculate energy at each level of the ecological pyramid. Completion of the lab report is expected.

## CONTEXT FOR LESSON ACTIVITIES

### Standards

Georgia Performance Standards
S4L1. Students will describe the roles of organisms and the flow of energy within an ecosystem.
a. Identify the roles of producers, consumers, and decomposers in a community.
b. Demonstrate the flow of energy through a food web/food chain beginning with sunlight and including producers, consumers, and decomposers.
Next Generation Science Standards
LS2 Ecosystems: Interactions, Energy and Dynamics
LS2.a Cycles of Matter and Energy Transfer in Ecosystems

### Background Information

Energy Pyramids explained by Learner.org: http://www.learner.org/courses/essential/life/session7/closer5.html
AAAS Science Assessment- Matter and Energy in Living Systems: http://assessment.aaas.org/topics/ME#/
All things related to owls and owl pellets: http://www.putnamscienceonline.com/owlpellets.htm
Soil Food Web, including posters to reprint: http://soils.usda.gov/sqi/concepts/soil_biology/soil_food_web.html
Student Misconceptions about Energy Flow: http://www.learner.org/courses/essential/life/session7/ideas.html

### Teacher Preparation

- Assemble the supplies and materials needed for the lesson
- Make copies of the Owl Pellet Dissection Lab Report (attached)
- Make copies of www.biologycorner.com/resources/Owl_Pellet_Bone_Chart_grid.pdf
- Print a copy of each organism card and ecosystem role sign. Tape the ecosystem role signs to benches or chairs set up in a straight line, a la Musical Chairs.
- Provide students with access to an Internet-connected computer and one of these web sites, when they are researching owl prey: http://mdc.mo.gov/discover-nature/field-guide OR http://www.enature.com/home/ OR have a classroom set of mammal field guides available.
- Provide students studying the garden soil with a soil food web.

## PROCEDURES FOR LESSON ACTIVITIES

"It's Lonely at the Top" Ecosystem Role Play

- Pass out a role play card to each student and have them play a simulation game much like musical chairs, with ecological roles marked on chair backs. After each round, have students identify their organism and its ecological role, and let the class peer-review this choice.

Owl Pellet Dissection and Food Chain

- Pass out the Owl Pellet bone chart, the Owl Pellet Dissection Worksheet, and one owl pellet to each pair of students, along with a paper bowl, water, a bamboo skewer or forceps, and gloves (optional - pellets are sterile).
- Direct students to dissect the owl pellet, compare contents to bone chart, and determine what the owl ate.
- Let students research the prey animal recovered from owl pellet and determine its diet from a field guide.
- Students should reconstruct the owl's food chain or web down to the garden (producer) level with Sun as source.

Soil Food Web

- Students will explore the hidden soil food web by sifting soil in the garden to find and identify animals; observing their characteristics and guessing whether they are predators or prey; and looking up their place in soil food web.

Environmental Stewardship

- Students will go on a non-native worm hunt in the garden and remove any large alien, invasive worms that eat native worms and cut roots of plants OR students will release beneficial organisms like ladybugs, who keep the pest population in the garden under control organically.

# Owl Pellet Dissection Lab Report

Pellet Length: _____

Pellet Width: _____

**How many of the following bones did you find?**

Humerus: _____

Femur: _____

Lower Jaw: _____

Skull: _____

Vertebrae: _____

Shoulder Blade: _____

Ulna/Radius: _____

Ribs: _____

Pelvic Bones: _____

Tibia/Fibia: _____

How many animals did this owl eat?

What prey species did this owl eat?

What habitat do you think this owl would be hunting in?

What species of owl made this pellet? why do you think so?

Draw a food web for the owl, based on the prey found in the pellet and research you have conducted with field guides, to determine what the owl's prey eats. Be sure your web includes producers and that arrows between organisms point from the lower level (food source or prey animal) towards the upper level (predator/eater). Include garden plants or animals and the Sun in your food web with an arrow indicating energy flow to producers.

Draw an ecological pyramid with the owl as third order consumer and its prey as second order consumer. Assuming the solar energy reaching this site is 72,000,000 kcal/$m^2$/year, calculate the amount of energy available at each trophic level if only 10% of energy flows from one level to the next. Remember to include producers!

Name: _____

## Ecosystem Role Cards for "It's Lonely at the Top" Game

Directions: Print out the Ecosystem Role Cards and Organism Cards and cut apart
Arrange chairs in a line and tape Ecosystem Role Cards to seat backs
Let students draw Organism cards
Start the music (or sing) and have everyone walk around the chairs in the same direction
When they music stops, students sit on a chair with the correct Role card for their Organism
Have students tell which Organism they are, and let the class decide it they are in the right spot
Collect Organism cards, shuffle, pass them out again, and play next round with one less chair

| |
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| **PRODUCER** |
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1ST LEVEL CONSUMER

1ST LEVEL CONSUMER

PRODUCER

1ST LEVEL

CONSUMER

**1ST LEVEL**

CONSUMER

2ND LEVEL

CONSUMER

2ND LEVEL

CONSUMER

2ND LEVEL

CONSUMER

TERTIARY CONSUMER

TERTIARY COPNSUMER

DECOMPOSER

DECOMPOSER

DECOMPOSER

DECOMPOSER

SCAVENGER

## ECOSYSTEM ORGANISM CARDS FOR "It's Lonely at the Top" Game

| | |
|---|---|
| GRASS | MOSS |
| OAK TREE | MILKWEED |
| KUDZU | DOGWOOD TREE |
| PUMPKIN PLANT | LIVERWORT |
| BROCCOLI PLANT | CARROT PLANT |
| JOE PYE WEED | WHEAT |
| HONEYSUCKLE VINE | BEE |
| DEER | OWL |
| SPIDER | FIELD MOUSE |
| SQUIRREL | CHIPMUNK |
| FERN | CRABAPPLE TREE |
| WORM | PILL BUG |
| BACTERIA | VULTURE |
| FUNGUS | MUSHROOM |

| | |
|---|---|
| BLACKBERRY BUSH | SNAKE |
| ROBIN | HUMAN |
| TRUMPET VINE | STRAWBERRY PLANT |
| FROG | SALAMANDER |
| FISH | KELP |
| SHARK | WHALE |
| ALLIGATOR | SEAGULL |
| RABBIT | FOX |
| BEAVER | PENGUIN |
| COW | ELK |
| CORN | BUTTERFLY |

# Assessment for Energy Flow in the Garden Ecosystem

**Student Name(s):** _____ **Date:** _____

| Level of Mastery → / Benchmark or Performance Measure ↓ |  Mastered task @ 90%+ accuracy: 5 pts |  Mastered task @ 85% accuracy: 4 pts |  Mastered task @ 80% accuracy: 3 pts |  More learning needed | TOTAL POINTS |
|---|---|---|---|---|---|
| **Ecosystem role playing simulation** | Participated | n/a | n/a | Did not participate | |
| **Owl pellet dissection** | Dissected owl pellet, determined owl prey, researched prey animal's diet, reconstructed owl food web to producer level, sketched and labeled food chain on lab report | Dissected owl pellet, determined prey, attempted food chain reconstruction with some flaws or lack of labels, arrows | Dissected owl pellet | No attempt | |
| **Owl energy (ecological) pyramid** | Calculate the energy loss at every level of the pyramid, from sun to tertiary consumer | Calculated incorrectly at some levels | n/a | No attempt | |
| **Soil food web investigation** | Sift soil and investigate creatures living in the garden; observe characteristics; guess whether predator or prey; find their place in soil food web | Sifted soil , did not identify creatures or discover their place in food web | n/a | No attempt | |
| **Environmental Stewardship** | Remove invasive non-native worms from the garden OR release beneficial insects such as labybugs; articulate how this helps the Earth | Engaged in activity but unable to articulate how it helps the earth | n/a | No attempt | |
| **TOTAL in LAST BOX →** | | | | | **_ /25 pts** |

CAPTAIN PLANET'S LEARNING GARDENS

4

GPS S4E4 a,b,c,d
Next Gen Sci ESS2.D

4 hours over two weeks

(per student)
**Wind vane**
• pencil • straws (4) • straight pins
**Barometer**
• wide mouth jar • rubber band
• balloon • scissors
**Anemometer**
• ping pong ball • ruler • tape
• string
**Wind sock**
• long sleeve • ribbon • wire hanger
• tape • pliers • rock or washer
**Thermometer**
• 11 oz plastic bottle
• rubbing alcohol
• red food coloring
• modeling clay or tac

(per class)
• internet connected computers for all

(optional)
• old CD jewel cases for making mini greenhouses

## Overview

4th grade students will explore weather instruments and maps, as well as the impact of weather on the garden.

**What they will learn**
• How weather is predicted
• How weather instruments work
• How weather data is used
• Ways to care for the Earth

**How they will learn it**
• Online simulation
• Make weather instruments
• Collect and interpret data
• Track seasonal trends for database or design/build season extender in garden

## Essential / Guiding Question

How can we predict the weather in advance, anticipate seasonal changes, and use this knowledge to grow a better garden?

## Engaging Students

**Technology Connection: Weather Prediction Simulation**
Students will report and predict the weather three days in advance based on simulated weather fronts to the West, using the Predict-O-Matic software at the Edheads interactive web site: http://www.edheads.org/activities/weather/

## Exploration

Students will make a working weather vane, a wind sock, an anemometer, a barometer, and a thermometer. Over a period of two weeks, students will collect weather data from all 5 instruments. They will use this data with wind maps (http://hint.fm/wind/) to forecast the weather and see how accurate their predictions are.

Using a vegetable planting guide (http://cmg.colostate.edu/gardennotes/720.pdf), previous Georgia frost dates (http://www.caes.uga.edu/publications/pubDetail.cfm?pk_id=7778) and /or a farmer's almanac as references, students will predict when soil and air temperatures will be

conducive to planting seeds and transplanting seedlings in spring.

### Explanation
Students will be able to articulate that weather is the result of different systems and conditions, and that instruments can be used to observe trends in data, make predictions.

### Debriefing
The teacher will use background info from AAAS to reiterate key concepts and correct misperceptions.
- Weather is the result of several earth systems, and is interrelated and global, as well as local.
- Students can use instruments to collect and interpret weather data.
- Weather trends can be recognized by interpreting data over time.

### Environmental Stewardship
Students will use the information they learned in this lesson to care for the Earth by observing seasonal changes and contributing to a national phenology database such as Project Budburst or Journey North. Additionally, students may accept a design challenge to find a way to extend the growing season of tender plants, during winter.

### Evaluation
Students will demonstrate mastery of Edheads weather prediction simulations at all three levels, collect current weather data with home-made devices, record and interpret weather data, predict when it will be safe to plant.

## CONTEXT FOR LESSON ACTIVITIES
### Standards
Georgia Performance Standards in Science
S4E4. Students will analyze weather charts/maps and collect weather data to predict weather events and infer patterns and seasonal changes.
a. Identify weather instruments and explain how each is used in gathering weather data and making forecasts (thermometer, rain gauge, barometer, wind vane, anemometer).
b. Using a weather map, identify the fronts, temperature, and precipitation and use the information to interpret the weather conditions.
c. Use observations and records of weather conditions to predict weather patterns throughout the year.
d. Differentiate between weather and climate.
Next Generation Science
ESS2 Earth Systems
ESS2.D Weather and Climate

### Background Information
- AAAS Weather: http://assessment.aaas.org/topics/WC#/
- AAAS Climate and Seasons:http://assessment.aaas.org/topics/CL#/
- Edheads Teacher Guide: http://www.edheads.org/activities/weather/teacher.shtml
- Children's Misconceptions about Weather/ Tables 3 and 4: http://www.csulb.edu/~lhenriqu/NARST2000.htm
- Weather Misconceptions of 4th Graders:
https://www.georgiastandards.org/Frameworks/GSO%20Frameworks/4%20Science%20Framework%20Weather.pdf

## PROCEDURES FOR LESSON ACTIVITIES
Predicting Weather
- Provide students with access to Internet connected computers and tell them to complete the Edheads weather reporting and prediction game, mastering it at all three levels. http://www.edheads.org/activities/weather/

Wind
- Show the class this Wind Map, which is updated throughout the day: http://hint.fm/wind/

- Initiate a discussion about what causes wind (temperature differentials and the fact that warm air rises).
- Provide students with materials for making wind vanes.
- Wind vane directions: http://www.ciese.org/curriculum/weatherproj2/en/docs/windvane.shtm
- Provide the materials necessary to make a wind sock, in addition to students' sleeves.
- Wind sock directions: http://familycrafts.about.com/od/gardendecor/ss/Shirt_Sleeve_Windsock_Craft.htm
- Modify the windsock directions by using tape over the hem of the wind sock instead of sewing it.
- Provide students with materials to make an anemometer.
- Anemometer directions: http://www.nsta.org/elementaryschool/connections/201104MakingAnenometers.pdf

Air pressure

- Ask students whether they think air has mass. Discuss air masses and weather fronts (the edge between an air mass of one temperature and one of a different temperature). High pressure is indicative of "good" weather.
- Provide students with materials to make barometers.

Thermometer

- Ask what thermometers measure? (temperature) And what temperature indicates? Heat level.
- Provide supplies and these directions for making a thermometer: http://www.weatherwizkids.com/experiments-thermometer.htm

Collecting, Recording and Interpreting Data

- Provide students with a chance to collect and record weather data from 5 instruments every day for two weeks.
- Compare data from home-made instruments to that in the news or collected from commercially made instruments.
- Allow students to display in an graphic form they choose. One possibility is a simple line plot such as this: http://illuminations.nctm.org/LessonDetail.aspx?id=L287
- Ask students to analyze trends in data collected, both short and long term.

Predicting Trends in Weather Data related to Seasonal Change: Spring Planting Weather

- Analyze changes in weather to predict the date of last freezing temperatures in spring.
- Why is this an important date to estimate correctly? (planting too early could result in freeze-damaged plants; planting too late could fail to take advantage of the longest growing season possible).
- Ask students to consult a farmer's almanac and this vegetable planting guide http://cmg.colostate.edu/gardennotes/720.pdf and compare their estimates of frost-free date to student's.
- Have the class vote on the first date to plant outdoors in the school garden this spring.

Environmental Stewardship

Using information they have learned in this lesson, students will care for the Earth by taking on one of the following projects:

Design Challenge: Extend the Growing Season for Tender Plants

- Challenge students to think of a way to extend the growing season of plants in the garden. For inspiration: http://webecoist.momtastic.com/2012/03/02/diy-greenhouses-10-structures-you-can-build-yourself/2/
- One possibility: make a mini-greenhouse from two old empty CD jewel cases: http://recycle.hu93.com/cds/make_a_mini_greenhouse_from_recycled_cd_cases__curbly__diy_d.htm
- Provide students with materials to complete a project of the class' choosing.

Citizen Science Project: Phenology

- Students may contribute data on the first appearance of spring to a citizen science program such as Journey North http://www.learner.org/jnorth/pde/PhenDataAbout.html or Project Budburst http://neoninc.org/budburst/.

# Assessment for Whether the Weather is Good for the Garden

**Student Name(s):** _____ **Date:** _____

| Level of Mastery → / Benchmark or Performance Measure ↓ |  Mastered task @ 90%+ accuracy: 5 pts |  Mastered task @ 85% accuracy: 4 pts |  Mastered task @ 80% accuracy: 3 pts |  More learning needed | TOTAL POINTS |
|---|---|---|---|---|---|
| **Edheads Weather Prediction Simulation** | Completed and mastered all three levels of the simulation. | Completed and mastered two levels of the simulation. | Completed and mastered one level of the simulation. | No attempt. | |
| **Weather Instrument making and data collection** | Built a working wind vane, wind sock, anemometer, barometer and thermostat. Collected and recorded weather data for two weeks. Analyzed data for trends. Compared to news. | Build fewer than five weather instruments. Collected and recorded weather data for two weeks | Built one or two weather instruments. Collected and recorded data for less than two weeks. | No attempt. | |
| **Frost Free Prediction** | Predicted frost free planting date for school, based on research into previous frost free dates and recent weather trends. | Prediction made without reference to any research or recent weather trends. | n/a | No attempt | |
| | | | | | |
| | | | | | |
| **TOTAL in LAST BOX →** | | | | | _/25 pts |

CAPTAIN PLANET'S LEARNING GARDENS

Grade

4

Standards

Math Common Core MCC 4.G.1, 4.G.2, 4.G.3 GPS Science S4L1 a, c, d
GPS Health HE 4.5 e

Time

approx 1.5 - 2 hours over 1 or 2 days

Supplies

(per student)
**For fly (cootie) catchers**
- (recycled) paper
- markers

**For triangle hunt**
- completed fly catcher
- ruler
- protractor
- journal

**For frog banners**
- fabric or paper
- scissors
- twine
- tape

**For frog juice**
- variety of fruit juices
- measuring cup
- paper cup
- recipe card

**For toad abode**
- plastic flower pot
- clippers, scissors
- acrylic paint, brushes

(per class)
- school garden

## Overview

4th grade students will explore geometry and frogs in the garden.

**What they will learn**
- Types of triangles
- Right triangles
- Measuring angles
- Lines of symmetry
- Drawing triangles
- Role of toad as a consumer
- Changes in environment, community
- Measuring liquid volume
- Health and nutrition

**How they will learn it**
- Making a garden banner
- Squaring a garden frame
- Finding triangles in garden
- Making fly (cootie) catchers
- Decorating a toad abode
- Make a toad abode in garden
- Introduce toads to eat "pests"
- Creating a recipe for Frog Juice
- Triangle garden party snacks

## Essential / Guiding Question

How can I recognize, measure and create angles and triangles in the garden? How can I attract toads to the garden, so they will help control unwanted pests?

## Engaging Students

Fly (cootie) catchers
Students will make fly (cootie) catchers to observe lines of symmetry and "catch" triangle facts for future reference.

## Exploration

In preparation for hosting a garden party for frogs, students will. . .

Triangle hunting

Use completed fly catchers to look for triangles in the garden; measure angles and side lengths to confirm what types of triangles are found; sketch and label the triangles.

Miniature pennant banners
Demonstrate their ability to recognize, measure and draw different types of triangles by creating festive, frog-sized pennant-banners for the garden party.

Frog Juice
Measure and record liquid volumes of different ingredients, while inventing their own special tasty and healthy "frog juice" to drink at the party.

Triangle Snacks
Brainstorm and choose healthy snacks for human and toad guests at the garden party, including garden-grown and triangular-shaped foods.

## Explanation
Students will be able to articulate what makes a triangle, tell about triangle types, and describe a healthy snack.

## Environmental Stewardship
Students will use what they learned about triangles and toads to design, create and decorate a Toad Abode that features every type of triangle (equilateral, isosceles, scalene, obtuse, acute, right) and provides a suitable habitat. Students may also become part of the FrogWatchUSA citizen science efforts, and collect data to contribute.

## Evaluation
Students will demonstrate mastery of triangles by labeling all types on their toad abode.

## CONTEXT FOR LESSON ACTIVITIES
## Standards
Georgia Performance Standards: Science
Life Science
S4L1. Students will describe the roles of organisms and the flow of energy within an ecosystem.
a. Identify the roles of producers, consumers, and decomposers in a community.
c. Predict how changes in the environment would affect a community (ecosystem) of organisms.

Next Generation Science Standards
Core Idea LS2: Ecosystems: Interactions, Energy and Dynamics
LS2.A : Interdependent Relationships in Ecosystems
LS2.C : Ecosystem Dynamics, Functioning and Resilience

Health Ed GPS
HE4.5: Students will demonstrate the ability to use decision-making skills to enhance health.
e. Determine a healthy choice when making a decision.

Common Core: Math
Measurement and Data 4.MD
Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
MCC4.MD.2 Use the four operations to solve word problems involving . . . liquid volumes. . . Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.
MCC4.MD.5 Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:
a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering

the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles.

b. An angle that turns through n one-degree angles is said to have an angle measure of n degrees.

MCC4.MD.6 Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

MCC4.MD.7 Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.

Geometry 4.G

Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

MCC4.G.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

MCC4.G.2 Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.

MCC4.G.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

## Background Information

Triangle Basics: http://www.mathsisfun.com/triangle.html

Backyard Houses for Toads:
http://www.nwf.org/News-and-Magazines/National-Wildlife/Gardening/Archives/2006/Backyard-Houses-for-Toads.aspx

FrogWatch USA citizen science program: http://www.aza.org/become-a-frogwatch-volunteer/

## Teacher Preparation

Assemble supplies needed for the lesson. Ask students or a garden store for used plastic flower pots.

## PROCEDURES FOR LESSON ACTIVITIES

Explain the premise of the lesson: to hold a garden party for frogs and toads that will encourage them to live in the school garden. Ask why a toad might be a better solution than pesticides, for controlling the population of insects eating fruits and vegetables in the garden. (Residual pesticides in and on food are not healthy for humans to eat). Also tell students that the theme of the garden party will be triangles. Introduce Triangle Basics http://www.mathsisfun.com/triangle.html, if the class does not have this background knowledge.

Fly (cootie) Catchers

- Provide each student with a piece of paper. (If the paper is 8 1/2" x 11", students should fold a corner to the opposite side, making a square, and cut off the excess.
- Follow directions for making a cootie catcher http://www.billybear4kids.com/holidays/ChineseNewYear/CootieCatcher.shtml, if needed: As students are folding, unfolding and refolding their papers, ask if they recognize any lines of symmetry (on either side of which is a matching shape).
- http://www.billybear4kids.com/holidays/ChineseNewYear/CootieCatcher.shtml
- Ask whether people, animals and plants also have lines of symmetry. (People and most animals are bilaterally symmetrical. However, plants are radially symmetrical, as is a circle).

Triangle hunting

- Tell students to use completed fly catchers to look for triangles in the garden.
- Students will use a protractor to measure angles and side lengths, to confirm what types of triangles are found.
- Students will sketch and label the triangles.

Design Challenge: Miniature pennant banners

- Challenge students to use every type of triangle when creating a festive, frog-sized pennant-banners for the party.
- Provide twine, tape , fabric scraps or colored paper, and markers (to label triangles).

Design Challenge: Frog Juice

- Provide an assortment of juices, graduated measuring cups, paper cups.
- Challenge students to measure and record liquid volumes of different ingredients, while inventing their own special tasty and healthy "frog juice" to drink at the party. The recipe may be copied on a recipe card.

Triangle Snacks

- Ask the class to brainstorm snacks for human and toad guests at the garden party, including garden-grown and triangular-shaped foods. Sort the list of possibilities into healthy and not-so-healthy columns.
- Challenge the class to develop criteria for distinguishing healthy from unhealthy eating.

Debriefing

Ask students to reflect on what they learned in this lesson and guide the discussion to include the following:
Properties of triangles

- All triangles have 3 sides and angles that total 180 degrees.
- Scalene triangles have no equal angles; isoceles have two equal angles; equilaterals have three equal angles.
- Right triangles have a 90 degree angle
- Right triangles can be useful.
- Geometric shapes can have more than one line of symmetry; most animals have bilateral symmetry.

Reasons for attracting frogs and toads to the (organic) garden

- Toads help the garden with organic pest removal (1 toad can eat 10,000 insects in a season, per USDA).
- The garden can help toads (toad and frog populations are in decline due to loss of habitat, disease, pesticides).

Choosing healthy party refreshments

- It is healthy to eat five 1-cup fruit and/or vegetable servings a day.
- Fresh fruits and vegetables are healthiest to eat when they are plain, unadulterated, unprocessed.
- Children can choose to eat healthy food.

Extension

The Delta Kite

Making a delta kite can be a great lesson extension if used to reinforce measuring angles and classifying triangles. Students use inexpensive common items to create their own Delta wing kites. Simple directions with photos are available at: http://www.my-best-kite.com/how-to-build-a-delta-kite-s.html

Supplies for each delta kite

- 30 lb. kite string
- 2-ply trash bag (lg)
- electrical tape
- ruler
- (2) 70 cm (32") 5mm dowels
- (2) 80 cm (36") 5mm dowels

# Triangle Hunt in the Garden

**Name:** _____

**Date:** _____ **Location:** _____

**Hunt for triangles in the schoolyard, measure their angles and sides, sketch each type, label its measurements, and tell where you found it. You may sketch a third "imagined" side opposite an angle with a dotted line, to create a triangle that does not physically exist.**

## Right

## Obtuse

## Acute

## Isosceles

## Scalene

## Equilateral

# Assessment for (Lesson Plan Title)

**Student Name(s):** _____ **Date:** _____

| Level of Mastery → / Benchmark or Performance Measure ↓ |  **Mastered task @ 90%+ accuracy: 5 pts** |  **Mastered task @ 85% accuracy: 4 pts** |  **Mastered task @ 80% accuracy: 3 pts** |  **More learning needed** | **TOTAL POINTS** |
|---|---|---|---|---|---|
| **Triangle facts caught in cootie (fly) catchers** | Student drew and correctly labeled right, acute, obtuse, scalene, isosceles, and equilateral triangles for reference, in cootie catcher | Student participated without a lot of accuracy | n/a | No attempt | |
| **Triangle Hunt in the Garden** | Correctly identifies several types of triangles by measuring angles with protractors and sides with rulers. | Triangles incomplete or in error. | n/a | No attempt | |
| **Frog-Scale Miniature Party Banners** | Correctly draws triangles and labels angles and side lengths. Makes pennant banner featuring each type of triangle | Creates a banner with some triangle shapes, but not all; or triangles are incorrectly labeled. | n/a | No attempt | |
| **Frog Juice Frog Party Food** | Creates a recipe by measuring and combining different types of juices, to taste. Selects healthy triangular shaped food for snacks. | Creates fruit juice blend without measuring. | n/a | No attempt | |
| **Toad Abode** | Creates a mini-habitat in the garden that depicts every type of triangle, and attracts toads that will help eat garden pests. Student may also choose to join FrogWatch and contribute data to national database to protect frogs | Mini-habitat created for toads, but all triangles not depicted on it. | n/a | No attempt | |
| **TOTAL in LAST BOX →** | | | | | **_ /25 pts** |