

## Introduction

*Biodiversity, Conservation & our National Forests* was developed in partnership with the College of Education, Health, and Human Sciences and the College of Agriculture Sciences and Natural Resources at the University of Tennessee and the US Department of Agriculture Forest Service, Cherokee National Forest. The focus of this curriculum is conservation and management of our National Forests. There is a great need to educate children about their natural environment and reconnect them to nature, fostering a long term sense of natural resource awareness and stewardship. Through real life experiences, simulation activities in the classroom, outdoor activities, and field trips to natural settings this can be achieved.

The initial objectives of this project are: (1) to provide educational resources and build teacher expertise about conservation and management practices; (2) inform teachers and students of the conservation of public lands; and (3) to produce a curriculum based on current educational national standards and best teaching practices.

This curriculum was written in conjunction with Tennessee's state education standards for the third through sixth grades and the North American Association for Environmental Education's Guidelines for Excellence in Environmental Education. Activities are developed for both classroom and outdoor use. This teacher's manual is divided into three units. The first section provides an introductory unit to conservation, the second contains a similar introductory unit on biodiversity, and the third section provides units integrating the issues of conservation, biodiversity, and forest management.

The curriculum is designed to be presented beginning with the first lesson and progressing over a six-week period. However, these activities can be used as single, stand alone activities or can be ordered to meet the needs of the teacher and the classroom. Supplemental activities can be used in addition to or in conjunction with these lessons. Suggested materials are Project Wet, Project Wild, and Project Learning Tree.

Materials, activities, and ideas provided in this curriculum will be helpful in teaching issues which forest managers face every day. It is anticipated that upon completion of the materials students will develop a sense of stewardship for and an increased awareness and understanding of natural resources and conservation issues.

There are many careers available in conservation. It is important to introduce students to natural resource management concepts and issues in addition to conservation careers. Such careers include forester, wildlife biologist, ecologist, conservationist, hydrologist, soil scientist, geologist, environmental policy maker, and a host of other jobs.

## Concepts

- 🌱 Senses are used to explore and better understand the natural world.
- 🌱 Biodiversity encompasses the rich variety of plant and animal life and also includes humans.
- 🌱 The abundance of biodiversity is so great that some life forms have yet to be discovered.
- 🌱 Many beneficial products are derived from biodiversity.
- 🌱 Humans affect biodiversity by our use of the environment.
- 🌱 Biodiversity is impacted by human actions and needs.
- 🌱 Conservation practices can help protect biodiversity and the services provided to humans and other organisms.

## Skills

- 🌱 Exploring and observing different elements of the environment.
- 🌱 Use problem skills to investigate the environment.
- 🌱 Develop math, reading, and writing skills.

## Attitudes

- 🌱 Develop an interest in exploring and caring for the environment
- 🌱 Develop a sense of stewardship for the environment and an increased awareness and understanding for conservation issues.
- 🌱 Develop positive attitudes towards the environment
- 🌱 Develop sensitivity towards ecosystems, specifically those in the National Forests.
- 🌱 Develop an understanding and appreciation for the complex interactions in the natural world.
- 🌱 Develop an appreciation of the US Forest Service's many challenges in meeting the many needs of the public as related to the Multiple Use-Sustained Yield Act and the National Forest Management Act.

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<i>Activity</i>	<i>Learning Objectives</i>	<i>Questions Addressed</i>	<i>Time Required</i>	<i>Materials Needed</i>
<b>I.A.</b> Reading about Conservation	1. Students will identify and define conservation concepts  2. Students will gain reading practice  3. Students will identify conservation practices	1. What is Conservation?  2. How does conservation relate to humans/why does it matter?  3. How does conservation relate to the national forests?	1. Introduction: 5 minutes  2. Reading: 20 minutes  3. Discussion: 15-20 minutes  <b>Total: 40-45 minutes</b>	Book ( <i>The Lorax</i> , by Dr. Seuss)  Pencils  Paper  Dry-erase/chalk board

<i>Activity</i>	<i>Learning Objectives</i>	<i>Questions Addressed</i>	<i>Time Required</i>	<i>Materials Needed</i>
<b>I.B.</b> Nature Writing	1. Students will gain an understanding of the natural world and the important role that they play in that world.  2. Students will practice prewriting and writing skills to express their connection to the natural world	1. How does each student relate to the natural world?  2. How do you define/describe the natural world?  3. How can you express a connection to the natural world through writing?	1. Introduction: 5 minutes  2. Nature hike/ reflection: 15-20 minutes  3. Writing: 20 minutes  4. Sharing: 5-10 minutes  <b>Total: 50-60 minutes</b>	Clipboards  Paper and pencils  Poetry reference materials  Crayons, markers, paint  Outdoors location

<i>Activity</i>	<i>Learning Objectives</i>	<i>Questions Addressed</i>	<i>Time Required</i>	<i>Materials Needed</i>
<b>I.C.</b> Preservation and Conservation	<p>1. Students will gain an understanding of the difference between national parks and national forests</p> <p>2. Students will gain an understanding of the different management approaches for our national parks and our national forests in relation to preservation and conservation concepts; respectively</p> <p>3. Students will gain an understanding of the benefits and disadvantages associated with the management of our forests</p>	<p>1. How are our national forests and our national parks different?</p> <p>2. What is preservation and how is it related to our national parks/What is conservation and how is it related to our national forests?</p> <p>3. Why do we manage our national forests?</p> <p>4. What are the benefits and disadvantages of managing our national forests?</p>	<p>1. Introduction: 10-15 minutes</p> <p>2. Case study: 15-20 minutes</p> <p>3. Class discussion: 15-20 minutes</p> <p>4. Historical reading: 15-20 minutes</p> <p>5. Class discussion: 5-10 minutes</p> <p><b>Total: 60-85 minutes</b></p>	<p>Photos of national parks and national forests from outdoors magazine or related materials</p> <p>Paper</p> <p>Pens and pencils</p> <p>Case study student sheets</p> <p>Historical reading student sheets</p> <p>Chalk or dry erase board</p> <p>Chalk or dry erase markers</p>

<i>Activity</i>	<i>Learning Objectives</i>	<i>Questions Addressed</i>	<i>Time Required</i>	<i>Materials Needed</i>
II.A. Renewable and Non-renewable Resources	<p>1. Students will be able to identify renewable and non-renewable resources</p> <p>2. Students will be able to identify whether resources they use are renewable or non-renewable</p> <p>3. Students will identify locations resources come from (locally and globally)</p> <p>4. Students will gain an understanding of resource consumption rates</p>	<p>1. What resources come from the Cherokee National Forest versus other forest lands?</p> <p>2. What resources are used to make various everyday items?</p> <p>3. How fast do humans use various resources?</p> <p>4. What local/non-local resources are found in our classrooms?</p>	<p>1. Small group discussion: 15-20 minutes</p> <p>2. Mapping: 15-20 minutes</p> <p>3. Rate of consumption activity: 25-30 minutes</p> <p>4. Classroom resources discussion: 15 minutes</p> <p><b>Total: 70-85 minutes</b></p>	<p>Items made from renewable and non-renewable resources</p> <p>Paper and pencils</p> <p>World map</p> <p>Colored push pins/stickers</p> <p>Resources extraction location information page</p> <p>Consumption data</p> <p>Colored pencils/crayons</p> <p>Math worksheet on consumption</p>

<i>Activity</i>	<i>Learning Objectives</i>	<i>Questions Addressed</i>	<i>Time Required</i>	<i>Materials Needed</i>
<b>II.B.</b> Non-renewable Resources	<p>1. Students will identify where different minerals are found</p> <p>2. Students will understand mineral resource limits and the need to conserve these resources</p> <p>3. Students will understand environmental degradation related to mineral extraction</p> <p>4. Students will understand the historical impacts of a local mine</p>	<p>1. Where are minerals found locally and globally?</p> <p>2. What mineral resources are found in the Cherokee National Forest?</p> <p>3. What are the environmental impacts of non-renewable resources?</p> <p>4. How do we use non-renewable resources in our everyday lives?</p>	<p>1. Locating resources game: 10-15 minutes</p> <p>2. Mapping: 10-20 minutes</p> <p>3. Discussion worksheet: 15-20 minutes</p> <p>4. Cookie mining: 10 minutes</p> <p>5. Mine history: 10-15 minutes</p> <p><b>Total: 55-80 minutes</b></p>	<p>Items for treasure hunt</p> <p>Two separate locations (for placing beads)</p> <p>Colored bead data sheet</p> <p>World map</p> <p>Pushpins/stickers</p> <p>Paper clips/toothpicks</p> <p>Paper towels</p> <p>Directions for cookie mining activity</p> <p>Photos/history of Copper Basin Mine</p> <p>Mining extraction worksheet</p> <p>Pencils</p> <p>Chalk board/dry erase board</p> <p>Chalk/dry erase markers</p> <p>Brown paper bags</p> <p>Magnifying glasses one per student</p>

<i>Activity</i>	<i>Learning Objectives</i>	<i>Questions Addressed</i>	<i>Time Required</i>	<i>Materials Needed</i>
<b>II.C. Renewable Resources</b>	<p>1. Students will understand how we use local renewable resources</p> <p>2. Students will understand the quantity of resources consumed in the construction of an individual home</p>	<p>1. How does rate of resource consumption vary with different needs?</p> <p>2. How much lumber is consumed to build a house?</p>	<p>1. Introduction: 5 minutes</p> <p>2. House-building activity: 15-20 minutes</p> <p>3. Calculations: 15 minutes</p> <p><b>Total: 35-40 minutes</b></p>	<p>Popsicle sticks</p> <p>Glue</p> <p>Frame to glue popsicle sticks onto (milk cartons)</p> <p>Calculations and scale worksheet</p> <p>Markers/paint</p>



<i>Activity</i>	<i>Learning Objectives</i>	<i>Questions Addressed</i>	<i>Time Required</i>	<i>Materials Needed</i>
III.A. Dividing the Resources	<p>1. Students will understand how resources are used in a forest</p> <p>2. Students will gain an understanding of sustainable resource use</p> <p>3. Students will develop an understanding of the connection between conservation and sustainability</p>	<p>1. What is a niche? Habitat? What are requirements among different forest-dwelling species?</p> <p>2. How does sustainability work?</p> <p>3. What conservation practices do we practice/what can we do to lead to sustainability?</p>	<p>1. Introduction: 5 minutes</p> <p>2. Bingo Game: 15 minutes</p> <p>3. Dividing the resources game: 10-15 minutes</p> <p>4. Worksheet: 10-15 minutes</p> <p>5. Closing: 5-10 minutes</p> <p><b>Total: 45-60 minutes</b></p>	<p>Bingo cards</p> <p>Bingo answers for teachers to draw during game</p> <p>Bingo chips</p> <p>Niche/habitat species cards</p> <p>Set of resources for each group</p> <p>Worksheet</p> <p>Pencils</p>

<i>Activity</i>	<i>Learning Objectives</i>	<i>Questions Addressed</i>	<i>Time Required</i>	<i>Materials Needed</i>
III.B. Population Growth and Sustainability	1. Students will understand how populations increase	1. What are the contributors to population growth within an area?  2. What is carrying capacity?  3. Why is conservation necessary?	1. Introduction: 5-10 minutes  2. Storyline activity: 15-20 minutes  3. Closing: 5-10 minutes  <b>Total: 25-40 minutes</b>	Storyline  At least 15 students to simulate population growth  Chalk/dry erase board  Chalk/dry erase markers  Worksheet  Graphing sheet  Pencils and pens  Markers/coloring pencils  Masking tape

<i>Activity</i>	<i>Learning Objectives</i>	<i>Questions Addressed</i>	<i>Time Required</i>	<i>Materials Needed</i>
<b>IV.A.</b> Forest Management	<p>1. Students will be able to identify reasons for forest management in the U.S. in connection with pressures placed on timber in foreign countries</p> <p>2. Students will gain an understanding of pressures on other countries timber supplies</p> <p>3. Students will gain an understanding of the distances that resources travel to reach the U.S.</p>	<p>1. What other countries supply the U.S. with timber? Are their management methods sustainable?</p> <p>2. Why should we manage our forests as opposed to relying on other countries timber supplies?</p> <p>3. How do other countries resources reach the U.S.? How far do certain resources travel?</p>	<p>1. Introduction: 5-10 minutes</p> <p>2. Timber imports fact sheet: 10-15 minutes</p> <p>3. Mapping: 10-20 minutes</p> <p>4. Calculation: 10-15 minutes</p> <p>5. Class discussion: 10-15 minutes</p> <p><b>Total:</b> <b>45-75 minutes</b></p>	<p>Timber imports fact sheet</p> <p>Timber route calculation sheet</p> <p>World map</p> <p>Push pens</p> <p>Yarn</p> <p>Corkboard or other soft board for push pen use</p>

<i>Activity</i>	<i>Learning Objectives</i>	<i>Questions Addressed</i>	<i>Time Required</i>	<i>Materials Needed</i>
IV.B.1. Water: Soil and sedimentation	1.	1. ?	1. : minutes  2. : minutes  3. : minutes  4. : minutes  5. : minutes  <b>Total:</b> <b>60-85 minutes</b>	s

<i>Activity</i>	<i>Learning Objectives</i>	<i>Questions Addressed</i>	<i>Time Required</i>	<i>Materials Needed</i>
IV.B.2. Water: Quality Issues	1.	1. ?	1. Introduction: 10-15 minutes  2. Case Study: 15-20 minutes  3. Class discussion: 15-20 minutes  4. Historical reading: 15-20 minutes  5. Class discussion: 5-10 minutes  <b>Total: 60-85 minutes</b>	s

<i>Activity</i>	<i>Learning Objectives</i>	<i>Questions Addressed</i>	<i>Time Required</i>	<i>Materials Needed</i>
<b>IV.C.1.</b> Habitat Management: Forest Change	<p>1. Students will gain an understanding of the importance of forest succession</p> <p>2. Students will identify human and natural practices that set forest succession back and the benefits of each forest stage</p> <p>3. Students will identify wildlife using the different forest stages</p>	<p>1. What are the different forest stand stages?</p> <p>2. What is habitat management?</p> <p>3. Why is forest stand reinitiation important?</p> <p>4. What natural and human occurrences allow forests to redevelop (i.e. set forest succession back to seedling stage)?</p> <p>5. What are some examples of wildlife that use the early stages of the forest? Intermediate forest stages? Mature forests?</p>	<p>1. Introduction: 10-15 minutes</p> <p>2. Labeling forest activity: 10-15 minutes</p> <p>3. Labeling wildlife habitats: 10-15 minutes</p> <p>4. Assessment/creative writing activity: 30-40 minutes</p> <p>5. Class discussion: 5-10 minutes</p> <p><b>Total: 65-95 minutes</b></p>	<p>Photos of different forest stand stages (young, intermediate, mature) from outdoors magazine</p> <p>Butcher paper</p> <p>Markers, crayons</p> <p>Pens/pencils</p> <p>Photos of wildflie</p> <p>Forest stage description cards</p> <p>Wildlife habitat cards</p>

<i>Activity</i>	<i>Learning Objectives</i>	<i>Questions Addressed</i>	<i>Time Required</i>	<i>Materials Needed</i>
<b>IV.C.2</b> Habitat Management: Endangered Species	<p>1. Students will gain an understanding of the different threats facing wildlife</p> <p>2. Students will be able to define the benefits their wildlife member contributes to the ecosystem</p> <p>3. Students will gain an understanding of the importance of habitat management</p>	<p>1. What are endangered species?</p> <p>2. What threats are facing wildlife populations?</p> <p>3. How does the loss of a species upset the balance of an ecosystem?</p> <p>4. Why is it necessary to manage wildlife habitats?</p>	<p>1. Introduction: 5-10 minutes</p> <p>2. Adoption process: 30-40 minutes</p> <p>3. Wildlife Research: 10-20 minutes</p> <p>4. Adopted wildlife presentation: 20-35 minutes</p> <p>5. Class discussion: 5-10 minutes</p> <p><b>Total: 70-105 minutes</b></p>	<p>Adoption certificates</p> <p>Markers, crayons</p> <p>Research materials</p> <p>Computer access</p> <p>Wildlife information card</p> <p>Poster boards (one/student)</p> <p>Paper</p> <p>Pens/pencils</p> <p>Coloring pencils</p>

<i>Activity</i>	<i>Learning Objectives</i>	<i>Questions Addressed</i>	<i>Time Required</i>	<i>Materials Needed</i>
IV.C.3. Invasive Species	1.	1. ?	1. Introduction: minutes  2. : minutes  3. : minutes  4. : minutes  5. : minutes  <b>Total:</b> <b>minutes</b>	



<i>Activity</i>	<i>Learning Objectives</i>	<i>Questions Addressed</i>	<i>Time Required</i>	<i>Materials Needed</i>
<b>IV.D.</b> Forest Management for Multiple Use	<p>1. Students will identify different users of the national forest</p> <p>2. Students will understand how different interests groups interact and compromise to meet the Forest Service's Multiple Use-Sustained Yield objectives</p> <p>3. Students will practice critical thinking and debating skills</p>	<p>1. Who are the different users of the national forests?</p> <p>2. How do our allowed uses of the forest come into conflict with our desired uses of the forest?</p> <p>3. How do we compromise to meet the objectives of Multiple Use-Sustained Yield for the forest?</p>	<p>1. Introduction: 5-10 minutes</p> <p>2. Read informational cards/answer related questions: 15-30 minutes</p> <p>3. Debate/compromise: 10-20 minutes</p> <p>4. Class discussion: 10-20 minutes</p> <p><b>Total:</b> <b>40-80 minutes</b></p>	<p>Informational cards</p> <p>String</p> <p>Visual aid</p>

## Lesson I.A.1: Reading about Conservation

### LESSON OBJECTIVES:

Students will:

- identify and define conservation concepts
- gain reading practice
- identify conservation practices

### QUESTIONS ADDRESSED:

1. What is conservation?
2. How does conservation relate to humans/why does it matter?
3. How does conservation relate to the National Forests?

### STANDARDS COVERED:

#### **3<sup>RD</sup> GRADE:**

#### **Reading**

- 3.1.01 Develop oral language.
  - 3.1.01 a,b,c,d,e
- 3.1.02 Develop listening skills.
  - 3.1.02 a,b,e
- 3.1.07 Develop and extend reading vocabulary.
  - 3.1.07 a
- 3.1.08 Develop and use pre-reading strategies.
  - 3.1.08 a,e
- 3.1.09 Use active comprehension strategies to derive meaning while reading and check for understanding after reading.
  - 3.1.09 a.4,5; b.1,6,7
- 3.1.13 Experience various literary and media genres.
  - 3.1.13 d,f
- 3.2.01 Use a variety of pre-writing strategies.
  - 3.2.01 b

#### **Science**

- 3.10.2 Realize that earth materials can be recycled or conserved.
  - 3.10.2

**4<sup>TH</sup> GRADE:****Reading**

4.1.01 Continue to develop oral language and listening skills.

- 4.1.01 a,b,d,e

4.1.05 Read to develop fluency, expression, accuracy, and confidence.

- 4.1.05 a,c

4.1.07 Employ pre-reading strategies to facilitate comprehension.

- 4.1.07 f

4.1.08 Use active comprehension strategies to derive meaning while reading and to check for understanding after reading.

- 4.1.08 a. 1,4,5; b. 2,3

4.1.10 Develop skills to facilitate reading to learn in a variety of content areas.

- 4.1.10 a

4.1.11 Read independently for a variety of purposes.

- 4.1.11 b,e

4.1.12 various literary and media genres

- 4.1.12 b

**5<sup>th</sup> GRADE:****Reading**

5.1.01 Continue to develop oral language and listening skills.

- 5.1.01 a,b,d,e

5.1.05 Read to develop fluency, expression, accuracy, and confidence.

- 5.1.05 a,c

5.1.07 Employ pre-reading strategies to facilitate comprehension.

- 5.1.07 a

5.1.08 Use active comprehension strategies to derive meaning while reading and check for understanding after reading.

- 5.1.08 a.1,4,5,6,7,8; b.2,3

5.1.11 Read independently for a variety of purposes.

- 5.1.11 b,e

**6<sup>TH</sup> GRADE:****Reading**

6.1.01 Continue to develop oral language and listening skills.

- 6.1.01 a,b,c

6.1.05 Read to develop fluency, expression, accuracy, and confidence.

- 6.1.05 b

6.1.06 Expand reading vocabulary.

- 6.1.06 a

6.1.07 Employ pre-reading strategies to facilitate comprehension.

- 6.1.07 a,b,h

6.1.08 Use active comprehension strategies to derive meaning while reading and to check for understanding after reading.

- 6.1.08 a.1,2; b.2,3

6.1.11 Read independently for a variety of purposes.

- 6.1.11 b,e

**MATERIALS:** Book (*The Lorax*, by Dr Seuss), Pencils, Paper, Dry-erase/chalk board

**ACTIVITIES:** Reading About Conservation

**LESSON OUTLINE:**

TIME	DAY 1, LESSON I.A.1: Reading about Conservation
5 min	Introduction
20 min	Reading
15-20 min	Discussion

## Introduction

Conservation involves the wise use and protection of our lasting resources. By thoughtfully using our natural resources we can have a longer and more sustainable supply for future generations. All natural resources such as forests, wildlife, minerals, water, oil, and coal need to be managed sustainably and conserved in order to provide a sustained supply.

There are many opportunities to practice conservation in our everyday lives. It can be simply a lifestyle change such as adopting a more environmentally conscious attitude (i.e. the three R's—reduce, reuse, and recycle) or it can involve a career in natural resources, such as a conservationist, wildlife biologist, forester, soil scientist or ecologist. A conservationist is someone who works to conserve certain aspects of the natural world. A specific type of conservationist is a wildlife biologist. A wildlife biologist is someone who studies certain wildlife patterns so that they can be better protected in their natural environment. A forester is someone who is trained in forestry; the art and science of developing, caring for, or cultivating forests. Ecology does not have to take a managed form. It can come in the form of smaller and simpler acts such as turning off lights when leaving a room, saving paper for scratch sheets, or simply recycling instead of throwing trash away or littering. The most common terms associated with conservation are the three R's—reduce, reuse, and recycle. By reducing how much we use, items such as paper or energy resources for example can be conserved. The same is true with reusing. Recycling is one way to reuse items made from natural resources. Recycling involves processing used materials into new products. Recyclable materials include glass, paper, metal, textiles, electronics (cell phones, computers), and plastics.

By reading the book, *The Lorax*, students can begin understanding ways that conservation can be applied. The connections made by reading the story will help students develop a better understanding of how our environment can be conserved for future generations. *The Lorax* was chosen as an introduction to conservation both for its appeal to young readers and its ability to convey the message of conservation in an easily understandable way.

## Teacher preparation

Read *The Lorax* before the class meeting.

Read the background information provided dealing with conservation in order to get a general idea of this topic.

## Activity

1. Begin the activity by telling the class that you are going to read *The Lorax*. Tell the class that this story is going to introduce a new unit on conservation. Tell students that by reading this book,

as with others, they will be able to creatively develop and brainstorm their own ideas about conservation.

2. Before reading the story ask students to write down their ideas about conservation, specifically ask students to write down ways that resources can be conserved. You may provide a hint for students such as listen for what the Once-ler does to the forest. How could he have caused less of an effect? Also, students may have questions about certain vocabulary words presented in the book. Have them write these down as well or create a list on the board.
3. Read the book, *The Lorax*, to the class (3<sup>rd</sup> grade). Older students will read the book individually or read aloud, alternating readers (4-6<sup>th</sup> grades). Both grade level groups will be asked to write down their ideas and questions while the teacher reads the book or while they read the book to themselves.
4. After reading the book, lead a discussion about conservation (questions provided below). Begin the discussion by presenting the following questions (students can refer to the ideas which they wrote down to answer the following):
  - a. Ask students to identify the main characters and their role in the book.
  - b. What is the author's main point/purpose for writing *the Lorax*?
  - c. Give a brief summary of the story. This will help them to better understand the central theme.
  - d. Are there any present situations which are similar to the issues presented in *The Lorax*?
  - e. What are some ways that the issues presented in *The Lorax* could be counteracted?  
Hopefully students will produce a resolution to the issues presented in the book which will put them in the mindset of conservation. If not go ahead and suggest conservation as a resolution, but allow students to define it in the following question.
  - f. Based on what we read in *The Lorax* what is conservation? You may provide the students with some hints first, i.e. based on what we just read what do you think the term conservation might mean or what does it mean to you? If students struggle to define conservation you may provide the definition, in addition to an example. Some classes may be able to reach an acceptable definition of conservation based on previous knowledge or exposure. Differences in previous knowledge, and exposure, as well as varying grade level will produce differences in knowledge; therefore varying levels of teacher assistance is required.
  - g. What are some examples of conservation? You may provide an example to get the students headed in the right direction (i.e. turn off the lights, save paper for scratch paper, recycle, etc.). Have students raise their hands and contribute to the discussion. These ideas should be written on the board or poster board.
  - h. Are any of the conservation practices that we listed as a class those that you and your family practice in your home?

- i. Can we apply any of these conservation practices in our classroom? Students should then brainstorm how conservation could be applied in the classroom. For example, students can reuse sheets of paper by saving left over pieces of paper for scratch paper, etc.
  - j. Did you have any other thoughts about the book that we just read; does it have any significance in your life?
    - i. Students should now share other insights which they should write down. This might be a time when students want to share a program on television that they watch about the environment such as Captain Planet or they may also want to share that they go with their parents to the recycling center, etc.
5. Continue the activity by asking students to create a short list of things they do at home to conserve resources. For example, their parents may tell them to turn off the lights when they leave a room or they may have a family recycling box. If so have them write down these and other practices which conserve the use of resources.

#### **List of student-friendly ideas for conservation**

- 1.) Ride a bike to the park or other destination instead of driving a car
- 2.) Pick up litter
- 3.) Recycle aluminum cans or other materials
- 4.) Use both sides of paper for homework or use the other side for scratch paper
- 5.) Make art projects out of 'trash'
- 6.) Turn off the water while brushing your teeth
- 7.) Take shorter showers
- 8.) Turn off the lights when you leave a room
- 9.) Unplug items that are not in use
- 10.) Watch less TV and/or play less video games.
- 11.) Play outside

#### **Extension**

If students come up with an idea have them try to incorporate the idea in the classroom. Some ideas might include recycling paper as a class or collecting cans as both a fundraiser and recycling activity. Funds can be used to purchase art supplies, classroom necessities or can be used to adopt and help a family in need.

**Other supplemental environmental literature****3<sup>rd</sup> - 5<sup>th</sup> grade:**

Van Allsburg, Chris. *Just A Dream*. Houghton Mifflin, 1990.

**6<sup>th</sup> grade:**

George, Jean Craighead. *Julie of the Wolves*. HarperCollins Children's Books, 1972.

George, Jean Craighead. *My side of the Mountain*. Penguin Young Readers Group, 1999.

**Addition Handouts**

No additional handouts required for activity I.A.1



## Lesson I.A.2: Nature Writing

### LESSON OBJECTIVES:

Students will:

- Students will gain an understanding of the natural world and the important role that they play in that world
- practice prewriting and writing skills to express their connection to the natural world

### QUESTIONS ADDRESSED:

1. How does each student relate to the natural world?
2. How do you define/describe the natural world?
3. How can you express a connection to the natural world through writing?

### STANDARDS COVERED:

#### **3<sup>RD</sup> GRADE:**

##### **English**

- 3.1.02 Develop listening skills.
  - 3.1.02 a,e
- 3.1.03 Demonstrate knowledge of concepts of print.
  - 3.1.03 d
- 3.1.04 Develop and maintain phonemic awareness.
  - 3.1.04 c
- 3.1.10 Introduce informational skills to facilitate learning.
  - 3.1.10 c
- 3.2.01 Use a variety of pre-writing strategies.
  - 3.2.01 a,d
- 3.2.02 Write for a variety of purposes.
  - 3.2.02 b
- 3.2.09 Write expressively using original ideas, reflections, and observations.
  - 3.2.09 a,b,d
- 3.2.11 Write in a variety of modes and genres
  - 3.2.11 f
- 3.3.01 Demonstrate knowledge of standard English usage.
  - 3.3.01 d

#### **4<sup>TH</sup> GRADE:**

##### **English**

- 4.1.06 Expand reading vocabulary.
  - 4.1.06 a
- 4.2.01 Engage in prewriting using a variety of strategies.
  - 4.2.01 a,d,f
- 4.2.09 Write expressively using original ideas, reflections, and observations.
  - 4.2.09 a,c
- 4.2.11 Write in a variety of modes and genres.
  - 4.2.11 e
- 4.3.01 Demonstrate knowledge of standard English usage.
  - 4.3.01 d

#### **5<sup>th</sup> GRADE:**

##### **English**

- 5.2.01 Engage in prewriting using a variety of strategies.
  - 5.2.01 a,f,h
- 5.2.09 Write expressively using original ideas, reflections, and observations.
  - 5.2.09 a,c
- 5.2.11 Write in a variety of modes and genres.
  - 5.2.11 e
- 5.3.01 Demonstrate knowledge of standard English usage.
  - 5.3.01 d

#### **6<sup>TH</sup> GRADE:**

##### **English**

- 6.1.09 Define study skills and develop methods of research to enhance learning.
  - 6.1.09 f
- 6.2.01 Engage in prewriting, using a variety of strategies.
  - 6.2.01 a,b,d,f
- 6.2.02 Write for a variety of audiences and purposes.
  - 6.2.02 f,g,h
- 6.2.12 Write in a variety of modes and genres.
  - 6.2.12 b
- 6.2.13 Locate and analyze information to prepare written works and presentations.
  - 6.2.13 a
- 6.3.01 Demonstrate knowledge of standard English usage.
  - 6.3.01 d

**MATERIALS:** Clipboards, Paper and pencils, Poetry reference materials, Crayons, markers, paint, Outdoors location

**ACTIVITIES:** Nature Hike, Poetry/Nature writing

**LESSON OUTLINE:**

TIME	<b>Day 2, LESSON I.A.2: Nature Writing</b>
5 min	Introduction
15-20 min	Nature hike/reflection
20 min	Writing
5-10 min	Sharing

## Introduction

The various parts of speech such as nouns, pronouns, verbs, adverbs, and adjectives allow us to convey descriptive personal experiences. Adjectives, which this lesson focuses on, are used to describe almost all elements of life to which we are connected. By allowing students to sit and reflect upon their natural environment they can brainstorm words that allow them to describe their natural environment. Students can use these descriptive words to further express their personal experiences through writing.

The use of poetry is one way to express a personal connection to the environment. Giving students several choices in which to write their poetry will allow creativity in their writing. Several suggested forms of poetry are: haiku, acrostic poem, limerick, shape poem, diamante, cinquain, and free verse. Other forms of poetry can be used to meet classroom standards. A list of references is also provided following the lesson. Students can use references to see the many different ways in which environmental poetry is expressed.

A **haiku** is a form of Japanese poetry. This type of poetry is typically written to describe nature. Many instructors prefer to stick to the rigid three line, five-seven-five syllable structure, however as long as the entire poem has seventeen syllables it is still considered a haiku. It is not necessary to stick to the three line structure unless your students require a more structured writing activity.

An example of a haiku,

Trees grow fast (three).

Trees grow slow (three).

Live oaks grow whimsically along the hot coast (eleven).

An **acrostic poem** is a poem which spells a certain word out using the first letters of each sentence. This is a great way to incorporate the adjectives and other parts of speech because they are clearly represented. The main focus of the poem is also distinct and clearly displayed.

An example of an acrostic poem,

Pitchy

Intriguing

Noticeably grand

Enduring

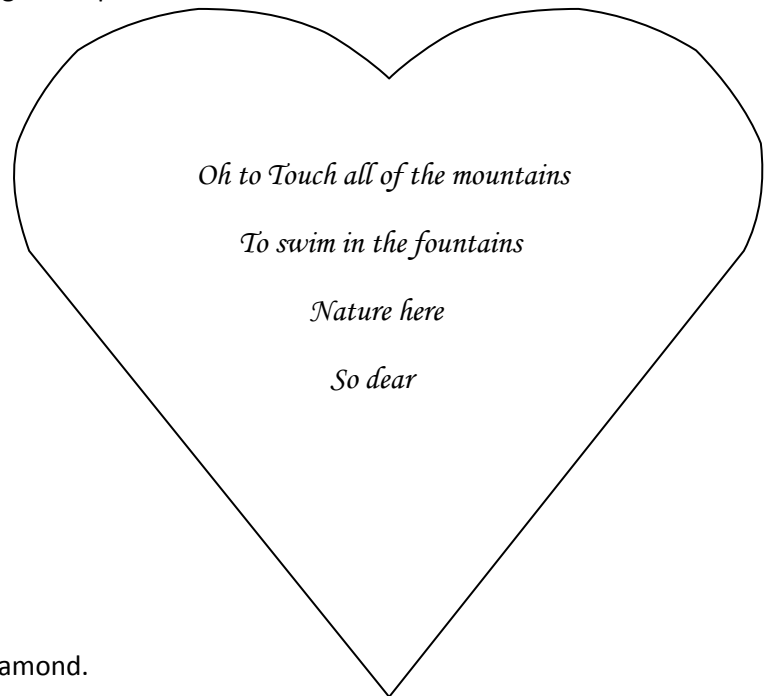
A **limerick** is a five-line poem written with one couplet and one triplet. Limericks contain both a couplet and a triplet. A couplet is a two-line rhymed poem and a triplet is a three-line rhymed poem. The rhyming scheme flows a, a, b, b, a. Lines 1, 2 and 5 contain 3 beats and rhyming, the triplet. Lines 3 and 4 have two beats and rhyming (couplet).

An example of a limerick,

I went to the park (a)  
 All the dogs began to bark (a)  
 Lack of solitude (b)  
 Left me in a mood (b)  
 I may return after dark (a)

A **shape poem** forms a shape of what is happening in the poem.

For example,



A **diamante** is a seven line poem, shaped like a diamond.

A diamante follows this order:

line one has one word,

the second line has two words,  
 the third line has three words,  
 the fourth line has four words,  
 the fifth line has three words,  
 the sixth line has two words  
 the last line has one word.

For example,

Fern  
 Growing cool  
 Morning dew nurture  
 Spring and summer comfort  
 Humid and moist  
 Green lush  
 Fern

A **cinquain** is a five lined poem varied in rhyme and line. The traditional cinquain is based on a syllable count.

Line 1- contains two syllables

Line 2-contains four syllables

Line 3-contains six syllables

Line 4-contains eight syllables

Line 5-contains two syllables

The modern cinquain is based on a word count of words of a certain type.

Line 1-one word (noun) a title or name of the subject

Line 2-two words (adjectives) describing title

Line 3-three words (verbs) describing an action related to the title

Line 4-four words describing a feeling about the title, a complete sentence

Line 5-one word referring back to the title of the poem.

Yet another pattern, recommended for younger students is:

Line 1-one word

Line 2-two words

Line 3-three words

Line 4-four words

Line 5-one word

For example,

Branches  
 Growing old  
 Lichens live, abound  
 Bare leaves and fruit  
 Hackberry

Free verse is yet another type of poetry. This type of poetry provides no bounds. It does not follow a set formula or style. This type is recommended for students who do well without structured lessons. Nonetheless, students should be encouraged to choose which type of poetry is most appealing to them. Students should also be encouraged to write more than one type of poetry.

Example of free verse,

Growing straight and tall,

I am the conquering of all.

My branches lean, whimsically in the wind.

I will grow till my end.

The following activity provides a focus on the use of adjectives. Students will be able to brainstorm adjectives to write their own poetry as it connects to the natural world.

### **Teacher preparation**

To prepare for the activity you should first choose an outdoor area, checking for safety. If you wish to prepare clipboards for each individual student, a description of the clipboard assembly is listed below. The teacher can prepare personal clipboards for the students or have students make them as a class. Reference materials need to be available for the activity (reference materials listed below).

### **Clipboards assembly**

#### **Materials**

Cardboard, binder clips, scissors, paper

#### ***Step-by-step***

1. Trace a clip board or clip board sized item on a piece of cardboard.
2. Cut the cardboard.
3. Place binder clip at the top of the cardboard.
4. Place paper underneath the binder clip and each student will have their own clipboard.

\*Students can easily make and use these for their own personal use.

### **Activity**

1. Introduce the activity to the class by telling students that they are going on a nature hike. Inform students that while on the nature hike they are going to search for descriptive words dealing with the natural environment. For this activity the natural environment will include a previously checked area of the schoolyard or area near school, such as a park or gardens.



2. Have students review descriptive words, adjectives. To do so ask students to provide some examples of adjectives. Discuss a common object such as paper and have students describe it—white, smooth, thin, etc. Students should also review and provide examples of nouns, pronouns, adverbs and verbs, though this is not the focus of this activity.

You may present these forms of speech similarly. For example, ask students, “Who can provide me an example of a noun?” Repeat this process for pronouns, adverbs, and verbs. This is not required, but will be a nice review for students.

Students may state the following:

A *noun* is a person, place, thing or idea. Examples include policeman, park, year or knowledge, respectively.

A *proper noun* is a proper or significant person, place, thing or idea. Examples of include Harriet Tubman, Dolly Wood, War of 1812 or the ‘I Have a Dream Speech;’ respectively.

A *proper noun* is a part of speech that can take the place of a noun in a sentence and function as a noun. Examples include I, you, me, he, she, him, it and themselves.

A *verb* is an action, occurrence, or a state of being. Examples include read, decompose, or stand, respectively.

An *adverb* is a word that modifies a verb, an adjective or another adverb. For example, how did he drive (slowly-verb)? How fast was his bicycle (very fast-adjective)? How fast did he run (extremely fast-another adverb)?

3. Proceed with the activity by allowing students to prepare to go outside. Students will need to gather clipboards, paper, and pencil or pens.
4. Once outside introduce the activity by telling students that they are going on an exploratory walk. Students will be asked to reflect upon their surroundings. First, make several stops and have students use adjectives to describe their surroundings or a certain type of vegetation. For example, you may point out a fern and ask students to describe it. Students might say the fern is green, smooth, etc. Other common objects found outside such as grass could also be used. For a description of grass students might say the grass is scratchy on their feet, shiny, etc.
5. After students have been given some examples to reference they may begin the activity. Students may go and find a quiet spot where they can reflect, brainstorm, and write down descriptive words that come to mind about the natural environment. The words that students choose can be words that remind them of past experiences in the natural environment or they can be descriptive words that students recall based on their current reflections. Encourage students to use all of their senses to describe their natural environment, i.e. have students describe how the grass feels, how does the air smell, what do they hear, etc. Make sure to remind students that they need to “leave no trace,” i.e. replace and do not damage the natural objects that they used to collect and brainstorm their descriptive words.

6. Once students have collected and written down their words they will then return to the classroom. Once again remind students to leave anything that they found. This ensures that others can enjoy them in the future.

If you would prefer to carry out the remainder of the activity outside you may place all necessary materials and references on a blanket. Students may leave their 'quiet area,' to retrieve the references and materials necessary to assist in writing the style of poetry of their choice.

7. After returning to the classroom. You may continue the activity by introducing several different poems about nature and reviewing various styles with the students, as well as how to write in each particular manner. For example, a sample of each of the most common poem styles is listed in the introduction. You may want to review these styles of poetry or you may choose to read some of the sample poetry readings listed at the end of the activity procedure (i.e. Carl Sandburg or Shel Silverstein).
8. Begin the activity by reminding students that they need to follow the basic writing skills to produce several different types of the suggested poems such as commas and periods in proper places. For example, Shel Silverstein's poems provide a great reference of many different types of poems. Students can use reference materials such as Shel Silverstein's poem to assist them in writing their own poems about their personal experience outside. This can be written from their experience either today or it can come from a previous experience. For example, some students may have taken a special road trip with family out West to a National Park or National Forest or they may have visited a local park, National Park or National Forest such as the Great Smoky Mountains National Park or the Cherokee National Forest. Students are encouraged and it is hoped that they will make a connection to the natural environment with a past experience through the nature writing activity.
9. Once students have completed their poems, they may share them with the class. Students can either share their poem or the descriptive words they brainstormed while outside. It is not required that all students share, but it is encouraged. Some students may feel that their poetry is personal. One option for these students would be to simply present their list of descriptive words and have the class speculate what special outdoor features they were attempting to describe.

You may want to list the adjectives that students brainstormed on the board. If so, compile a list of important words students used to write their poems. Have students identify each— adjective, noun, pronoun, adverb, verbs, etc.

10. You could also continue this activity by leading a class discussion. Some questions which could be used are listed below:

- a. Did anyone write about a trip to a local park, National Forest or National Park?
  - i. At this time the teacher should introduce Great Smoky Mountains National Park and the Cherokee National Forest. Briefly state that these are two important areas that have been designated as natural areas.
- b. What types of words were used to write our poems? (adjectives, nouns, pronouns,
- c. What were some of the places, if any, which students choose to write about? Have students briefly tell the class about their trip (a special encounter in the woods or with wildlife, a breathtaking vista, etc.).

### Extension

Students can use creative art supplies such as paint, crayons, markers, coloring pencils, etc. to better express their feelings and poetry about what emotions the natural environment evokes. Students may also want to take crayons or coloring pencils to draw what they were trying to depict in their poem.

A digital camera can also be used to capture each child's reflection spot.

### Poetry References

Ada, Alma Flor. *Gathering the Sun: An Alphabet in Spanish and English*. Lothrop, Lee and Shepard, 1997.

Cooling, Wendy. *Come to the Great World: Poems from Around the Globe*. Holiday House, 1997.

Hopkins, Lee Bennett. *Spectacular Science: A Book of Poems*. Aladdin, 2002.

Mora, Pat. *This Big Sky*. Scholastic, 1998.

Sandburg, Carl. *Poetry for Young People*. Sterling Publishing, 1995.

Silverstein, Shel. *A light in the Attic*. HarperCollins Children's Books, 1981.

Silverstein, Shel. *Falling Up*. HarperCollins Children's Books, 1996.

Silverstein, Shel. *Where the Sidewalk Ends*. Harper Collins Publisher, 1974.

Yolen, Jane. *Bird Watch*. Philomel Books, 1990.

Yolen, Jane. *Welcome to the Icehouse*. G.P. Putnam's Sons, 1998.

**Related Books**

Silverstein, Shel. *The Giving Tree*. HarperCollins Children's Books, 1986.

**Additional Handouts**

No additional handouts required for activity I.A.2

## Lesson I.B.1: Renewable and Non-Renewable Resources

### LESSON OBJECTIVES:

Students will:

- Be able to identify renewable and non-renewable resources
- Be able to identify whether resources they use are renewable or non-renewable
- Be able to identify locations resources come from (locally and globally)
- will gain an understanding of resource consumption rates

### QUESTIONS ADDRESSED:

1. What resources come from the Cherokee National Forest versus elsewhere?
2. What resources are used to make various everyday items?
3. How fast do humans use various resources?
4. What local/non-local resources are found in our classroom?

### STANDARDS COVERED:

#### **3<sup>RD</sup> GRADE:**

##### **Social Studies (Geography)**

- 3.2.03 Discuss the patterns and results of international trade.
- 3.2.03 a,f

##### **Science**

- 3.10.2 Realize that earth materials can be recycled or conserved.
- 3.10.2

##### **Math**

- 3.1.3 Solve problems, compute fluently, and make reasonable estimates.
- 3.1.3 a
- 3.5.1 Develop, select, and use appropriate methods to collect, organize, display, and analyze data.
- 3.5.1 b,c

#### **4<sup>TH</sup> GRADE:**

##### **Science**

- 4.10.1 Recognize that earth materials have a variety of practical uses.
- 4.10.1
- 4.10.3 Realize the difference between renewable and non-renewable resources.
- 4.10.3

**Math**

4.1.1 Understand numbers, ways of representing numbers, relationships among numbers, and number systems.

- 4.1.1 i

4.1.3 Solve problems, compute fluently, and make reasonable estimates.

- 4.1.3 g

4.2.1 Understand patterns, relations, and functions.

- 4.2.1 b

4.5.1 Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer questions.

- 4.5.1 c,d

**5<sup>th</sup> GRADE:****Social Studies (Geography)**

5.3.01 Understand how to use maps, globes, and other geographic representations, tools, and technologies to acquire, process and report information from a spatial perspective.

- 5.3.01 a,c

**Science**

5.10.1 Recognize that earth materials have a variety of practical uses.

- 5.10.1

5.10.3 Realize the difference between renewable and non-renewable resources.

- 5.10.3

**Math**

5.1.1 Understand numbers, ways of representing numbers, relationships among numbers, and number systems.

- 5.1.1 d

5.1.3 Solve problems, compute fluently, and make reasonable estimates.

- 5.1.3 d

5.2.1 Represent and analyze patterns, relations, and functions.

- 5.2.1 b

5.5.1 Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer questions.

- 5.5.1 c, d

**6<sup>th</sup> GRADE:****Social Studies (Geography)**

6.3.01 Understand the characteristics and uses of maps.

- 6.3.01 a,b

**Math**

6.1.1 Understand numbers, ways of representing numbers, relationships among numbers, and number systems.

- 6.1.1 b

6.1.3 Solve problems, compute fluently and make reasonable estimates.

- 6.1.3 a

**MATERIALS:** Items made from renewable and non-renewable resources, paper & pencils, world map, colored pins/stickers, resources extraction location information page, consumption data, colored pencils/crayons, math worksheet on consumption

Detailed list of materials required:

- (1) Items made from renewable and non-renewable resources (plastic, tins cans, metals, paper, etc.). A list of sample materials titled 'sample items used for introductory activity' is provided following the activity in the 'teaching materials' section (Teacher Pages, p. 43-46).
- (2) Suggested teacher discussion questions (Teacher Pages, p. 47)
- (3) Answer keys for teacher (Teacher Pages, p. 48-50)
- (4) Additional information for teachers provided as a list of URL's (Teacher Pages, p. 51)
- (5) Paper & pencils
- (6) Resource discussion worksheet (Student Pages, p. 52)
- (7) Colored push pins, Post-it notes, or stickers—you can use either depending on what type of surface you want to apply these labels to. For instance push pins will work well if you have a paper map covering a bulletin board.
- (8) World map—you may want to use a paper map or the traditional pull down maps normally found in classrooms. If you use the pull down maps you may want to use stickers or post-it notes. These are less permanent for use in marking the countries for the resource location activity.
- (9) Resources extraction location information page (Student Pages, p.53-56)
- (10) 6<sup>th</sup> grade consumption data page (Student Pages, p. 57)
- (11) 6<sup>th</sup> grade math calculating consumption worksheet (Student Pages, p. 58)
- (12) 3-6<sup>th</sup> grade consumption data page (Student Pages, p. 59)
- (13) 3-6<sup>th</sup> grade math calculating consumption worksheet (Student Pages, p. 60)
- (14) Colored pencils or crayons

**ACTIVITIES:** small group discussion, mapping, rate of consumption activity, classroom resources discussion

**LESSON OUTLINE:**

TIME	DAY 3, LESSON I.B.1: Renewable and Non-Renewable Resources
15-20 min	Small group Discussion
15-20 min	Mapping
25-30 min	Rate of Consumption Activity
15 min	Classroom Resources Discussion

**Key terms**

Renewable resources—are natural resources that can be used to benefit people and can then be replaced for future human use.

Non-renewable—a resource that has a limited supply and that cannot be replaced in a timely way once it has been extracted and used.

Fossil fuels—there are three major forms of fossil fuels: coal, oil, and natural gas. All three were formed many hundreds of millions of years ago before the time of the dinosaurs- hence ‘fossil fuels.’

Natural gas—is lighter than air and is made mostly of a gas called methane. It is the major source of electricity generation.

**Introduction**

Natural resources are naturally occurring substances considered valuable in their relatively unmodified and natural state. Natural resources are considered valuable because of human needs and interests. Available supply and demand drive the extraction of such resources. Resources are defined in two ways, those that are renewable and those which are non-renewable.

Renewable resources are those that can be renewed themselves given that they are used wisely, not over-harvested. This type of wise use is known as sustainable use or sustainability.

If renewable resources are used at a rate which exceeds their natural rate of replacement their availability will diminish and eventually the resource will be depleted. The rate at which one can sustainably use a certain natural resource is determined by the resources replacement rate and its availability. Some examples of renewable resources are forests, fish, deer, coffee, wildlife, vegetables



etc. In other words renewable resources are things that can be made again. Soil and fossil fuels, for example, cannot be made again, at least in a timely fashion.

Non-renewable resources are those that cannot be renewed. Some examples of these types of resources are fossil fuels such as coal, oil, and natural gas, as well as zinc and copper. These resources play a vital role in human life therefore wise use of these nonreplenishable resources is essential for the well-being of future generations.

Some non-renewable resources can be recycled. Aluminum is an example of a resource that can not be renewed, but that can be recovered from its prior use and used again...

Many of the items that we use everyday are derived from both renewable and non-renewable resources. Our forests supply a variety of necessities ranging from paper to houses. Non-renewable resources also provide us with items that are needed for human life in the 21<sup>st</sup> century, some of which we do not often realize such as plastics which are derived from oil or electricity which is derived from coal or natural gas. Other everyday uses such as medicines and even perfumes are derived from coal. It is important to recognize the connection between the source and the products derived from that source so that we can be more environmentally conscious and conserve our natural resources.

Another important factor which limits our use and future supply of certain non-renewable and even renewable resources deals with the location where they are derived. Certain resources such as diamonds are limited to certain areas of the world which further limits and reduces their supply for human use. Only one diamond mine is located in the United States. This mine is found in Arkansas. It is also the only diamond mine open to public diamond mining.

The world's largest producer of diamonds is Africa. It has somewhat of an oligopoly on the diamond market, as it produces forty-seven percent of the world's diamonds. An oligopoly simply means that there are so few suppliers of diamonds around the world that the companies that have diamond mining operations in Africa can have a significant impact on diamond prices and on diamond competitors.

Oil is another example of a non-renewable resource that is controlled by a few countries, mainly those in the Middle East, which allows these countries to have a large impact on the production, distribution and price of oil around the world

This lesson provides students with a look at a variety of the products we use every day and which resources they are derived.

### **Teacher preparation**

Assemble materials and make all necessary photo copies of the worksheets attached in the Student Pages section (p. 52-60).

Obtain some of the sample items listed of renewable and non-renewable resources for the introductory lesson. Sample items are listed in the Teacher Pages section (p. 43-46).

Suggested items include:

Coal & natural gas—simply turn off the lights and have students form their own ideas

Oil—plastic bottles, crayons, c.d.'s

Copper—penny, remind students that pennies are no longer made from silver and this is used simply as a symbol

Iron—paper clips, staples, computers

Gold—cell phone

Silver—silverware, coinage before 1965 (nickel, dime, or quarter) or simply remind students that coins are no longer made from silver and this is used as a symbol

Lead—battery

Aluminum—cans

Forests—paper plates, clothing made from rayon fabrics, medicine, tea bags

For the extraction location activity you can use push pins and a paper map posted on a bulletin board. This will work best; however if you do not have access to these materials you can also use stickers if only a hard wall surface or globe is accessible.

### Activity

1. You will first need to introduce the concept of renewable and non-renewable resources to the class. You can begin the discussion by telling students something like, *“renewable resources are those that can be renewed themselves given that they are used wisely, not over-harvested.”* Involve the class by asking something like: “What is an example of a renewable resource?” You may need to simplify the question by saying something like, “Try to think of things that grow or come back every year or reproduce?” Answers may range from plants to animals.

To help keep track of the students' ideas you may want to write their responses on a board. Draw a line down the middle of the board so that both renewable and non-renewable suggestions may be written on the board and easily distinguished. Label one column renewable resources and the other column non-renewable resources.

2. Continue the activity by telling students that these resources can be used to make things that we use every day. The teacher can show students a commonly used and well-known product

such as paper. This can be used as an example of a renewable resource which students can use to build upon for the group activity, 'resources discussion activity.' This is important because students will be provided with several examples of products which they will need to discriminate between as either renewable or non-renewable resources and if possible what resource these products were derived.

3. Continue the activity by asking students, "If renewable resources are those that can be replenished, what are non-renewable resources?" You can give students a hint like, "if renewable resources are those that grow or reproduce (i.e. replenishing themselves); what are non-renewable resources?" Students should then be able to define non-renewable resources. Look for an answer like, "a non-renewable resource is a resource that cannot be re- grown, re-made, or regenerated to keep up with the growing consumption. Natural resources such as coal, oil, or natural gas, take millions of years to form naturally and cannot be replaced as fast as they are consumed. Reiterate the definition that students have provided by saying something like, "*A non-renewable resource is one that cannot be renewed in a timely way.*"

After students have come up with a definition of non-renewable resources, ask them if they can think of any examples of items that cannot be renewed. You will most likely need to provide them with examples. For non-renewable resources, you could turn off the lights in the classroom as an example of fossil fuels. This is a good point to inform students that fossil fuels are burned to produce electricity. You may then provide students with a definition of fossil fuels.

Fossil fuels or mineral fuels are found within the earth's crust and extracted. They are found in the form of oil, gas, or coal. Though this is not the focus of this activity it is still a good idea to introduce the definition to students. Fossil fuels will be discussed more in depth in the following lesson.

Other examples which can be used are plastic jugs. Show students a milk jug and tell them that plastic items such as milk jugs are made from oil. Oil is used in the production of plastics; therefore plastics are a by-product of oil. By giving this example the activity is not compromised because there are still other items that allow for brainstorming by students such as C.D.'s. Students most likely won't compare the two items (plastic jugs and C.D.s) and will still be able to brainstorm if they are given the example of the jug as a basis to build upon when carrying out the activity-"Resource Discussion." Examples such as these should allow students to more easily identify other renewable and non-renewable resources.

4. Begin the group activity by dividing students into pairs. It may be easiest to move their desks together so that the pair can easily discuss their product. Inform students that they will need to recall the items that we just presented and discussed as a class, i.e. the example products and which resource they were derived from. Each pair will be given a Resource Discussion table (Student Pages Section, p. 52) and a renewable or a non-renewable product or item.

5. You can choose a product from the list attached in the teaching materials section (Sample Items Used for Introductory Activity sheet, p. 43-46). Each group needs one product or item. It is best to give each group one resource to identify at a time. Give each group several minutes to discuss the resource. In groups, students should discuss amongst themselves if the item is renewable or non-renewable. Also, the pairs will need to write down any other thoughts or ideas they have about the items such as from what resources their items were derived. This will be easy for the paper items, but the others such as the variety of plastics made from oil are not as apparent. When it appears that all the pairs have written down their observations have them rotate the resource in a clockwise direction to the closest residing group.

Repeat this observation and rotation of the resources five times in order to fill out the entire resource discussion table.

6. Review the activity once all the rotations are complete. You may review the activity by having each pair introduce and present the observations of the last resource that they assessed. Have students present their inferences to the class. If they are incorrect, provide the appropriate label, renewable or non-renewable and the resource from which the item was derived or other corrections if necessary. If students had any other insights about the items, allow them to share these as well (i.e. previous knowledge or where these were found –Mayfield dairy carton is a local dairy that uses plastics from other areas to feed the local population).
7. Continue this activity by asking students something like, “where do you think these resources came from?” You can be specific and ask the class, “Where in the world, country or state, do you think the oil to make plastics are mined or removed?” You can also ask, “Where do we get our paper products?” This question could be followed by; “do we have any forests that are harvested to make paper?” Once students have brainstormed where they believe the resources came from, pass out the handouts titled ‘Resource Extraction Locations (Student Pages Section, p. 53-56).’
8. Begin this activity by having a volunteer look on the sheet and identify where one of the items his/her group assessed was extracted. For example, if this student had paper as one of their resources have them look up the resource extraction location on the data sheet.

Once the student volunteer has identified the countries listed, have them come up to the map and place a marker (either a push pin or a small post it note) on one of the locations in the United States and one location in another country where this resource was derived. The class and the teacher may assist in finding these locations if needed.

Request as many volunteers as necessary to map the resources used in the activity (i.e. map all the resource extraction locations as it relates to the items used for the activity). All these products or items used in the game should be mapped so that students have a better

understanding of each individual product, and the resource used to produce it, presented in the activity.

Students will locate and mark the geographic location where their renewable/non-renewable resource was extracted (i.e. certain resources specific to a location, local or non-local). It is best to use colored push pins or post-it notes corresponding to the same resources mined worldwide. Students will be able to make the distinction of the various or limited locations where resources are extracted.

9. Refer to the 'Teacher Discussion,' sheet to lead the class discussion (Teacher Discussion Questions, p. 47 part 1).
10. Hand out the consumption data worksheets—both the data sheet and worksheet. Students will need to calculate and graph the rates of consumption of various natural resources given the data provided (Student Pages Section, 6<sup>th</sup> grade: p. 57-58, 3<sup>rd</sup>-6<sup>th</sup> grades: p. 59-60).
11. Close the activity with a class discussion to ensure students understand the concepts presented in the calculation activity. A list of discussion questions can be found at the end of the activity (Teacher Pages Section, p. 47, part 2 and 3).

## (1.) Teacher Page

### I.B.1. Activity 1. Sample items used for introductory activity

#### Renewable resources:

##### *Forests:*

*Products derived from trees:* toothpicks, paper, wooden bowls, hardwood floor, paper cup, tissues, toilet paper, paper towel, camp fire, dyes (nuts from trees), food (fruits, nuts), rubber, medicines, cribs, beds, textbooks, magazines, pencils, books, carpets, ink, chopsticks, houses, luggage, golf balls, cardboard, cleaning compounds, tea bags, newspapers, beds, fish food, rayon fabrics, colognes, boardwalks, napkins, guitars, shampoo, football helmets, bottle corks, baseballs, chewing gum, cures for certain diseases, (National Geographic Society, 2006), etc.

*Foods derived from trees:* almonds, chestnuts, walnuts, lemons, cinnamon, maple syrup, figs, cloves, olives, coffee, coconuts, oranges, apples, cherries, pears, etc.

*Ecosystem services provided by forests:* noise pollution lessened, produce oxygen, provide shelter for wildlife, allow soil to be retained (i.e. prevent erosion), nutrient retention, temperature reduction, nutrient cycling, contribute to biodiversity, carbon storage, energy, heat, shelter and food for wildlife, contribute to biodiversity, produce oxygen, provide food and shelter for wildlife, allow soil to be retained (prevent erosion), nutrient retention, nutrient cycling, etc.

*Personal interests/values:* aesthetics, photography, climbing, tree houses, making canoes, or other types of boats, woodworking (National Geographic Society, 2006).

##### *Wildlife:*

*Human needs:* food, shelter (tepees) warmth (provide clothing)

*Interests/values associated with wildlife:* wildlife viewing, recreational hunting and fishing, photography, intrinsic values (i.e. just knowing that they are around and still exist, not extinct), etc.

*Ecosystem benefits provided by wildlife:* contribute to biodiversity

##### *Plants:*

*Human needs:* medicines, herbal medicines, food products (berries), cures for certain diseases,

### Non-renewable resources:

#### *Fossil fuels (coal, oil/petroleum, natural gas):*

*Coal:* provides electricity for heating, cooling, and lighting our homes and cooking and refrigerating our food. By products of coal are used by companies to make materials such as steel, cosmetics, rubber cement, soda water, roofing, paving, perfumes, billiard balls, medicines, fire proofing materials, food preservatives, street lighting, laughing gas, tar and a host of other products (Kentucky Coal Education, 2008).

Lignite (soft, brown form of coal)

Bitumen (hard, dark brown or black form of coal)

*Oil:* gasoline, diesel, airplane fuel, electricity, antihistamines, aspirin, balloons, ballpoint pens, bandages, beach umbrellas, boats, cameras, candles, carpets, combs, cosmetics, crayons, credit cards, curtains, deodorants, detergents, dice, disposable diapers, dolls, dyes, eye glasses, fishing rods, fishing line, fishing lures, food preservatives, food packaging, garden hose, glue, hair coloring, hair curlers, hand lotion, hearing aids, ink, insect repellent, lip stick, milk jugs, nail polish, panty hose, perfume, petroleum jelly, plastics, rubber cement, shampoo, shaving cream, shoes, toothpaste, trash bags, yarn and a host of other products (Giles 2005).

*Natural gas:* primarily used for electricity generation for such purposes as cooking (turn lights on/off), clothes dryer, heating/cooling, central heating. It is also used in the manufacture of fabrics, glass, steel, plastics, paint, and a host of other products (Wikipedia 2008).

#### *Rocks:*

*Sandstone*—used to make concrete and asphalt. Also used for flooring, walls, pavers, and fireplaces.

*Marble*—used to construct buildings, monuments, and sculptures. Also used for countertops, headstones, etc.

*Limestone*—used for architectural purposes, cement, mortar, crushed for use as an aggregate, toothpaste, glass making (windows, glasses, mirrors), added to bread as a source of calcium,

used to purify sugar, used to make paper white, brake pads, wools and dyes, commonly found in drinking water around East Tennessee (Wikipedia 2008).

*Clay*—used in brick making, cooking pots, porcelain, drainage pipes, tiles, used in construction, clarifying water and wine, purifying sewage, medicinal and nutritional purposes, cosmetics, combat acne, toothpaste. Also used to make cement and gravel.

*Ball clay*—dinnerware, floor and wall tile, pottery and ceramics (NSTA 2005).

*Phosphate rock*—United States is the leading producer of phosphate.

*Phosphate*—soft drinks, toothpaste, gum, bone china, film, light bulbs, vitamins, flame-resistant fabrics, optical glass, shaving cream, and detergents. Mostly used for agriculture, fertilizer, and as a supplement for livestock.

*Minerals:*

*Zinc*—rust inhibitor for steel in the construction of cars, buildings, bridges, ships, and trains.

*Copper*—coins, jewelry, cooking utensils, brass, bronze, televisions, wiring in electrical appliances, stereos, computers, aircraft, automobiles, etc.

*Iron*—(metal) staples, nails, paper clips, computers, furniture, airplanes, ships, cars, trucks, camp ovens, cans and containers, drill bits, etc.

*Gold*—jewelry, used to make parts for electronic products and equipment for items such as computers, telephones, cellular phones, home appliances, televisions, VCRs. It is also used in dentistry and for lasers, eye surgeries, etc.



*Silver*—jewelry, silverware, photography, electronics, coinage, water purification, electrical appliances, microwaves, dishwashers, televisions, toys, computers, medicines, and tooth filings. Also used to make switches, contacts and fuses.

*Lead*—batteries, ammunition, lead paint, preservative, custom cars, flashlight batteries, portable tape player, scuba diving belts, combined with brass, weights for fishing lines, plumbing, manufacture of pewter, etc.

*Rock*— used in cement, used in the manufacture of glass (limestone—to make windows, glasses, and mirrors), housing and building material, used to create steel (limestone), etc.

*Dolomite*—used in cement, added to soils and soilless potting mixes to lower soil acidity ('sweeten' them), used for gardening purposes, and dietary supplements (USGS 2008) (TDEC 2008).

*Diamonds*—used to make mechanical parts, cutting tools for saws and drill bits, instruments for laboratories, and jewelry.

*Tin*—some magnets are made from tin, tin cans—coats other metals to prevent corrosion or chemical action (i.e. tin cans are made from tin coated steel), window glass is produced using tin, tin salts can be sprayed onto glass to produce electrically conductive coatings-these salt treated panes can be used for panel lighting and for frost-free wind shields, etc.

*Aluminum*—cans, foil wrap, bottle tops, kettles, saucepans, tennis racquets, softball bats, indoor and outdoor furniture, power lines, wires, cables, components for television, radios, refrigerators, and air-conditioners, propellers, airplane and vehicle body sheet, gearboxes, roofing, door and window, etc.

*Nickel*—used in stainless steel products, magnets, coinage, special alloys. It is also used as a green tint for glass.

**(1.) Teacher Page**

## I.B.1. Teacher discussion questions:

## 1. Renewable/nonrenewable:

- a. Once the class has finished introducing their items, the teacher can now tell the students what resources they were derived from.
- b. How many of the students realized that oil was used to make plastics (depending on the items chosen to sort and identify you can rephrase this question)?
- c. Do we use these items in our everyday lives? If so when? How often?
- d. What would we do if we ran out and these everyday or valued items could no longer be produced?

## 2. Rates of consumption fact sheet:

- a. Which resource was depended on most heavily? Why?
- b. How much did the use of these resources increase over the five year period?
- c. How do you think the increased use will impact our supply overtime?
- d. What would we do if we ran out of these resources?
- e. Can you think of ways to use these items sustainably?

## 3. Classroom resources search:

- a. Can you name some classroom items made from natural resources? Which resources were these items made from?
- b. How would our learning environment change if we did not have these items if the resources they were derived from were depleted?
- c. What are some ways we could start practicing sustainability in our classroom in order to conserve the resources these items were made from?
- d. Do you practice any of these in your homes? If not, what could you do at home to lessen the impact on our natural resources?

**(1.) Teacher Page**

## I.B.1. Teacher Answer Key Math Calculation

Calculate the consumption of various resources by the US and Canada

**6<sup>th</sup> Grade Calculations**

- 1.) How much more electricity did the United States use in 2005 than Canada?

*The United States used 3,275,800,000,000 kWh more than Canada*

- 2.) What is the total of both countries electricity usage?

*The total electricity that both Canada and the US used in 2005 was 4,356,200,000,000 kWh*

- 3.) How much more oil did the United States use in 2004 than Canada?

*The US used 17,595,000 bbl/day more oil than Canada.*

- 4.) What is the total of both countries oil consumption?

*The total amount of oil used by both Canada and the US was 23,865,000 bbl/day.*

- 5.) How much more natural gas did the United States use than Canada?

*The US used 511,240,000,000 cu m more natural gas than Canada.*

- 6.) What is the total of both countries natural gas consumption?

*The total amount of natural gas used by both Canada and the US was 696,760,000,000 cu m.*

- 7.) Why do you think the usage varies so much between the US and Canada?

*The United States has a greater population than Canada.*

**(1.) Teacher Page**

## I.B.1. Teacher Answer Key Math Calculation

**3<sup>rd</sup>-5<sup>th</sup> grades Calculation**

- 1.) Make a pie chart representing the percent usage for 2007 of the following resources for electrical production (Department of Energy, 2007):

Coal fired plants—48 %

Nuclear plants—19 %

Natural gas-fired plants—22 %

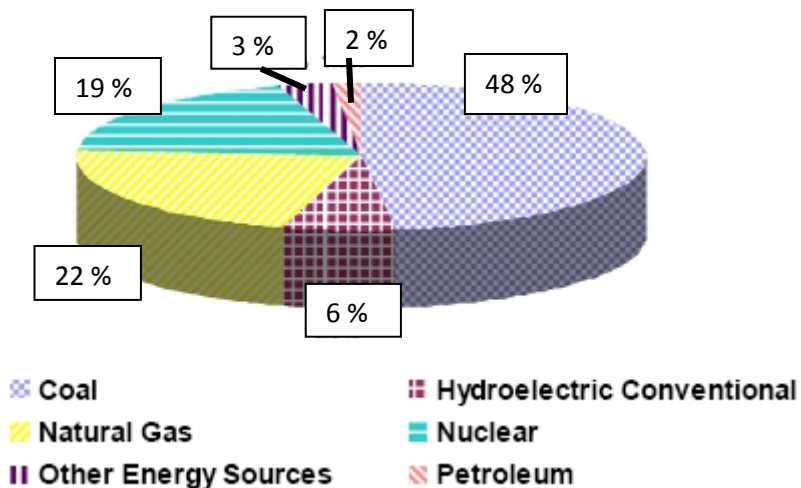
Petroleum-fired plants—2 %

Conventional hydroelectric power—6 %

Other energy sources—3 %

Includes renewable, primarily biomass, but also geothermal, solar, and wind, and other miscellaneous energy sources generated the remaining electric power.

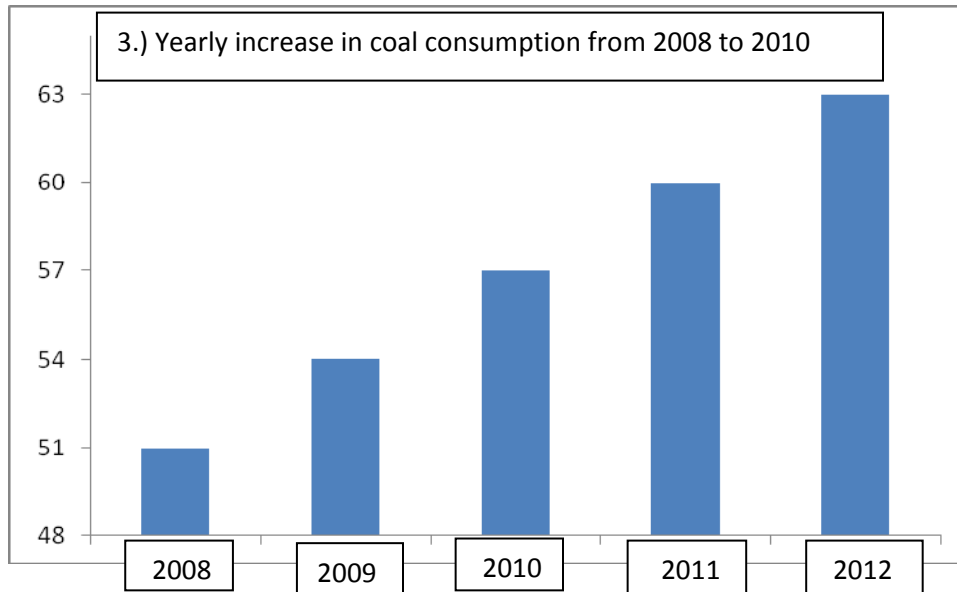
Graph can either be a pie chart or graph. Listed below is a sample pie chart provided on the Department of Energy website (US DOE 2008).



- 2.) Which natural resource was depended on most heavily? *Coal*
- 3.) Which was used the least? *Other energy sources*
- 3.) If coal continues to increase by 3% what will the percentage be for the following years:
- What was the percentage in 2008? *51 %*

- b. What was the percentage in 2009? 54 %
- c. What was the percentage in 2010? 57 %
- d. What was the percentage in 2011? 60 %
- e. What was the percentage in 2012? 63 %

3.) Make a bar graph to represent the increase from 2004 to 2010.



4.) How long was the total increase from 2008 to 2012 in years? What was the increase?

*Coal use increase 12 % over the five year time frame.*

### (1.) Teacher Page

#### Resources lists adapted from the following websites:

CIA. World Factbook: Canada. 11 Jan. 2008.

<<https://www.cia.gov/library/publications/the-world-factbook/index.html>>.

CIA. World Factbook: United States 10 Jan. 2008.

<<https://www.cia.gov/library/publications/the-world-factbook/index.html>>.

Giles, Tim. 2005. *“Peak Oil Crisis: Products from Oil.”* 11 Jan. 2008.

Gladstone Centre for Clean Coal. Coal. 13 Jan. 2008.

<<http://www.gc3.cqu.edu.au/modern-world/index.php>>.

Kentucky Coal Education. *“Kentucky Coal and Energy Education Project.”* 11 Jan. 2008.

<<http://www.coaleducation.org/lessons/uses.htm>>.

National Geographic Society. *“If a Tree Falls in the Forest...”* 11 Jan. 2008.

<<http://www.nationalgeographic.com/xpeditions/lessons/15/g35/treefalls.html>>.

National Science Teachers Association. 10 Jan. 2005. *“The Rock Cycle.”* 12 Jan. 2008.

<[www.rocksandminerals.com](http://www.rocksandminerals.com)>.

TDEC. Tennessee’s mineral industry. 8 Jan. 2008.

<<http://www.state.tn.us/environment/tdg/mineralind.shtml>>.

United States Geological Services. Dolomite. 9 Jan. 2008. <<http://pubs.usgs.gov/fs/FS-042-96/>>.

United States Department of Energy. Electricity. 10 Jan. 2008.

<[http://www.eia.doe.gov/cneaf/electricity/epm/epm\\_sum.html](http://www.eia.doe.gov/cneaf/electricity/epm/epm_sum.html)>.

United States Department of Energy. Coal. 9 Jan. 2008.

<<http://www.eia.doe.gov/oiaf/ieo/coal.html>>.

Wikipedia. Limestone. 9 Jan. 2008. <<http://en.wikipedia.org/wiki/Limestone>>.

Wikipedia. *Natural Gas.* 10 Jan. 2008. <[http://en.wikipedia.org/wiki/Natural\\_gas](http://en.wikipedia.org/wiki/Natural_gas)>.

(2.) Student page

DATE: \_\_\_\_\_

## Resource discussion worksheet

Group members: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

	Item 1	Item 2	Item 3	Item 4	Item 5
<b>What is the item?</b>					
<b>Is it renewable or non-renewable?</b>					
<b>What resource was used to make this item?</b>					
<b>Additional observations. How did you decide whether it was a renewable or non-renewable resource; what resource was used to make your item?</b>					

**(2.) Student Page****Resource Extraction Location**

Producers of various resources are listed in the data sheet below. For the most part, the resources are listed by major producing countries; however some of the resources were mined and extracted extensively worldwide. Major and minor producers of resources were chosen for the countries listed in order to ensure that a diversity of countries represented in the activity. The list provided is not an exhaustive list of resource extraction locations. All resource extraction locations were obtained from the CIA Factbook website.

For more information visit the CIA Factbook online.

<<https://www.cia.gov/library/publications/the-world-factbook/index.html>>.

Renewable Resources

*Forests*—Alaska, Oregon, Washington, Idaho, North Carolina, Tennessee, many places all over the U.S.

Abroad—tropical rainforests--Nicaragua, Cameroon, Democratic Republic of Congo  
Papua New Guinea, Indonesia, and others.

Temperate rainforests—Ireland, Scotland, Pacific coast of Canada, Russia, Norway,  
Turkey, Taiwan, Korea, and others.

*Wildlife*—found globally. For example, moose of Alaska, hellbender salamander of the Appalachia's, buffalo of Yellowstone National Park, roadrunner of California (in south and southwest region), Ptarmigan of Alaska, Osprey of Oregon and Pacific Northwest, as well as Tennessee

Abroad—caribou of Canada, saddlebill stork of Africa, dugong of Egypt, Spanish red deer of Spain, komodo dragon of Indonesia, and others.

*Plants*—found globally. For example, Ruth's golden aster of Cherokee National Forest, Indian paint brush of California and the southeast

Abroad—Bahama nightshade of the Bahamas, and others.

Non-renewable Resources

*Fossil fuels (coal, oil, natural gas)*

*Coal*—mined in Tennessee, Kentucky, West Virginia, and others.



Abroad—China, Russia, United Kingdom, Great Britain, Northern Ireland

\**Oil*—Tennessee, Alaska, North Dakota, Utah

Abroad—Iran, Iraq, Norway, Russia, Canada, Germany, Saudi Arabia, Venezuela

*Natural gas*—multiple sites offshore Alaska, Wyoming, Kansas

Abroad—offshore--Qatar, Iran, Russia, North Sea, Canada

### *Rocks*

*Sandstone*—Tennessee, as well as Arches National Park--great Sandstone landscape

Abroad—Red sandstones are also seen in the Southwest and West of England and Wales, as well as central Europe and Mongolia

*Marble*—Tennessee marble (east TN), Florida, Vermont, Texas

Abroad—Poland, Belgium, Pakistan, Croatia, Greece, Romania, France, Great Britain, India, Italy, and Spain.

*Limestone*—Tennessee (TN *state rock*), Mississippi, Arkansas, South Carolina, Virginia, Iowa, Indiana, Notch Peak in Utah, Niagara Escarpment-Canada/USA

Abroad—Norway, Verdon Gorge in *France*, Malham Cove in North Yorkshire, Isle of Wight in *England*, Faro near Swedish island of Gotland-*Sweden*, Ha Long Bay National Park in *Vietnam*, and others.

*Clay*—Ball Clay-Tennessee, Alaska-Quick Clays, Indiana

Abroad—some clays indigenous to certain areas include Quick Clays of Norway, Canada and Sweden

*Dolomite*— Tennessee, Mississippi valley area

Abroad—Italy

*Minerals*

*Zinc*—Tennessee, Missouri, Alaska

\*four zinc mines in Tennessee (Gordonsville and Clinch Valley Mines)

Abroad—largest producers in China, Australia, and Peru

It is estimated that there is only 46 years supply of zinc remaining.

*Copper*—Utah, Nevada, Tennessee (Copperhill, Tennessee)

Abroad—Chile- world's largest producer of copper, Zaire, Zambia, China, Australia

*Iron*—historically mining occurred in New Jersey, Minnesota, Northern California

\*Hibbing, Minnesota mine (still mined today)

Abroad—Australia (mostly western Australia), Brazil, Paraguay, Portugal, Romania

*Gold*—Tennessee, Nevada, Utah, South Dakota, California, South Carolina, Washington, Montana

Abroad—largest producer, South Africa. Other producers include Peru, Columbia, Russia

*Silver*—Tennessee, Alaska, Nevada, Idaho

Abroad—Canada, Ontario, Mexico, Bolivia, Australia, and others.

*Lead*—Tennessee, Missouri, Alaska, Idaho, Montana (U.S. largest producer)

Abroad—north-east Wales, Asia, Europe, Mexico

*\*Diamond*— The Crater of Diamonds State Park is an Arkansas State Park located near Murfreesboro in Pike County, Arkansas, USA containing the only diamond bearing site in the world that is open to the public

Abroad—Africa including: South Africa, Namibia, Botswana, the Democratic Republic of Congo, Angola, Tanzania, and Sierra Leone; Canada, India, Russia, Brazil, Australia

*\*Tin*—California, Alaska

Abroad—Bolivia, Indonesia, Zaire, Thailand, Nigeria, China

*Aluminum (bauxite)*—Alabama, Georgia, Arkansas.

Abroad—Australia, Jamaica, Brazil, French, Surinam, Guiana, France, Hungary

*Nickel*—Riddle, Oregon.

Abroad—Australia, Canada, Norway

*Phosphate rock*—Tennessee, North Carolina, Florida, Idaho, Utah

Abroad—Brazil, Russia, China, South Africa.

\*denotes minerals that are not as common in the United States

**(2.) Student Page—6<sup>th</sup> grade****Consumption Data Page**

There is an abundance of natural resources found within the United States. Renewable resources include timber, fish, and wildlife. Non-renewable resources include coal, copper, lead, gold, iron, mercury, nickel, silver, zinc, petroleum, and natural gas. One of the most important resources used by the United States is oil. About two-thirds of the oil used for consumption is imported from other countries (CIA 2007).

Canada has a variety of natural resources. Renewable resources include timber, fish, and wildlife. The non-renewable resources found in Canada include iron ore, nickel, zinc, copper, gold, lead, diamonds, silver, coal, petroleum, and natural gas. Much of these, if not all, are imported for use in the United States.

Canada resembles the United States in its economic system, production and living standards. It is the U.S.'s largest export and import partner. The United States uses about 85% of Canadian exports of natural resources. Canada is the U.S.'s largest foreign supplier of energy, including gas, uranium and electric power (CIA 2007).

**Consumption of various resources:**

	<b>United States</b>	<b>Canada</b>
<b>Electricity</b>	3,816,000,000,000 (trillion) kWh (2005)	540,200,000,000 (billion) kWh (2005)
<b>Oil</b>	20,730,000 (million) bbl/day (2004)	3,135,000 (million) bbl/day (2004)
<b>Natural gas</b>	604,000,000,000(billion) cu m (2005)	92,760,000,000 (billion) cu m (2005)

Statistics obtained from the Central Intelligence Agency, The World Factbook

(2.) Student Page—6<sup>th</sup> grade      NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

### Consumption Calculation Fact sheet

Calculate the consumption of various resources by the US and Canada

#### 6<sup>th</sup> Grade:

- 1.) How much more electricity did the United States use in 2005 than Canada?
- 2.) What is the total of both countries electricity usage?
- 3.) How much more oil did the United States use in 2004 than Canada?
- 4.) What is the total of both countries oil consumption?
- 5.) How much more natural gas did the United States use than Canada?
- 6.) What is the total of both countries natural gas consumption?
- 7.) If the total population of both countries did not increase what would be the total usage over a 5 year period of the following:
  - a. Electricity in the US?
  - b. Electricity in Canada?
  - c. Oil in the US?
  - d. Oil in Canada?
  - e. Natural gas in the US?
  - f. Natural gas in Canada?

**(2.) Student Page****Consumption Calculation Data sheet****3-6 grades:**

The Department of Energy calculated the average use for the following resources from September 2006-September 2007 (US DOE 2007). The following figures represent the use of natural resources in both residential and commercial sectors\*:

Coal fired plants—48 %

Nuclear plants—19 %

Natural gas-fired plants—22 %

Petroleum-fired plants—2 %

Conventional hydroelectric power—6 %

Other energy sources (includes renewable, primarily biomass, but also geothermal, solar, and wind, and other miscellaneous energy sources generated the remaining electric power)—3 %

\*Data acquired from Department of Energy website

Coal provides the single largest fuel source for the generation of electricity. The use of coal contributes to over 23% of primary energy needs worldwide. In addition, 38% of global electricity is generated from coal. Coal is also beneficial in terms of its safety. It is the safest fossil fuel to transport, store and use (US DOE 2007).

Coal consumption is expected to increase by about three percent per year on average from 2004 to 2015. However, from 2006 to 2007 coal usage reduced to only about two percent. This brought the annual usage to about 48 % as shown above.

(2.) Student Page      NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

### 3-6<sup>th</sup> grade Calculations

- 1.) Make a pie chart representing the percent usage of the following resources:

Coal fired plants—48 %

Nuclear plants—19 %

Natural gas-fired plants—22 %

Petroleum-fired plants—2 %

Conventional hydroelectric power—6 %

Other energy sources—3 %

Includes renewable, primarily biomass, but also geothermal, solar, and wind,  
and other miscellaneous energy sources generated the remaining electric power

- 2.) Which natural resource was depended on most heavily? \_\_\_\_\_

- 3.) Which was used the least? \_\_\_\_\_

- 4.) If coal continues to increase by 3 % yearly what will the percentage be for the following years:

a. What was the percentage in 2008? \_\_\_\_\_

b. What was the percentage in 2009? \_\_\_\_\_

c. What was the percentage in 2010? \_\_\_\_\_

d. What was the percentage in 2011? \_\_\_\_\_

e. What was the percentage in 2012? \_\_\_\_\_

- 5.) Make a bar graph to represent the increase from 2004 to 2010.

- 6.) What was the total increase from 2008 to 2012?

## Lesson I.B.2: Non-Renewable Resources

### LESSON OBJECTIVES:

Students will:

- identify where different minerals are found
- understand mineral resource limits and the need to conserve them
- understand environmental degradation related to mineral extraction
- understand the historical impacts of a local mine

### QUESTIONS ADDRESSED:

1. Where are minerals found locally and globally?
2. What mineral resources are found in the Cherokee National Forest?
3. What are the environmental impacts of non-renewable resources?
4. How do we use non-renewable resources in our everyday lives?

### STANDARDS COVERED:

#### **3<sup>RD</sup> GRADE:**

##### **Science**

3.2.4 Recognize that the environment and the organisms that live in it can be affected by pollution.

- 3.2.4

3.10.2 Realize that earth materials can be recycled or conserved.

- 3.10.2

##### **Social Studies (History)**

3.2.03 Discuss the patterns and results of international trade.

- 3.2.03 a,d

3.3.02 Recognize the interaction between human and physical systems around the world.

- 3.3.02 a

3.6.02 Understand how groups can impact change at the local, state, and national level.

- 3.6.02 a

#### **5<sup>th</sup> GRADE:**

##### **Social Studies (Geography)**

5.3.01 Understand how to use maps, globes, and other geographic representations, tools, and technologies to acquire, process and report information from a spatial perspective.

- 5.3.01 a,c

##### **Science**



5.10.3 Realize the difference between renewable and non-renewable resources.

- 5.10.3

## 6<sup>TH</sup> GRADE:

### Social Studies (Geography)

6.3.01 Understand the characteristics and uses of maps.

- 6.3.01 a,b

6.3.02 Know the location of places and geographic features, both physical and human.

- 6.3.02 b

6.3.04 Understand the physical and human characteristics of place.

- 6.3.04 a

**MATERIALS:** Colored beads, Two separate locations (for placing beads), Colored bead data sheet, World map, Pushpins/stickers, Cookies, Directions for cookie mining activity, Paper clips/toothpicks, Paper towels, Photos and history of Copperhill Mine , Mining extraction worksheet, Pencils, Chalk board or dry erase board, Chalk or dry erase markers , Brown paper bags or other bags for resources game, Magnifying glass

#### Detailed list of materials required

- (1.) Multicolored craft beads for mining treasure hunt game. Colors required: black, yellow, red, brown, blue, green, purple, orange, white and pink.
- (2.) Two separate locations (for hiding beads). The entire room will represent the world. One specific area in the classroom will represent Cherokee National Forest such as the reading area or the science area.
- (3.) Colored bead data sheet (Teacher Pages Section, p. 72-73) (Student Pages Section, p. 76-77)
- (4.) World map—you may want to use a paper map or the traditional pull down maps normally found in the classroom. If you use the pull down maps you may want to use stickers or post-it notes. These are less permanent for use in marking the countries for the resource location activity.
- (5.) Colored push pins or stickers—a variety of colors is best. This should correspond to the colors used in the bead mining treasure hunt. Colors used for treasure hunt: black, yellow, red, brown, blue, green, purple, orange, white and pink.
- (6.) Chocolate chip cookies—be aware of any potential food allergies, dietary restrictions, and school policy on sweet snacks. It may be necessary to approve this activity first. Also, sending a note home will alleviate any concerns.
- (7.) Paper clips
- (8.) toothpicks
- (9.) Directions for cookie mining activity (Student Pages, p. 78)
- (10.) Paper towels—have enough paper towels handy for each student, one per student.
- (11.) History of Copperhill Mines (Teacher Pages, p. 74)
- (12.) Additional teacher references (Teacher Pages, p. 75)
- (13.) Photos of Copperhill Mines
- (14.) Chocolate chip mining extraction worksheet (Student Pages, p. 79)

- (15.) Pencils
- (16.) Chalk board or dry erase board
- (17.) Chalk or dry erase markers
- (18.) Brown paper bags or other bags for resources game

**ACTIVITIES:** Locating Game Resources, Mapping, Cookie Mining

**LESSON OUTLINE:**

TIME	DAY 4, LESSON I.B.2: Non-Renewable Resources
10-15 min	Locating Game Resources
10-20 min	Mapping
15-20 min	Discussion Worksheet
10 min	Cookie Mining
10-15 min	Mine History

## Key Terms

*Ore*—an ore is a naturally occurring mineral containing a valuable constituent (such as coal or metal) for which it is mined and worked. In order to be considered valuable an ore must contain concentrations of minerals that can be profitably mined, transported, milled, and processed. It must also be able to be extracted from the waste rock by mineral processing techniques.

*Waste rock*—is essentially that, 'waste.' It is the material left over after the coal or other mineral is removed from the ore. No economic value is derived at that time so the waste rock is dumped onto a waste pile away from the ore bearing rock.

*Mining*—involves the separation of valuable mineral ores from the non-ore rock.

*Fossil Fuels*—coal, petroleum, and natural gas.

*Basin*—a basin is a natural depression in the surface of the land which often contains a lake at the bottom. An example of a basin is the Copper Basin a focus of this lesson.

## Introduction

Mining is the process of retrieving minerals from the earth. Miners dig into the earth in order to extract different minerals. These minerals provide us many benefits such as coal for fuel and electricity, iron for steel making, salt for food, and gold and silver for jewelry. Mined minerals also come in the form of rocks. Rocks play an important role in our everyday lives. We use rocks for building, for the construction of highways and driveways, and even for jewelry, i.e. diamonds. Rocks are also used in farming practices. For example, phosphate is used for fertilizer.

The mining process varies depending on how deeply the minerals are within the earth. Mining practices are cheaper when minerals are found at or near the earth's surface. Still some minerals are found deep within the earth and can only be retrieved by tunneling deep underground. Minerals also differ in how they are formed. Some can be found as a compact mass while others are scattered widely within the earth. Mining is not only done within mountain ranges, but also along plateaus and other land types, as well as in oceans, lakes, and rivers. Minerals found in bodies of water are obtained by pumping or drilling into the earth.

When miners separate the ore from the waste rock, 10-50% of the rock that was originally in the ground is blasted or moved. Historically over half of the waste rock was moved and often filled areas such as stream valleys.

Mountaintop removal mining is a popular type of mining that is practiced often within the Appalachian Mountain range. This type of mining involves removing the top of the mountain to get to the coal underneath. Once this type of mining is carried out vegetation is often nonexistent.

Other cases of devastation following extensive mining practices occur simply by the release of harmful chemicals and heavy metals. By releasing chemicals such as sulfur dioxide vegetation surrounding mine sites such as those of the Copper Basin is killed. The release of these chemicals, in addition to heavy metals, also affects aquatic and soil health. These practices decimated fish populations in the Ocoee River. The river remained sterile until recent years. Mining practices often upset the delicate balance of ecosystems.

Restoration of the river began in \*\*\*\* as part of the Environmental Protection Agency. Work continues, and the stream has begun to support several types of fish. The Ocoee River had the honor of hosting the 1996 Olympics water sports. Native rocks and boulders were placed in and around the riverbed. Despite restoration efforts which have led to greater recreational opportunities for whitewater enthusiasts the river remains sterile.

The Environmental Protection Agency released this statement regarding the Copper Basin:

**Site Background:** The Copper Basin Mining District Site (CERCLIS ID TN0001890839), hereinafter, referred to as the "Copper Basin" or the "Site") is located in southeast Tennessee in Polk County, and northern Georgia in Fannin County, near the state border with North Carolina. The Copper Basin is the site of extensive former copper and sulfur mining operations that date back to the early 1800s. For more than 150 years, numerous companies and individuals were involved in various mining, refining and manufacturing operations in the area. Historically, over 30 square miles of Polk County in southeastern Tennessee and Fannin County in northern Georgia were a deforested, barren, eroded landscape caused by copper mining and sulfuric acid processing. Over the past 25 years, various government agencies and private parties have taken steps to stabilize and re-vegetate this large area. Mining operations ceased in 1987, and sulfuric acid production was discontinued in 2000. Mining and related activities have resulted in the environmental degradation of portions of the Copper Basin, including the North Potato Creek Watershed, the Davis Mill Creek Watershed, and parts of the Ocoee River. Waste materials from mining and processing activities remain as sources of contaminants in the form of acidic drainage and high levels of metals in the soils, sediments and surface waters of the watersheds that drain into and impact the Ocoee River. Acidic conditions and leaching metals have impaired water quality and deforestation has resulted in severe erosion. PCB containing oils have been released to the environment from abandoned transformers. Abandoned and collapsing mine works and other deteriorating facilities and waste piles also pose significant physical hazards. In addition, the lack of a healthy soil structure and the poor quality of riparian and upland ecosystems contribute to poor surface water quality. This has caused the degradation of large portions of the 10,000 acre North Potato Creek and the 3,000 acre Davis Mill Creek Watersheds and 26 miles of the Ocoee River. The two creeks that drain the Copper Basin Mining District site, when left untreated, were releasing over 8,600 pounds of metals and greater than 19,000 pounds of acid into the Ocoee River every day.

Mining is a necessary yet destructive practice. Signs of past mining operations can be seen in historically mined areas such as the Copperhill Mines of Polk County, Tennessee. Not only are mined areas removed of essential landscape features, such as mountain tops, but they also suffer from erosion, formation of sinkholes, loss of biodiversity, and contamination of groundwaters and surface water by chemicals from the mining process and products. In forested areas mining may also cause habitat destruction and destruction or disturbance of ecosystems. Farming communities can also be impacted by disturbing or destroying productive grazing and crop lands.

After the devastating effects of mining in areas such as the Copperhill Basin Mines, mining practices have improved. In recent years mining companies have been under much criticism; however practices are now carried to ensure the least impact is imposed on the environment. Ultimately once areas are mined it is hoped that they will be returned to a similar state.

This activity allows students to explore current mining practices while also learning about the natural history of East Tennessee as it relates to the impact of mining practices.

### **Teacher preparation**

Teacher will need to hide the colored beads when the students are not in the room. This can be done while students are outside or during lunch hours. Two designated hiding locations are required. The entire classroom will represent resources that can be extracted or in this case 'found' throughout the entire world. One specific area of the classroom will represent resources found in East Tennessee.

You may hide the beads at your discretion. If you feel that hiding all ten different colored beads or 'resources,' is too overwhelming then you should hide the amount that is appropriate for your students. See the attached list found in the teacher pages section, 'colored bead-data sheet,' to read more about the resources for the treasure hunt (Teacher Pages, p. 72-73).

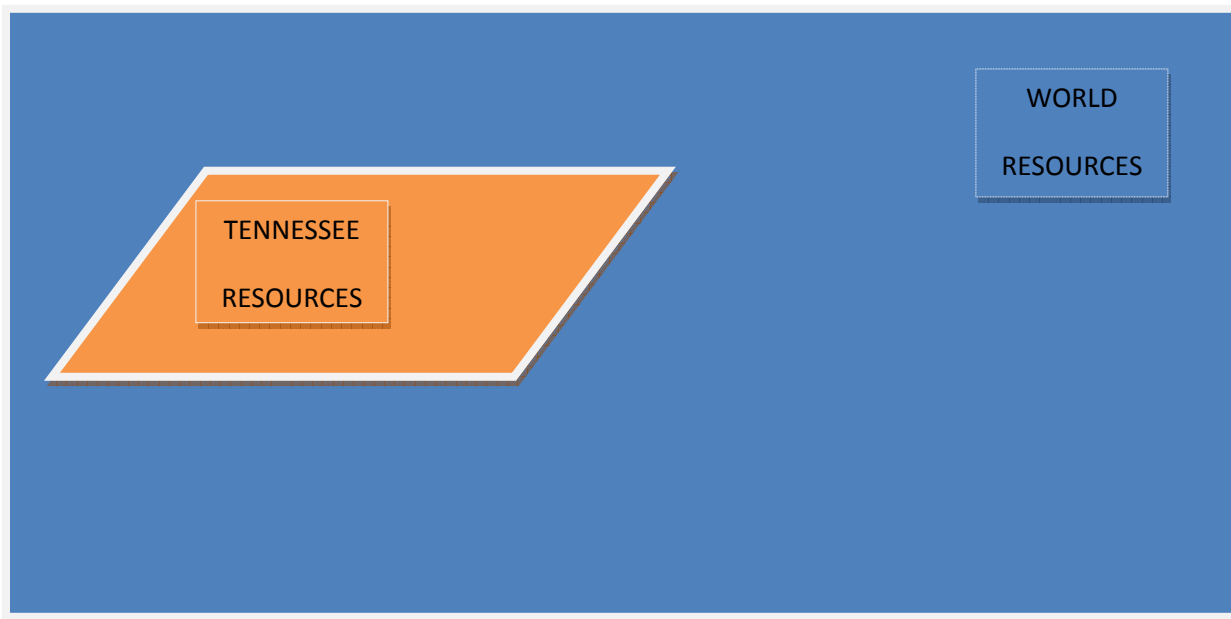
You will need to read the 'History of the Copperhill Mines' located in the Teacher Pages section before you present this information to the class (Teacher Pages, p. 74).

### **Activity**

1. Introduce the activity by telling students that they are going to participate in a treasure hunt. Tell students that there are colored beads placed around the room. Provide students with the following directions for the game:
  - First you will need to write on a dry erase or chalk board which color corresponds to which resource:
    - Black bead—coal
    - Yellow—oil

- Red—natural gas
  - Brown—copper
  - Blue—iron
  - Green—gold
  - Purple—silver
  - Orange—lead
  - White—diamonds
  - Pink—aluminum
- Hand each student three bags. Label the bags accordingly, i.e. bag one would be ‘world resources,’ bag two would be Tennessee resources, and bag three would be Copperhill resources.’ A diagram is provided to better understand the arrangement of the classroom.
  - The blue area represents all the colored beads or ‘resources’ hidden throughout the room that are found and extracted all around the world. One bag labeled ‘world resources’ will be used to collect the resources found in the area of the classroom designated as the world.
  - The orange area represents all the colored beads or ‘resources’ hidden throughout the room that are found and extracted throughout the state of Tennessee including those historically extracted from the Copper Basin. Bag two labeled ‘Tennessee resources’ will be used to collect the resources found in the area of the classroom designated as Tennessee.

Diagram 1. Classroom partitions for locating the resources game



- “Each color bead represents a different extractable resource mined throughout the world. The entire classroom represents resources that are mined worldwide. One designated area of the class (you-the teacher- will need to select the area most appropriate) represents minerals mined only in Tennessee. The first round you will search the room for two minutes and attempt to locate all possible beads/resources. The second round you will then search until all the beads/resources have been recovered.”
2. Continue the activity by having students review the colored bead data sheets (Student Pages, p. 76-77) to reference the location where specific colored beads ‘resources’ were extracted. Once students have read the resource location data sheet they will then map the various locations of the extractable resources which they located in the room.

You may wish to call on volunteers to come in front of the class and locate and map the resource extraction location. Students will use colored push pins to compare and contrast the varying locations where minerals are mined. If you are not able to correspond the bead colors and push pin colors try to distinguish the push pins. This can be done making a note on a piece of masking tape stating which resource the push pin represents and then applying the masking tape to the push pin. Using the colored push pins students will be able to make the distinction of where the various resources were extracted. Call on different student volunteers to come in front of the class to locate and map each resource used in the treasure hunt game.

By color coding the resource extraction locations students are able to make the comparison of the various countries which provide the same resources and those resources which are only found in certain countries or few countries.

3. Summarize the activity by hosting a classroom discussion. Questions that students may be asked are listed below:
  - What were some minerals that were mined worldwide? Where?
  - What minerals were mined in Tennessee?
  - What minerals were mined in the Cherokee National Forest?
  - Were there any minerals that were found in few locations or that appeared to be rare based on the resources location worksheet? (Diamonds and oil probably the most common answer)
  - What minerals were not found in Tennessee but were found in other countries?
4. Begin the activity by giving each student a chocolate chip cookie, a magnifying glass, a paper towel and a set of cookie mining directions (see student pages section, p.78). First students will choose to 'mine' using a toothpick, paper clip or pencil.

Important reminders for the activity—to review before beginning the activity:

- Use one hand to mine the cookie and the other to hold the cookie.
  - Use caution when 'mining' so that they do not accidentally jab themselves with their 'mining tools.'
  - Use magnifying glass to observe the chocolate chips, 'ores' to get a closer view and to inspect for possible damage.
  - Attempt to keep the cookie in its starting location and allow the parts of the cookie that crumble to remain in the place that they crumble.
  - Give students about 3-5 minutes to try and extract all of the chocolate chips from the cookie.
5. Once students have completed this activity have them visually assess the damage and then complete the chocolate chip mining extraction worksheet (see student pages section, p. 79). Discuss the effects of removing the chocolate chips. Example discussion questions include:
    - How hard was it to 'mine' your cookie and remove the pieces of coal?
    - How do you think this relates to the mining of the Appalachian Mountains?
    - Were you able to mine without damaging the cookie?
    - Which 'tool' do you think caused the least damage? Why?



- How do you think this relates to mining today?
  - Thinking back on our mapping activity why is it important to conserve non-renewable resources?
  - What are some ways to conserve non-renewable resources?
  - How do we use non-renewable resources in our everyday lives?
6. Read students an exert about the history of the Copperhill Mines (Teacher Pages, p. 74). Show students the aerial photo of the Copperhill Mines taken from outer space. The impact of the historical mines can be noted by viewing this photo. Show the photos in the following order— pass the space photo around to the students first and followed by the photos representing the damage after the Copperhill Basin was mined. The photos provided are relatively small so they can be passed around the classroom for students to view individually. The class will then discuss:
- What objects stand out in this photo?
  - What were some of the effects of mining?
  - What are some ways that we can conserve our resources?
  - What are some ways we can minimize the damage caused by mining?
7. Extension-how are minerals found and why are certain minerals found in certain places? Physical geologists learn how to read the earth and its clues in the rocks to locate minerals. Someday maybe you would like to become a geologist?

Other related careers include forestry, botany, and wildlife technicians. These technicians will go to specified areas and collect data on areas of potential interest for mining. The technicians record wildlife species present in the area of interest, existing vegetation, timber species, characteristics of the timber trees such as tree height, tree diameter, disease presence, and also looks at the vegetation present in the area. These reports are also done for potential timber harvests. Once they have collected the data reports are then developed to assess the environmental impact that a mining operation or timber harvest would cause.

**(1.) Teacher Page****Colored Bead Data Sheet**

Suggested color beads, resources, and locations

This is not an exhaustive list of all mining locations. The list merely provides sample mining locations for each resource.

*Worldwide mined resources:*

- (1) Coal—Black colored bead—extractions within United States include Tennessee, Kentucky, West Virginia, and various other states. Worldwide extractions—China, Russia, United Kingdom (UK)
- (2) Oil—Yellow colored bead— extractions within United States include Tennessee, Alaska, North Dakota, Utah and various other states. Worldwide extractions—Iran, Iraq, Norway, Russia, Canada, Germany
- (3) Natural gas—red colored bead—extractions within United States include Alaska, Wyoming, Kansas, and others. Worldwide extractions—offshore in Qatar, Iran, Russia, Canada
- (4) Copper—brown colored bead—extractions within the United States include Utah, Nevada, Tennessee. Worldwide extractions—Chile, Zaire, Zambia, China, Australia
- (5) Iron—blue colored bead—extractions within the United States Minnesota (historically-New Jersey, Northern California and others). Worldwide extractions—Australia, Brazil, Paraguay, Portugal, Romania
- (6) Gold—green colored bead—extractions within the United States Tennessee, Nevada, Utah, South Dakota, California, South Carolina, Washington, Montana, and others. Worldwide extractions—South Africa, Peru, Columbia, Russia
- (7) Silver—purple colored bead—extractions within the United States Tennessee, Alaska, Nevada, Idaho, and others. Worldwide extractions—Canada, Ontario, Mexico, Bolivia, Australia
- (8) Lead—orange colored bead—extractions within the United States Tennessee, Missouri, Alaska, Idaho, Montana and others. Worldwide extractions—United Kingdom, Asia, Europe, Mexico
- (9) Diamond—white colored bead—extractions within the United States Arkansas. Worldwide extractions—Africa, Canada, India, Russia, Brazil, Australia
- (10) Aluminum—pink colored bead—extractions within the United States Alabama, Georgia, and Arkansas. Worldwide extractions—Australia, Jamaica, Brazil, French, Surinam, Guiana, France, Hungary, etc.

The following is a list of minerals mined historically in the Cherokee National Forest, in addition to several minerals currently being mined throughout various parts of Tennessee.

*Tennessee*

- (1) Copper—brown colored bead—historically mined within the Cherokee National Forest, Copperhill Mines. The most abundant mineral found in the Copperhill Mines.
- (2) Iron—blue colored bead—historically mined within the Cherokee National Forest.
- (3) Zinc—white colored bead—historically mined within the Cherokee National Forest. Now mined in Grainger, Jefferson, and Knox Counties.
- (4) Gold—green colored bead—historically mined within the Cherokee National Forest, though only found in small quantities.
- (5) Silver—purple colored bead—historically mined within the Cherokee National Forest, though only found in small quantities.
- (6) Coal—Black colored bead—Cumberland Plateau and Cumberland Mountains.
- (7) Oil—Yellow colored bead—various areas throughout Tennessee.
- (8) Natural gas—red colored bead—various areas throughout Tennessee.

\*Sulfur was also historically mined in the Copperhill Mines.

**(1.) Teacher Page****History of Copper Basin Mine Teacher discussion**

Materials: Aerial photos of Copper Basin mine or other mining site

Present photos of the Copper Basin Mines. Tell students that these are mines located within the Cherokee National Forest.

In 1843 the rich copper ore deposits were discovered by European settlers looking for gold in Copperhill, Tennessee. The copper was found in the remote Copper Basin. At the time this area had no roads connecting it to Georgia or other parts of Tennessee where the copper would need to be transported. Construction on the Copper Road began in 1851 and thereafter the extensive mining operations began following the roads completion in 1853. This became one of the earliest formed roads in the area known as the Old Copper Road (USDA FS 2007).

The opening of the road allowed for greater and more extensive mining of the Copper Basin. A variety of minerals were extracted such as iron, sulfur, zinc and small amounts of gold and silver, however copper was most abundant. The Copper Basin was the largest mining community in the Southeast prior to the 1900s. It provided a source of income for the locals, employing more than 3,300 people with an annual payroll in excess of 35 million dollars (this is a good point to note to students that this sum of was even greater than what it would be today) (Tellico Plains Mountain Press 2008).

The mines provided the locals with jobs and sources of income; however the mining practices were not run without large costs to the environment. The mines of Copperhill caused extensive visible, as well as hidden damage to the ecosystem. The sulfur rich ore was roasted, a process fueled by the removal of surrounding trees. The process of roasting released large concentrations of sulfur dioxide into the air killing all the vegetation within Copper Basin. The trees which once surrounded the area and helped to hold the soil in place were absent. The loss of trees caused large amounts of sediment to be eroded into nearby streams. Waterways in the area suffered from sedimentation and the leaching of toxic chemicals. Rivers such as the Ocoee were left sterile due to the runoff.

By the 1930s, those concerned about the devastated landscape began reclamation efforts. These efforts continue today. The land has been treated and revegetated and has begun to make the slow return to forested land though largely different from what it once was. Many efforts have lead to improvements and with the closing of the last mines in 1987 and the honor of hosting the 1996 Olympics on the Ocoee River the landscape has benefited greatly.

The bare clay hills around the Copper Basin were once so red that when NASA took the first satellites photos from space the only recognizable image in the southeastern United States was the round red spot of the Copper Basin. The red hills have largely faded, but signs within the landscape are still present with the abandoned mining areas and the fish that are slowly returning to the Ocoee River.

**(1.) Teacher Pages****Historical information for Copperhill Mines:**

Waters, Jack. *"Mining the Copper Basin in Southeast Tennessee."* The Tellico Plains Mountain Press. 13 Jan. 2008.

USDA Forest Service. *"Old Copper Road Trail."*

**Additional information on cookie mining activity can be accessed on the following website:**

Adams, John J. *Cookie Mining*. 14 Jan. 2008.

<<http://www.skidmore.edu/~jthomas/fairlysimpleexercises/pdf/cookieminig.pdf>>.

(2.) Student Page

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

### Colored Bead Data Sheet

The locations listed do not represent all the areas where this resource can be found. Some of the resources have many locations where they are mined (i.e. coal) whereas others have fewer locations (i.e. diamonds). You may want to find other areas where these resources can be found and share them.

*Worldwide mined resources:*

- (1) Coal—Black colored bead—extractions within United States include Tennessee, Kentucky, West Virginia, and various other states. Worldwide extractions—China, Russia, United Kingdom (UK)
- (2) Oil—Yellow colored bead—extractions within United States include Tennessee, Alaska, North Dakota, Utah and various other states. Worldwide extractions—Iran, Iraq, Norway, Russia, Canada, Germany
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- (5) Silver—purple colored bead—historically mined within the Cherokee National Forest, though only found in small quantities.
- (6) Coal—Black colored bead—Cumberland Plateau and Cumberland Mountains.
- (7) Oil—Yellow colored bead—various areas throughout Tennessee.
- (8) Natural gas—red colored bead—various areas throughout Tennessee.

\*Sulfur was also historically mined in the Copperhill Mines.

(2.) Student Page

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

### Cookie Mining Directions

Imagine that your cookie is a 'mine.' This will involve the careful removal of as many of the chocolate chips or 'ores' from the cookie as possible. In order to mine your cookie you will need a tool. You can choose a toothpick, pencil, or paperclip. Use this tool to dig into the cookie and try to remove the chocolate chips or ores.

Things to keep in mind while 'mining:'

- (1.) Try not to move the cookie.
- (2.) You may use your one hand to hold the cookie and the other to remove chocolate chips with your tool.
- (3.) Keep the cookie on the paper towel.
- (4.) Try to keep the 'waste pile,' any crumbling that occurs, in the location that it falls.
- (5.) Do not eat your cookie until you have completed the chocolate chip mining extraction worksheet.

Keep in mind:

Cookie —represents the earth that is being mined

Chocolate chips—represents your ores

Crumbling of the cookie—represents your waste pile



**(2.) Student Page**

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

**Chocolate chip mining extraction worksheet**

(1.) Purchase a tool:

Cookies \$ 5.00

Paper clips \$2.00 or toothpick \$1.00

Hardhat \$1.00

Which tool did you purchase? List cost. \_\_\_\_\_

(2.) How many chocolate chips 'ores' were you able to extract?

\_\_\_\_\_

(3.) If each of these chocolate chip 'ores' was worth \$2.00 how much did you make?

\_\_\_\_\_

(4.) Were these chocolate chips 'ores' damaged in the process?

\_\_\_\_\_

(5.) Why is damage to the chocolate chip 'ore' important, i.e. what happens if your resource is damaged?

\_\_\_\_\_  
\_\_\_\_\_

(6.) Any damage to the chocolate chip 'ores' will cost you .50 cents for each damaged chocolate chip 'ore.' Calculate your loss.

\_\_\_\_\_

(7.) During your mining process you caused sedimentation to run off in the stream. You have to pay \$6.00 to clean up the area. Add this to your loss so far.

\_\_\_\_\_

(8.) Add any observations you had. For example, the cookie was difficult to mine because....

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(9.) Add your total profit (starting with calculations in #3) after the cost for your tools (#1), cost of damaged ores (6), and damage to the stream (#7).

\_\_\_\_\_

## Lesson I.B.3: Renewable Resources

### LESSON OBJECTIVES:

Students will:

- understand how we use local renewable resources
- understand quantity of resources an individual household might use understand

### QUESTIONS ADDRESSED:

1. How does rate of resource consumption vary with different needs?
2. How much lumber is consumed to build a house?

### STANDARDS COVERED:

### STANDARDS COVERED:

#### **3<sup>RD</sup> GRADE:**

##### **Science**

3.10.2 Realize that earth materials can be recycled or conserved.

- Identify materials and resources that can be reused

#### **4<sup>th</sup> Grade**

##### **Math**

4.1.3 Solve problems, compute fluently, and make reasonable estimates.

- 4.1.3 d, f, g

##### **Science**

4.10.3 Realize the difference between renewable and non-renewable resources.

- Identify renewable and non-renewable resources.

#### **5<sup>th</sup> GRADE:**

##### **Math**

5.1.3 Solve problems, compute fluently, and make reasonable estimates.

- 5.1.3 a, d, g

### Science

5.10.1 Recognize that earth materials have a variety of practical uses.

- Choose the appropriate use for an earth material (e.g., fuel, monument, house foundation).

5.10.3 Realize the difference between renewable and non-renewable resources.

- Explain the implications of society's dependence on non-renewable resources.

### 6<sup>TH</sup> GRADE:

#### Math

6.1.1 Understand numbers, ways of representing numbers, relationships among numbers, and number systems.

- 6.1.1 g, k

6.1.3 Solve problems, compute fluently and make reasonable estimates.

- 6.1.3 a, c

**MATERIALS:** Popsicle sticks, Glue, Paper milk/juice cartons, Calculations & scale worksheet, Markers/paint, Scissors

sticks

#### Detailed List of Materials

(1.) House-building instructions (see teacher and student page section, p. 86-87)

(2.) Large house supplies (per student/house):

70 standard size popsicle sticks

1 half-gallon size paper milk or juice carton (emptied, rinsed, and dried)

Scissors

Marker or pen

(3.) Small house supplies (per student/house):

30 standard size popsicle sticks (pre-cut)

1 pint-size paper milk or juice carton (emptied, rinsed, and dried)

(4.) Multi-purpose craft glue (one per student or pair of students)

(5.) Calculations and scale worksheet (see student page section, p. 88-89)

(6.) Markers or paint (optional)

**ACTIVITIES:** House Building Activity, calculations worksheet

**LESSON OUTLINE:**

<b>DAY 5, LESSON I.B.3: Renewable Resources</b>	
5 min	Introduction
10-20 min	House Building Activity
15 min	Calculations

**Key Terms**

*Lumber*—or timber, is wood in any of its stages, from cutting or felling the wood through readiness for its use. These uses include structural material for construction or wood pulp for paper production.

**Introduction**

Lumber or timber is wood in any of its stages from cutting or felling the wood through readiness for use as structural material for construction, or wood pulp for paper production. There are two types of wood, softwoods and hardwoods. Softwood is wood derived from conifers (needle-bearing trees) such as pines, spruce, fir, redwood, etc. Despite its name it is often harder than hardwoods. Softwood is typically used for construction and to make paper. Hardwoods are derived from broad-leaved, *mostly deciduous trees*, or angiosperms such as oaks, yellow poplar, and hickories. It is typically used to make furniture, and also used for construction, flooring, etc.

We rely on timber greatly and it takes large quantities to supply human demands. This lumber comes from either the forest or it is grown on tree farms. In order to supply our everyday needs it is necessary to manage our forests. As populations continue to increase, greater amounts of timber are consumed. For example, a five foot piece of 2X4, the standard size of lumber, is about how much a person in the US uses every day (Taylor, 2008). Much of this comes from our use of paper. You may want to bring a visual of a five foot piece of 2X4 board foot of timber for students to see. This will help them make the connection.

**Materials needed****Lesson I.B.3: Renewable Resources****LESSON OBJECTIVES:**

Students will:

- understand how we use local renewable resources
- understand quantity of resources an individual household might use understand

**QUESTIONS ADDRESSED:**

1. How does rate of resource consumption vary with different needs?
2. How much lumber is consumed to build a house?

**STANDARDS COVERED:****3<sup>RD</sup> GRADE:****Science**

3.10.2 Realize that earth materials can be recycled or conserved.

- Identify materials and resources that can be reused

**4<sup>th</sup> Grade****Math**

4.1.3 Solve problems, compute fluently, and make reasonable estimates.

- 4.1.3 d, f, g

**Science**

4.10.3 Realize the difference between renewable and non-renewable resources.

- Identify renewable and non-renewable resources.

**5<sup>th</sup> GRADE:****Math**

5.1.3 Solve problems, compute fluently, and make reasonable estimates.

- 5.1.3 a, d, g

**Science**

5.10.1 Recognize that earth materials have a variety of practical uses.

- Choose the appropriate use for an earth material (e.g., fuel, monument, house foundation).

5.10.3 Realize the difference between renewable and non-renewable resources.

- Explain the implications of society's dependence on non-renewable resources.

**6<sup>TH</sup> GRADE:****Math**

6.1.1 Understand numbers, ways of representing numbers, relationships among numbers, and number systems.

- 6.1.1 g, k

6.1.3 Solve problems, compute fluently and make reasonable estimates.

- 6.1.3 a, c

**MATERIALS:** Popsicle sticks, glue, paper milk/juice cartons, calculations & scale worksheet, markers/paint, scissors

**Detailed List of Materials**

- (1.) (1.) House-building instructions (see teacher and student page section, p. 86-87)
- (2.) Large house supplies (per student/house):
  - a. 70 standard size popsicle sticks
  - b. 1 half-gallon size paper milk or juice carton (emptied, rinsed, and dried)
  - c. Scissors
  - d. Marker or pen
- (3.) Small house supplies (per student/house):
  - a. 30 standard size popsicle sticks (pre-cut)
  - b. 1 pint-size paper milk or juice carton (emptied, rinsed, and dried)
- (4.) Multi-purpose craft glue (one per student or pair of students)
- (5.) Calculations and scale worksheet (see student page section, p. 88-89)
- (6.) Markers or paint (optional)

**ACTIVITIES:** House Building Activity, Calculations

**LESSON OUTLINE:**

<b>DAY 5, LESSON I.B.3: Renewable Resources</b>	
5 min	Introduction
10-20 min	House Building Activity
15 min	Calculations

### Teacher preparation

Assemble materials for each student

Photocopy attached “House building instructions” (one per student)

Photocopy attached “Calculations and Scale” worksheet (one per student)

Set up classroom for activity

Cut Popsicle sticks for small houses [safety alert!]

For each small house being made, it is necessary to cut 24 Popsicle sticks to the height of the milk/juice carton. Remaining shorter pieces can be used for the roof and base of the house. It can be difficult to cut these with scissors, so a more powerful tool, such as an electric jig saw, or an X-ACTO SAW may be used. These can be purchased at a hardware store or a art supply store, respectively. **Please use caution and wear appropriate safety gear while engaging in this activity.**

Approximate cut sizes for the small house:

Base—1.5 inches

Sides—2 inches

Roof—1 inch

### Activity

1. Introduce the idea of renewable resources (see activity I.B.1., p. 33) and explain to students that this activity will help them understand one way in which humans use a renewable resource.
2. Have students decide (or assign) what house size they will make (small or large). You may also choose to assign groups to work together. To save preparation time for the activity it may be best to have only one student or student group make the ‘small house,’ as the cutting for the small house is tedious and time consuming. This would provide students with the needed size comparison.
3. Supply each student with the “House building instructions (Student & Teacher Pages, p. 86-87),” “Calculations and Scale (Student Pages, p. 88-89),” glue, optional markers or paint, and popsicle sticks and milk or juice carton appropriate to their house size
4. Create popsicle stick houses (note—it is possible to build a popsicle stick house without a milk/juice carton as the base; however the scale factor would not work unless the set number of popsicle sticks were used).



- a. For a large house, take the milk/juice carton and measure and mark one popsicle-stick-height up on each side. Draw a line to connect each mark, and cut the carton in half along this line. Insert the top half of the carton into the bottom half.
  - b. For both houses, decorate the popsicle sticks before or after the houses are constructed as desired (optional).
  - c. For both houses, glue popsicle sticks side-by-side along each side of the carton. Allow to dry.
  - d. Glue sticks side-by-side along each slanted side of the top of the carton, allowing ends of Popsicle sticks to extend over the edge of the sides, forming the roof. If the carton has a twist-off opening, do not glue sticks along this portion of the roof—the opening can act as the house’s chimney.
  - e. Glue sticks side-by-side along the base of the carton. Allow to dry.
5. Using the “Calculations and Scale” worksheet, have students indicate whether they have built a large or small house (number one on the worksheet). Then have students count the number of popsicle sticks they used to build their homes and enter it into number two on the worksheet.
  6. Have students complete the “Calculations and Scale” worksheet, based on each students’ individual “lumber” use (Student Pages, p. 88-89).
  7. Review with the students the different quantities of lumber used for each house. Suggested discussion questions include:
    - a. How much lumber/how many trees were used to build your houses?
    - b. How much lumber/how many trees were used to build homes for a town of 1000 households?
    - c. Where does this lumber/where do these trees come from?
    - d. Is lumber/are trees a natural resource? In what way?
    - e. What type of natural resource are they? Renewable, or nonrenewable? [if activity number I.B.1. has been completed]
    - f. What other things do we use that are made from wood?
    - g. How does our use of wood affect our forests?

- h. What other resources can be used to build homes?
- i. How do these options compare to use of wood to build a home?
- j. How can we change the impact that we have on our national forests and the lumber that we harvest from them?
- k. Were you surprised by how many trees were used to build your house today? Other students' houses? Why or why not?
- l. What size home do you hope to have one day? What material do you think you would like it to be made of?

### **Extensions**

Build a popsicle stick house, without using a milk/juice carton base that students can keep and use as a treasure box or birdhouse.

Have students research and report on other resources that are used to build homes and other structures.

### **Popsicle house decorations adapted from**

Kinder Planet. *"Popsicle Stick Treasure Box."* 18 Jan. 2008. <[www.kinderplanet.com](http://www.kinderplanet.com)>.

**(1.) Teacher Page & Student Page****House Building Instructions****Materials**

Small house:

30 standard size popsicle sticks (pre-cut)

1 pint-size paper milk or juice carton (emptied, rinsed, and dried)

Large house:

70 standard size popsicle sticks

1 half-gallon size paper milk or juice carton (emptied, rinsed, and dried)

Scissors

Marker or pen

Multi-purpose craft glue

Calculations and scale worksheet

Markers or paint (optional)

**Directions**

For the large house only:

1. Using a popsicle stick to measure, measure one popsicle-stick-height up the side of your milk/juice carton.
2. Mark this height.
3. Measure and mark the height of the popsicle stick once on each side of the carton.
4. Turn the popsicle stick sideways.
5. Place the popsicle stick against the carton, lining it up with the height of the mark.
6. Draw a line on the carton, using the edge of the popsicle stick to keep the line straight.
7. Do this on each side of the carton.
8. Cut the milk carton in half along the lines you have just drawn.

9. Fit the top half of the carton down into the bottom half of the carton. You should now have a carton that is about one popsicle-stick high, with the slanted top of the carton sticking up above that.

For both houses:

1. Decorate your popsicle sticks in colors you would like your house to be. (optional)
2. Turn your milk/juice carton sideways.
3. Glue popsicle sticks side-by-side onto the side of the milk/juice carton that is now facing up, until the carton's side is completely covered with popsicle sticks.
4. Turn the milk carton so a new side is facing up.
5. Glue more popsicle sticks onto this side until it is completely covered.
6. Let these sides dry for about 3 minutes.
7. When these two sides are dry, turn the milk carton so new sides are showing, and repeat parts b,c,d, and e.
8. When all four sides are finished drying, stand the carton onto its base again.
9. Glue popsicle sticks side-by-side along each slanted side of the top of the carton so that ends of popsicle sticks can extend over the edge of the sides, forming the roof. If the carton has a twist-off opening, do not glue sticks along this portion of the roof—the opening can act as the house's chimney.
10. Allow the roof to dry for about 5 minutes.
11. When the roof is dry, turn your house on its side again so that you can reach the base of the carton.
12. Glue sticks side-by-side along the base until it is completely covered with popsicle sticks.
13. Return any extra popsicle sticks you have to the teacher.
14. While the base of the house dries, complete the "Calculations and Scale" worksheet.



**Table 2**

<b>Large house</b>	
Total popsicle sticks used	Number of trees used
10	10
20	20
30	30
40	40
50	50

**Table 3**

<b>Small house</b>	
Total popsicle sticks used	Number of trees used
10	5
20	10
30	15
40	20

4. Depending on the size of your popsicle house, for a large house use table 2 and table 3 for a small house, and the number of popsicle sticks used to construct your home how many trees were used?
-

## ***Lesson I.C.1: Dividing the Resources***

### **LESSON OBJECTIVES:**

Students will:

- understand how resources are used in a forest
- gain an understanding of sustainable resource use
- develop an understanding of the connection between conservation and sustainability

### **QUESTIONS ADDRESSED:**

1. What is a niche? Habitat? What are requirements among different forest-dwelling species?
2. How does sustainability work?
3. What conservation practices do we practice/can we do to lead to sustainability?

### **STANDARDS COVERED:**

#### **3<sup>RD</sup> GRADE:**

##### **English**

3.1.01 Develop oral language.

- 3.1.01 f

3.1.12 Read independently for a variety of purposes.

- 3.1.12 b, e

##### **Math**

3.5.1 Develop, select, and use appropriate methods to collect, organize, display, and analyze data.

- 3.5.1c, d

##### **Science**

3.2.3 Examine interrelationships among plants, animals, and their environment.

- Explain how plants and animals depend upon each other and the non-living elements of an environment to meet basic needs.

**4<sup>th</sup> Grade****English**

4.1.01 Continue to develop oral language and listening skills.

- 4.1.01 f

4.1.11 Read independently for a variety of purposes.

- 4.1.11 b, e

**Math**

4.1.3 Solve problems, compute fluently, and make reasonable estimates.

- 4.1.3 f, g

4.5.1 Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer questions.

- 4.5.1 c, d

**Science**

4.2.1 Investigate the relationships among organisms in a specific ecosystem.

- 4.2.1. Examine and relate how plants and animals interact with each other and their environment.

**5<sup>th</sup> GRADE:****English**

5.1.01 Continue to develop oral language and listening skills.

- 5.1.01 f

5.1.11 Read independently for a variety of purposes.

- 5.1.11 b, e

**Math**

5.1.3 Solve problems, compute fluently, and make reasonable estimates

- 5.1.3 d

5.5.1 Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer questions.



- 5.5.1 c, d

### Science

5.2.1 Investigate the relationships among organisms in a specific ecosystem.

- 5.2.1 Classify specific kinds of relationships among plants and animals within an ecosystem.

### 6<sup>TH</sup> GRADE:

#### English

6.1.11 Read independently for a variety of purposes.

- 6.1.11 b, e

#### Math

6.1.3 Solve problems, compute fluently, make reasonable estimates.

- 6.1.3 a, c

6.5.1 Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer questions.

- 6.5.1 d

**MATERIALS:** Niche/habitat species cards, Set of resources for each group these can be either M & M's, poker chips or pieces of construction paper, Worksheet, Pencils

#### **Detailed List of Materials**

- (1) Wildlife cards (see student pages section, p. 103-117)
  - \* You need one wildlife card per group. These can be handed out to the students at random.
  - \* Each group also needs one white-tailed deer card. These will be handed out AFTER the first wildlife card is assessed by the students. The white-tailed deer card is the card that students will use for the game.
- (2) 50-60 (two medium handfuls) M&M's (or colored plastic chips, construction paper, etc.) for every four students
- (3) "Tally the resources" worksheet (see student pages section, p.118)
- (4) Pencils

**ACTIVITIES:** Divide the Resources

**LESSON OUTLINE:**

<b>DAY 6, LESSON I.C.1: Dividing the Resources</b>	
15 min	Introduction
10-15 min	Divide the Resources Game
15 min	Worksheet
5-10 min	Closing

### Key Terms-students

*Habitat*—is an ecological or environmental area that is inhabited by a certain species, i.e. the area where an organism lives.

*Niche*—the relationship position of a species or population in its ecosystem, i.e. it is the organisms job.

*Herbivores*—animals that eat only plants.

*Carnivores*—animals that eat other animals.

*Omnivores*—animals that eat both plants and animals.

*Primary producer*—organisms in an ecosystem that produce biomass from inorganic compounds (autotrophs). An example of a primary producer is a plant.

*Nocturnal*—describes an animal behavior where animals are asleep during the day and active at night.

*Metamorphosis*—an animal that physically develops after birth or hatching (i.e. monarch butterfly—egg, larva/nymph, pupa, and adult).

*Endangered species*—these are populations of organisms that are listed on the Endangered Species List. They are at risk of becoming extinct due to either threats from the environment, predation, human activities, or simply because they are low in number.

*Threatened species*—includes any species vulnerable to extinction in the near future. These species are listed as ‘threatened.’

*Conifer*—cone-bearing seed plants with needle-leaves or scaled-leaves.

*Deciduous*—trees or shrubs that lose their leaves seasonally. The term deciduous means “falling off at maturity” or “tending to fall off.”

### Reference terms for teacher

*Understory*—vegetation that grows underneath the over topping forest trees.

*“In Need of Management”*—species which need to be managed (i.e. ensure the type of habitat they require is available).

*Hardwood*—wood most often from a deciduous tree or angiosperm.

*Foraging*—how wildlife hunt or graze for food within their environment.

*Roosting*—a shelter where wildlife (fowl and other birds) perch and nest.

*Nesting*—an activity practiced by birds and other fowl when reproducing, provides a place where they raise offspring.

*Home range*—range within wildlife normally reside (i.e. one mile radius).

\*These terms are simply presented for clarification purposes. Some of the student cards use these terms. When students present the information about their animals have them try to identify what these words mean if they show up on their wildlife fact cards.

### **Introduction**

All wildlife require food, water, shelter, and space in order to survive. The scientific name for this is habitat. If any of these factors are limited, or even worse, exhausted, wildlife populations will decline. Likewise, if food, water, or habitat is over abundant wildlife will thrive and become overpopulated. The management of wildlife may be helpful in some circumstances to ensure that population numbers are kept at optimal levels and at an organism's carrying capacity. An organism's carrying capacity simply means that its population can be supported given the food, habitat, and water available within that ecosystem.

Our National Forests are managed sustainably to ensure that wildlife have adequate amounts of food and water within their specific habitats. Just as wildlife populations affect the resources required by wildlife so do human interests. Read more about this topic in lesson I.D.1.

The following activity will give students experience with important ecological terms such as niche and related terms associated with organisms and their survival. Students will be able to better understand the requirements of organisms in order to survive.

### **Materials**

Wildlife cards (see student pages section, p. 103-117)

- \* You need one wildlife card per group. These can be handed out to the students at random.
- \* Each group also needs one white-tailed deer card. These will be handed out AFTER the first wildlife card is assessed by the students. The white-tailed deer card is the card that students will use for the game.

50-60 (two medium handfuls) M&M's (or colored plastic chips, construction paper, etc.) for every four students

"Tally the resources" worksheet (see student pages section, p.118)

Pencils

### Teacher preparation

Prepare habitat & niche cards:

Photocopy wildlife cards (see student pages section, p. 103-117)

Cut out each card

Glue card to construction paper or other heavy backing

Laminated (if desired).

Photocopy “Tally the Resources” worksheets (see student pages section; p. 118, one copy per group of four students)

### Activity

1. Divide the class into groups of four students each. It may be best to have the student groups move their desks together.
2. Provide each group with one “wildlife” card (see student pages section p. 103-117). Student groups will read about the animal that is given to them. This discussion provides an introduction to the activity.
3. Introduce the activity to the class by first reviewing the following key terms: habitat, niche, herbivore, carnivore, and omnivore. You may want to ask for volunteers to provide the class with a definition and an example of each. A list of definitions of these terms is provided in the ‘key terms’ section, prior to the activity introduction.

A brief review of these terms could be presented in the following manner; “does anyone know what a habitat is? If none of the students are familiar with these terms simply tell them that a habitat is where an animal lives, for example an owl lives in the forest and hunts in the meadows for mice. The owl really has two habitats then, right? Can you identify which two habitats he uses (forest and meadow)? What type of consumer would the owl be? He is a carnivore because he eats mice or other animals. What type of consumer is a mouse? He is an herbivore because he eats plants, fruits and mushrooms, but no animals. What is an animal called that eats both plants and animals (omnivore)? Does anyone know what a niche is? It is an animal’s job. For example, the owl is a carnivore. That is, he eats other animals. This is his job or niche.

4. Continue the activity by telling students every card represents an animal that is found on the Cherokee National Forest. Tell students that some animals on the Cherokee National Forest are endangered or threatened. Define these terms by saying something like, “endangered species are those animals, plants, trees or other species that are in danger of being lost forever.

Threatened species are those species that are likely to become endangered species. Have student groups go around the room and tell whether their animal is endangered, threatened or neither.

5. Have student groups raise their hands according to the unique needs on their cards. For example, pose the following questions and have students raise their hands accordingly
  - 5.1 Whose wildlife character needs to live near water or in water to survive?
  - 5.2 Whose wildlife character needs meadows to survive?
  - 5.3 Whose wildlife character needs forests to survive?
  - 5.4 Whose wildlife character needs both forests and open areas or meadows to survive?
  
6. Continue the activity by telling students that they will be playing a game involving white-tailed deer (see student pages section, pg. 103). This game will either ensure that the deer will survive or not. Tell students that although white-tailed deer are not endangered or threatened that they are still individually at risk because if they do not receive enough resources then they will not survive. If there were not enough resources for all the deer the species could one day be threatened or endangered, but right now this is one species that is stable or have enough resources.
  
7. Give each group of four a copy of the white-tailed deer card (see student pages section, p. 103). All groups will use the white-tailed deer card to carry out the game.
  
8. Have each group study the needs of the white-tailed deer. Ask for volunteers to read aloud to class the various parts addressed on the cards: habitat, niche, and other facts found on the card.
  
9. Give each group a “Tally the Resources” worksheet which they will use to record their overall totals for each—habitat, food, and water collections.
  
10. Begin game play within each group:
  - 10.1 Designate players 1, 2, 3, and 4 and label them on the “Tally the Resources” worksheet
  - 10.2 Place the M&Ms in the center of the group (do not allow players to touch the resources until game play begins). Depending on classroom rules you may prefer to use multicolored chips or construction paper. These items will be the resources found in the group’s “Resource pool.” Each color represents a different resource:

*Blue & red: water*

*Green & yellow M&M’s: food*

*Brown & orange: habitat*

\*You will need to give each group 30 total blue and red chips, 20 total green and yellow chips, and 5 brown and orange chips for each group.

\*Each child can take no more than four of the blue and red chips, 3 of the green and yellow chips, and two of the brown and orange chips each turn.

10.3 Beginning with player 1 and continuing in order, each player will gather at least one food, water, or habitat resource each round. Each player must collect a minimum of one resource each round or his or her animal character will not survive that round and does not participate in play for the succeeding rounds.

10.4 To begin play: Player 1 selects one or more resources from the group's resource pool.

10.5 Player 2 selects one or more resources from the group's resource pool.

10.6 Continue with players 3 and 4. This completes round one.

10.7 Repeat this cycle of gathering the resources three times or until all the resources have been taken or 'used.'

10.8 When all the resources have been taken by the students have them total the amounts they took of each-food, water, and land. On the "Tally the Resources" worksheet, fill in the numbers of resources each player removed from the Resource Pool during Round 1.

10.9 Now hand out the consequence cards (see student pages section p. 119). Have students check to see how many resources they received in total. This will allow them to see if they survived or not.

11. Once the game is over have students complete the "Tally the Resources" worksheet.

12. Have students create a bar graph of the results on page two of the "Tally the Resources" worksheet (see student pages section p. XX). To construct the bar graph tell students to simply use the total amount of resources they collected for food, water and habitat. Bar graph template attached in student pages section (see student pages section p. 120).

13. Lead the students in a group discussion to compare their results and understand how they could better share their resources. Suggested discussion questions are included in the teacher pages section (see teacher pages section p. 102).

### Extensions:

Once students have completed this activity it may be helpful to also do the food web activity. To do this you will need a ball of yarn. Have the student gather in a circle and designate each student as an animal or plant. One student will need to be the sun. Start with the sun (this student will hold the yarn first) and then pass the yarn to one of the students that has been designated as a plant. This will simulate the sun as essential to the growth of all plant life necessary for all plants to grow. You will then have one of the animals that eats a plant such as fruit or grass (i.e. grasshopper or deer) hold the yarn and then progress through the chain. Pass the yarn to each respective consumer, for example Sun -> Grass -> Grasshopper-> bird -> fox. As you do this pass to others who eat the same products or animals.

By the end of the game students should all be connected and fill some tension in the yarn. This signifies the connectedness of all plants and animals in food web.

Note it is best to designate several students (2-3 students) as grass due to its high demand.

### Characters included:

Sun-> Grass -> Rabbits -> fox

Sun -> Grass -> Grasshopper-> bird -> fox

Sun -> Algae -> fish -> Frog -> turtle

Sun -> Fruits, grains, mushrooms or seeds -> Mice -> owl

Sun -> Tree-> Acorns -> Squirrels -> fox

Sun -> mushroom, fish, or frogs -> turtles

Sun -> grass, twigs, fruits, or mushrooms ->Deer

Sun - > grass, twigs, fruits, or mushrooms -> Elk

For older students, or for a more detailed version of the game, use specific examples of resources that each animal may use. Another option is to add human interest groups that use the National Forest (see teacher pages section p. XX).



**(1.) Teacher Page****Tally the Resources Teacher Discussion**

- (1) How many rounds did you go through before you noticed your supply of resources diminishing?  
How many before they were gone?
- (2) Which resources were used up first? Second? Which lasted the longest? Why do you think this occurred this way?
- (3) Was there one player who used more resources than others? Why did this happen?
- (4) How did player's resource use affect the rounds and players that followed?
- (5) What happened when all the resources were used up? What does this mean for your groups' animals?
- (6) How does this relate to human resource use?
- (7) How can we prevent using up our resources? What are some ways we can try to live more sustainably or with less impact on resources?
- (8) What else did you learn from the game?

**(2.) Student Page**

## I.C.1. Wildlife Cards

**White-tailed deer**

Scientific name: *Odocoileus virginianus*

*Habitat*—forests, swamps, and open fields.

*Food*—twigs, shrubs, fungi, acorns, grass, and herbs.

*Niche*—*herbivore*. Preyed upon by wolves, cougars, and humans.

*Other information*—occurs in groups of up to 25 or more in winter, usually singly or 2-3 (doe and fawns) in summer and fall; some in North migrate to swamps in winter. Home range generally one mile wide.





### **Black bear**

Scientific name: *Ursus americanus*

*Habitat*—forested areas with a thick understory and plentiful food supply.

*Food*—In the spring, bears eat grasses and small soft plants. In the summer, they usually eat soft fruits from bushes and trees such as squawroot, blackberry, blueberry, huckleberry, and black cherry. In the fall, they will feed on fruits and nuts, like black cherries, huckleberries, blackberries, blueberries, acorns, hickory nuts, and bechnuts. When they prey on animals, bears will usually eat beetles, yellow jackets, wasps, hornets, and ants, and some will eat larger animals like wood-eating roaches, poultry, livestock, and carrion. Other foods that bears sometimes will eat include mushrooms, green leaves, roots, buds, clover, dandelions, and wild oats. Bears that live near human populations will also eat garbage and food of all types left by humans.

*Niche*—*omnivore*, because they sometimes prey on animals, but they are mainly herbivores.

*Other facts*—active in daytime during spring and fall, but are more active during dawn and dusk in the summer. During the breeding season (June and July) males may be nocturnal.





### Barn owl

Scientific name: *Tyto alba*

*Habitat*—open, non-forested areas, such as grasslands, deserts, marshes, and agricultural fields. They also utilize buildings and cavities.

*Food*—small mammals such as rodents mice and small rats.

*Niche*—carnivore, nocturnal hunter.

*Other facts*—have asymmetrical ears which allow them excellent hearing and the ability to hunt in total darkness.





### Grey squirrel

Scientific name: *Sciurus carolinensis*

*Habitat*—forests and urban areas near oaks, beeches, and other nut trees.

*Food*—hickory nuts, beechnuts, acorns, berries, soft fruits, buds, seeds, and fungi. Red maple is an important food source in the early spring, and mulberry is in the late spring and early summer. It may also eat seeds, insects, and baby birds.

*Niche*—omnivore

*Other facts*—have become easily adapted to urban areas, unlike many other forest-dwelling animals.





### Carolina northern flying squirrel

Scientific name: *Glaucomys sabrinus coloratus*

*Habitat*—high elevation, greater than 4,500 feet, near the boundary of conifer and hardwood forests. They use both forest types for foraging and nesting areas throughout the year.

*Food*—lichens, fungi, seeds, buds, fruit, cones, catkins, tree sap, and insects.

*Niche*—omnivore

*Other facts*—this nocturnal squirrel is listed on the Endangered Species list. The northern flying squirrel has a relative, the southern flying squirrel, which is found in the Eastern U.S. from Canada to Florida. The Carolina northern flying squirrel is smaller than its relative.





### **Black rat snake**

Scientific name: *Elaphe obsoleta*

*Habitat*—rocky, forested hills, hardwood forests, river floodplains, and the border of swampy areas.

*Food*—mice, rats, squirrels, birds, and bird eggs. Young rat snakes eat frogs, lizards, and small rodents.

*Niche*—carnivore

*Other facts*—adults are typically 3-5 feet long, but larger snakes can be 6 feet long or more. They are usually dark to light gray with darker gray or brown blotches. The belly is whitish in color near the head and becomes checkered or spotted toward the tail. Rat snakes are constrictors, which means they catch their prey live and kill them by twining their bodies around the prey to choke it. They are also great climbers, known for scaling brick walls as well as tree trunks. If frightened they will vibrate their tail (to imitate a rattlesnake, although they don't have a rattle) and give off an unpleasant musky scent.







### Wild turkey

Scientific name: *Meleagris gallopavo*

*Habitat*—hardwood forests with scattered openings. Wild turkey feed in the forests and during mating season they move to open areas such as open woods, fields, pastures, shrubby growth, and even quiet roads.

*Food*—turkeys forage on the ground or climb shrubs and small trees to feed. Nuts and seeds, such as acorns, chestnuts, and hickory nuts provide the best nutrition. Turkeys also eat other seeds, fruits, berries, insects, buds, and salamanders.

*Niche*—omnivore

*Other facts*—male is larger than the female and has a more prominent beard, head, and neck completely bare and often bluish.







### **American bullfrog**

Scientific name: *Rana catesbeiana*

*Habitat*—medium to large bodies of water (i.e. lakes or ponds).

*Food*—eat almost any living creature that can fit in their mouths such as insects, spiders, crayfish, mice, other frogs, small turtles, fish, snakes, birds, and other amphibians.

*Niche*—carnivore

*Other facts*—American bullfrogs are the largest native frogs in the U.S. They are about 3.5-6 inches long. Females lay 1000-5000 eggs at a time. Life cycle: metamorphosis of tadpoles takes about 1-2 years. 2-3 more years are required for the bull frog to reach maturity.





differential grasshopper

### Grasshopper

Scientific name: *Caelifera spp.*

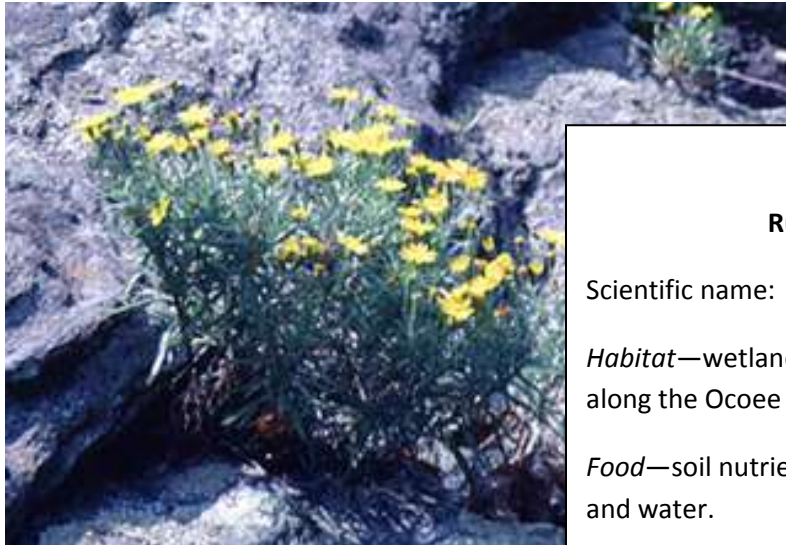
*Habitat*—meadows and other grassy open areas.

*Food*—leaves and other soft plant parts.

*Niche*—herbivore

*Other facts*—they can jump up to 20 times their body length.





### Ruth's golden aster

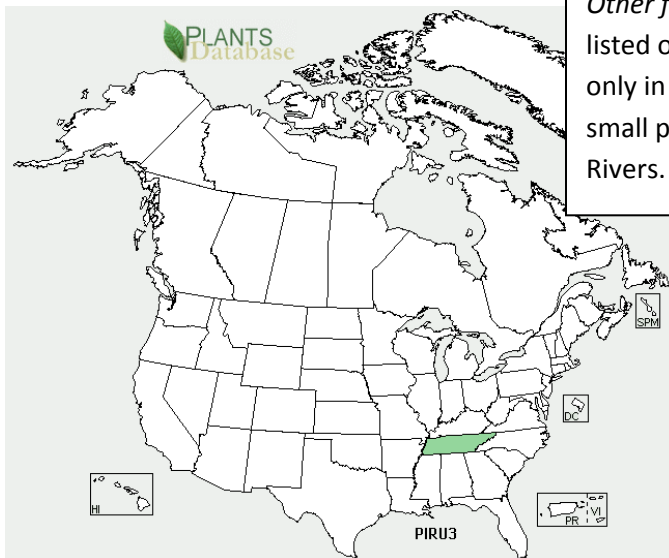
Scientific name: *Pityopsis ruthii*

*Habitat*—wetlands, found only on certain rocks along the Ocoee and Hiwassee Rivers.

*Food*—soil nutrients, sunlight, carbon dioxide, and water.

*Niche*—primary producer

*Other facts*—Ruth's golden aster is currently listed on the Endangered Species list. It is found only in Tennessee, but is most commonly found in small populations along the Ocoee and Hiwassee Rivers.





### Snail darter

Scientific name: *Percina tanasi*

*Habitat*—found over gravel and sand soils in rivers with a medium pace current in large tributaries.

*Food*—primarily eats aquatic snails, but also caddis flies, midges, and black flies.

*Niche*—carnivore

*Other facts*—only found in Alabama and Tennessee. Listed as a threatened species by the U.S. Fish and Wildlife Service.

*The snail darter is not found on the CNF.*



Snail darter habitat





### Hellbender salamander

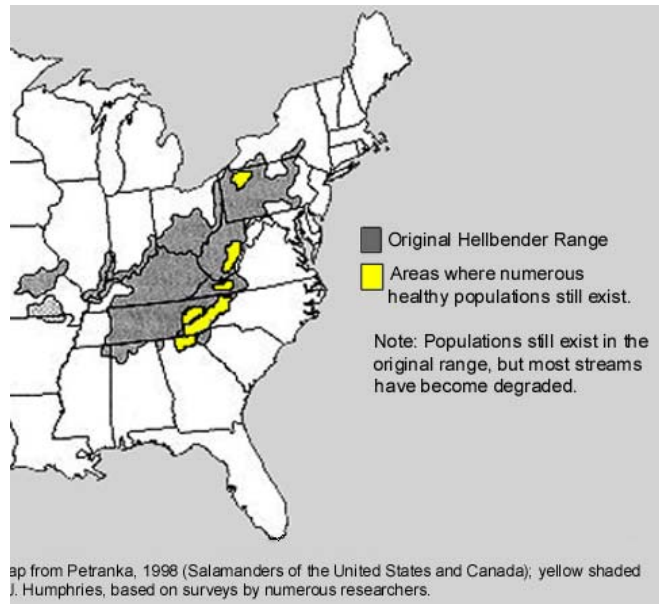
Scientific name: *Cryptobranchus alleganiensis*

*Habitat*—fast flowing streams and rivers, where large flat rocks provide cover.

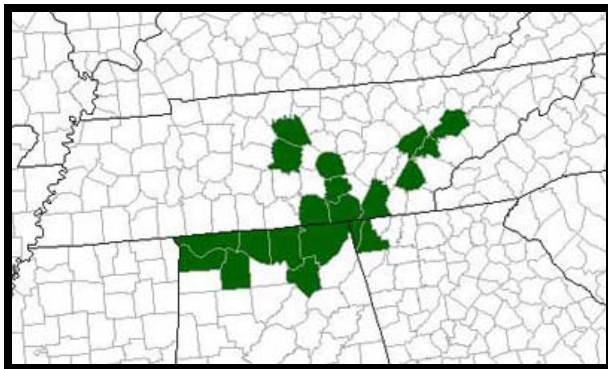
*Food*—small fish and crayfish.

*Niche*—carnivore

*Other facts*—nocturnal and search at night for prey at night. The hellbender salamander has declined throughout the eastern two-thirds of Tennessee, and it is currently listed by the State of Tennessee as “In Need of Management.” The hellbender is one of the largest salamanders in the world and can grow to nearly two and a half feet long.







### Tennessee Cave Salamander

Scientific name: *Gyrinophilus palleucus*

*Habitat*—restricted to limestone caves containing water. Tennessee cave salamanders live in deep still pools within the caves.

*Food*—eats almost anything it can capture and swallow such as aquatic insects and crustaceans.

*Niche*—carnivore

*Other facts*—the Tennessee cave salamander is our state amphibian. Currently it is listed on the Endangered Species list.





### **Bald eagle**

Scientific name: *Haliaeetus leucocephalus*

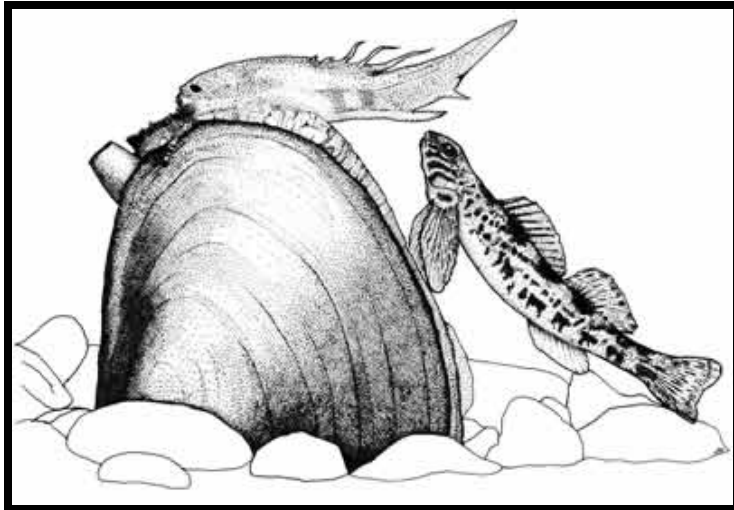
*Habitat*—live near large bodies of open water such as lakes, marshes, seacoasts and rivers where there is plenty of food and small trees for nesting and roosting.

*Food*—mostly fish, but will also eat small animals such as ducks, coots, muskrats, turtles, rabbits, and snakes. Bald eagles occasionally eat dead animals.

*Niche*—carnivore

*Other facts*—they were recently removed from the Endangered Species list. The bald eagle is our National Emblem for the United States.





### **Southern pigtoe mussel**

Scientific name: *Pleurobema georgianum*

*Habitat*—the southern pigtoe mussel lives in the sand and gravel bottoms of the Conasauga River. Like all mussels they require good water quality, stable stream channels and free-flowing water.

*Food*—mussels filter their food out of the river water. Their diet includes algae and other small [microscopic?] plants and animals.

*Niche*—omnivore

*Other facts*—the Southern pigtoe is listed as Endangered on the Endangered Species list.





## (2.) Student Page

## Tally the Resources: Dividing the Resources

## Worksheet

<b>Resources</b>	<b>Player 1:</b> _____	<b>Player 2:</b> _____	<b>Player 3:</b> _____	<b>Player 4:</b> _____
Water resources used ( <i>blue</i> and <i>red</i> M&Ms):				
Food resources used ( <i>green</i> and <i>yellow</i> M&Ms):				
Habitat used ( <i>brown</i> and <i>orange</i> M&Ms):				
Total resources used:				

**(2.) Student Page**

Consequence cards

\*Requirements are based on winter months

White-tailed deer

Requirements for survival

Food—food requirements for deer will depend on the season; however for the game we will use the requirements for winter. During the winter deer require more energy for survival than in the summer. They need *about 3,192 calories* per day for maintenance energy.

Resources—**8 green and/or yellow** resources to survive

Each card represents 500 calories

Water—deer need about 3 to 6 quarts of water a day

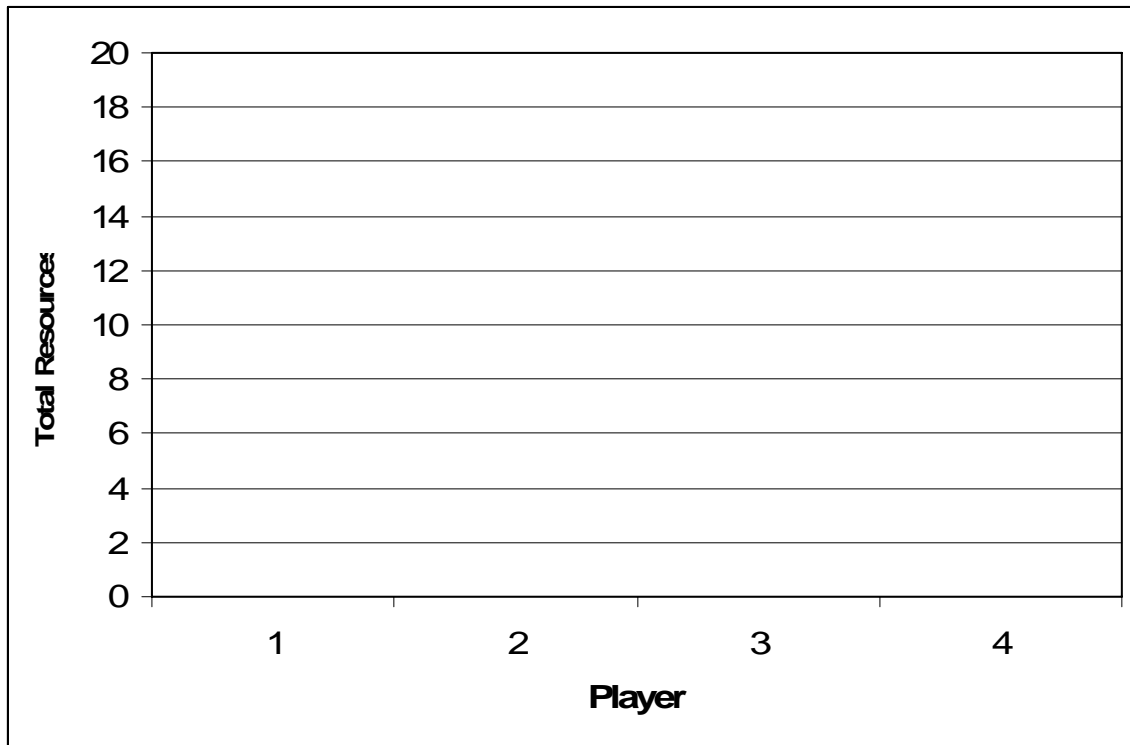
Resources—**6 blue and/or red** resources to survive

Each card represents one liter of water

Habitat—deer need open fields and forests

Resources—**2 brown and/or orange** resources to survive

Each represents a habitat and deer need two habitats—you need at least two resources.

**(2.) Student Page****Figure 1. Total amount of all resources collected**

Directions: Draw in a bar that corresponds to the *total* number of resources each player used throughout the entire game. Compare the height of the bars.

## Lesson I.C.2: Population and Growth Sustainability

### LESSON OBJECTIVES:

Students will:

- understand how populations increase

### QUESTIONS ADDRESSED:

1. What are the contributors to population growth within an area?
2. What is carrying capacity?
3. Why is conservation necessary?

### STANDARDS COVERED:

#### **3<sup>RD</sup> GRADE:**

##### **Math**

3.2.2 Represent and analyze patterns and functions.

- 3.2.2 a,b

3.2.5 Analyze change in various contexts.

- 3.2.5 a,b

3.5.1 Develop, select, and use appropriate methods to collect, organize, display, and analyze data.

- 3.5.1 a,b,c,d

3.5.2 Apply the basic concepts of probability.

- 3.5.2 a

#### **4<sup>th</sup> Grade**

##### **Math**

4.1.3 Solve problems, compute fluently, and make reasonable estimates.

- 4.1.3 b,i

4.2.1 Understand patterns, relations, and functions.

- 4.2.1 a,b

4.5.1 Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer questions.

- 4.5.1 a,c,d

## 5<sup>th</sup> GRADE:

### Social Studies

5.2.05 Understand the interaction of individuals, families, communities, businesses, and governments of Tennessee and the United States in a market economy.

- 5.2.05 d

### Math

5.1.3 Solve problems, compute fluently, and make reasonable estimates.

- 5.1.3 d

5.2.1 Represent and analyze patterns, relations, and functions.

- 5.2.1 b

## 6<sup>th</sup> GRADE:

### Social Studies

6.1.03 Appreciate the relationship between physical environments and culture.

- 6.1.03 a

### Math

6.2.1 Understand patterns, relations, and functions.

- 6.2.1 a,b

6.2.3 Use mathematical models to represent and understand quantitative relationships.

- 6.2.3 a

6.5.1 Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer questions.

- 6.5.1 d

6.5.3 Develop and evaluate inferences and predictions that are based on data.

6.5.3 a

**MATERIALS:** Storyline, Worksheet, Masking tape

### Detailed List of Materials

(1) Masking tape

(2) Storyline for the activity (see teacher pages section, p. XX)

(3) Population growth page for teacher to assist in tracking the increases for the graph to be produced upon completion of the activity (see teacher pages section, p. XX)

(4) Student response page (see student pages section p. XX)

**ACTIVITIES:** Population Growth (graphing)

**LESSON OUTLINE:**

<b>DAY 6, LESSON I.C.1: Dividing the Resources</b>	
5-10 min	Introduction
15-20 min	Storyline Activity
5-10 min	Closing

**Key Terms**

*Population growth*—refers to the change in population over time. It is measured as the change in the number of individuals in a population per unit of time. Population growth most often refers to humans, but it also represents the population change in other species.

**Introduction**

Human population is affected by many factors such as birth and death rates can lead to population growth and decline. Birth and immigration allow for population growth in a community. Factors such as death are commonly associated with population decline, but other factors such as emigration, disease, famine, and war are also responsible for the loss of individuals. Given all these aspects at times populations can experience somewhat of a yo-yoing effect, but overall populations worldwide are increasing steadily.

As world populations of humans continue to rise there is greater emphasis and demand placed on resources such as timber and coal. As individuals dependent on our environments we must learn to use our resources more wisely. This can be achieved by adopting and initiating conservation practices such as recycling or carpooling which will reduce consumption. By implementing conservation efforts like recycling and use of alternative non-fossil fuels, the depletion of natural resources like timber and coal may be significantly reduced.

**Teacher preparation**

Teacher will need to place tape on the floor in either a circle or square shape. The shape should be large enough to hold all the students inside it; however it should also be small enough so that by the end of the game students begin to feel crowded. Teacher will also need to print out the storyline and any necessary worksheets (see teacher pages section p. XX).

**Activity**

1. Introduce the activity to the students by first defining the term population growth to the class. Tell students something like, “population growth means the increase in the number of people that inhabit an area. This can include the increase in both people and animals living in one area.” The emphasis does not yet need to be placed on the effects; however students should be introduced to the term and allowed to experience its effects through the course of the game.
2. Have students gather on one side of the tape that you placed on the floor.
3. Introduce the activity by saying something like, “we are going to play a game that focuses on the effects of population growth. We will simulate the effects of population growth through this game.”

- a. You will need to explain that the circle in the middle is the community which students are moving into and thus this is the area that they will 'inhabit,' or 'reside' in.
  - b. Next you will need to assign each student a character. All characters are listed in the storyline (see teacher pages section, p. XX).
  - c. Once students have been assigned a character begin reading the story. The storyline will give students personal experience with population increases overtime. The activity begins with just two students. The square will become 'cramped' as the storyline progresses.
  - d. Each time a student is added to the group write these additions on the teacher population growth page (see teacher pages section, p. XX).
  - e. Continue reading the story until all students/characters have been added to the square and the population grows.
5. You will then need to hand out the population growth graphing activity (see student pages). Have students make their graphs and complete the questions.
  6. The class will then discuss the activity and graph. Some questions you can ask the students are
    - a. What were the contributing factors to the population growth?
    - b. What influenced the movement of the settlers or characters into the area or square?
    - c. How did you feel as more characters were added to the circle?
    - d. What effect did the increasing population on the resource?
  7. Following the class discussion a brief summary can be given to wrap up the activity say something like, "this activity just demonstrated population growth and its effect on our resources. Population growth strains our resources because as the population increases more individuals are using the same resources in an area. Eventually if careful use or conservation is not practiced this resource may be depleted and the population would have to move to another area. This process will most likely be repeated at the new area due to lack of understanding or practice of conservation." Ask students to review ways that we can have less of an impact on our resources.

#### Extension

To increase students understanding of population growth and its impact on an area use a 'resource,' to be broken up as students enter the square. This can be a sheet of paper or other item that can be easily divided amongst students as they enter the square.



**(1.) Teacher Page****Population Growth**

\*write these increases on the board as students are added to the circle (i.e March there will be four characters added).

Month by month population growth in 1843Population loss in 1843

March— \_\_\_\_\_

April— \_\_\_\_\_

May— \_\_\_\_\_

June— \_\_\_\_\_

July— \_\_\_\_\_

August— \_\_\_\_\_

September— \_\_\_\_\_

October— \_\_\_\_\_

November— \_\_\_\_\_

December— \_\_\_\_\_

November— \_\_\_\_\_

Month by month population growth in 1844Population loss in 1844

January— \_\_\_\_\_

February— \_\_\_\_\_

March— \_\_\_\_\_

April— \_\_\_\_\_

March— \_\_\_\_\_

**(1.) Teacher Page****Population Growth Storyline**

Teacher preparation: Have a square of masking tape marking the area that the students will join. Students should be assigned characters before beginning activity. There are a total of 35 characters.

Characters:

Prospectors: 2 brothers, Al & Walt Wallace (2)

Pioneers: husband and a wife, William & Audrey (2)

Pioneers children: Two boys and a girl, Andrew, Richard & Gertrude (3)

Audrey has twins: Mae & Shelby (2)

Prospectors:

Friends: Woodrow & Red (2),

Cousins: Earl & Big Bill (2),

Brothers: Tex, Trigger, & Luke (2),

\*If not enough students are present some of the prospectors can be left out. Teacher may use as many prospectors as necessary.

Store clerk: Sally (1)

Doctor: Doc (1)

Preacher: Reverend (1)

Preacher's wife: Rose (1)

Preacher's children: Clara, Charlie, & Beth (3)

Mae has an additional child: Ella (1)

Fur trappers: Jonah, Fire, & Grizzly (3)

Timber harvesters: Abe, Reed, & Robert (3)

Smelters: Ben & Mike (2)

Native Americans: Tennessee (male), Sequoia (male/female), Salali (female), Awinita (female) (4)

Storyline of Copper Basin:

*March, 1843*—The forested hills and rich landscape of Polk County, Tennessee held many opportunities for settlers heading westward, especially in the rich resources found in the Southern Appalachian Mountains. Though the Cherokee Indians such as Tennessee, Sequoia, Salali, and Awinita used these areas for hunting and knew of the rich mineral deposits which Copper Basin held, the Cherokee had not extensively extracted its resources. Nonetheless, in 1838 the white settlers removed the Cherokees from their lands. Whites pushed the Cherokees from their native lands and relocated them to reservations within the state of Oklahoma. Tennessee, Sequoia, Salali and Awinita hid in the Southern Appalachian Mountains so they would not be forced from their home lands.

\*Have the new players, the Cherokees, move inside the square and tally these players on the population growth sheet or dry erase board.

*April*—In 1843, with the gold rush on everyone’s mind two Pennsylvanian brothers, Al & Walt Wallace, headed south to the hills of Tennessee in hopes of striking it rich. Once the brothers arrived, they built a small cabin and got to work panning for Gold. After months of panning and nothing to yield their efforts the brothers happened upon the copper deposits that lie in the Basin.

\*Have the new players, Al & Walt Wallace, move inside the square and tally these players on the population growth sheet or dry erase board.

*April*—About that time a husband and wife from Delaware who heard about the riches that East Tennessee held headed South in search of fresh farm lands. Their lands were exhausted, their soils were becoming badly eroded and all the prime timber had been removed for harvest or from poor farming practices. William and Audrey moved their family, two boys, Andrew and Richard, and daughter, Gertrude, to the fertile soils around the Hiwassee River? (Check to see if this area was farmable or if it was too steep sloped).

\*Have the new players, William & Audrey, Andrew, Richard & Gertrude, join the square and tally these players on the population growth sheet or dry erase board.

*July*—After the family built their cabin with timber removed from the forests they began farming a small plot of land. The boys helped hunt for deer and did most of the construction. Gertrude helped her

mother with the farming, cooking, and cleaning until her mother became pregnant with twins. Later that summer, Audrey gave birth to Mae & Shelby.

\*Have the new players, Mae & Shelly, join the square and tally these players on the population growth sheet or dry erase board.

*August*—Several months after the first settlers arrived in Polk County word of the Copper Basin’s rich deposits got out. Prospectors from Virginia, Kentucky and North Carolina all headed west to Tennessee to try their luck. Friends Woodrow and Red were the first of the influx of prospectors to arrive. They camped close to the mines so they would have a leg up on the rest of the prospectors.

\*Have the new players, Woodrow & Red, join the square and tally these players on the population growth sheet or dry erase board.

*August*—In close pursuit were cousins Earl & Big Bill from Kentucky. The two, tired of the rapidly increasing and ‘overcrowding’ lands in Virginia, headed south to Tennessee. Earl and Big Bill set up a cabin near the basin and got to work.

\*Have the new players, Earl & Big Bill, join the square and tally these players on the population growth sheet or dry erase board.

*August*—The McCall brothers were right behind the cousins. They too wanted to try their hand at mining. They built a cabin about a mile from the Basin. The McCall brothers had to build their cabin in the vicinity of the cousins. This started the two groups off on the right foot. The cousins felt that they had claimed these lands and all the area around it fair and square. The groups went on about their mining business anyway, but were uneasy about the situation.

\*Have the new players, the McCall brothers, join the square and tally these players on the population growth sheet or dry erase board.

*September*—News of the growing community reached Sally in Virginia. She decided she might be able to open a shop of store goods that the settlers might want to purchase or need for mining. She hired a trail guide and packed her wagon (trail guide can stay and take a resource if more characters are needed). Soon enough she was in the lush Southern Appalachian landscape.

\*Have the new player, Sally, join the square and tally Sally on the population growth sheet or dry erase board.

*September*—Sally quickly hired three timber harvesters, Abe, Reed, and Robert, to construct a country store where she could sell her goods. When the timber harvesters were done they decided it would be best to stay in the vast forested country. They opened a timber harvesting company and began exporting the largest white oaks they could cut without the help of a large crew or railroad. This would take away from their profit.

\*Have the new players, Abe, Reed, and Robert, join in the square and tally these players on the population growth sheet or dry erase board.

*October*—Concerned about the care of their children and in the best interest of the growing community Audrey wrote a letter back home to her family asking them to inquire around town for a doctor with an interest in exploration. Audrey hoped that if she described the beauty which this area held she would be able to persuade someone with a medical background. To her surprise several months later “Doc” showed up. Doc built a house near the Ocoee River where he found solitude in the already steadily increasing population.

\*Have the new player, Doc, join the square and tally these players on the population growth sheet or dry erase board.

*November*—Shelly had been a sickly baby since birth. After several months of various health problems she passed away from pneumonia.

\*Have Shelly leave the square and tally her on the population growth sheet or on a separate section of the board labeled ‘population loss.’

*November*—News of the mining operations sparked an interest in smelters, Ben and Mike. The two packed up and headed over the hills from North Carolina. They were able to get one of the last good spots close to the Copper Hill Basin. They fought with the timber harvesters to be able to cut timber, but finally were able to cut enough to construct a house (by this time it should be getting harder to ‘take away’ from the resources so adding the part about ‘fighting’ over trees intensifies the effect?)

\*Have the new players, Ben and Mike, join the square and tally these players on the population growth sheet or dry erase board.

*March, 1844*—Virginia was becoming far too populated and much of the disgruntled community was leaving in hopes of finding solitude. It seemed like Reverend Jones lost about a family a week. By the end of the fall he had only a few families to preach for. Early the next spring he loaded the family wagon and headed South (can leave out family—wife, daughters, sons-if not enough participants). Reverend Jones took with him a wife, Rose, and three children, Clara, Charlie, and Beth.

\*Have the new players, Reverend Jones, Rose, Clara, Charlie, and Beth, join the square and tally these two players on the population growth sheet or dry erase board.

*March, 1884*—Al & Walt Wallace felt cramped in the area due to the increasing population. They packed their belongings and headed west.

\*Have Al and Walt Wallace leave the circle and tally these players on the population growth sheet or on a separate section of the dry erase board labeled 'population loss.'

Shortly after Rose arrived she learned she was pregnant. Late that summer she gave birth to a daughter, Ella.

\*Have the new player, Ella, join the square and tally Ella on the population growth sheet or dry erase board split a piece of the resource.

*April*—Fur trappers had been trapping in these mountains for years, but never had a permanent residence. Jonah, Fire, and Grizzly decided to build a small hunting cabin and made their residence more permanent.

\*Have the new players, Jonah, Fire, and Grizzly, join the square and take a piece of the resource.

**(2.) Student Page**

*(1) Using the month-by-month totals listed on the board produce a bar graph (3-5 grades) or a line graph (6 grades). The back side or a separate sheet of paper can be used to do so.*

*(2) Describe the graph that you made.*

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*(3) Predict why certain months had higher population growth while others had none.*

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*(4) What month had the highest population growth? How much? Predict why this happened.*

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*(5) How many settlers moved to the area in the first year? \_\_\_\_\_*

*(6) How many total settlers moved to the area? How long did this occur?*

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*(7) Predict why population movement was so great in this particular area?*

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*(8) Predict issues that this community will face now that the population has grown*

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## Lesson I.D.2: Role-Playing and Forest Interaction

### **LESSON OBJECTIVES:**

Students will:

- identify different users of the National Forest
- understand how different interest groups interact and compromise to meet the Forest Service's Multiple Use-Sustained Yield objectives
- practice critical thinking and debating skills

### **QUESTIONS ADDRESSED:**

1. Who are the different users of the National Forest?
2. How do our allowed uses of the forest come into conflict with our desired uses of the forest?
3. How do we compromise to meet the objectives of Multiple Use-Sustained Yield for the forest?

### **STANDARDS COVERED:**

#### **3<sup>RD</sup> GRADE:**

##### **Social Studies**

3.6.01 Recognize the impact of individual and group decisions on citizens and communities.

- 3.6.01 a,b

#### **4<sup>th</sup> Grade**

##### **Science**

4.2.2 Recognize that organisms are able to change their environment.

- 4.2.2

#### **5<sup>th</sup> GRADE:**

##### **Science**

5.2.2 Recognize that organisms are able to change their environment.

- 5.2.2

**MATERIALS:** Character cards, String, Visual aid

**Detailed List of Materials**

- (1) Character cards—user groups (see student pages, 3<sup>rd</sup>-4<sup>th</sup> grades p. 144-146; 5<sup>th</sup>-6<sup>th</sup> grades p. 147-151)
- (2) Worksheet of character questions (see student pages section, p. 152)
- (3) Visual aids
- (4) Dry erase board
- (5) Ball of yarn, cut into 30 15-foot lengths (5<sup>th</sup>-6<sup>th</sup> grade only)

**ACTIVITIES:** Role-Playing Forest Interest Group

**LESSON OUTLINE:**

<b>DAY 7, LESSON I.D.1: Role-playing Forest Interest Groups</b>	
5-10 min	Introduction
15-30 min	Read informational cards and answer related questions
10-20 min	Debate/compromise
10-20 min	Class discussion

**Key Terms**

Recreational activities—activities in which individuals participate for enjoyment, leisure, or as a hobby, such as white water rafting, kayaking, tubing, hiking, swimming, canoeing, hunting, fishing, biking, wildlife viewing, horseback riding, etc.

User groups or interest groups—groups of individuals with a similar interest, in particular, such groups that work together to protect or improve their common interest. For example, a group of fishermen might join together to promote better water quality.

**Introduction**

The concept behind sustainability simply implies that individuals, as well as populations, use both renewable and nonrenewable resources more conservatively. By focusing on practicing a more sustainable lifestyle we can ensure that resources such as forests, wildlife, and minerals are available for future generations to use and enjoy.

As discussed in previous lessons, there are many uses of our forests, especially National Forests. The National Forests provide opportunities for both public recreation and for human needs. As a result, there are various interests attached to our National Forests. Our National Forests are managed under the Multiple Use-Sustained Yield (MUSY) Act, which states that the National Forests must be sustainably managed to meet multiple uses, including both public recreation (e.g., hiking, fishing) and human needs (i.e., timber, minerals and clean water).

The Cherokee National Forest is managed for a variety of recreational uses, including fishing, hunting, hiking, mountain biking, horseback riding, camping, photography, white water sports and wildlife viewing, among a host of others. Many of these uses overlap, meaning that several interest groups may come into conflict with others wanting priority over the areas and their resources; therefore, it is important that the forests be managed in a way that is equitable for all involved, as indicated by MUSY. In addition, impact must remain minimal during any use, to ensure that what the forest provides today is here future for generations to enjoy.

In addition to recreation, the National Forests are managed for public needs. Minerals and timber are extracted to supply increasing human demands. The extraction of these resources overlaps with the recreational opportunities provided by the Cherokee National Forest. This is true of all our National Forests. The following activity, “Public Participation Role Play,” allows students to better understand differing values among National Forest interest groups and how they might be resolved.

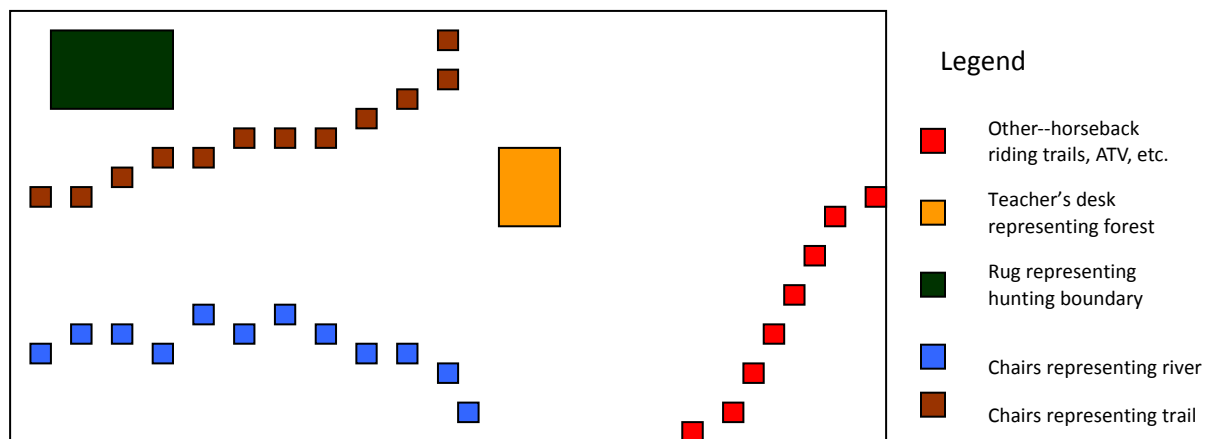
### Teacher preparation

Print and cut out the character cards (see student pages, 3<sup>rd</sup>-4<sup>th</sup> grades p. 144-146; 5<sup>th</sup>-6<sup>th</sup> grades p. 147-151)

*3<sup>rd</sup>-4<sup>th</sup> grade:*

You will need to prepare the classroom so that it is arranged to be conducive to the activity. It may be easiest for the students to assist you in shifting the desks and chairs. The following classroom arrangement is suggested:

Creating your forest—you will need to move desks, chairs, and the teacher’s desk in your classroom to simulate the Cherokee National Forest (Figure 1). One set of about 12



**Figure 1.** Representation of classroom set up as a forest.

Chairs should be placed lengthwise meandering across the room. This will represent the river. This should be labeled because there will eventually be three sets of chairs representing three different features of the forest. The second set of chairs will represent the trail system. Locate the trail system near the stream and the forest. Label this set of chairs as the trail. The teacher’s desk will simulate the forest and should be located near the stream and the trail. Finally, a designated area (such as a carpet) for hunting boundaries should be placed near the trails.

\*A third “trail” may need to be added towards the end of the game, consisting of 8-10 chairs, as a designated ATV user trail.

*5<sup>th</sup>-6<sup>th</sup> grade:*

Students in grades 5 and 6 will carry out a web activity using yarn, but this age group may also move the desks and chairs to simulate the forest if desired.

**Activity***3<sup>rd</sup>-4<sup>th</sup> grade:*

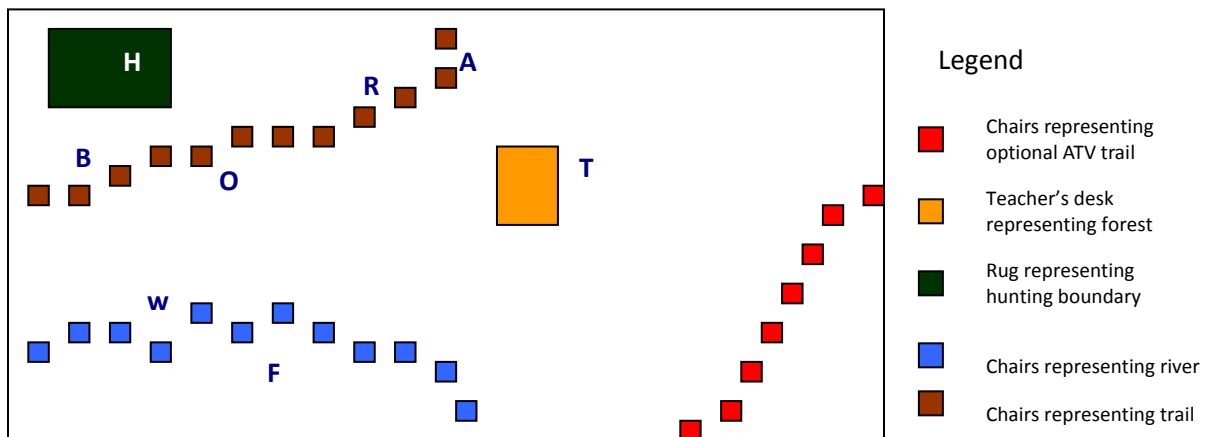
1. Introduce the topic to the class by asking students, "Have any of you ever visited the Cherokee National Forest or any other National Forests or National Parks with your family or friends? If so, what kinds of activities did you participate in? What did you see?"

Have students elaborate by discussing the different types of wildlife and plants that they encountered. It may be helpful to list all the different activities that the students participated in on a chalk board or dry erase board. You may also want to list the activities, animals, and trees in different columns to help differentiate between the various types of activities.

2. Continue the activity by telling students that they are going to play a game representing how our forests are used and shared among these various users.
3. Divide students into groups of 3-4 and assign a character to each group. Provide each group with a character card (see student pages section, p. 144-146). Characters include:
  - a. Mountain biker (B)
  - b. Hiker/bird watcher/wildlife and outdoor enthusiast (O)
  - c. Horseback rider (R)
  - d. All-Terrain Vehicle (ATV) user (A)
  - e. White water rafter/kayaker/canoer/swimmer/tuber (W)
  - f. Fisherman (F)
  - g. Hunter (H)
  - h. Timber harvester (T)
4. Have each group of students read and study their card within their groups and move to the area of the classroom representing their value or interest (Figure 2). For example, the fisherman

group stands near the river or sits in the chairs representing the river. Make sure students bring their cards with them.

- a. Note: before students move to their designated areas they may want to write down on another sheet of paper or highlight the groups that they are in conflict with and why it is a problem.
- b. Students representing Mountain Biker, Hiker/bird watcher/wildlife and outdoor enthusiast, Horseback rider, and ATV user (B, O, R, and A) will move to the area where the chairs have been arranged to simulate a trail (Figure 2).
- c. Students representing the Hunter (H) will move to the designated hunting area (Figure 2).
- d. Students representing the Fisherman and the Water sports enthusiast (F and W) will move to the chairs representing the river (Figure 2).
- e. Students representing the Timber harvester (T) will move to the desk representing the forest (Figure 2).



**Figure 2.** Locations of different interest groups within the forest.

5. Once student groups have assembled in their designated locations in the “forest,” have each group select a representative to tell the rest of the class about their character by reading the character card aloud, followed by a summary of the main points (e.g., students might say, “In summary I am a fisherman and I have to share the river with the kayakers.”).
6. When students are finished presenting their characters’ values and interests, have them discuss the group interactions as a class and try to reach a compromise where needed. Remind

students that the landforms cannot be moved, but a trail can be added (e.g., to accommodate the ATV user. This additional trail should consist of 8-10 chairs and should be placed such that it has the least affect on the other groups).

7. To guide the students in reaching a compromise, pose questions such as:
  - How might the Fisherman and the Kayaker use the same river? (Answers may range from, “Be careful,” “They can only use specific areas of the stream,” to “Have different use days.”)
  - How might the Hiker and the Horseback rider use the same trail?
  - How might the Timber harvester still remove timber and have less conflict with the Hiker and Biker?
  - Did we find a way to respect all activities?
8. Have students return to their seats and individually fill out the ‘Role Play Activity’ worksheet (see student pages section, p. 152).

*5<sup>th</sup>-6<sup>th</sup> grade:*

1. Introduce the topic to the class by asking students, “Have any of you ever visited the Cherokee National Forest or any other National Forests or National Parks with your family or friends? If so, what kinds of activities did you participate in? What did you see?”

Have students elaborate by discussing the different types of wildlife and plants that they encountered. It may be helpful to list all the different activities that the students participated in on a chalk board or dry erase board. You may also want to list the activities, animals, and trees in different columns to help differentiate between the various types of activities.

2. Continue the activity by telling students that they are going to role-play different characters that use the forest, and will need to reach some sort of agreement or compromise in regards to those uses. Students can be divided into groups of three or four depending upon the number of character cards to student ratio.

Each group will be given a “character” or interest group to represent. These include (by use):

- Trails:
  - i. Mountain biker
  - ii. Hiker/bird watcher/wildlife or outdoors enthusiast
  - iii. Horseback rider

- iv. All-Terrain Vehicle (ATV) user
  - Water:
    - i. White water sports enthusiast (i.e., white water rafter, kayaker, canoer, tuber/swimmer)
    - ii. Fisherman
  - Other designated areas:
    - i. Hunter
  - Industry:
    - i. Timber harvester
    - ii. Miner
3. Once you have provided each group with a character card have the students read about their character. The story provided on each card will tell each group what their character wants to protect and/or what their character is most concerned about within the Cherokee National Forest. (As an extension, 6<sup>th</sup> grade students can research additional facts from whatever sources may be available—journals/magazines, internet, encyclopedia, etc.). In addition, the card tells the students how the characters might respond to other interest groups. For example, the Hunter is caught between the Timber harvesters. Logging is a necessity, but in some aspects it causes some wildlife to lose their habitats.
- Use may wish to have students fill out the 'Role Play' worksheet to guide and help them to better understand what their character values most; however it may be best to use the worksheet as an assessment after students carryout the activity (see student pages section, p. 152). Having students fill out these worksheets beforehand will help them better present their character and the character's values to the class, as well as prepare them to compromise with other interest groups. Use your best judgment on your students' abilities.
4. Once students have completed the worksheets, have them form a single circle large enough to contain each group, yet maintaining distinct groups. Place the lengths of yarn in the center of the circle.
5. Begin the role-play:
- The first group presents their character by reading the character card introduction.
  - Any group that has a "conflict" with the first group listed on their character card reads this aloud. The "conflict" group then takes a length of yarn from the middle of the circle and, holding one end of the yarn, they pass the other end to the first group, so that



there is both a connection and some resistance between the first group and the “conflict” group.

- The second group presents their character, as did the first group, and again, any groups that have a “conflict” listed on their character cards read this conflict and link to the second group with a length of yarn.
  - Repeat this process until all groups have presented their characters and are linked with other groups.
6. With all groups maintaining their links, have them discuss ways to reach a compromise. To help students begin this process say something like, “Can you all try to find a way to work together or reach a compromise to share your character’s valued area or resource found in the Cherokee National Forest?”

Other possible questions include:

- How can the Hunter and the Wildlife enthusiast reach a compromise?
- How can the Timber harvester compromise with other forest users?
- How can the Water sports enthusiasts reach a compromise with the Fisherman?

Some example resolutions include:

- The forest will be split up into designated tracts where the various users can safely participate in their recreational or use activities.
  - The forest will be split up temporally for different users. An example of this would be the areas that are open to hunting only during each specific hunting season, such as deer or turkey season.
  - Students may come up with a compromise similar to the Forest Service mission of management under the Multiple Use-Sustained Yield Act, in which all user groups have a small part of the forest designated for their use, with some sharing, so that all groups are treated as equitably as possible. For example, there may be several hiking trails in the Cherokee, and some of these are for hikers only, some are for horseback riding only, and some are for both hikers and riders.
7. Now that students are familiar with the different activities that may occur in a National Forest, discuss recreational activities that they take part in and how their different interests come into conflict with one another and also with extraction efforts. A few sample discussion questions are listed below:

- What are some activities that you do in our National Forests, specifically the Cherokee National Forest?
- Did you ever feel like another user was crowding your space and/or negatively impacting an area that you wanted to protect within the Cherokee National Forest?
- What might you do if you were fishing and kayakers came through “your” fishing spot?
- How would it affect you if the ATV users were using a trail that they were not supposed to be using?
- Did you see or hear any logging or signs of logging in the National Forest while you were there?
- Have you ever encountered hunters in an area where you were hiking? (This is a good time to point out that due to safety hazards there most likely were not people actively hunting in a hiking area. The forest is maintained with the intent that each user group has a separate and safe area to carry out their recreational activity.)

## Student Page

### I.D.1. Interest Group Character Cards (3<sup>rd</sup>-4<sup>th</sup> grade)

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#### *Mountain biker*

Introduction: We like to ride on the mountain trails in the Cherokee National Forest. We need to use trails so that we don't injure the forest.

Problem: The horseback riders and the hikers have to use the same trails that we do. Hikers and horseback riders have to be respectful of us. They need to share the trail by moving aside when they encounter each other. Horses and our mountain bikes can also cause erosion, meaning that the soil can be washed away when it rains.

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#### *Hiker/bird watcher/wildlife and outdoor enthusiast*

Introduction: We like to hike along the peaceful and quiet trails of the Cherokee National Forest. We need these trails so that we hike in the appropriate areas and don't harm the forest. For example, walking in areas that are not part of the trail harms the plants and habitat that we are here to see.

Problem: The horseback riders and the bikers have to use the same trails as we do. We want to have peace and quiet. If there is a lot of biking and horseback riding activity we have to move over to the side to let them pass. They bike really fast and dangerously! The horses leave behind deep hoofprints and smelly "presents," so we have to watch our step. This is a hassle. The mountain bikers and horses also cause erosion.

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#### *Horseback rider*

Introduction: We love to ride our horses. The Cherokee National Forest allows us to participate in two things that we enjoy—horseback riding and being in the outdoors.

Problem: We have to share the trail with the mountain bikers. They sometimes make our horses nervous, but it is mainly just annoying to have to move over and allow them to pass. The hikers are nice and move out of our way, but I don't think they are happy about sharing the trail with us. Horseback riding can also cause damage to the trails.

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*ATV user*

Introduction: We really like to ride our four-wheelers, but the Cherokee National Forest only has one trail for us to use. The trail is very far away. It is near Virginia!

Problem: We don't have any nearby trails to use. We want to share with the hikers, bikers, and horseback riders. But then there would be a lot of different users on the trail. This would make it really busy and people might get hurt. The trail would also be harmed by all the different activities eroding the soil.

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*White water sports enthusiast*

Introduction: We like to play in the water! The Cherokee National forest provides all types of water sports such as whitewater rafting and competitive kayaking. The 1996 Summer Olympic games were even held here. There is also swimming and tubing.

Problem: We have to share with other water sports enthusiasts, water lovers, and fishermen. Everyone in the water has to be respectful of each other. For example, when they are using the same areas we are in, they need to keep their distance so that no one gets hurt.

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*Fisherman*

Introduction: We love to fish. The Cherokee National Forest provides many great fishing opportunities such as the Hiwassee River. I am teaching my children to fish this summer. It is a family tradition that we want to keep going for many generations.

Problem: We have to share with water sports enthusiasts, water lovers, and other fishermen. When these water sports enthusiasts near our fishing spots we have to move and sometimes the fish are even scared off.

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### *Hunter*

Introduction: We like to hunt. It is a widely-enjoyed family tradition. This also allows for deer and other wildlife populations to be kept at acceptable numbers.

Problem: We need a designated area to hunt so that we don't encounter other forest users, and risk hurting them, thinking they're wild animals. Everybody wants to use the forest for different reasons. Also, we know that wildlife lovers want to enjoy the wildlife, not manage the populations.



### *Timber harvester*

Introduction: We need jobs to be able to live. The public needs timber to be able to build houses, do homework for school, stay warm, and a lot of other things.

Problem: We have to share the forests with the many other users such as the fisherman, hiker, and biker. Sometimes timber harvesting, if done too close to streams, can cause erosion which harms fish. This would then affect the fishermen. Hikers and bikers don't want to see the trees cut down; they want to be able to enjoy them. But, we all use timber in our everyday lives, and some of that comes from the Cherokee.



## Student Page

### I.D.1. Interest Group Character Cards (5<sup>th</sup>-6<sup>th</sup> grade)

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#### *Mountain biker*

Introduction: I am training for the Southeastern mountain biking race. I need all the practice I can get on mountain trails to prepare for the competition. To properly train for the race I need steep dirt trails similar to the ones in the competition. I love being able to bike outdoors and I should be allowed to!

#### Conflicts:

With Hiker: It's really hard to practice or even just go for a fun ride when there are so many hikers and other foot traffic on the trails. We have to be extremely cautious when we use the same trails as the hikers, if we don't we might injure someone. Sharing the trails is a hassle.

With Horseback Rider: Most of the trails in the Cherokee are for multiple use: hiking, biking, and horseback riding. We have to watch where we bike because of the horses and the things they leave behind, like deep hoofprints on muddy trails, and smelly presents for anyone who comes along after them. Why are they allowed on the same trails as bikers? We have to try to go around them which is difficult because they are riding horses and we are on bikes—the trails are often quite narrow, making it difficult to share with them.

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#### *Hiker/bird watcher/wildlife and outdoor enthusiast*

Introduction: We love to hike in solitude, peace, and quiet, but we realize that we do have to share the trails with others. We love to watch for birds and other wildlife. We take photos of all of nature's wonders—giant trees, colorful wildflowers, and of course all of the wildlife we encounter! The trails provide a safe path for us to follow and enjoy the natural beauty that this area holds.

#### Conflicts:

With Mountain Biker: We just want to have a peaceful hike through the trail system, but when we are bombarded with mountain bikers our recreation time is spoiled. They practically run us over trying to go around us. Not only that, they scare birds and other wildlife off. Their bikes also tear up the trail, which causes erosion, so the trail starts to wash away.

With Horseback Rider: The trails are used for hiking, biking, and horseback riding, but having all three activities on the trail at once be tricky. We have to watch our step—for those deep hoofprints and smelly "presents" horses leave behind. Not only that, we have to move over and

let the groups riding the horses go around us. The horses are a bother on the trails. Why can't people just hike?

With Hunter: We want to be able to take a safe and peaceful hike, but it is difficult to because when Hunter shoots his shotgun it is really loud. It really scares my young children and makes the wildlife hide away. We want to watch wildlife, not shoot them.

With Timber Harvester: We just want to be able to enjoy the peace and beauty, but when the trees are being cut down the forest is neither peaceful nor beautiful. There are a lot of noises from the logging and the trees are being removed.

With Miner: We want to be able to enjoy nature, but when the miners are removing parts of the earth, they're taking the beauty too, and animal and plant habitats.



#### *Horseback rider*

Introduction: Horseback riding trails in the Cherokee National Forest allow me to participate in two things that I care deeply about: Experiencing the wonder of nature and riding my horse. The Cherokee provides designated horse trails and camp sites for horseback riders. Some of these are shared with other trail users such as hikers.

#### Conflicts:

With Mountain Biker: We have to share the trails with the mountain bikers. Sometimes the bikes scare our horses. We also have to try to move aside while they pass. It is not easy when you have a big horse on a small trail!

With Hiker: We don't have a problem with the hikers as long as they don't scare the horses, but they often get upset with us when we cross paths. We want to be able to participate in our recreational activities too.



#### *ATV user*

Introduction: We want to be able to use the trails too, but there is only one trail in the Cherokee National Forest that is designated for ATV use. It is not fair that the hikers, bikers, and horseback riders get to use almost all of the trails, but we get one and it is a long drive away, all the way north, almost in Virginia.

#### Conflicts:

None: ATV users do not overlap with other users because there is only one trail that is designated for ATV users to access. They want to share with the hikers, bikers, and horseback riders though. What would happen if they did? What other options could ATV users pursue?



*White water sports group (white water rafter, kayaker, canoer, tuber/swimmer)*

Introduction: There are many different water sports that we are involved in. We love to white water raft, kayak, canoe, tube, and swim. The Ocoee River provides all these opportunities for us. There are even white water companies that provide guided trips on the Ocoee. This river provides such great whitewater rafting opportunities that even the 1996 Summer Olympics were held here. Kayakers came from many different countries to compete for the gold medal. This river provides water sports opportunities for experienced kayakers and even those that just want to swim.

Conflicts:

With Fisherman: I can't kayak freely because Sam fishes in the best spots. I have to work to avoid hitting him with my kayak.

With Timber harvester: We want to enjoy the beauty of nature. If the trees near the river are cut, the forest is not as beautiful, and the river is much hotter and sunnier. When trees are cut, it also harms the quality of the water by allowing soil and nutrients to wash into it. This hurts fish and other animals that live in or use the water.



*Fisherman*

Introduction: My name is Sam. I come to the Hiwassee River to fish every Saturday morning with my son during the trout season. It's important that we work together with the other users so that my son and I can continue to fish here.

Conflicts:

With Water sports: I wish I didn't have to share the river with the kayakers, white water rafters, and the other water lovers. It is hard to go fishing with all those interruptions and annoying groups boating and floating through here. How can I catch fish when they are all scared off?

With Timber harvester: Sometimes logging can cause erosion into the streams. This is bad because the soils and nutrients that are washed into the streams cause fish eggs and insects to suffocate, destroy habitats, cover up protective areas for fish to hide from predators—fish are killed when this happens. What's more, I can't have a peaceful day out fishing. I just want to be able to catch fish, but the all the commotion caused by the logging across the river makes it difficult for me to fish. All the fish are scared and won't bite.



With Miner: Mining can also cause erosion. This kills fish and also my fishing trips.

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### *Hunter*

Introduction: My name is Hunter and I hunt in the Cherokee National Forest every deer season with my father. He is getting older and probably will not be able to make these strenuous hunting trips, but I plan to keep the tradition alive when my son is old enough to start hunting. In fact, he is already taking the Hunter Safety class. Every year in late November, after the big hunt, we have a family cookout. Hunting has been a family tradition for several generations and we intend to keep it that way.

#### Conflicts:

With Timber Harvester: In order to hunt, our wildlife need habitats to survive in. The forests provide food and cover for deer and turkey. Cutting the timber is both good and bad. It takes away habitat, but can create areas that increase food sources. Also, I made my tree stand out of lumber, but I wish I weren't so reliant on it because the loggers make a lot of noise and disturb my hunting trip.

With Miner: Mining can harm habitat for deer, turkey and other wildlife. How can I hunt if the wildlife don't have a habitat to live in? There would be no animals to hunt.

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### *Timber harvester*

Introduction: We need jobs to be able to live and pay for the things we need. Harvesting timber is our job. The public needs timber to be able to build houses, do homework for school, stay warm, and a lot of other things. We just want to harvest the timber that is ready to be removed from the forests. We are not trying to ruin the forest or people's recreational activities. We cut the timber so that erosion is avoided and little harm to the forest results.

#### Conflicts:

With Fisherman: We need and use timber in our everyday lives, but timber harvesting causes noise pollution, and even greater is the problem caused by the eroding of the lands after logging. If this is done too close to the rivers the sediment builds up and pollutes the streams which then harm the fish.

With Hunter: We need jobs and the public needs the timber. We use timber in our everyday lives, but it does affect different activities within the Cherokee National Forest. It is loud, it scares off the animals, and it can be good and bad for wildlife habitats. Cutting trees might remove some trees that wildlife might still be using, but it also allows new trees to come into the forest which some wildlife need.



### *Miner*

Introduction: Like the timber harvesters, we need jobs to be able to live. Mining is our job. The public needs minerals so that they can survive. The Cherokee National Forest does not have any mining going on now, but other forests do. These forests allow us to have coal which allows us to stay warm and oil to make plastics for things such as sleds or bottled water.

Conflicts:

None: There is not any mining happening right now within the Cherokee, but if you pretend that there is, or has been recently, you can hear replies from the Hiker/birdwatcher/wildlife and outdoor enthusiast, the Fisherman, and the Hunter.



**Student Page**

**Role Play Activity Interest Groups**

Group members: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

1. What/who is your character?

\_\_\_\_\_

2. What other characters want the same resources or areas as your character or came into conflict with you?

\_\_\_\_\_

3. What resources or areas do both characters value?

\_\_\_\_\_

4. What are some ways that these groups could share the forest and the areas that they value?

Option (1) \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Option (2) \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Option (3) \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

5. Could these two groups work together to improve their valued areas? How?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

6. List any other ideas or observations.

\_\_\_\_\_

\_\_\_\_\_

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