

# Sandia Mountain Natural History Center

## Ecology Field Program

### Unit Plan

<b>Your Name:</b> Steven Henley & Vince Case, SMNHC Instructors	
<b>Grade Level:</b> Grade 5	<b>Subject Area:</b> Life Science, English Language Arts
<b>Lesson Title:</b> 5 <sup>th</sup> Grade Ecology Field Program	<b>Lesson Length:</b> 3.5-4.5 hours

### The Teaching Process

#### Lesson Overview:

The Ecology Field Program (EFP) is a 3.5-4.5 hour field experience for 5<sup>th</sup> grade students at the Sandia Mountain Natural History Center. Aligned to fifth grade standards, this program provides students an opportunity to delve deeply into understanding the concepts of ecosystems and the interrelationships between the parts of ecosystems in an outdoor classroom setting. In general, the EFP follows the structure below:

- 30-45 minute Introduction to/review of ecosystems (with or without an observation activity)
- 2.5-3 hour field program hike with inquiry-based activities and relevant discussions
- 30 minute lunch
- if time permits, a 30-45 minute wrap-activity

#### Unit Objectives:

- 1 Students will understand the definitions of an ecosystem, abiotic factors, and biotic factors (producers, consumers, decomposers).
- 2 Students will explore, through field activities, the parts of an ecosystem (abiotic & biotic) to deepen their understanding of ecosystems.
- 3 Students will recognize the intricate relationships between ecosystem parts and understand the interactions among those parts.
- 4 Students will begin to question the role and impact of human beings on ecosystems and in ecosystem conservation.

#### Standards addressed

The Ecology Field Program addresses multiple standards from the Common Core State Standards (English Language Arts & Math), the Next Generation Science Standards (Disciplinary Core Ideas, Cross-Cutting Concepts, & Science & Engineering Practices), as well as the 5<sup>th</sup> grade New Mexico Science Standards. For ease of alignment, we list the priority-focus-power standards below, but a complete list of standards addressed can be viewed on our big picture charts for CCSS, NGSS, & NMSS.

#### NGSS – Disciplinary Core Ideas

- LS2.A – Interdependent Relationships in Ecosystems
- LS2.B – Cycles of Matter and Energy Transfer in Ecosystems

- ESS2.A – Earth Materials & Systems
- ESS2.C – The Roles of Water in Earth’s Surface Processes
- ESS3.C – Human Impacts on Earth Systems

**NGSS – Crosscutting Concepts**

- Cause & Effect: mechanism & prediction
- Systems & System Models
- Energy & Matter: flows, cycles & conservation
- Stability & Change

**NGSS – Science & Engineering Practices**

- Asking Questions & Defining Problems
- Engaging in Argument from Evidence

**NMSS-Power Standards**

- Strand I – Scientific Thinking & Practice – Benchmark I – Scientific Method
- Strand I – Scientific Thinking & Practice – Benchmark III – Measurement & Data
- Strand II – Life Science – Benchmark I – Ecosystems
- Strand II – Life Science – Benchmark III – Structure & Function

**CCSS-ELA Focus Standards**

- RI.5.4 – General academic & domain-specific words
- W.5.8 – Recall relevant information and summarize information
- SL.5.1 – Engage in collaborative discussions
- SL.5.3 – Summarize a speaker’s points with evidence
- SL.5.6 – Adapt speech to variety of contexts
- L.5.2 – Command of English writing conventions
- L.5.4 – Determine meaning of unknown words within context

**CCSS-Math Priority Standards**

- MP2 – Reason abstractly & quantitatively
- MP3 – Construct viable arguments

**List of Materials**

Wilderness Area – trails  
 Outdoor classrooms – benches, whiteboards, dry erase markers & erasers  
 Activity sheets  
 Notebooks & pencils

**Instructional Sequence**

**Phase One: Engage the Learner – EFP Introduction to/Review of Ecosystems**

The instructor guides students through a series of questions and observations of the natural surroundings to a definition of ecosystems – a place where living and non-living things are connected. The goal of this phase is to “mentally engage students with a question” so that the instructor can assess the “students’ prior knowledge” of ecosystems and the concepts addressed within this topic. In some cases, this introduction is more like a review for students (since they come with certain concepts understood) while at other times this introduction is truly a beginning point.

<p><b>What’s the teacher doing?</b></p> <ul style="list-style-type: none"> <li>• Writes the word “ecosystem” on the board</li> <li>• Asks students “what do you think of when you hear the word ecosystem?”</li> <li>• Writes student responses on the board</li> <li>• Through questioning, guides students to a definition of ecosystem</li> <li>• Listens carefully to student responses</li> </ul>	<p><b>What are the students doing?</b></p> <ul style="list-style-type: none"> <li>• Observe the natural surroundings while seated</li> <li>• Think about/considering what they think an ecosystem is</li> <li>• Answer instructor questions</li> <li>• Take notes</li> <li>• Ask questions</li> </ul>
<p><b>Differentiation:</b> As noted above in the description, instructors evaluate student preparedness for the concepts to be explored and learned in the EFP while also assessing student prior knowledge and experience with ecosystems, first at the group level. Instructors adjust this instruction based upon student responses, questions, silence, etc. Secondly, at the individual level, since this is the first time we see these students, instructors also attempt to get a handle on needs of individual students during this time period through observing how individual students respond to questions, what they say/don’t say.</p>	

<p><b>Phase Two: Explore the Concept – Introduction: Observation Activity</b></p>	
<p>Students participate in a 7-10 minute observation activity where they create a list of as many observations as they can, using their 4 senses (sight, smell, hearing, touch – not taste!). This activity seeks to engage students in a hands-on exploration of the surrounding ecosystem, so that they are able to have “a common set of experiences” to help them “make sense of the concept.” Besides the definition of an ecosystem that they generated in phase I, students are provided very little additional explanation or terminology at this point. Students spend substantial time making observations, discussing with each other in small groups (and with participating adults) what they are observing, questions they have about what they experience, and how this experience builds upon their prior understanding of ecosystems. In addition, this phase of “exploring” blends into the next phase of “explaining and defining” terms related to the study of ecosystems.</p>	
<p><b>What’s the teacher doing?</b></p> <ul style="list-style-type: none"> <li>• Asks students how they will study ecosystems</li> <li>• Discusses observation techniques using senses</li> <li>• Explains directions of the activity (physical boundaries, number of observations to make, importance of being quiet &amp; taking care of the ecosystem)</li> <li>• Ensures student safety</li> </ul>	<p><b>What are the students doing?</b></p> <ul style="list-style-type: none"> <li>• Walk around a natural area</li> <li>• Make and list observations in their notebook</li> <li>• Think about each observation and how it relates to the rest of the ecosystem</li> <li>• Share observations with each other quietly</li> </ul>
<p><b>Differentiation:</b> In this phase, instructors focus on ensuring that each student is engaged in the observation activity and making connections between their observations and their knowledge of ecosystems. Instructors actively monitor students during the activity and check in with students who may be struggling with the activity.</p>	

### Phase Three: Explain the concept and define terms – Introduction: Definition of Ecosystem Terminology

The instructor gathers student observations, categorizes them into abiotic & biotic factors and further divides the biotic factors into producers, consumers & decomposers. Through a series of questions, the instructor provides (or reviews) definitions of these components and helps students recognize the interactions between each of these ecosystem parts. The goal of this phase is to “provide the scientific explanation and terms” of ecosystems and preparing them to “use the terms” as they being the next phase of more deeply elaborating on the concepts being learned.

#### What’s the teacher doing?

- Gathers students back to benches
- Creates a 4-square chart
- Asks students to share observations
- Categorizes the observations into the chart
- Asks students guiding questions that help them understand the different parts of the ecosystem
- Provides definitions of abiotic (sun, air, water & soil) & biotic factors (including producers, consumers, decomposers)
  
- Asks students to consider how each living thing gets its energy
- Challenges students to consider the relationships among the different parts
- Provides examples that illustrate the ecosystem parts and their interactions

#### What are the students doing?

- Share observations with the whole group while seated
- Take notes
- Ask relevant questions
- Think about the differences between the 4 categories (Non-living things, plants, animals, decomposers)
- Wonder about how the different parts are connected

**Differentiation:** Since this is whole class discussion and questioning, instructors ensure that the class is taking notes and understanding the definitions provided.

### Phase Four: Elaborate the Concept - Field Experience Activities

The field experience includes a 2-mile hike through forest wilderness with inquiry-based activities and/or discussions. These activities and discussions are many and varied, but all build upon the interconnectedness of the biotic and abiotic components of the ecosystem. Depending on the trail being hiked, student preparation and instructor preference, activities will differ; however, a number of activities are “regulars” and relevant to all parts of the SMNHC. The goal of this phase is to provide students multiple and varied learning opportunities to apply the concepts and terminology learned in “unique situations.” Students have the chance to “interact” with one another while “constructing a deeper understanding of” ecosystems.

#### What’s the teacher doing?

- Introduces the activity
- Explains the directions and defines the physical

#### What are the students doing?

- Depending on the activities selected, students
- Observe and move through their natural

<p>boundaries.</p> <ul style="list-style-type: none"> <li>• Circulates to provide guidance</li> <li>• Checks for understanding</li> <li>• Encourages student exploration</li> <li>• Provides students the chance to make connections between content learned and the activities</li> </ul>	<p>surroundings to develop details and deepen their understanding of the parts and entirety of the ecosystem (i.e. producers, consumers, decomposers, and abiotic)</p> <ul style="list-style-type: none"> <li>• Identify and differentiate between tree, lichen &amp; consumer species or non-living things</li> <li>• Search for items or evidence relating to ecosystem parts</li> <li>• Use forestry tools to determine forest health.</li> </ul>
<p><b>Differentiation:</b> During activities, instructors consistently pay attention to whether or not students understand the purpose and scientific processes involved in the task. Instructors actively monitor and check for understanding, appropriately modifying as needed.</p>	

**Phase Five: Evaluate students' Understanding of Concept – Informal Formative Assessment**

Student understanding is checked throughout their time on the trail by means of informal formative assessments. It is always part of the various field experience activities as well as many planned and unplanned stops along the trail. The results may determine the extent to which the instructor may push the activity and what to highlight or focus on for the duration of the hike. Instructors guide students through questions, discussion, observation of physical evidence, collection of data while paying specific attention to what is understood and the depth at which that understanding takes place.

<p><b>What's the teacher doing?</b></p> <ul style="list-style-type: none"> <li>• Evaluates student understanding through discussion with and questioning of small groups and individuals about their finding</li> <li>• Wraps up each activity by questioning, discussion and sharing student discoveries</li> </ul>	<p><b>What are the students doing?</b></p> <ul style="list-style-type: none"> <li>• Check their own understanding through partner discussions about findings</li> <li>• Explaining through writing or to the instructor what their finding means in the context of the ecosystem</li> <li>• Take part in the follow-up whole group discussion</li> </ul>
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