The Peabody Fellows Program
Peabody Museum of Natural History
Yale University

World of Plants

Activities on Botany and Ecology for 2nd, 3rd and 4th Graders

The Peabody Fellows Program aims to improve science teaching and learning among elementary, middle and high school teachers and students. These Connecticut standards-based activities are tailored to be incorporated into the existing science curriculum.

Project Director
Jim Sirch

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Vincent Carbone, Maria DiMeo, Marjorie Drucker, Susan Durato, Alexia Frumento, Judy Honey, Shelby Irwin, Janette Lange, Kim Savoia, Melissa Socolow,Cleo Trotman, Allison Wills, Kel Youngs, and Kim Zabilowski

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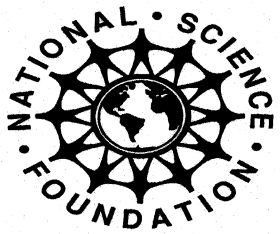


SECOND GRADE

Lesson #1 Seeds

Title of Lesson: Seed Searching

CT Standards: 2.2 - Plants change their form as part of their lifecycles. Use senses and simple tools to collect data about the roots, stems, leaves, flowers and seeds of various plants, (including trees, vegetables, and grass.)

National Science Standard:

- Content Standard A: As a result of activities in grades K-4, all students should develop abilities necessary to do scientific inquiry and understanding about scientific inquiry.
- Content Standard C: As a result of activities in grades k-4, all students should develop understanding of the characteristics of organisms, life cycles of organisms, organisms and environments.

Length of Lesson: Two 40 minute periods.

Grade Level: 2

Grade Level Expectations: Students will understand the following:

1. Flowering plants produce plants.
2. Seeds come in many shapes and sizes.

3. New plants grow from these seeds.

Performance Expectations:

(CMT Expected Performance)

A.19 Describe the life cycles of flowering plants as they grow from seeds, proceed through maturation and produce new seeds.

Materials:

variety of seeds including euphorbia seeds

bag o' beans

egg cartons

plastic baggies

"I Am A Seed" Hello Reader Level 1 by Jean Marzollo.

Four (4) Lima Beans

Chart/poster on plant or seed parts

Background Information: All seeds consist of two parts, the little plant or embryo and the seed coat. The seed coat protects the developing plant; the embryo is inside the seed. Cotyledons store food. They are the leaves that are attached to the little plant or embryo. When the seed begins to grow, one part of the embryo becomes the root and the rest becomes the upper stem and leaves.

Inquiry

Students will be ***engaged*** by examining what they already know about seeds. They will then ***explore*** the different characteristics of seeds. Following the activity the children will then ***explain*** the process in which plants grow. Students will further ***elaborate*** by developing experiments that show how seeds grow. The teacher can then use assessment material to ***evaluate*** the learning process.

Procedure:

**Before Lesson teacher needs to prepare four (4) sample cups of planted lima beans to be used in lesson #2. **

1. Begin K-W-L chart and brainstorm.
2. Read a storybook such as I Am A Seed by Jean Marzollo* (Kit) Hello Book #1
Refer to chart or poster as needed.
3. Have a bowl full of assorted seeds. Give a sample (handful) to each group. Students will use their senses to inquire and discuss a variety of shapes and sizes.
4. Then students will sort seeds using physical properties. (Refer to "Searching for Seeds" worksheet). Teacher will chart vocabulary words.

5. Dissect a soaked lima bean to reveal the parts of a seed. Students will observe a seed coat, embryo and food storage tissue. ("Inside a Seed" page 3 and 4 Primarily plants).
6. Students will choose three (3) seeds from their sorted collection to grow. Using clear plastic cups and potting soil students will plant each seed in it's own cup.

Evaluation: Students will record observations by drawing in their science journal ("A Plant Begins" journal template pgs, 10 & 11) (AIMS Education Foundation 1990).

Suggested Readings

Growing Vegetable Soup Ehlert, Lois. Harcourt Brace Jovanovich San Diego, CA 1990.

A Handful of Sunshine Eclare, Melanie. Ragged Bears USA 2000.

How A Seed Grows Jordan, Helen J. Harper Collins 1992.

From Seed to Plant. Gibbons, Gail Holiday House, 1993.

Web Links

*www.canteach.com

*www.enchantedlearning.com

*www.foss.com
*www.monroe2boces.org

Vocabulary

Properties - qualities that can be identified and measured.
Embryo - the tiny plant within a seed.
Dissect - to cut apart or separate tissue.
Observe - looking and discovering.
Tissue - part of an organism consisting of cells having a similar structure and function.
Seedpod - covering of a several seeded leguminous plant. (such as a peapod)
Seedcoat - the touch outside cover found on new seeds.
Germinate - when a seed starts to grow and produces a new plant.

Credits

Primarily Plants A Plant Study for Grade K-8
Hoover, Evalyn and Mercier, Sheryl 1990 by the AIMS Education Foundation.

The Mailbox Primary April/May 2001 page 8 Seed Summary and Pattern pages 4 - 6
I Am a Seed by Jean Marzollo Hello Books

Extensions

"Little Brown Seeds" booklet

SEARCHING FOR SEEDS

Where you do find seeds? See how many examples you can find.

1. Fruits _____ _____
2. Flowers _____ _____
3. Vegetables _____ _____
4. Trees _____ _____

How Do They Compare?

Smallest seed	Largest seed	Darkest color
Roundest	Most unusual	Lightest color
Flattest seed	Smoothest	Roughest

Lesson #2 Basic Needs of Plants and Parts of Plants

CT Science Standards (Content Standard)

2.2 Plants change their forms as part of their lifecycle.

- Student will use senses and simple tools to collect data about the roots, stems, leaves, flowers, and seeds of various plants, (including trees, vegetables and grass.)
- Use magnifiers to observe the parts of a flower and describe the interactions between pollinators and the flower that results in plant reproduction.
- Pose testable questions and design simple experiments to explore factors that affect seed germination and plant growth.

National Science Standards

- Content Standard A: As a result of activities in grades K-4, all students should develop abilities necessary to do scientific inquiry and understanding about scientific inquiry.
- Content Standard C: As a result of activities in grades k-4, all students should develop

understanding of the characteristics of organisms, life cycles of organisms, organisms and environments.

Time: Two 40-minute periods

Grade level: 2

Grade Level Expectations (objectives)

- Students will understand that in order to grow healthy plants, soil, water, light and air must be provided.

Performance Expectations: (CMT Expected Performance)

- A.19 Describe the lifecycles of flowering plants as they grow from seeds, proceed through maturation and produce new seeds.
- A.20 Explore and describe the effects of light and water on seed germination and plant growth.

Materials

The Carrot Seed by Ruth Krauss (*kit)

One (1) large plastic bag gallon size

One (1) cardboard box

Four (4) prepared plants from lesson #1
Several plant samples including euphorbs
Chart/Poster on Plant Parts catalog SK Elementary page 58.

Teacher Information and Background Part 1 & 2

Basic Needs - Plants require sunlight, water, soil and air in order to grow and be healthy. Energy received from the sun is used to convert carbon dioxide and water into food. When plants do not receive the things they need to live and grow, they will either die or be stunted in their growth.

Plant Parts – Each part of the plant plays a vital role in the survival and reproduction of the plant. The beautiful flower attracts insects and birds so that pollen will be carried from flower to flower. When a plant receives pollen from another plant, the flower is able to make seeds that will grow into new plants. The roots hold the plant firmly in the ground and absorb water and necessary nutrients from the soil. The stem carries water to different parts of the plant and holds the leaves up. The leaves trap energy from the sunlight to make food for the plant. (This process is called

photosynthesis.) The leaves take in carbon dioxide and release oxygen to fuel photosynthesis.

Inquiry

In this inquiry, students will be engaged by examining what they already know about plant parts. They will then explore the different characteristics of each part of plants following the activity. Students will elaborate by defining the function of each part of the plant. The teacher can then use students' drawings and completed flipbook to evaluate the learning process.

Procedures

Part 1

1. Continue K-W-L chart.
2. Read story, **The Carrot Seed** by Ruth Kauss
3. Discuss basic needs of living things and focus on plants.
4. The seeds should be sprouted, divide cups into four (4) groups to test growing conditions:

Group 1: NO AIR - Place cup in plastic bag
Group 2:NO LIGHT - Place in dark place

Group 3:NO WATER – do not water
Group 4:NEEDS MET – plant has soil, air, light and water.

5. Watch to see which plant grows best. A chart or class calendar can be made with the data collected.
Discuss what plants need to grow.

Evaluation: Record data in science journal.

Procedure
Part 2
Review Chart/Poster on Plant Parts
1. Read From Seed to Plant by Allan Fowler
2. Compare several types of flowering plants and euphorbs (poinsettia or see reference list) Observe and compare
3. Label and point out parts of each plant. Use the chart/poster and plant specimens to illustrate parts such as roots, stems, leaves and flowers.
4. Discuss function on each part. (See page 66 of Primary Plants)

5. Compare and contrast different kinds of plants by drawing and labeling two (2) types of plants a euphorbia and a flowering plant.

Evaluation

Make plant flip book matching parts of plants with phrases. (See pages 13 and 14 Teacher's Helper April/May/June 1999)

Suggested Readings

Flowers (Plant Parts) Lynn M. Stone, Rourke Publishing, 2007.

Hungry Plants Mary Batten Random House, 2004.

The Life and Times of the Peanut Charles Micucci, Houghton Mifflin, 2000.

From Pit to Peach Tree, Ellen Weiss Children's Press, 2007.

Web Links

www.desert-tropicals.com/plants/Euphorbiaceae

www.hhmi.org

Vocabulary

Nutrients - plants absorb nutrients from the soil.

Leaves - usually green flat structures attached and functioning as principal organs of photosynthesis.
Flower - the reproductive structure of some seed bearing plants.
Roots - the usual portion of a plant that draws minerals and water from soil.
Stem - the main ascending axis of a plant, a stalk or a trunk.

Credits

Primarily Plants: A Plant Study for K-3
Hoover, Evalyn and Mercier, Sheryl
1990 AIMS Educational Foundation. Page 50 & 66.
Teacher's Helper (April/May/June 1999) page 13-14. "Plant Flip Book Project"

Extensions

www.hhmi.org Howard Hughes Medical Institute
salad bowl activity
Make salad scavenger hunt activity
Celery Experiment - from Primarily Plants

Lesson #3 Life Cycle of Plants

Title of Lesson:

CT Science Standards (content standards)

2.2 Plants change their form as part of their lifecycles.

- Explain how roots, stems, leaves, flowers and seeds function to complete the plant's life cycle.
- Predict the sequenced stages of a flowering plant's life cycle.

National Science Standard:

- Content Standard A: As a result of activities in grades K-4, all students should develop abilities necessary to do scientific inquiry and understanding about scientific inquiry.
- Content Standard C: As a result of activities in grades k-4, all students should develop understanding of the characteristics of organisms, life cycles of organisms, organisms and environments.

Length of Lesson: One 40 minute period.

Grade Level: 2

Grade Level Expections (objectives) -

Students will observe the changes that occur during plant growth and development.

Students will understand that the life cycle of plant growth and development.
Students will sequence the stages of plant life.

Performance Expectations (CMT Expected Performance)

- A.19 Describe the lifecycles of flowering plants as they grow from seeds, proceed through maturation and produce new seeds. Explain how roots, stems, leaves, flowers and seeds function to complete the plant's life cycle.

Materials

The Plant Life Cycle flow chart student worksheet.
The Plant Life Cycle chart with drawings.
Lifecycles: Bean by David M. Schwartz *(kit)

Teacher Information and Background

All living things have life cycles. Plants have a life cycle that includes sprouting, developing roots, stems, leaves, and flowers; reproducing; and eventually dying. Nutrients from decaying plant material enrich the soil and allow the life cycle to continue.

Inquiry

Students will be **engaged** by examining what they already know about lifecycles. They will then **explore** the stages of a plant's life cycle. Following the activity the children will then **explain** the process in which plants grow. Students will further **elaborate** by completing a life cycle worksheet with drawings of each stage. The teacher can then use the drawings and worksheet to **evaluate** the learning process.

Procedure

1. The teacher will read LifeCycles Beans by David M. Schwartz.
2. In a visible location, create a diagram of the generic "plant life cycle". The plant lifecycle usually includes the following events: seeds germinate, roots and stems appear, leaves appear, flowers appear, flowers produce pollen, flowers receive pollen, plants produce fruit that contains seeds, seeds disperse.

Evaluation

Ask students to use the attached worksheet to create a diagram of the "plant life cycle". Students may draw and color directly on the

worksheet, or may use the worksheet as a guide, creating their Plant Life Cycle Diagram on a larger separate sheet of paper.

Suggested Readings

Usborne Mysteries and Marvels of Plant Life, Barbara Cook, Scholastic, Inc.

Beans – Plant Life Cycles Melanie Mitchell, Lerner Publishing Group, 2003.

Sunflowers and Other Plants (Life Cycles) Sally Morgan
Chrysallis Children's Books 2003.

The Life Cycle of a Flower, Molly Aloian and Bobbie Kalmon. Crabtree Publishing Company, 2004.

The Magic School Bus plants Seeds Joanna Cole, Scholastic, 1995.

Plants Are Living Things, Bobbie Kalmon, Crabtree Publishing, 2007.

The ABC's of Plants Bobbie Kalmon Crabtree Publishing, 2007.

Plants – The Ontario Science Centre, Kids Can Press

Stems Vijaya Bodach Clapstone Press, 2008.

Leaves Vijaya Bodach Clapstone Press, 2008.

Flowers Vijaya Bodach Clapstone Press, 2008.

Seeds Vijaya Bodach Clapstone Press, 2008.
Fruits Vijaya Bodach Clapstone Press, 2008.

Web Links

www.graves.K12.ky.US/powerpoints

Vocabulary

Lifecycle - the series occurring in each generation of a plant or animal's life.
Decay - to rot or decompose.
Enrich - to make a soil more fertile for growing.
Germinate - cause to grow or sprout.

Credits

www.wpi.edu/images/CMS/PIEE/3d2.PDF

Extensions

Compare Plant Life Cycle to Human or Butterfly Life Cycles
Plant Life Cycles Reading Comprehension and questions

THIRD GRADE

Learning About Adaptations

"How Plants Live in Different Places"

CT Science Standards

- 2.2.a. The life cycles of flowering plants include seed germination, growth, flowering, pollination and seed dispersal.
- 2.3.a. Soils support the growth of many kinds of plants, including those in our food supply
- 3.2.a. Plants and animals have structures and behaviors that help them survive in different environments.
- 4.2.a. When the environment changes, some organisms survive and reproduce, and others die or move to new locations.
- 6.2.a Populations in ecosystems are affected by biotic factors, such as other populations, and abiotic factors, such as soil and water supply.
- 6.2.b Populations in ecosystems can be categorized as producers, consumers and decomposers of organic matter.

Time Needed: 2 – 4 sessions of 30 – 40 minutes each

Grade Level: 2-6

Objectives: Students will view and discuss the video "How Plants Live in Different Places."

- Students will complete handouts, including a multiple choice exercise, a venn diagram, a chart, and a cloze exercise.
- Students will self-correct, reread, and review the completed handouts as study guides.
- Students will understand and use correctly the following vocabulary:

  adapt, adaptation, botanist, features, protect, survive
  desert, habitat, rain forest
  humid, leaves, moisture, nutrients, roots, shade, shady, soil, stem, sunlight
  buttress, drip tip, stilt roots, vine, waxy
- Students will explain how habitats and plant adaptations interconnect.
- Students will give examples of plant adaptations in the desert and in the rain forest.

Materials: Video, "How Plants Live in Different Places," handouts, pencils.

Procedures:

Handout # 1: Introduction.

This activity should be done as a whole group. For younger students you may choose either to complete the shorter version, or to complete the longer handout over two sessions. Session one could be devoted to the desert, while session two focused on the rainforest.

1. Have students read through the handout individually and in silence. Instruct them to predict answers. Give students the opportunity to ask about any new or unfamiliar vocabulary.
2. Have students discuss their individual predictions with partners or in small groups.
3. Report back to whole group.
4. View video together. Pause and discuss, or replay as appropriate.
5. Review and confirm that all students have the correct answers.
6. Assign students to reread the corrected handout as homework.
7. *Optional additional assignment:* Have students write their own original sentences using selected vocabulary words.

Handouts # 2 *and* #3: Chart *and* Venn Diagram.

These activities should be done on separate days from the "Introduction" worksheet. They can be done either as a whole group activity, or *(equipment permitting)* as a small group activity. They can be done in either order. It is recommended that if you choose to use both the "Chart" and the "Venn Diagram," that you do so on separate days. The procedure for both worksheets is the same.

1. Have students look over the handout individually and in silence. Instruct them to recall what they remember from the video and to predict answers.
2. Fill out the chart or diagram as they watch the video a second or third time. Encourage the students to pause and rewind the video as appropriate. Encourage small groups to discuss and agree on their answers, while permitting individual formulations.
3. Time permitting, allow the students to watch the entire video another time to correct and improve their work.

Handout # 4: Assessment.

This can be a formal or informal assessment.

1. Have the students complete the handout before viewing the video.
2. *(More formal)* Collect and correct the handouts. Hand them back and replay the video, pausing and replaying as appropriate, to review the correct answers. Clarify any lingering misconceptions.
3. *(Less formal)* Instruct students to use a colored pencil or pen to correct their own paper as you view the video together. Pause and replay the video as necessary to clarify each answer. Discuss any lingering misunderstandings.

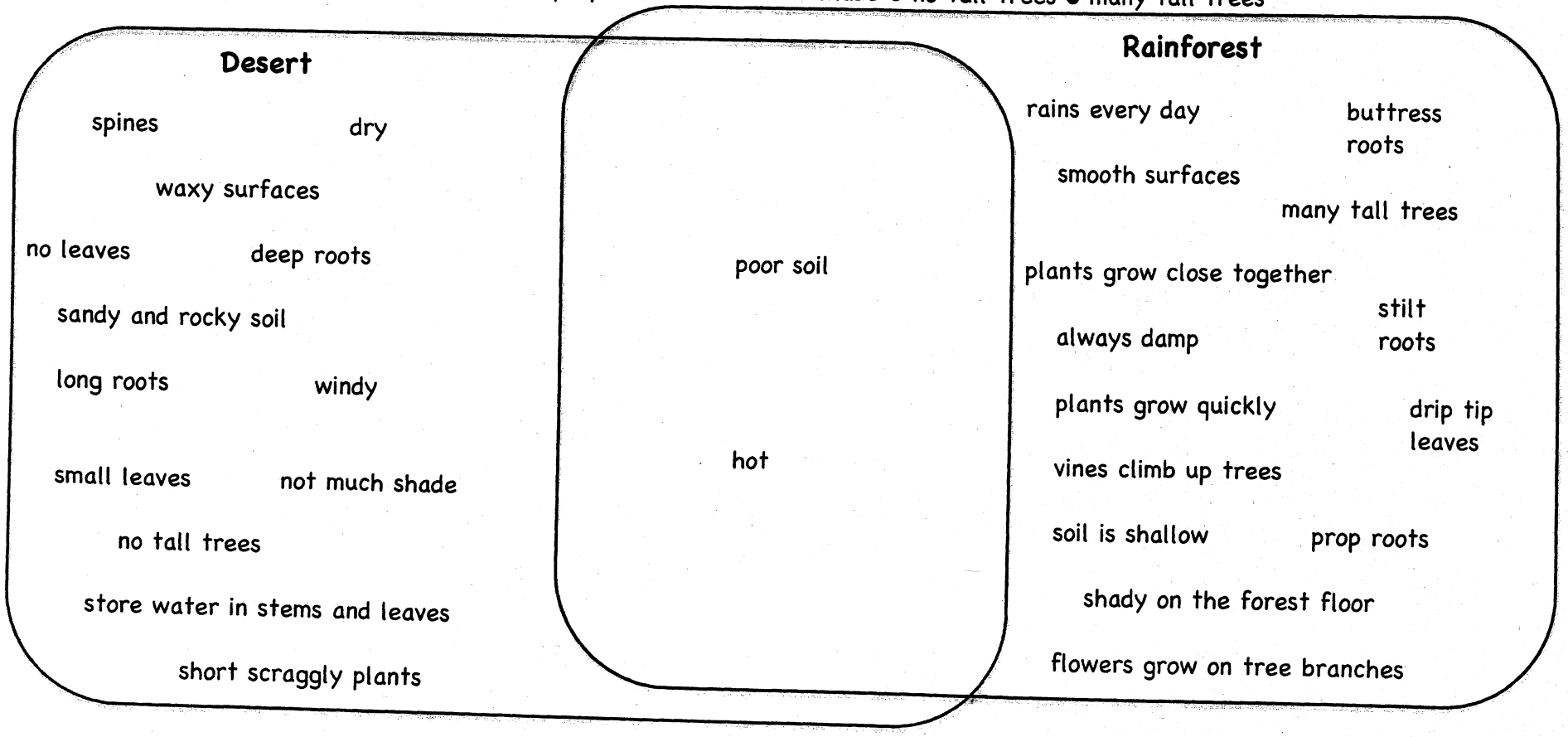
ANSWER KEY

Date: _____

Comparing Plants in the Desert and in a Rainforest

Directions: Fill in the Venn diagram using the phrases below, based on information from the video, "How Plants Live in Different Places."

~~poor soil~~ ● rains every day ● spines ● buttress roots ● hot ● dry ● plants grow close together ● waxy surfaces ● stilt roots ● no leaves ● sandy and rocky soil ● deep roots ● plants grow quickly ● plants grow slowly ● vines climb up trees ● long roots ● soil is shallow ● windy ● drip tip leaves ● small leaves ● flowers grow on tree branches ● store water in stems and leaves ● short and scraggly plants ● always damp ● shady on the forest floor ● smooth surfaces ● prop roots ● not much shade ● no tall trees ● many tall trees



Name: _____ Date: _____

Comparing Plants in the Desert and in a Rainforest

Directions: Fill in the Venn diagram using the phrases below, based on information from the video, "How Plants Live in Different Places."

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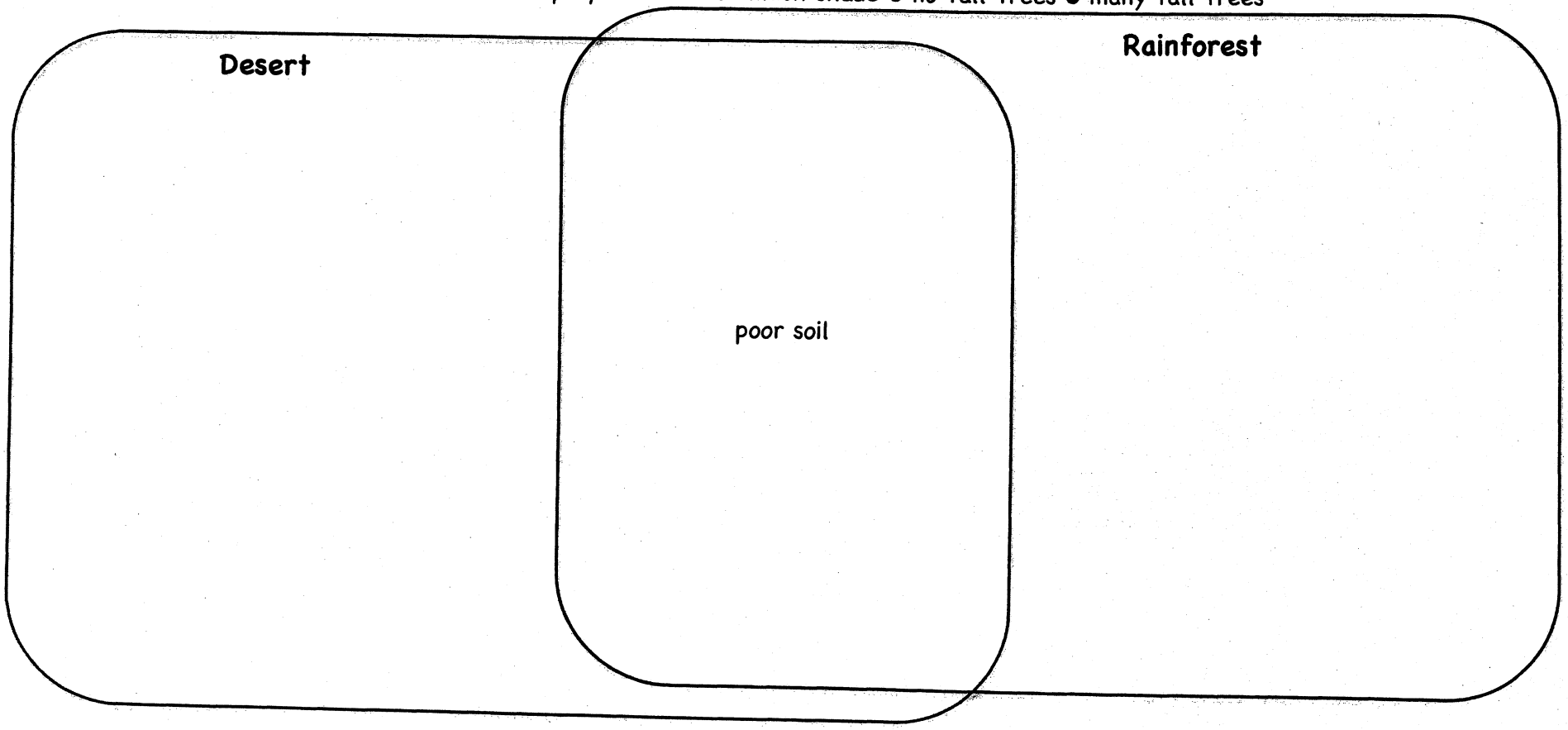

Name _____ Date_____

How Plants Live in Different Places: Introduction

Directions: *Before viewing the video,* read through this entire handout. Discuss any words that you are unsure about. Predict which answers will be correct. Discuss your predictions with your classmates.

While you are watching the video, circle the answer that belongs in each blank.

After you have finished watching the video, fill in each blank with the correct word you have circled. Reread the completed sentences. If time permits watch the video a second time and proofread your work.

1. The children in the video live in a habitat with four seasons. Sometimes the weather is cold and other times it is hot. The plants where they live have _____ to their habitat. That means the plants have special features that allow them to live in their habitat.	adapted adopted
The Desert Greenhouse	
2. Each desert plant has a special way to _____ in the hot, dry environment. That means the plants are able to live and grow in their habitat.	surprise survive
3. There are not any _____ trees in the desert, so there is not much shade.	tall small
4. The _____in the desert dries out quickly. It is very sandy and rocky.	soil leaves
5. The _____ blows all the time.	fog wind
6. When it rains, desert plants save _____ . That way some of them can live for hundreds of years.	water nutrients

7. Cactus plants and many other plants in the desert do not have any _____ .	flowers leaves
8. Plants in the desert grow very _____.	quickly slowly
The Rain Forest Greenhouse	
9. Some plants in the tropical rain forest grow very _____ .	quickly slowly
10. It is _____ and _____on the forest floor.	dark / shady dry / dusty
11. The soil is not _____ and not very _____ .	deep /good shallow / poor
12. Lianas, or woody _____ climb up the trees to get to where the sun is.	roots vines
13. Orchids and many other flowers are separate plants that grow on the _____ or trunks of trees.	roots branches
14. Some rain forest plants never touch the soil at all. They get all the nutrients they need from the _____ and the _____.	air / rain sun / trees
15. The pointy tip of a leaf is called its _____ tip. The leaf is smooth and slippery. Both adaptations help the leaf get rid of water fast.	drip needle

Summary	
16. In the hot, dry _____ plants grow very _____.	desert/slowly rain forest / fast
17. In the warm, wet _____ _____ plants grow very _____.	desert/slowly rain forest / fast
18. Plants are different because their _____ are different.	habitats colors
19. In order for a plant to _____ it has to adapt.	flower live
20. When a plant adapts, it develops special _____ that allow it to deal with the temperature, moisture, the kind of soil, and the amount of sunlight that is around it.	leaves features

ANSWER KEY

How Plants Live in Different Places: Introduction

Directions: *Before viewing the video,* read through this entire handout. Discuss any words that you are unsure about. Predict which answers will be correct. Discuss your predictions with your classmates.

While you are watching the video, circle the answer that belongs in each blank.

After you have finished watching the video, fill in each blank with the correct word you have circled. Reread the completed sentences. If time permits watch the video a second time and proofread your work.

1. The children in the video live in a habitat with four seasons. Sometimes the weather is cold and other times it is hot. The plants where they live have _____adapted_____ to their habitat. That means the plants have special features that allow them to live in their habitat.	adapted adopted
The Desert Greenhouse	
2. Each desert plant has a special way to _____survive_____ in the hot, dry environment. That means the plants are able to live and grow in their habitat.	surprise survive
3. There are not any _____tall_____ trees in the desert, so there is not much shade.	tall small
4. The _____soil_____ in the desert dries out quickly. It is very sandy and rocky.	soil leaves
5. The _____wind_____ blows all the time.	fog wind
6. When it rains, desert plants save _____water_____. That way some of them can live for hundreds of years.	water nutrients

7. Cactus plants and many other plants in the desert do not have any _____leaves_____ .	flowers leaves
8. Plants in the desert grow very _____slowly_____.	quickly slowly
The Rain Forest Greenhouse	
9. Some plants in the tropical rain forest grow very _____quickly_____ .	quickly slowly
10. It is _____dark_____ and _____shady_____ on the forest floor.	dark / shady dry / dusty
11. The soil is not _____deep_____ and not very _____good_____.	deep /good shallow / poor
12. Lianas, or woody _____vines_____ climb up the trees to get to where the sun is.	roots vines
13. Orchids and many other flowers are separate plants that grow on the _____branches_____ or trunks of trees.	roots branches
14. Some rain forest plants never touch the soil at all. They get all the nutrients they need from the _____air_____ and the _____rain_____.	air / rain sun / trees
15. The pointy tip of a leaf is called its _____drip_____ tip. The leaf is smooth and slippery. Both adaptations help the leaf get rid of water fast.	drip needle

Summary	
16. In the hot, dry _____desert_____ plants grow very _____slowly_____.	desert/slowly rain forest / fast
17. In the warm, wet _____rain_____ _____forest_____ plants grow very _____fast_____.	desert/slowly rain forest / fast
18.Plants are different because their _____habitats_____ are different.	habitats colors
19. In order for a plant to _____live_____ it has to adapt.	flower live
20. When a plant adapts, it develops special _____features_____ that allow it to deal with the temperature, moisture, the kind of soil, and the amount of sunlight that is around it.	leaves features

Name _____ Date_____

How Plants Live in Different Places: Introduction

Directions: *Before viewing the video,* read through this entire handout. Discuss any words that you are unsure about. Predict which answers will be correct. Discuss your predictions with your classmates.

While you are watching the video, circle the answer that belongs in each blank.

After you have finished watching the video, fill in each blank with the correct word you have circled. Reread the completed sentences. If time permits watch the video a second time and proofread your work.

1. The children in the video live in a habitat with four seasons. Sometimes the weather is cold and other times it is hot. The plants where they live have _____ to their habitat. That means the plants have special features that allow them to live in their habitat.	adapted adopted
The Desert Greenhouse	
2. Dr. McCook is a _____ . She is someone who studies plants.	chemist botanist
3. The children see lots of _____ plants in the desert greenhouse. But they see lots of other plants too.	skinny cactus
4. Each desert plant has a special way to _____ in the hot, dry environment. That means the plants are able to live and grow in their habitat.	surprise survive
5. There are not any _____ trees in the desert, so there is not much shade.	tall small

6. The _____ in the desert dries out quickly. It is very sandy and rocky.	soil leaves
7. Because there is a lot of wind in the desert, plants have to be _____ .	tall tough
What is the desert habitat like?	
8. In the desert it is very _____ all the time.	hot and dry hot and wet
9. The soil is very _____ and _____ .	sandy / rocky salty / rough
10. The _____ blows all the time.	fog wind
11. When it rains, desert plants save _____ . That way some of them can live for hundreds of years.	water nutrients
12. The saguaro cactus stores water in its _____ .	stem leaves
13. The _____ of the saguaro cactus are very long and they spread out like a _____ just below the surface of the ground. So it can get water, even if it just rains a little.	roots / net leaves / paste
14. Other desert plants have _____, _____ roots that reach way down into the soil for moisture.	long / deep strong / steep

15. The aloe plant stores water in its _____.	stem leaves
16. The outside of many desert plants is kind of _____. That helps keep the water in.	waxy wavy
17. Cactus plants and many other plants in the desert do not have any _____.	flowers leaves
18. _____ can escape through leaves.	Nutrients Moisture
19. Desert plants _____ themselves against animals with sharp spines.	protect attract
20. Many plants in the desert are _____ and _____ in order to protect themselves from wind and blowing sand.	short / scraggly tall / branchy
21. Plants in the desert grow very _____.	quickly slowly

The Rain Forest Greenhouse	
22. In the greenhouse for tropical plants it is _____ and _____ inside.	warm / humid cool / dry
23. Tropical rain forests are all found in an area around the _____ .	poles equator
24. Some plants in the tropical rain forest grow very _____ .	quickly slowly
25. In the tropical rain forest there are so many plants growing so close to each other that not very much _____ can get through to the forest floor.	rain sunlight
26. It is _____ and _____ on the forest floor.	dark / shady dry / dusty
27. The soil in the rain forest is _____.	good poor
28. Plants in the rain forest grow so fast that they absorb most of the _____ from the soil very quickly.	nutrients water
What is the tropical rain forest like?	
29. It rains every _____ .	day week
30. There are so many plants that it is shady on the _____	rivers forest floor
31. It is warm all _____ long.	summer year

32. The soil is not _____ and not very _____.	deep /good shallow / poor
33. Some of the large trees in the rain forest have _____ . They seem to hold up the tree and support it in the shallow soil.	branches buttresses
34. _____ bark lets the rain run right off.	Smooth Waxy
35. Lianas, or woody _____ climb up the trees to get to where the sun is.	roots vines
36. Prop roots or _____ are on top of the ground instead of underneath. They help to hold the tree up.	stilt roots sturdy roots
37. Orchids and many other flowers are separate plants that grow on the _____ or trunks of trees.	roots branches
38. Some rain forest plants never touch the soil at all. They get all the nutrients they need from the _____ and the _____.	air / rain sun / trees
39. A lot of bromeliads have leaves that form a cup and then _____ collects in them. Animals like frogs and insects live in there.	water soil
40. The pointy tip of a leaf is called its _____ tip. The leaf is smooth and slippery. Both adaptations help the leaf get rid of water fast.	drip needle

Summary	
41. In the hot, dry _____ plants grow very _____.	desert/slowly rain forest / fast
42. In the warm, wet _____ _____ plants grow very _____.	desert/slowly rain forest / fast
43. Plants are different because their _____ are different.	habitats colors
44. In order for a plant to _____ it has to adapt.	flower live
45. When a plant adapts, it develops special _____ that allow it to deal with the temperature, moisture, the kind of soil, and the amount of sunlight that is around it.	leaves features

ANSWER KEY

How Plants Live in Different Places: Introduction

Directions: *Before viewing the video,* read through this entire handout. Discuss any words that you are unsure about. Predict which answers will be correct. Discuss your predictions with your classmates.

While you are watching the video, circle the answer that belongs in each blank.

After you have finished watching the video, fill in each blank with the correct word you have circled. Reread the completed sentences. If time permits watch the video a second time and proofread your work.

1. The children in the video live in a habitat with four seasons. Sometimes the weather is cold and other times it is hot. The plants where they live have _____adapted_____ to their habitat. That means the plants have special features that allow them to live in their habitat.	adapted adopted
The Desert Greenhouse	
2. Dr. McCook is a _____botanist_____. She is someone who studies plants.	chemist botanist
3. The children see lots of _____cactus_____ plants in the desert greenhouse. But they see lots of other plants too.	skinny cactus
4. Each desert plant has a special way to _____survive_____ in the hot, dry environment. That means the plants are able to live and grow in their habitat.	surprise survive
5. There are not any _____tall_____ trees in the desert, so there is not much shade.	tall small

6. The _____soil_____ in the desert dries out quickly. It is very sandy and rocky.	soil leaves
7. Because there is a lot of wind in the desert, plants have to be _____tough_____ .	tall tough
What is the desert habitat like?	
8. In the desert it is very _____hot and dry_____ all the time.	hot and dry hot and wet
9. The soil is very _____sandy_____ and _____rocky_____ .	sandy / rocky salty / rough
10. The _____wind_____ blows all the time.	fog wind
11. When it rains, desert plants save _____water_____ . That way some of them can live for hundreds of years.	water nutrients
12. The saguaro cactus stores water in its _____stem_____ .	stem leaves
13. The _____roots_____ of the saguaro cactus are very long and they spread out like a _____net_____ just below the surface of the ground. So it can get water, even if it just rains a little.	roots / net leaves / paste
14. Other desert plants have _____long_____, _____deep_____ roots that reach way down into the soil for moisture.	long / deep strong / steep

15. The aloe plant stores water in its _____leaves_____.	stem leaves
16. The outside of many desert plants is kind of _____waxy_____. That helps keep the water in.	waxy wavy
17. Cactus plants and many other plants in the desert do not have any _____leaves_____.	flowers leaves
18. _____Moisture_____ can escape through leaves.	Nutrients Moisture
19. Desert plants _____protect_____ themselves against animals with sharp spines.	protect attract
20. Many plants in the desert are ____short_____ and _____scraggly_____ in order to protect themselves from wind and blowing sand.	short / scraggly tall / branchy
21. Plants in the desert grow very _____slowly_____.	quickly slowly

The Rain Forest Greenhouse	
22. In the greenhouse for tropical plants it is _____warm_____ and _____humid_____ inside.	warm / humid cool / dry
23. Tropical rain forests are all found in an area around the _____equator_____ .	poles equator
24. Some plants in the tropical rain forest grow very _____quickly_____ .	quickly slowly
25. In the tropical rain forest there are so many plants growing so close to each other that not very much _____sunlight_____ can get through to the forest floor.	rain sunlight
26. It is _____dark_____ and _____shady_____ on the forest floor.	dark / shady dry / dusty
27. The soil in the rain forest is _____poor_____.	good poor
28. Plants in the rain forest grow so fast that they absorb most of the _____nutrients_____ from the soil very quickly.	nutrients water
What is the tropical rain forest like?	
29. It rains every _____day_____ .	day week
30. There are so many plants that it is shady on the _____forest floor_____	rivers forest floor
31. It is warm all _____year_____ long.	summer year

32. The soil is not _____deep_____ and not very _____good_____.	deep /good shallow / poor
33. Some of the large trees in the rain forest have _____buttresses_____. They seem to hold up the tree and support it in the shallow soil.	branches buttresses
34. _____Smooth_____ bark lets the rain run right off.	Smooth Waxy
35. Lianas, or woody _____vines_____ climb up the trees to get to where the sun is.	roots vines
36. Prop roots or _____stilt roots_____ are on top of the ground instead of underneath. They help to hold the tree up.	stilt roots sturdy roots
37. Orchids and many other flowers are separate plants that grow on the _____branches_____ or trunks of trees.	roots branches
38. Some rain forest plants never touch the soil at all. They get all the nutrients they need from the _____air_____ and the _____rain_____.	air / rain sun / trees
39. A lot of bromeliads have leaves that form a cup and then _____water_____ collects in them. Animals like frogs and insects live in there.	water soil
40. The pointy tip of a leaf is called its _____drip_____ tip. The leaf is smooth and slippery. Both adaptations help the leaf get rid of water fast.	drip needle

Summary	
41. In the hot, dry _____desert_____ plants grow very _____slowly_____.	desert/slowly rain forest / fast
42. In the warm, wet _____rain_____ _____forest_____ plants grow very _____fast_____.	desert/slowly rain forest / fast
43. Plants are different because their _____habitats_____ are different.	habitats colors
44. In order for a plant to _____live_____ it has to adapt.	flower live
45. When a plant adapts, it develops special _____features_____ that allow it to deal with the temperature, moisture, the kind of soil, and the amount of sunlight that is around it.	leaves features

Name _____ Date_____

How Plants Live in Different Places: A Chart

When Jim and the children looked at the plants in the desert and rainforest greenhouses, they **observed** many different **features**. Plants were tall or short, leafy or bare, smooth or prickly. Jim explained that these features were **adaptations**. That means, the features developed for a reason. Adaptations are features that have a **function**. They do something that helps the plant to **survive** in its particular habitat.

For instance, an adaptation of some leaves in the rainforest is the pointy "drip tip." The function of the drip tip is to help water slide off the leaf.

Complete the chart below (which continues on the reverse side) by explaining the function of each of the adaptation. The first one is done for you.

drip tip	helps the water slide off the leaf
waxy surfaces	
stilt roots	
sharp spines	
long deep roots	

no leaves	
short plants	
roots that spread out just below the surface	
buttresses	
smooth bark	
climbing vines	
small leaves	
tall trees	

ANSWER KEY

How Plants Live in Different Places: A Chart

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Complete the chart below (which continues on the reverse side) by explaining the function of each of the adaptation. The first one is done for you.

drip tip	helps the water slide off the leaf
waxy surfaces	helps keep the water in
stilt roots	because the soil is not very deep they are above ground rather than below; they help to hold the tree up
sharp spines	protect the desert plants from animals
long deep roots	reach far down into the soil to get moisture

no leaves	moisture can escape through leaves
short plants	helps to protect the plant from being damaged by the wind
roots that spread out just below the surface	the plant can get water, even if it just rains a little
buttresses	they seem to hold up the tree and support it in the shallow soil
smooth bark	lets the water run right off the tree
climbing vines	help the plants to get up to where the sun is
small leaves	moisture can escape through leaves
tall trees	reach up high to get sunlight

Name _____ Date _____

How Plants Live in Different Places: Assessment

Directions: After you have watched the video (maybe more than once), check to see how much you remember. Complete the following sentences choosing the correct vocabulary word from the box. After you are done, watch the video again, and check your answers.

survive	smooth	adapted	botanist
roots	buttresses	stilt roots	shade
drip tip	soil	vines	shady
protect	moisture	nutrients	waxy

1. At the beginning of the video, Jim tells the children, "The plants around here have _____ to our kind of weather." That means the plants have special features that allow them to live in their habitat.

The Desert Habitat

2. Dr. McCook is a _____. She studies plants.

3. Each plant in the desert has a special way to _____ in the hot, dry environment. They are able to live and grow there.

4. There is not much _____ in the desert because there are no tall trees there.

5. The _____ in the desert is dry, sandy, and rocky.

6. The _____ of the saguaro cactus are very long and spread out like a net just a few inches below the surface of the ground.

7. The outside of many desert plants is _____. That helps to keep the water inside.

8. _____ can escape through leaves. That is why many desert plants have no leaves, or only very small ones. Desert plants do a lot of things to hold onto water.

9. Desert plants have adapted to _____ themselves from the wind. The outside of some stems is tough. Many plants are short and scraggly.

The Rainforest Habitat

10. It is dark and _____ on the rainforest floor because so many plants grow closely together and not much sunlight can get through.

11. In the rainforest, plants absorb most of the _____ from the soil very quickly because the plants there grow so fast.

12. Some large trees in the rainforest have _____. They seem to hold up the tree and support it in the shallow soil.

13. The _____ bark of some rainforest trees lets the water run off.

14. _____ climb up trees to get more sunlight.

15. Some trees have prop roots or _____. These roots are on top of the ground instead of under the ground. They help to hold the tree up.

16. A _____ is a pointy end of a leaf. It helps the water slide off the leaf.

ANSWER KEY

How Plants Live in Different Places: Assessment

Directions: After you have watched the video (maybe more than once), check to see how much you remember. Complete the following sentences choosing the correct vocabulary word from the box. After you are done, watch the video again, and check your answers.

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13. The _____smooth_____ bark of some rainforest trees lets the water run off.

14. _____Vines_____ climb up trees to get more sunlight.

15. Some trees have prop roots or _____stilt roots_____. These roots are on top of the ground instead of under the ground. They help to hold the tree up.

16. A _____drip tip_____ is a pointy end of a leaf. It helps the water slide off the leaf.

Lesson 2: Plants adapt to different environments

Connecticut Content Standard
3:2 Plants can survive and reproduce in environments that meet their needs. Adaptations for Survival in Different Habitats

National Science Standard
Each plant has different structures that serve different functions in growth, survival, and reproduction.

Time 30 minutes

Grade Level 3rd

Grade Level expectations (objective)

Student will identify the function of different structures of plants and relate the parts to man made objects depicted on flash cards.

Performance Expectations
B3 Describe how plants are adaptive to survive in different land habitats.
B4 Describe how different plants are adapted to survive in water habitats.

Materials: Included in kit- 10 envelopes with 2 sets of each/ in Green Folder
- Plants photos
- Man made and function flash cards
- Student sorting mats
- Chart with answers to make matches

Teacher information and Background

Plants have made adaptations to grow and reproduce in various and diverse habitats. Many of the plant adaptations have man made counterparts, for example, some tropical leaves have holes in their leaves to reduce the strong effects of burning sun, and allows air to circulate like a piece of shade cloth used to shade greenhouses or tobacco plantations. Another example of environmental adaptation is desert plants store water in its tissue like a sponge.

The Euporbia family of plants is amazing in regards to adaptation. Different species of euporbs can be found in each type of biomes around the world and are currently under study worldwide. Euporbias in the form of poinsettias make up a huge commercial interest during Christmas holidays, huge desert dwelling euphorbias mirror branching cacti and succulents. Amazingly, this family of plants exhibits adaptation of a species to a wide spectrum of environments.

A literature resource may be to read <u>Nature Did It First</u>, by Susan Ring.

Procedures

Matching game: The object of this game is to match cards of the plant description, man made analogy, and the function of the adaptation.

Give each small group of students a sorting mat and an envelop of photos and cards.

Have each group complete their matches and share their results. Each envelope is different, so the sets may be passed to the next group.

In a large group or for review, the cards may be placed in a pocket chart, or displayed on a magnetic board with magnets.

See the chart to use as the answer key.

Extension

Allow students to select pictures in the habitat books provided and to identify more examples of plants adapted to their habitat.

Observing Plants

CT Science Standards

- 2.2.a. The life cycles of flowering plants include seed germination, growth, flowering, pollination and seed dispersal.

From "CT Science Curriculum Content Standards and Expected Performances" for Grades 3 – 5 :

- Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.
- Scientific literacy includes speaking, listening, presenting, interpreting, reading and writing about science.

Time Needed: 50 minutes

Grade Level: 2-6

Objective: Students will use their senses of sight, smell, and touch to observe plants. They will record their observations. They will read each other's observations and identify which plants are described.

Materials:
Two each of four to seven different plants [Alternatively, eight to fourteen different plants]; labels; pencils or pens; and paper or large index cards held together on a ring.

You will be dividing your group (class) and space in half for the exercise. For the purposes of these directions, like us refer to them as group A and group B.

1. Label the plants with numbers. The two plants of the same species will have the same number. You may choose to label them A-1 and B-1, A-2 and B-2, etc. Create a color code to identify each plant secretly. A-1 and B-1 could be blue; A-2 and B-2 might be green, etc. The children should not see the color code key.
2. Children will move in pairs or trios within their groups (A or B) from one plant to the next. Set the plants around the room so that students can circulate easily from one plant to the next, in numerical order. Place a stack of index cards on a ring next to each plant. You will need as many cards as you have different plants. [Alternatively, place a sheet of lined paper and a sheet of dark construction paper at each station.] On the back of the last card [or page of comments] indicate the corresponding color code.
3. Divide the group (class) in half, to form groups A and B. Within each group have the children form teams of two or three. You want to distribute the children evenly among the available plants. [If you have six different plants with twelve children in each group, you will have teams of two; if you have four different plants, you will have teams of three.]

4. Assign each team to its first plant. Explain that the two or three of them should observe the plant by seeing, smelling, and touching. They should discuss their observations and agree on one or two short phrases or key words to describe the plant. On the top index card the team should write its observations, and then flip their comments to the back of the stack so that the next team will not see their comments. [Alternatively, they should write on the first lines of the paper, then cover their comments with the dark construction paper.]
5. Depending on the age of your group, give the children 2 -5 minutes at each plant station. Upon your signal, all children should rotate with their partner(s) to the next plant. [The plants and comments do not move.] [Groups A and B are performing identical tasks at the same time. Each group of teams will be rotating, independently of the other group's teams, looking at the same four to seven different species of plants. It is important that both groups are essentially looking at the same plants. This is why you need two examples of each plant.]
   [Alternatively, you could use unique plants in each group. The exercise will take a little longer and be slightly more challenging. Children will need more time to observe the other group's novel plants later in the exercise.]
6. Once all the children have observed all the plants within their group, collect the index cards [or pages of comments.] Keeping the group A comments separate from the group B ones, mix up the numerical order of the cards [pages.] [The comments should not have the actual plant number indicated anywhere on them, only the corresponding color code.]
7. The two groups, A and B, should now switch places. The children from group A will be working with the B plants, and vice versa.
8. Pass out a stack of index cards [or comments page], now randomly mixed up, to each team. Instruct the children to identify which plant is described by the comments on their cards [page.] Teams should be encouraged to help each other if they are having difficulty. [If groups A & B are viewing different plants, children will need extra time here to become acquainted with the new group of plants.]
9. Once all the comments have been matched to plants, have each team present its plant and read aloud its comments to the rest of the group. [If groups A & B are viewing different plants, the group will need extra time to observe each plant as it is presented.] The group should decide whether or not it agrees with the team's choice.
10. After all the teams have presented, pass out the color key. Have the children confirm whether or not their matches were accurate.

Follow-up questions for discussion:

1. How were the comments recorded about the same plant, but by the different teams, similar? How were they different? [If groups A & B are viewing the same plants, children can compare and contrast their own observations of a given plant with their classmates' observations.]
2. Which observations were most helpful to you in identifying a plant? Explain why,
3. Did you disagree with any of your classmates' comments? Defend your ideas.
4. Were you surprised or entertained by any of your classmates' comments? Explain.
5. What new ideas about ways to describe plants did you discover? Can you brainstorm yet others?
6. Describe ways in which the plants you observed are similar and different.

Lesson 4: Create-a-Plant

Connecticut Science Standards

- 3.2 Organisms can survive and reproduce only in environments that meet their basic needs.

National Science Standards

- Each plant or animal has different structures that serve different functions in growth, survival, and reproduction. For example, humans have distinct body structures for walking, holding, seeing, and talking.
- Many characteristics of an organism are inherited from the parents of the organism, but other characteristics result from an individual's interactions with the environment. Inherited characteristics include the color of flowers and the number of limbs of an animal. Other features, such as the ability to ride a bicycle, are learned through interactions with the environment and cannot be passed on to the next generation.

Time: 2 session (1 hour each)

Grade level: 3rd

Grade level expectations (objectives)

- Students will apply their knowledge of plant parts and adaptations to design a plant that could survive in a chosen biome.

Performance expectations (CMT expected performance)

- B3 Describe how different plants and animals are adapted to obtain air, water, food and protection in specific land habitats.

- B4 Describe how different plants and animals are adapted to obtain air, water, food and protection in water habitats.

Materials

Session 1:

- Detailed pictures of a rainforest, desert, an aquatic environment and a temperate environment
- Chart paper (or SMART board or whiteboard)
- Crayons, colored pencils, and/or markers
- Create a plant design sheet

Session 2:

- Resource books and web links listed in the lesson
- Construction paper
- Paper mache
- Fabric
- Tempura paints
- Glue

- Cardboard tubes
- Q-tips
- Clay
- Tape
- Toothpicks
- Buttons
- Thread
- Thread spools
- Cotton
- Corks
- Straws
- Packing peanuts

Teacher Information and Background

In this creative activity students take what they learned about plant adaptations in the previous lessons and apply that to the creation of a "new" plant. Students should create a plant that can survive in either a rainforest, a desert, an aquatic environment, or a temperate environment. They will need to support their creation with specific information about how each part of the plant is suited to the chosen biome. NOTE: We live in a temperate environment, so that is why it is included in this activity.

Biome	Water	Temperature	Soil	Plants
Desert	Almost none	Hot or cold	Poor	Sparse (succulents)
Rainforest	Very wet	Always warm	Poor, thin soil	Many plants
Aquatic	Very wet	Warm or cold	Nutrient-rich	Many plants
Temperate	Adequate	Cool and warm seasons	Fertile soil	Many plants

Session 1 Procedures

1. Tell the class that today we will "visit" a rainforest, a desert, an aquatic environment and a temperate environment.
2. Break the class into four groups.
3. Give each group a picture of one of the four biomes and ask them to discuss the pictures and create a list detailing what's found in that environment. Tell them to look closely at the plants and discuss features of the plants that make them suited to the environment.
4. Have each group present distinguishing features from their environment. Create a four-column chart on chart paper or the board listing their results. Students will use this as reference later in the lesson.
5. Discuss what environments have overlaps in plant features and why that is the case.
6. Tell students that they are going to design a plant that could survive in one of the four biomes. They will need to consider the roots, stem, leaves and flowers. They may consider other parts of the plant as well.
7. Give students a Create a Plant Design Plan sheet. Review the sheet with them and answer any questions. Tell them that they will complete the sheet and a sketch. After you have approved their design plans they will construct their plant.

8. Have students select a biome and complete the planning sheet. Students will also need to sketch the plant. Instruct students to bring their completed design plan and sketch to you for approval before they may begin creating their plant. Make them aware that there are print materials and websites available for review or to do research for their plant designs.
9. As students complete their design plans, meet with them and discuss the viability of their choices. Then discuss materials that could be used to create their plants.

Session 2 Procedures

1. Set out the materials for session 2 on a table.
2. Have students take out their design plans and collect materials they will need for creating their plants. Allot them 30 minutes for creating their plants.
3. Label four areas of the room Rainforest, Desert, Temperate, and Aquatic. Have students bring their creations to a display table in the appropriate area of the room.
4. Once everything is set up, have students from each biome present their plants one at a time. Students can take up to three comments or questions from peers about the plant they designed.
5. Once all plants have been presented discuss:
    - Which biome was most popular? Why?
    - Which adaptations were most often chosen? Why?
    - Do you think plants ever move from one environment to another?
    - Which biomes might be likely to have similar plants? Why?

Evaluation

	Emerging	**Satisfactory**	**Advanced**
Design plans	My design plans included basic information and a basic sketch	My design plans included some detailed information and a complete drawing	My design plans included detailed information and a detailed drawing
Biome choice	I chose a biome that we talked about in class and that I already knew a lot about.	I chose a biome that I knew a little about already.	I chose a biome I knew little about and had to research further on my own.
Plant features	I gave basic information about one, two or three parts of the plant.	I gave basic information about four part plants. Some of my information is more detailed.	I gave detailed information about more than for plant parts.
Vocabulary use	I didn't use specific plant vocabulary.	I used some specific vocabulary I learned during the plant unit.	I used a lot of specific plant vocabulary I learned during the plant unit.

Suggested Readings

Plants in Different Habitats (2006). Kalman, Bobbie. Crabtree Publishing

Plant Habitats (2003). Spilburg, Richard. Heinemann Library

Crabtree Publishing: Introducing Habitats Series:

- *A Desert Habitat*
- *A Forest Habitat*
- *A Rainforest Habitat*
- *Land Habitats*
- *Water Habitats*

Plants in Our World (2006). Delta Science Reader

Delta Education: Growing Flowers Library

- *Leaves*
- *Seeds*
- *Stems*
- *Flowers*

Web links

- University of California Museum of Paleontology The World's Biomes http://www.ucmp.berkeley.edu/exhibits/biomes/index.php
- Biology online http://www.biology-online.org
- Biozone http://www.biozone.co.nz/PLANT_BIOLOGY.html
- Missouri Botanical Garden MGBnet http://www.mbgnet.net

Vocabulary

- **Roots**: stilt, tap root, buttresses, aerial roots
- **Leaves**: waxy, drip tip, broad leaf, feathery
- **Stems**: waxy, spin or prickles, thorny
- **Flowers**: composite flower, trumpet flower, umbel flower

Credits

Shelby Irwin, Janie Lange, Kim Savoia, Melissa Socolow, Kel Youngs

Extensions

- Students can invite other classes to view their creations.
- Students can discuss adapting an existing plant to help it survive in a different, non-native biome.
- Students can explore invasive plants that have invaded a biome. The impact on native plants can be discussed as well.

FOURTH GRADE

Title of Lesson: Identifying Common Trees in the Schoolyard

Connecticut Science Content Standards:
4.2- All organisms depend on the living and nonliving features of the environment for survival.

National Science Standards:
Content Standard C: As a result of activities in grades K-4, all students should develop understanding of the characteristics of organisms, life cycles of organisms, and organisms and environments.

Content Standard G: As a result of activities in grades K-4, all students should develop understanding of science as a human endeavor.

Length of Lesson: 60 minutes

Grade Level: Grade 4

Subject Area: Science (Plant Study)

Credit: Creating a Dichotomous Key from *Bridges to the Natural World* 2003 New Jersey Audubon Society (found in No Student Left Indoors by Jane Kirkland, pg 95-97)

Grade Level Expectations:
B INQ.1 Make observations and ask questions about objects, organisms and the environment.

B INQ.2 Seek relevant information in books, magazines and electronic media.

CMT Expected Performance Expectations:
B10. Describe how animals, directly or indirectly, depend on plants to provide the food and energy they need in order to grow and survive.

Materials:
Student copies of Making a Dichotomous Key (pg 97) on 11x17 paper for larger writing space

Student copies of pages: Leaf Characteristics (two pages), and Common Deciduous Trees of New England (found in SNAP notebook)

10 Tree Field Guides

Nature Journals

Vocabulary:
Dichotomous key
A tool that people use to help organize scientific information so it can be identified more easily.

Veins
The tubes that carry nutrients to parts of a leaf.

Lobed
A leaf with rounded edges.

Arrangement
The patterns of how leaves are attached to stems.

Simple Arrangement
The leaf is a single blade.

Compound Arrangement
The leaf is composed of leaflets, each of which looks like a small leaf.

Teacher Information and Background:
Teachers should be familiar with how to use and make a dichotomous key. Teachers should also be familiar with common deciduous trees found in the schoolyard. The goal of this first lesson for students to develop observation and classification skills while gathering leaves, recording in their nature journals, and sharing findings with classmates.

Procedures:

1. Follow the Creating a Dichotomous Key activity beginning with identifying the characteristics of classmates as practice for informally classifying leaves from the schoolyard trees.
2. Students will choose one tree on the school ground about which to make a journal entry using such features as color and texture of the bark, overall shape of the tree, color and shape of leaves, thorns, berries, acorns, seeds, or flowers.
3. After journaling, pairs of students, will collect eight different leaves from the ground and return to the classroom to create a dichotomous key. Students will need copies of the two leaf characteristics pages and dichotomous key form.

4. Have pairs of students meet to share their keys with one another. You many want to have some pairs share with the whole class. Or, students could exchange dichotomous keys and use them to classify their own leaves.
5. The teacher will distribute to each group of students copies of Common Deciduous Trees of New England and the tree field guides. Students will attempt to name the trees from which their leaves came.
6. Display students' work so that students can become familiar with common trees found in the schoolyard.

Evaluation

	1	2	3
Accuracy	The student-created key successfully isolates 1-3 leaves.	The student-created key successfully isolates 4-6 leaves.	The student-created key successfully isolates 7-8 leaves.
Participation	Student does not follow directions and does not participate cooperatively with group members.	Student inconsistently follows directions and/or participates cooperatively with group members.	Student follows directions and participates cooperatively with group members.

Suggested Readings

Keeping a Nature Journal by Clare Walker Leslie & Charles E. Roth

Web Links

http://students.ed.qut.edu.au/n2364379/mdb377/dichotomouskey.html
This site has students choose an animal to classify, and then has them answer appropriate questions to identify the animal.

http://www.enchantedlearning.com/subjects/plants/activity/key.shtml
This site describes to teacher and students how to construct a dichotomous key.

www.ct-botanical-society.org
This site features pictures and reference information.

Title of Lesson: Leaf Ratios

Connecticut Science Content Standards:
4.2- All organisms depend on the living and nonliving features of the environment for survival.

National Science Standards:
Content Standard C: As a result of activities in grades K-4, all students should develop understanding of the characteristics of organisms, life cycles of organisms, and organisms and environments.

Content Standard G: As a result of activities in grades K-4, all students should develop understanding of science as a human endeavor.

Length of Lesson: 2-3 sessions

Grade Level: Grade 4

Subject Area: Science (Plant Study), Mathematics (Ratios)

Credit:

Grade Level Expectations:
B INQ.1 Make observations and ask questions about objects, organisms and the environment.

B INQ.3 Design and conduct simple investigations.

B INQ.4 Employ simple equipment and measuring tools to gather date and extend the senses.

B INQ.5 Use data to construct reasonable explanations.

B INQ.9 Use measurement tools and standard units (e.g., centimeters, meters, grams, kilograms) to describe objects and materials.

B INQ.10 Use mathematics to analyze, interpret and present data.

CMT Expected Performance Expectations:
B10. Describe how animals, directly or indirectly, depend on plants to provide the food and energy they need in order to grow and survive.

CT Mathematical Content Standards:
Numeric and Proportional Reasoning

2.1 Understand that a variety of numerical representations can be used to describe qualitative relationships.

Geometry and Measurement

3.3 Develop and apply units, systems, formulas and appropriate tools to estimate and measures.

Working with Data: Probability and Statistics

4.2 Analyze data sets to form hypotheses and make predictions.

Materials:
One leaf for each student from the same kind of tree (simple shape)

Metric ruler

String

Tape

Calculators

Vocabulary:
Perimeter
The measured distance around the outer edge of a shape.

Ratio
The proportional relationship between two numbers.

Midrib
The vein that runs from the base of the leaf to the opposite end of the leaf.

Teacher Information and Background:
Students will need previous work with ratios to understand relationships between numbers (especially multiplication and division). Teachers will need to know that each variety of tree has its own unique ratio. Teachers should try to guide students to choose leaves with simple shapes for more accurate measuring.

Procedures:

1. Is there a relationship between the midrib vein and the perimeter of a leaf?
2. Each student will need a ruler, leaf, string, piece of tape, paper, and pencil.
3. Have each student record the midrib length of their leaf using centimeters.
4. Have each student record the perimeter around the leaf using string and tape, measured in centimeters.
5. Record class information on the board using the chart below:

	Midrib Vein (cm)	Perimeter (cm)
Student 1		
Student 2		
Student 3		

6. Have students look at data and discuss observations. The teacher should guide students to look for number relationships between the midrib vein and the overall perimeter. (Sample data below)

	Midrib Vein (cm)	Perimeter (cm)
Student 1	6.5	39.2
Student 2	8.4	54.6
Student 3		

- The ratio is about 6 for the above data.

7. After students have discovered the numerical relationship for this leaf, have students pose further questions to investigate. (ex. Does this same relationship exist in other kinds of leaves?)
8. Have students work in small groups of at least 4 students to conduct investigations. (ex. Each group should go outside and select four different sized leaves from a new kind of tree.)
9. Have students share the findings of their investigation with their class.
10. Optional: You may want to repeat this activity with circles of different sizes and guide students to discover the relationship between circumference and diameter, and introduce the concept of pi.

Evaluation

	1	2	3
Geometry and Measurement	Few to no measurements are accurate.	Some measurements are accurate.	All measurements are accurate.
Numeric and Proportional Reasoning	Student makes no or inaccurate conclusions about number ratios.	Student makes simple conclusions about number ratios.	Student makes accurate and more complex conclusions about number ratios.
Working with Data: Probability and Statistics	Student makes no or inaccurate predictions about investigation.	Student makes simple predictions about investigation.	Student makes predictions and plans investigations to test them.

Suggested Readings

Sir Cumference and the Dragon of Pi by Cindy Neuschwander

Web Links

www.illuminations.nctm.org

Further investigations about pi and a large library of online activities.

Grade 4 Materials List

10 Tree Field Guides

String

25 Binoculars

25 Handheld Magnifying Lenses

Grade 4 Book List

Keeping a Nature Journal by Clare Walker Leslie & Charles E. Roth

The Field Guide to Wildlife Habitats of the Eastern United States by Janine M. Benyus

Webs of Life: Oak Tree by Paul Fleisher

Oak Tree by Gordon Morrison

Journeys: Learning Activities from the Monarch Teacher Network

The Ecosystem of a Milkweed Patch Elaine Pascoe. Rosen Publishing, NY, c2003 ISBN: 0823963098. *This colorful book explores how a milkweed patch grows, what insects thrive there, and how Monarch butterflies depend on the milkweed in many ways. All four seasons in a milkweed patch are detailed with a scientific vocabulary that is accessible to the reader through clear descriptions and a full glossary.*

Other

Copies of PowerPoint presentation: Milkweed Community, along with presentation notes

Grade 4 Extra Wish List

Sir Cumference and the Dragon of Pi by Cindy Neuschwander

Garden Insects of North America: The Ultimate Guide to Backyard Bugs. The Forgotten Pollinators, Bushmann, Stephen & Gary Nabhan, Island Press, Washington DC, 1996. *Explores the vital but little appreciated relationship between plants, the animals they depend on for reproduction and the evidence that pollinators are declining around the world.*

The Milkweed Garden and Its World of Animals Ada and Frank Graham, Doubleday and Co, NY, 1976. ISBN 0-385-09932-0. *The ecology of milkweed and the variety of insects that are connected to it.*

Insects and Gardens: In Pursuit of a Garden Ecology, Grissell, Eric, Timber Press, Portland OR, 2001. *An introduction to the important role of insects in gardens.*

Milkweed Bugs, Donna Schaffer, Bridgeton Books, 1999, ISBN 0-7368-0208-8, *life cycles-juvenile literature*

Milkweed, Monarchs and More. Ba Rea, Karen Oberhauser and Michael Quinn. Bas Relief Pub Group, Glenshaw, PA, 2003, 0-965-7472-2-0

Grade 4 Credit Requests

Creating a Dichotomous Key from *Bridges to the Natural World* 2003 New Jersey Audubon Society (found in No Student Left Indoors by Jane Kirkland, pg 95-97)

Journeys: Learning Activities from the Monarch Teacher Network- Monarch Teacher Network, www.monarchteachernetwork.org (PowerPoint presentation)

Title of Lesson: Milkweed

Connecticut Science Content Standards:
4.2- All organisms depend on the living and nonliving features of the environment for survival.

National Science Standards:
Content Standard C: As a result of activities in grades K-4, all students should develop understanding of the characteristics of organisms, life cycles of organisms, and organisms and environments.

Content Standard G: As a result of activities in grades K-4, all students should develop understanding of science as a human endeavor.

Length of Lesson: minimum 1 week

Grade Level: Grade 4

Subject Area: Science (Plant and Animal Interdependency)

Credit: Journeys: Learning Activities from the Monarch Teacher Network- Monarch Teacher Network, www.monarchteachernetwork.org

Grade Level Expectations:
B INQ.1 Make observations and ask questions about objects, organisms and the environment.

B INQ.2 Seek relevant information in books, magazines and electronic media.

B INQ.7 Read and write a variety of science-related fiction and nonfiction texts.

B INQ.8 Search the Web and locate relevant science information.

CMT Expected Performance Expectations:
B10. Describe how animals, directly or indirectly, depend on plants to provide the food and energy they need in order to grow and survive.

B11. Describe how natural phenomena and some human activities may cause changes to habitats and their inhabitants.

Materials:
Journeys: Learning Activities from the Monarch Teacher Network

The Ecosystem of a Milkweed Patch Elaine Pascoe. Rosen Publishing, NY, c2003 ISBN: 0823963098. *This colorful book explores how a milkweed patch grows, what insects thrive there, and how Monarch butterflies depend on the milkweed in many ways. All four seasons in a milkweed patch are detailed with a scientific vocabulary that is accessible to the reader through clear descriptions and a full glossary.*

PowerPoint presentation: Milkweed Community, along with presentation notes

25 Handheld Magnifying Lenses

Vocabulary:
Ecosystem
An environment where diverse living organisms interact with each other and the habitat to form a community.

Community
A group of organisms living in the same area.

Teacher Information and Background:
This lesson will require some preparation:

1. Locate one or more milkweed plants on or near school property.
2. Read milkweed information in resources to familiarize yourself with the ecosystem.
    a. Milkweed, Shmilkweed
    b. Milkweed Community

Procedures:

1. Bring students outside to observe milkweed. Have students record in their nature journals what they observe about the milkweed and it's surroundings (see Identifying Schoolyard Trees lesson for specific characteristics to look for).
2. Gather students and read The Ecosystem of a Milkweed Patch to the class. Discuss what students might see, depending on the current time of year. Ask students to share their own experiences with milkweed.
3. Show students PowerPoint presentation of the milkweed community. Follow the presentation notes as students discuss the various parts of the community.
4. Bring students back to the same patch and have them make a new entry in their nature journals. Guide them to be specific about evidence that other organisms depend on this plant as a resource.

5. Students may wish to adopt the milkweed patch and make periodic observations throughout the year. Students may also wish to bring some organisms back to the classroom for closer observation and then later return them to the milkweed patch.

Evaluation

	1	2	3
Sketching	Some crude sketches but they are unclear or inaccurate in their representation.	Some sketches made that clearly represent what was observed.	All sketches are clear and show understanding of what was observed.
Vocabulary	No or few words used or words used incorrectly.	Few or several new words used, and most are used correctly.	Many new words used and all are used correctly.

Suggested Readings

Garden Insects of North America: The Ultimate Guide to Backyard Bugs. The Forgotten Pollinators, Bushmann, Stephen & Gary Nabhan, Island Press, Washington DC, 1996. *Explores the vital but little appreciated relationship between plants, the animals they depend on for reproduction and the evidence that pollinators are declining around the world.*

The Milkweed Garden and Its World of Animals Ada and Frank Graham, Doubleday and Co, NY, 1976. ISBN 0-385-09932-0. *The ecology of milkweed and the variety of insects that are connected to it.*

Insects and Gardens: In Pursuit of a Garden Ecology, Grissell, Eric, Timber Press, Portland OR, 2001. *An introduction to the important role of insects in gardens.*

Milkweed Bugs, Donna Schaffer, Bridgeton Books, 1999, ISBN 0-7368-0208-8, *life cycles-juvenile literature*

Milkweed, Monarchs and More. Ba Rea, Karen Oberhauser and Michael Quinn. Bas Relief Pub Group, Glenshaw, PA, 2003, 0-965-7472-2-0

Web Links

www.learner.org/jnorth
This site offers information on many different migratory animals, along with a symbolic butterfly migration.

www.ct-botanical-society.org
This site features pictures and reference information.

http://www.lifestrands.org/pages/monarch_studies/about_milkweed.html
Features up-close pictures of milkweed.

Extensions

Have students choose an organism that depends on the milkweed have them research the organism. Create a visual display of the milkweed habitat and research to communicate with other students.

Students could study the life cycle of the monarch butterfly, and study the migration patterns.

Title of Lesson: Oak Tree

Connecticut Science Content Standards:
4.2- All organisms depend on the living and nonliving features of the environment for survival.

National Science Standards:
Content Standard C: As a result of activities in grades K-4, all students should develop understanding of the characteristics of organisms, life cycles of organisms, and organisms and environments.

Content Standard G: As a result of activities in grades K-4, all students should develop understanding of science as a human endeavor.

Length of Lesson: minimum 1 week

Grade Level: Grade 4

Subject Area: Science (Plant and Animal Interdependency)

Credit:

Grade Level Expectations:
B INQ.1 Make observations and ask questions about objects, organisms and the environment.

B INQ.2 Seek relevant information in books, magazines and electronic media.

B INQ.7 Read and write a variety of science-related fiction and nonfiction texts.

B INQ.8 Search the Web and locate relevant science information.

CMT Expected Performance Expectations:
B10. Describe how animals, directly or indirectly, depend on plants to provide the food and energy they need in order to grow and survive.

B11. Describe how natural phenomena and some human activities may cause changes to habitats and their inhabitants.

Materials:

The Field Guide to Wildlife Habitats of the Eastern United States by Janine M. Benyus

Webs of Life: Oak Tree by Paul Fleisher

Oak Tree by Gordon Morrison

25 Binoculars

25 Handheld Magnifying Lenses

Vocabulary:

Teacher Information and Background:

This lesson will require some preparation:

1. Locate one or more oak trees on school property.
2. Read trade books cited in materials to gain background knowledge.
    a. The Field Guide to Wildlife Habitats of the Eastern United States- pages 260-271 describe the oak-hickory forest habitat. The section, *What's in it for Wildlife?* and paragraphs about wild turkeys and gray squirrels build the animal-plant relationships.
    b. Webs of Life: Oak Tree- Book describes the cycle of the oak tree through the seasons, the many animals that depend on the tree for food and shelter, and the forest ecosystem. (This would be an appropriate read aloud or guided reading book)
    c. Oak Tree- The text of this book provides a detailed and extensive picture of the oak tree, the animals which depend on it, and the forest ecosystem.
3. If not already familiar with the process of nature journaling, refer to Keeping a Nature Journal by Clare Walker Leslie & Charles E. Roth.

Procedures:

1. Bring students outside to observe an oak tree. Have students record in their nature journals what they observe about the oak tree and it's surroundings (see Identifying Schoolyard Trees lesson for specific characteristics to look for).
2. Gather students and read Webs of Life: Oak Tree to the class. Discuss what students might see, depending on the current time of year. Ask students to share their own experiences with oak trees.
3. Bring students back to the same tree and have them make a new entry in their nature journals. Guide them to be specific about evidence that other organisms depend on this tree as a resource.

4. Students may wish to adopt the tree and make periodic observations throughout the year. Nature journal entries could include the changes that occur through the year. Students may also wish to adopt an oak tree at home.

Evaluation

	1	2	3
Sketching	Some crude sketches but they are unclear or inaccurate in their representation.	Some sketches made that clearly represent what was observed.	All sketches are clear and show understanding of what was observed.
Vocabulary	No or few words used or words used incorrectly.	Few or several new words used, and most are used correctly.	Many new words used and all are used correctly.

Suggested Readings

Keeping a Nature Journal by Clare Walker Leslie & Charles E. Roth

Web Links

http://streaming.discoveryeducation.com/
Username and password required. Search "oak" to find videos related to topic.

www.ct-botanical-society.org
This site features pictures and reference information.

Extensions

See Tree and Tree Math activities where students measure circumference, height, and branch spread of a tree.

Have students choose an organism that depends on the oak tree and have them research the organism. Create a visual display of the oak habitat and research to communicate with other students.