Reading the LTER Narratives for Understanding
By Tina Skjerping

Time: 3 class periods (approximately 1 hour each), or may be used intermittently
with ecological studies or test preparation activities

Grade Level: 6th-9th

Background: Native species have been overcome with changes in the
landscape over time. As humans move into an area, they bring with them a
variety of plant and animal species that may not be native to that landscape.
Using Geo Information Systems, we can identify and analyze the plants in our
community and plan for the future of our landscape. The LTER case studies
examine some of these changes over time and will be used as a backdrop for
this study in the classroom.

Objectives:
Students will be able to:
1. identify and describe native and non-native species in their communities
2. respond to non-fiction writing by answering multiple-choice questions and
   composing short answer responses

Standards
National Science Standards
Content Strand: Life Science
As a result of their activities in grades 5-8, all students should develop
understanding of
- Populations and ecosystems
- Diversity and adaptations of organisms

National Standards for the English Language Arts
Standard One: Students read a wide range of print and nonprint texts to build an
understanding of texts, of themselves, and of cultures of the United States and
the world; to acquire new information; to respond to the need and demands of
society and the workplace; and for personal fulfillment. Among these texts are
fiction and nonfiction, classics and contemporary works.

Standard Three: Students apply a wide range of strategies to comprehend,
interpret, evaluate, and appreciate texts. They draw in their prior experience,
their interactions with other readers and writers, their knowledge of word
meaning and of other texts, their word identification strategies, and their
understanding of textual features.
Arizona Science Standards
Strand 4: Life Science
• Analyze the relationships among various organisms and their environment
• Identify structural and behavioral adaptations

Arizona Reading Standards
Strand 3: Comprehending Informational Text
• Identify, analyze, and apply knowledge of the purpose, structures, and elements of expository text

Advanced Preparation: None

Materials: Copies of “Plants in My Neighborhood” and “Reading and Responding to Non-Fiction: Case Studies on Long-Term Ecological Research” worksheets for each student

Suggested Procedure:
Day One:
Introduce the concept of changing landscape with the activity “Plants in my Neighborhood”. This activity will help students identify the plants located in their neighborhoods and communities and recognize them as native or non-native species. After the activity, discuss with the class how non-native species would come into an area and how they might affect the local environment.

Day Two and Beyond:
Revisit the ideas developed in the previous day’s lesson before distributing the “Case Studies Comprehension” worksheet. This worksheet provides students with direct text from the LTER Case Studies and is accompanied by both short answer and multiple-choice questions. The questions are valuable for test-preparation and response to non-fiction literature. Depending on your students, you may want to read the case studies as a group, or discuss the student’s responses after completion.

Evaluation
See the “Teacher’s Answer Guide” for answers to the multiple-choice questions. Suggestions and rubrics are provided for free-response questions.

Extensions
As an extension, students can write their own “narrative” version of the history of their community. Narratives may include landscape, agricultural lands, plant, animal, or human histories. For areas that have experienced rapid growth and change, such as Phoenix, the students may want to write a history based on their own lives and the changes they have witnessed.
Plants in my Neighborhood

Directions: Draw and a picture and label the name of the 3 plants from your yard, your neighborhood, or your school grounds.

Name________________          Name________________          Name________________

Share your plant drawings with a partner. Record in what ways are your plants similar and it what ways are they different?

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Native plant species are those that grow naturally in the environment. Humans have transplanted non-native species over time from other environments.
Do you believe the plants you identified are native or non-native? What led you to your conclusions?

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Reading and Responding to Non-Fiction: Case Studies on Long-Term Ecological Research

**Introduction:** Scientists have studied many areas across the United States with regards to how the landscape has changed over time. These have been written into “case studies”, or “narratives”, that describe the changes in the area. Below you will read excerpts from the case studies and answer questions in order to better understand the relationships between humans and the ecological systems around them.

**CAPLTER – Arizona**

I. This narrative, the Arizona case study of the “Ag Trans” project, explores the relationship between ecological and human systems in the Salt River Valley of central Arizona over the past millennium, focusing upon the 140-year period of Anglo-American settlement. Our subject matter is the changing mosaic of Sonoran Desert landscapes, irrigated farmland, and urban settlement.

1. Why would the narrative focus on the 140-year period of Anglo-American settlement?

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2. What does the writer mean when they use the term “mosaic” to describe the Sonoran Desert?

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II. The Sonoran Desert is lush compared to other deserts, with the greatest diversity of plant life of any desert in the world. Despite such diversity, two distinctive plant types are most often associated with this desert—leguminous trees and large columnar cacti (including saguaro and organ pipe). The Sonoran Desert houses 2,000 species of plants (about half of which are annuals), 550 vertebrate animal species, and unknown numbers of invertebrates (Arizona-Sonoran Desert Museum 1999).

1. According to the passage, the Sonoran Desert is best described as:
   a. an arid, dry climate when few species can survive
   b. a bountiful array of plants and animals
   c. home to many species, but not as many as the Gobi Desert

2. According to the passage, which of the following is not found in the Sonoran Desert?
   a. columnar cacti
   b. annual plants
   c. palm trees
   d. leguminous trees

Part III. Modern (post-1867) human activities, including agriculture, in the Phoenix Basin have adversely affected many species. In Maricopa and neighboring Pinal and Pima counties, 19 species are classified as endangered (7 plant, 5 fish, 4 bird, 3 mammal), and 4 as threatened (2 fish, 1 amphibian, 2 bird) (AZCF 2005). Agricultural activities that have contributed to the demise of these species include land conversion, removal and redistribution of water from stream courses, alterations of riparian habitats, grazing, pesticide use, and species introductions.

1. What is NOT identified as a cause of the demise of endangered and threatened species?
   a. pesticide use
   b. changing stream courses
   c. wildfires
   d. grazing

2. Describe a time you have seen human activities negatively affect a plant or animal species. What happened? Could it have been prevented? How?
   __________________________________________
   __________________________________________
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The Nature-Human Conceptual Conundrum

Once people settled permanently in central Arizona and redirected the hydrological cycle to enable irrigation agriculture, separation of the natural environment from its human-engineered counterpart grew complex. In the course of altering land and water to suit economic needs, people often destroy much of what one would consider “natural.” Although irrigated landscapes are in some sense artificial, they are constructed with topography, climate, and soil characteristics as guideposts. Hence these early agrarian landscapes are sometimes thought of as “modifications” of the natural order. We will use the term “nature” to distinguish processes and conditions that have minimal human participation from those where the human impact is substantial. Nature is a vigorously reactive and creative force. As the construction of an irrigated landscape degrades habitats, it creates others, such as reservoirs, canals, and fields that provide homes for new species that establish new hydrological relationships. Nature does not disappear in the face of human activities but is transformed into new and, perhaps, novel ecosystems.

1. The “hydrological cycle” refers to:
   a. the cycle of life
   b. the rock cycle
   c. the water cycle
   d. the decomposition cycle

2. Describe what you consider to be “natural” landscape. What do you base your answer on?

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3. Why would irrigated landscapes be considered artificial or unnatural?

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________________________________________________________________________
4. The authors define the term “nature” as “processes and conditions that have minimal human participation”. Compose your own definition of “nature”.

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5. The narrative describes nature as
   a. changing with human impact
   b. stagnant with human impact
   c. simple and monochromatic
   d. beautiful and breathtaking
EURO-AMERICAN SETTLEMENT. Several factors drew the first settlers to southwest Michigan in the decades before 1850. One was grain production. From the colonial period up to the early part of the 19th century, wheat production in the mid-Atlantic region dominated national production. In the first decades of the 1800’s, however, market saturation and rising land prices prompted many settlers to take advantage of low land prices in the newly opened Northwest Territory. A second factor was transportation. The completion of the Erie Canal in 1825 facilitated the westward movement of new settlers and supplies and led to the establishment of a land office in Kalamazoo in 1834. Settlement in the region immediate accelerated. The third factor was fruit production. It is the introduction of an exotic, the peach (Prunus persica) early in the 19th century that is credited with the start of commercial fruit cultivation in southwest Michigan. Railroads and land speculators hyped land in southwest Michigan as the next Garden of Eden. The combination of the three factors meant that extensive farming development preceded even Michigan’s statehood in 1837. On these farms, animal enterprises were important both for self-provisioning and for petty commodity exchange, as well as for draft power.

1. Market saturation can be described as:
   a. a flooding of the market with too many products
   b. a wet market
   c. a storm that negatively effects the market
   d. a dry market with too few products

2. According to the narrative, what three factors drew settlers to southwest Michigan?
   a. grain production, fruit, and railroads
   b. grain production, vegetable production, and railroads
   c. fruit production, grain production, and transportation
   d. animals, fruit production, and canals
FAST FORWARD. Almost 200 years later, agriculture is still a dominant aspect of southwest Michigan. The early emphasis on wheat production has shifted to crops that support industrial agriculture – especially corn and soybeans. Animal enterprises now are concentrated on a smaller percentage of the farms in fewer locations across the region. Vegetables and fruit are very important in parts of the region. Currently, almost half of the fruit acreage in the state is located in the southwest Michigan region; within the region, five of the 17 counties account for 92 percent of the fruit land. Indeed, it is the diversity of agriculture in southwest Michigan that is its outstanding characteristic.

1. Why would you consider corn and soybeans to be “industrial agriculture”?  
   a. They grow quickly  
   b. They are hardy plants  
   c. They have a high market demand  
   d. All of the above

2. Analyze the statement “it is the diversity of agriculture in southwest Michigan that is its outstanding characteristic”. Is this statement a fact or opinion? Give 2 reasons for your response.

   Circle One: Fact / Opinion
   
   Reasons: ______________________________________________________________
   
   ______________________________________________________________
   
   ______________________________________________________________
FRUIT. When increasing numbers of formal peach, apple and pear orchards came into production, widespread pest damage became apparent as these plantings made the landscape more homogeneous which increased the transmission of diseases and the rapid spread of damaging insect pests. For instance, the Peach Yellows virus, first found in Michigan in 1866 in Berrien County, in combination with the severe winters of 1873 and 1879 severely damaged the peach industry. Yellows causes premature ripening and red spots from the skin through the flesh. While the cause of Peach Yellows was not understood during this period, it was believed that it was contagious and that the only preventative measure was to immediately remove and burn affected trees. Kessler states that control of yellows was so critical that it prompted the passing of the Insect and Plant Disease Act of 1875, the first state legislation in the nation with the objective of controlling a plant disease.

1. What does the author mean by “homogeneous" with regards to the landscape?
   a. many different species
   b. human species
   c. few different species

2. How would you explain the removal and burning of Peach Yellows?
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   ___________________________________________________________
   ___________________________________________________________

3. What prompted the passing of the Insect and Plant Disease Act of 1875?
   a. premature ripening of peaches
   b. disease and insects damaging peaches
   c. burning trees
   d. severe winters
FRUIT2: As the production of fruit expanded, it caused significant changes in the biophysical environment of the region. The varieties of apples and peaches and grapes which were planted were European and eastern North American varieties, exotic to the region. Although none escaped from cultivation to become an invasive nuisance, they did replace a significant percentage of the native vegetation. The sizable and concentrated planting of these varieties made it possible for native and introduced insect and microbial pest species to increase to the point of being significant problems.

1. After reading the passage, the reader can infer that the expanded production of fruit
   a. kept pests away from the region
   b. caused problems for the native vegetation
   c. reduced the numbers of native vegetation
   d. both a and b
   e. both b and c

2. Which of the following is the best definition of the word "exotic" as used in the passage?
   a. strange
   b. foreign
   c. weird
   d. odd
Konza Prairie - Kansas

The Flint Hills contains the largest remaining contiguous tract of unplowed tallgrass prairie. (Knapp and Seastedt 1998)

“There were wild flowers, hundreds of kinds of wild flowers, blooming in their place and season. There were elk and shaggy bison, and prairie chickens booming out their mating call on brisk April mornings. Great trees hugged the stream channels and floated like islands on distant horizons. And there was grass in abundance, dozens of kinds of grass. Eight feet tall on favored sites, belt high in most places, it was green and bronze and wine and gold, rippling and shining in the sunlight. It’s almost gone now, that shining, swirling landscape. Other prairie survives . . . . But the tallgrass prairie, the king of prairies, became the corn belt. Became Chicago, became Des Moines, became home for 25 million people. As the homesteaders’ steel plows sliced through its matted roots, it all but vanished in a ringing, tearing sound”. (Farney 1980: 38, writing in the National Geographic)

1. Based on the passage, how does the author feel about the tallgrass prairie?
   a. prairies should be conserved
   b. prairies are not important
   c. prairies help with relaxation
   d. prairies have many pleasant aspects

2. Which of the following in an example of a simile?
   a. rippling and shining in the sunlight
   b. floated like islands on distant horizons
   c. the tallgrass prairie, king of the prairies
   d. prairie chickens booming out their mating call

3. Which word best describes the mood of the passage?
   a. hostile
   b. friendly
   c. hopeful
   d. melancholy
Humans impose patterns on the Earth through purposeful as well as inadvertent land-use, and these patterns affect local, regional and global ecological processes. The effects ultimately influence the sustainability of biophysical and cultural landscapes, as well as the quality of life.

By virtue of its geographic position, southern Appalachia can serve as a natural laboratory. Physical environmental forces exert strong influences on the organization of southern Appalachian ecosystems, such as hurricanes. However, direct human disturbances such as farming, logging, mining and road construction have altered more than 98% of the southern Appalachian landscape. Indirect actions such as the introduction of non-native species such as the Chestnut blight (Cryphonectria parasitica) and the balsam wooly adelgid (Adelges piceae) have similarly caused profound changes.

1. Which is an example of purposeful land-use?
   a. a river
   b. a landfill
   c. a forest
   d. a mountain

2. What does the author mean by a natural laboratory?

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3. How would the introduction of a non-native species change the landscape of Appalachia?

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For centuries, European observers perceived the western high plains as a desert. Few signs remained, on the surface, of the Pawnee villages that once grew maize and bean crops and built earthen homes in the bottomlands of the South Platte and Republican River basins. Decades-long drought in the 13th century had forced an eastward retreat of the first agricultural peoples on the high plains. In the centuries that followed, humans were mainly visitors to a shortgrass steppe dominated by bison, drought and fire. The landscape that emerged favored resilient shortgrass species, like buffalo grass and blue grama, which thrived on natural disturbance. The longevity of these forces only began to unravel when Europeans introduced horses and firearms into plains ecology. The near demise of the bison in the 19th century, and the expansion of agriculture that followed, had dramatic consequences for the shortgrass, reducing its biomass and diversity.

1. Formulate a question about the Short Grass Steppe based on the paragraph above.

2. How would you go about answering your question? ____________________
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   ____________________________________________________________________
Harvard Forest LTER – Massachusetts

"[The land had] a weather-beaten face, and the whole country, full of woods and thickets, represented a wild and savage hue".
William Bradford, 1620 describing eastern Massachusetts.

"[The land is] full of rocky Hills ... and clothed with infinite thick Woods"
John Josselyn, 1672 writing about central New Hampshire.

"Our woods are now so reduced that the chopping of this winter has been a cutting to the quick...There is hardly a woodlot of any consequence left but the chopper's axe has been heard in it this season".
Henry David Thoreau, 1855 in Concord, Massachusetts

"The forests are not only cut down, but there appears little reason to hope that they will ever grow again".
Timothy Dwight, 1804 reflecting on southern New Hampshire

"In many ways the forest landscape of the Appalachians, as well as many parts of the East and South, has come full circle. By the 1960’s and 1970’s...its appearance is much like it must have been before the American Revolution."
Doug MacCleery, 1992, American Forests - A History of Resiliency and Recovery

"This unintentional and mostly unnoticed renewal of the rural and mountainous east -- not the spotted owl, not the salvation of Alaska's pristine ranges -- represents the great environmental story of the United States, and in some ways of the whole world."
Bill McKibben, 1995 An Explosion of Green The Atlantic Monthly

These passages all refer to the area of research called the Harvard Forest. Choose 2 or 3 of the passages and compare and contrast the statements by the authors. What is the story being told?

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Teacher’s Answer Guide

Please note the short answers are only suggestions for responses, your students’ responses will vary, based on experience.

CAPLTER – Arizona
Part I
1. most significant impact in last 140 years
2. variety, color, shape
Part II
1. b
2. c
Part III
1. c
2. answers will vary

The Nature-Human Conceptual Conundrum
1. c
2. answers will vary
3. unnatural because they are man-made
4. definitions will vary
5. a

KBS Narrative – Michigan
EURO-AMERICAN SETTLEMENT
1. a
2. c
FAST FORWARD
1. d
2. Opinion
FRUIT
1. c
2. People of the time did not know if Peach Yellows was contagious and burning the trees was the best way they knew to destroy the disease and keep it from spreading
3. b
FRUIT2
1. e
2. b

Konza Prairie – Kansas
1. a
2. b
3. d
Coweeta LTER – Southern Appalachia

1. b

2. A natural laboratory could be referred to as a natural setting where investigations can take place. Student answers may vary.

3. A non-native species may be detrimental to a native plant or animal in a variety of ways. Student answers may vary.