

# **FOREST ECOSYSTEM**

Teaching Unit for 4<sup>th</sup> Grade

Submitted by Ann Sroka, Anchor Bay School District  
ED 5630 Forest Ecology & Resource Teacher Institute, June 2009

**Target Grade and Subject** – This thematic unit is developed to target elementary students (4<sup>th</sup> grade).

## **Unit Overview**

This forest unit is part of an Ecosystem unit that covers the major types of ecosystems in Michigan (Great Lakes, rivers/streams, forests, wetlands, coastal dunes, urban areas, and agriculture) to give students a basic understanding of ecological principals within these areas.

The forest unit will give students the opportunity to learn about a forest habitat. Key concepts: food chains and food webs; basic needs in a forest ecosystem; parts of a tree; tree identification; social, economic, and ecological importance of this ecosystem; and historical examples of positive and negative impact by humans.

Five lessons are written out, but attached you will find a two week outline that will cover lessons within this thematic unit

The students will:

- observe the local forest ecosystem, defining the biotic and abiotic parts of the forest.
- observe and identify the groundcover, understory and canopy layers of the forest
- collect leaves, observe bark, buds and tree shape to identify correctly major hardwoods in their local forest
- be able to identify the parts of a tree
- infer the necessity to be able to identify tree species
- determine their use of the forest and forest species
- learn about the historical examples of positive and negative impacts by humans
- understand the need to manage a forest
- keep a journal of their observations in the forested area
- identify invasive, non-native species and understand the reason they are here
- trace the flow of energy through the forest ecosystem
- develop a presentation regarding what they have learned about the forest ecosystem. This could be a poster, powerpoint presentation, diorama, play, front page of a newspaper, interview, etc.

## **Resources Consulted:**

1. Ecosystems & Biodiversity, Michigan Environmental Education Curriculum Support, Michigan Department of Environmental Quality, pages
2. American Forest Foundation. Project Learning Tree: Environmental Education PreK-8 Activity Guide, 2003
3. Lilleskov, E., Trees: ID and Introduction to their Ecological Traits lecture, Forest Ecology Teacher Institute, June 2009.

4. Nagel, L., Forest Ecology lecture, Forest Ecology Teacher Institute, June 2009
5. DNR Millennium Education Project, Do L.A.P.s – EDCO Publishing, Inc. 1999

## **LESSON ONE: READ ALOUD – In A Nutshell**

**OBJECTIVE:** The students will observe the forest ecosystem, identifying the biotic and abiotic parts.

### **BENCHMARKS:**

S.IP.E.1 Inquiry involves generating questions, conducting investigations, and developing solutions to problems through reasoning and observation.

S.IP.04.11 Make purposeful observation of the natural world using appropriate senses.

S.IP.04.12 Generate questions based on observations.

### **MATERIALS:**

In a Nutshell, by Joseph Anthony

Journal designated for Nature Area

Pencil

### **ACTIVITY:**

Read Aloud: In A Nutshell, by Joseph Anthony,

Have a discussion regarding the book, utilizing the students' prior knowledge of abiotic and biotic components of an ecosystem, basic needs, and nature's cycles. (quick assessment of introductory lesson of ecosystems)

Journal Entry:

Take a 30 minute hike through the wooded section of the Nature Area, listing abiotic and biotic components of this ecosystem. (use Nature Area Journal)

Reminders prior to departure of classroom:

1. We are going to the nature area to be scientists; you need to be quiet using four of your five senses, feeling, hearing, smelling, and seeing to make observations.
2. Record date and time
3. Your assignment is to record the different abiotic and biotic (living and nonliving) components you see in the wooded environment.

### **ASSESSMENT:**

The ability to identify abiotic and biotic components within this environment, page should be full.

## **LESSON TWO: FIELD INVENTORY, PLOT LAYOUT**

**OBJECTIVE:** Plot Layout, students will select an area within a manageable sight for teacher/adult volunteers (within sight). Each group will make their circular 1/10 acre plot (37.2 ft radius). Marking the center with a flag and tying ribbon on trees at cardinal directions N, NE, E, SE, S, SW, W, NW, 37.2 ft. from plot center (making it easier for 4<sup>th</sup> grade students to visualize circle). Students will then take tree inventory of their plot.

*This plot will be used for multiple lessons throughout the year.*

### **BENCHMARKS:**

S.IP.04.14 Manipulate simple tools that aid observation and data collection

S.IP.04.15 Make accurate measurements with appropriate units for the measurement tool

M.UN.04.01 Measure using common tools and appropriate units

### **MATERIALS:**

Flag sticks

Pink ribbon, plot ribbon

Pink string, measuring 37.2 ft

Green ribbon sticks, subplot ribbon

Green string, measuring 2.63ft

### **ACTIVITY:**

1. Determine center of plot and place flag
2. Using the Bright Pink String made the day before with a measurement of 37.2 ft. make the 1/10 acre plot
  - a. have Person A stationary at center of plot (at flag) holding string
  - b. have Person B at the other end of string walk out from center 37.2 ft. in each direction
  - c. have Persons C & D follow Person B with Pink Ribbon to tie around tree or sapling. (if tree is not available a stake will be placed with ribbon) *making sure that ribbon is tied tightly-not wanting to litter*
3. CAN YOU HUG A TREE: the students will then count the number of trees that are in their plot that have a diameter that is the same or larger then the diameter of their arms put together. Students will record this information in to their Nature Area Journal.
4. Saplings: count the number of trees that are between 0.5 and 3.9 inches (this will only be an estimation, but samples of size will be shown to students) Students will record this information into their Nature Area Journal
5. Using the Green String a subplot will be made, this string has a measurement of 2.63 ft., Green Flags will be used to indicate edges of diameter.
  - a. have Person A stationary at center of plot
  - b. have Person B at the other end of string walk out from center 2.63 ft.
  - c. have Person C place flag at measurement
6. Seedlings: count the number of seedling within the subplot (>.5 inches) Students will record this information into their Nature Area Journal
7. When finished counting seedlings remove green flags and center flag
8. Have Students walk around plotted area and indicate in their journal if there is any ground flora (small plants, shrubs other than seedlings and saplings) Have them estimate the percentage of ground cover

**ASSESSMENT:** participation in activity, completion of plot layout, and the journal entries of data collected.

## **LESSON THREE: TREE STRUCTURE AND THE JOB THAT STRUCTURE PERFORMS FOR THE HEALTH OF THAT TREE**

**OBJECTIVE:** The students will learn that all organisms have basic needs. They will demonstrate how the tree obtains its needs.

### **BENCHMARKS:**

L.OL.04.15 – Determine that plants require air, water, light, and a source of energy and building material for growth and repair.

### **MATERIALS:**

Worksheet from LAPS, Can you Unlock the Secret of the Stump, Section Hartwick Pines State Park, HP12

Wood cutting to show Heartwood, Xylem, Cambium, Bark

Script for parts of the tree – Hand out from Forest Ecology Institute 2009

### **ACTIVITY:**

1. Students will be given a hand out regarding the parts of the tree and what their job is to support the tree. As a class we will review the handout.
2. Utilizing the pieces of wood allow the students to pin each section as we repeat where each section (heartwood, xylem, cambium, & bark) is located and what each section accomplishes for the tree allowing it to grow and be healthy.
3. Script: Students will participate in a demonstration of how a tree meets its basic needs. See page B of this lesson

### **ASSESSMENT:**

Students will demonstrate their understanding of this lesson by completing a diagram of a tree identifying the part of the tree and its job.

<p><b>Heartwood = Strength</b></p> <p>- Stand tall and tighten muscles</p> <p>* Chant: I support! I support!</p>	<p><b>Phloem = transports food from leaves to rest of tree</b></p> <p>- Join hands and form large circle around tree. Reach above heads and grab for food from leaves</p> <p>* Chant: Food to the tree! Food to the tree!</p>
<p><b>Xylem (sapwood) = transports water and nutrients up from roots to leaves</b></p> <p>- Join hands to form small circle around heartwood.</p> <p>* Chant: Gurgle, slurp! Gurgle, slurp!</p>	<p><b>Cambium = thin layer of growing tissue that becomes new xylem, phloem or cambium to keep tree growing</b></p> <p>- Form circle between phloem and heartwood. Sway from side to side.</p> <p>* Chant: New phloem, sapwood and cambium!</p>
<p><b>Roots = absorbs water from soil for sapwood</b></p> <p>- Lie down with feet next to sapwood. Fingers and hands spread out to represent root hairs.</p> <p>* Make sucking noises!</p>	<p><b>Bark = protects the tree</b></p> <p>- Lock arms around tree, and face outward. Look tough!</p> <p>*Chant: We are bark! Please keep out!</p>
<p><b>Leaves = make food through photosynthesis</b></p> <p>- Hold string attached to heartwood. Flutter hands.</p> <p>* Chant: We make food; we make food!</p>	<p><b>Leaves = make food through photosynthesis</b></p> <p>- Hold string attached to heartwood. Flutter hands.</p> <p>*Chant: We make food; we make food!</p>

## **LESSON FOUR: TREE IDENTIFICATION**

### **OBJECTIVE:**

Students will use leaves, tree shape, bark and buds to identify trees within their plot.

### **BENCHMARKS:**

Compare and Classify organisms into major groups on basis of their structure

L.EV.04.21 Identify individual differences in organisms of the same kind

L.EV.04.22 Identify how variations in physical characteristics of individual organisms give them an advantage for survival and reproduction

### **MATERIALS:**

Tree identification guides for Michigan Trees

Tree Identification Key – Leaf Guide 7-8 Unit, Wisconsin’s K-12 Forestry Education

Glossary of Terms Used in Tree Id Key – provided by Forest Ecology Teacher Institute 2009

Power Point by Erik Lilleskov, Research Ecologist, Forest Ecology Teacher Institute 2009

Power Point by Dr. Linda Nagel, Associate Professor of Silviculture, Forest Ecology Teacher Institute 2009

5 or more of the same depending on the number of students - Leaf, branch, bark, and seed

### **ACTIVITY:**

1. Utilizing powerpoint presentation to discuss key concepts of tree and key ecological terms, disturbance & succession. Utilize pictures of farmland, abandon farmland, wooded area, etc. to show succession within school area.
2. Introduce tree identification key and guides
3. Read together the glossary of the terms used in the Tree Id Key
4. Read through the guide following the flow of the key
5. Utilizing the leaf, branch, bark, and seed go through the key and try to identify the tree
6. Demonstrate, journal entry expectations
  - a. identify two trees by using the handouts given
  - b. collect a branch, leaf, a bark rub, and a seed if possible, place items in bag (don't forget to label bag, tree 1 or tree 2)
  - c. in their journals, they should use at least 2 pages for each tree, label tree 1 or tree 2  
write down the steps they took to identify the tree  
describe the tree and its surroundings
  - d. when they return to their desks, they will glue the tree specimens collected into their journals making sure that they are matching the correct tree specimens with the appropriate entry.
  - e. when dried students will label  
leaf – lobed, not lobed; compound, simple; etc.  
branching – alternate, opposite; etc.

DON'T FORGET TO DATE ENTRY.

### **ASSESSMENT**

In their Nature Area Journals have the students answer the following question. Why would it be important to be able to identify trees?

## **LESSON FIVE: TREE IDENTIFICATION, FIELD STUDY**

### **OBJECTIVE:**

Students will use leaves, tree shape, bark and buds to identify trees within their plot.

### **BENCHMARKS:**

Compare and Classify organisms into major groups on basis of their structure

L.EV.04.21 Identify individual differences in organisms of the same kind

L.EV.04.22 Identify how variations in physical characteristics of individual organisms give them an advantage for survival and reproduction

### **MATERIALS:**

Tree identification guides for Michigan Trees

Tree Identification Key – Leaf Guide 7-8 Unit, Wisconsin’s K-12 Forestry Education

Glossary of Terms Used in Tree Id Key – provided by Forest Ecology Teacher Institute 2009

Nature Area Journal

Pencil

Ziplock bag (2)

### **ACTIVITY:**

1. Review tree identification key and guides
2. Read together the glossary of the terms used in the Tree Id Key
3. Remind students that they are going out to the Nature Area as scientists
4. Their job is to
  - a. identify two trees by using the handouts given
  - b. collect a branch, leaf, a bark rub, and a seed if possible, place items in bag (don’t forget to label bag, tree 1 or tree 2)
  - c. In their journals, they should use at least 2 pages for each tree, label tree 1 or tree 2  
write down the steps they took to identify the tree  
describe the tree and its surroundings
5. After approximately 30 minutes outdoors return to the classroom with materials and specimens collected.
6. Students will return to their desks and will glue the tree specimens collected into their journals making sure that they are matching the correct tree specimens with the appropriate entry.
7. When dried students will label
  - leaf – lobed, not lobed; compound, simple; etc.
  - branching – alternate, opposite; etc.
  - needles

**DON’T FORGET TO DATE ENTRY.**

### **ASSESSMENT**

In their Nature Area Journals complete entries, which will include steps it took to find the identification of the trees, the trees’ surroundings, and the items collected glued onto the pages and parts labeled

**THIS LESSON WILL BE REPEATED THROUGHOUT THE YEAR**

ECOSYSTEMS: FOREST

Week 1

SUBJECT	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Lang. Arts Reading Writing Research	Class Book: Journey Back to Lumberjack Camp by Janie Lynn Panagopoulos Chapters 1&2 Before, During, and After Reading Questions (BDARQ)	Class Book: Journey Back to Lumberjack Camp Chapters 3&4 BDARQ  With the discussion of who may have worked in the camps, types of jobs, and rules of the camp.  A list of jobs will be posted and the students will be asked to select a job to research.  Students will be asked to find Job duties Tools needed Nickname Special clothing needed	Class Book: Journey Back to Lumberjack Camp Chapters 5 & 6 BDARQ  Go to the computer Lab and have students research their job of choice.	Class Book: Journey Back to Lumberjack Camp Chapters 7& 8 BDARQ  Prepare research for tomorrows Breakfast, student is to show up for breakfast as that lumberjack  Dress and tells us about a day in the camp as that lumberjack during our breakfast tomorrow	Class Book: Journey Back to Lumberjack Camp Chapters 9 & 10 BDARQ  Breakfast with the Lumberjacks
Math	Measurements: Diameter Length Practice setting up plot of land	Set up Plot of land *measurements *data collection <i>Lesson2</i>	Geometrical Shapes, review together these shapes.	Using digital camera students will take pictures of geometrical shapes that they can locate within their land plot; only allow 15 minutes	Make Breakfast Students will follow a recipe to make pancakes, using measuring cups

<p>Science</p>	<p>Read Aloud: In A Nutshell, by Joseph Anthony, Have a discussion regarding the book, utilizing their prior knowledge of abiotic and biotic components of an ecosystem, basic needs, and nature's cycles. (Have this discussion prior to going out to the wooded area) Take a 20 minute hike through the forest, listing abiotic and biotic components of this ecosystem. (use nature are journal) <i>Lesson 1</i></p>	<p>Tree Structure and The Job That Structure Performs For The Health of That Tree  <i>Lesson 3</i></p>	<p>Tree Identification lecture  <i>Lesson 4</i></p>	<p>Tree Identification Field Study  <i>Lesson 5</i></p>	<p>Trees as Habitats, Project Learning Tree (22)</p> <p>Tree costume:</p> <p>What am I?</p> <p>Am I important? Why or Why not? Do things depend on me?</p> <p>Lets list the plants and animals that may depend on me.</p> <p>After this discussion, show them the surprises that hide in the bark of the tree, under the leaves, on the branches, at the base of the tree.</p> <p>Tell the students they are going to study a tree from their land plot in nature area, to find out which plants and animals depend on it</p>
----------------	---	--	---	---	---

					or use it in some way. Refer to pg. 70 in PLT
Social Studies	<p>Use of Topographical Maps to help understand the Four Regional Landscapes.</p> <p>Copy of Michigan's Four Regional Landscapes from MEECS pgs 4-5</p> <p>Read together as a class, FOCUS on Southern Lower Peninsula discuss climate, topography, soil types, types of trees</p>	<p>Read: <u>Forest in Michigan</u> and answer questions from LAPS, pgs HP17 &amp; 24</p> <p>This article covers the needs of a tree soil types and moisture, climate, changes caused by people</p>	<p>Discussion of the White Pine and why it was important to the Lumber Barons.</p> <p>GREEN GOLD</p> <p>Discuss the operation of a logging camp.</p>	<p>The students will get seven pictures that represent the start of a logging camp to the final product and they will need to put them in order. Students will work in groups of 3</p>	<p>Name the Product</p> <p>Most of the lumber cut during the great logging days of the Midwest was used to build houses, stores, churches, and other buildings. But many other products were also made of wood at that time and today. What products can you think that are made from trees.</p> <p>Give three minutes to make a list of items.</p> <p>Share items, make a class list.</p>

ECOSYSTEMS: FOREST

Week 2

SUBJECT	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	
Lang. Arts Reading Writing Research	<p>Class Book: Journey Back to Lumberjack Camp by Janie Lynn Panagopoulos Chapter 10 Before, During, and After Reading Questions (BDARQ)</p> <p>Moving the Logs, make their own log mark out of sponge</p>	<p>Class Book: Journey Back to Lumberjack Camp Chapter 11 BDARQ</p> <p>Talk about how Lumberjack's liked to tell and hear tall tales. Some of the most famous of these were the tales about the Lumberjack named Paul Bunyan. Read a few Paul Bunyan stories and then have student try their hand at making up some tall tales of their own</p>	<p>Class Book: Journey Back to Lumberjack Camp Chapter 12 BDARQ</p> <p>What's the Chance of Forest Fire? When the lumberjacks had finished their work they left behind the dead stumps and branches from the tree that they had cut. When these dried they were perfect place for forest fires to start. Talk about how the over harvesting of tree changed the land of Michigan.</p>	<p>Class Book: Journey Back to Lumberjack Camp Chapter 13 BDARQ</p> <p>Have you Thanked a Tree Today? Why are Trees important?</p> <p>Comprehension test on book</p>	<p>READ ALOUD: <u>Grandad's Prayers of the Earth</u>, by Douglas Wood</p> <p>Final Assessment, develop a presentation that will demonstrate what they have learned. Powerpoint, diorama, newspaper article, etc.</p>
Math	Collect different types of tree leaves	Utilize leaves collected yesterday to calculate area, use graphing paper trace leaf and count squares to get area squared. Have	Loggers' Math, worksheet from LAPS, HP 26	Form a survey to collect data from other 4 <sup>th</sup> grade students regarding a topic about the forest ecosystem, use a tally chart to collect responses.	<p>Bar &amp; Line Graphs</p> <p>Discuss the use of graphs and demonstrate the design of the two graphs</p> <p>Have students utilize information</p>

		students infer why a leaf may be bigger than others. What is the leaf's job?		Such as: What is your favorite tree? Do you think it is important to protect the forest? What is your favorite forest animal, wood pecker, bear, deer, etc	collected to develop a bar or line graph.
Science	Ecosystem Scavenger Hunt, MEECS Ecosystem and Biodiversity, lesson extension 1.1 Take students out to nature area to take a closer look	Web of Life, Project Learning Tree, pg. 148	The Fallen Log, Project Learning Tree, pg 72	Nature's Recyclers Learning Tree, pg 75  Every time we go out students will discover more and more things about the forest ecosystem	Wildlife Habitat Riddle Cards, MEECS Ecosystem and Biodiversity Lesson extension 1.2  *Michigan Environmental Education Curriculum Support, Post-Unit Student Assessment, ECOSYSTEMS
Social Studies	READ ALOUD: <u>The Lorax</u> , Dr. Seuss  What was the cost to Michigan for the Green Gold?	Threats and Protections of Michigan Biodiversity  MEECS, Ecosystem and Biodiversity, Lesson 8	Most Unwanted: Invaders of the Great Lakes Region  MEECS, Ecosystem and Biodiversity Lesson 9	Michigan's Threatened Species  MEECS, Ecosystems and Biodiversity Lesson 10	What can we do to protect our natural resources?  Writing assignment.