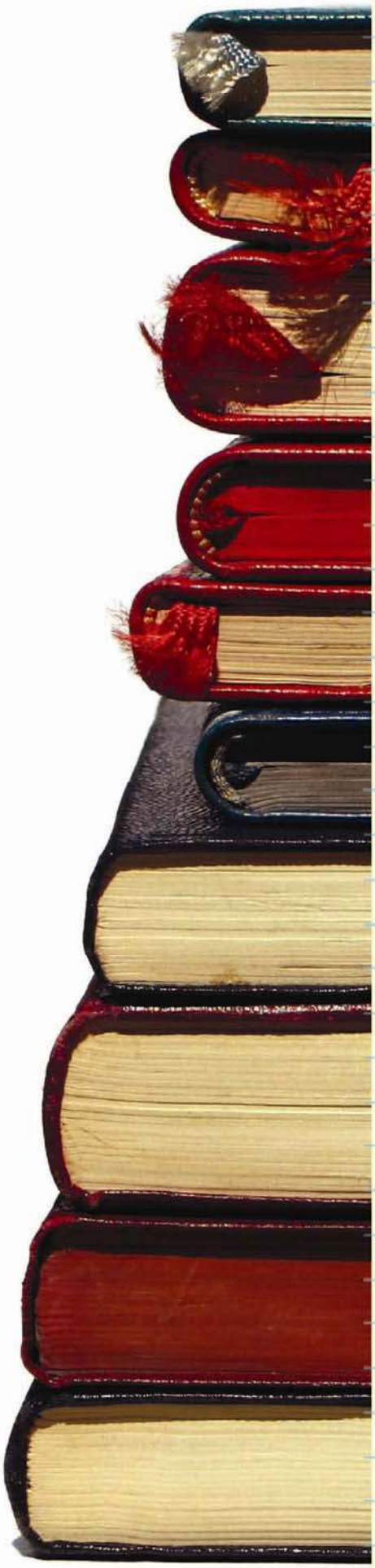

Comprehensive Curriculum

Revised 2008

Environmental Science

Louisiana Department of
EDUCATION

Paul G. Pastorek, State Superintendent of Education

Mini-Projects

Mini-projects are designed to allow each student an opportunity to individualize his or her education by selecting a project of interest and to complete it for credit. These projects will allow the student an opportunity to take the study of biology and environmental science "outside" traditional classroom activities. Opportunities available in the community and other activities relevant to the coursework will be listed each grading period. (*Note:* As community activities will vary with the season and with the locale, it will be necessary for teachers to locate opportunities available in their local areas.)

Remind students to discuss project choices with their parents before signing up for any projects—especially those that involve some expense or travel. They should also discuss project choices with employers and coaches, if applicable. When specifying a due date, consider assigning an earlier due date for any contest entries in order to get these graded and mailed on time.

Some mini-projects ideas:

1. Annual Louisiana Beach Sweep and Inland Waterway Clean-Up
The Annual Louisiana Beach Sweep and Inland Waterway Cleanup is held the third Saturday in September in conjunction with the International Coastal Cleanup sponsored by the Ocean Conservancy (www.oceanconservancy.org) and the Louisianan Department of Environmental Quality (www.deq.louisiana.gov). This project combines community service with the collection of relevant scientific data. Students will collect debris and while doing so, collect scientific data to be submitted to an international data bank. Be sure to make students aware of debris collection safety issues and recruit sufficient numbers of adult chaperones to act as monitors.

2. **The Wild Things Youth Art Contest!** Sponsored by the U.S. Fish and Wildlife Service

Students help celebrate National Wildlife Refuge Week with artwork representing the plants, animals and landscapes of Louisiana. Entrants must be youth between the ages of 5 and 18. Art is categorized by age groups and is judged on both creative representations and accuracy of the subject(s).
Artwork must represent **native** wildlife of Louisiana. This includes plants, animals, and landscapes and any combination of these. A resource list and an entry form are available on the refuge web site. Due date is early October.

3. Louisiana's Environmental Awareness Student Art & Language Art Contest
Sponsored by the Louisiana Environmental Education Commission and Alcoa Foundation

Students of ages 5-18 may participate in either or both visual and language arts contests. Entries highlight our state's environmental resources and natural treasures. Winning entries are published in a Louisiana Environmental Awareness calendar. Official entry forms and contest information are available from the Office of Environmental Education, P.O. Box 82980, Baton Rouge, LA 70884. The due date is generally late March.

4. Louisiana Observation of National Hunting and Fishing Day

On a Saturday in late September, the Louisiana Department of Wildlife and Fisheries sponsors this national observation at several sites state-wide. This event is fun and educational for the whole family. It is free and open to the public. Participants can canoe, fish, and take part in archery, shooting, and falconry activities. They can also enjoy wild game dishes, learn about wetlands and wildlife, and collect biological and ecological resource materials.

5. Create a classroom/courtyard **Louisiana Natives Study Area.** With teacher approval, students develop a Louisiana native species garden, aquarium, or terrarium. Have students develop a plan, get it approved, develop the site, collect the organisms, care for the organisms, and maintain the habitat. Louisiana Dept. of Wildlife and Fisheries regulations and animal and human safety considerations are factors to be considered in the approval process. Students should be allowed to work in groups if the amount of work so warrants and if each student contracts for his/her contribution.

6. Have students complete a **Book Report** for literature (fiction or non-fiction) that includes environmental concepts or that profile individuals who have had an impact on environmental studies.
Inform students that the book report will be based upon the ecology concepts and will not be a typical book report.

7. Allow students to **design their own projects**. Have individuals or small groups of students develop a project in which they are active in teaching/learning about biology or environmental studies in the community.

Date:_____

Topic: Split-Page Notetaking

Big Ideas	**Supporting Information**

Date:_____

Topic: Split-Page Notetaking

Big Ideas	Supporting Information
Step 1 ***Prepare the paper***	• *Using an 8 ½ by 11- inch piece of notebook paper, draw a line from top to bottom approximately 2 to 3 inches from the left edge of the notepaper.* • *Try to split the page into one third and two thirds.* • *Label the columns:* *Label the left column, "Big Ideas" (or "Key Terms").* *Label the right column "Supporting Information" or "Notes."*
Step 2 ***Take notes***	• *During the lecture or reading assignment, record notes in the right-hand column.* • *Write notes in short sentences, leaving out unnecessary words.* • *Paraphrase information and abbreviate as much as possible.* • *Write legibly.*
Step 3 ***Review the material***	• *As soon as possible after the lecture or reading session, review the material and process the information. (If something seems incomplete or confusing, review appropriate readings and ask questions during class.)* • *Identify the "Big Ideas" (key concepts or terms).* • *Record the "Big Ideas" in the left-hand column.*
Step 4 ***Prompt Recall/ Review***	• *Bend the paper so that the information in the right column is covered. Read each "Big Idea" and state (in your own words) the pertinent notes related to it.* • *Check your answers for accuracy and completeness.* • *Bend the paper so that the information in the left column is covered. Read the supporting notes and identify the "Big Ideas" or key concepts (or terms).* • *Check your answers.* • *Summarize your notes in your own words.* • *Review your notes and summary frequently; everyday is best!*

Investigation Analysis

Name_____ Period____
Date_____

Investigation title: _____

1. This investigation includes

___Observation **___Literary survey** **___Experimentation**

___Description **___Classification** **___Modeling**

___Math relationships **___Role-playing** **___Computer simulations**

___Organizational tools [Indicate type(s)] _____

___Other—specify_____

2. Technology used to enhance this investigation and/or presentation includes

___light microscope **___typewriter/word processor** **___CD Rom**

___internet resources **___digital camera** **___ video camera**

___flex cam **___television** **___DVD/player**

___VHS/VCR **___calculator**

___Other (Specify) _____

3. Identify appropriate safety measures associated with this activity.

4. The investigation's purpose/rationale is _____

_____

_____

5. Investigation abstract (Summarize the investigation "findings" in one concise paragraph on the back of this sheet.)

EXPERIMENTAL DESIGN DIAGRAM

Name_____

Date_____ Period_____

Title:

Purpose/rationale:

Hypothesis:

Independent Variable(IV):						
Levels of the Independent Variable (The levels of an Independent Variable are the quantities or forms of the experimental factor. For example, if the IV is an amount of water , the levels might be 50 mL, 100 mL, or 150 mL.)						
Number of Repeated Trials x Sample Size						

Dependent Variable:

Constants:

Control Group:

FYI: OWL PELLETS

Background Information:

Predatory birds, such as owls, lack teeth to grind up food. Small prey are sometimes swallowed whole and larger prey are generally torn into small pieces. Digestive juices can break down the body tissues of the owl's prey; indigestible materials (such as feathers, fur, bones, and teeth), however, collect within a digestive structure known as the ventriculus or gizzard. Within the gizzard, the indigestible materials (which might also include beaks, claws, fish scales, and insect exoskeletons) are compressed, forming a bolus (or pellet). Once compressed, the pellet begins its movement back up the digestive system. It spends several hours within the proventriculus until it is expelled. While other predatory birds also produce pellets, owl pellets contain a greater concentration of indigested materials (as owls pluck their prey less, and owl digestive juices are less acidic than those of other birds of prey).

Scientists take advantage of these adaptations by collecting owl pellets and examining their contents. Owls are not very selective eaters; therefore, their pellets can be used to estimate the diversity of available prey. The pellet contents are also a direct indicator of what the owl has fed on—Information crucial for both owl and prey species management and protection.

In this activity, pellets produced by Barn Owls (*Tyto alba)* will be examined. Barn Owl pellets have been selected because these owls swallow small birds and rodents whole, and the resulting pellets generally contain the complete skeletons of the prey species.

References consulted:

Investigation of NW v .SE Owl Pellets, WARD'S Natural Science Establishment (1993)
The Owl Pages www.owlpages.com
Digestion in Owls www.earthlife.net/birds/digestion.html

Additional resource materials recommended for student use:

- "On Silent Wings: The Owls of Louisiana" published by the Louisiana Dept. of Wildlife and Fisheries *Louisiana Conservationist*
- KidWings Virtual Owl Pellet Dissection www.kidwings.com

BARN OWL PELLET Dissection

PROCEDURES:

1. Read the background information. Also, read and discuss the procedures listed below.
2. As part of a class pre-lab discussion, complete sections 1 and 2 of an Investigation Analysis Format sheet.
3. Identify appropriate safety measures associated with this activity. Discuss these with your class and record them on section 3 of the Investigation Analysis Format sheet.
4. Familiarize yourself with your assigned individual job descriptions/responsibilities within your group.
5. Remove the Owl Pellet from the packet and place it on the plate.
6. Remove the dissecting needles, gloves, and Bone ID Sheet from the lab packet.
7. After putting on the gloves, begin the dissection by removing the aluminum foil.
8. Break the pellet into smaller portions so that more than one group member can dissect.
9. Using the dissecting needles (or your fingers), begin to loosen the hair of the pellet. As bones are recovered, carefully remove them.
10. As the bones are removed, have one group member place these on the appropriate locations on the Bone ID Sheet.
11. After all bones have been removed, one group member should collect all excess material and dispose of the wastes as instructed by the teacher. (Do not dispose of the bones until the group data table has been completed.)
12. On the Owl Pellet Lab Report, complete the pellet analysis, share the data with the class, and complete/ revise the vocabulary cards and the answers to the lab problems. (Each student will submit a completed lab report.)
13. Complete the Investigation Analysis Format Sheet.
14. Return this sheet to the resource folder.
15. Staple your Investigation Analysis Format Sheet to the front of your Owl Pellet Investigation Lab Report and submit your lab report on the date specified.

OWL PELLET INVESTIGATION LAB REPORT

Name_____

Purpose:

Materials per group:
One owl pellet
Gloves
Dissecting needles
Folder containing the resource materials and Bone ID Sheet
Paper towels
Paper plate or large sheet of newsprint
One set of instructions/lab report form **per group member**

Procedures: Refer to the procedures distributed.

Group's Data: (Alter the table as needed.)
What "my" owl ate:

Name of organism	Number found	% of total

Class Data:
Record the class totals for each of the prey species:

Name of organism	Number found	% of total

The data collected is: ____continuous ___discrete
The best graph for this type of data is: ___bar ___line___ pie

✪**Be sure to label the axes correctly and to use the appropriate type of graph.**
Graph: (title)

Vocabulary: Define the terms on your *vocabulary cards.*

Predator
Prey
Range
Habitat
Diversity

Analysis of Data: Use your research and the class's data in completing the next section.

1. How often does a Barn Owl produce a pellet? (You may need to do a little research.) How many does it produce per year?

2. Assuming the pellet you studied was collected in Louisiana, how much food does the owl eat in one year?

3. How accurately do you think information gained from pellet analysis reflects the kind and abundance of ALL the small animal populations in the owl's habitat? (Hint: Think about where/when the owls feed.)

4. How stable does this barn owl population seem to be? Justify your answer.
   FYI: Increased diversity=increased stability
   If a predator depends upon one prey type, then a decline in that particular prey will lead to a decline in the predator. If the prey is eradicated through disease or over-hunting, the predator must relocate or die. If the predator feeds upon five prey types, a decline in one or two may cause some stress, but the predator may still feed on the remaining types.

5. Would a crash of the shrew population seriously affect the owl population studied? Explain.

6. Would a crash in the mole population seriously affect the owl population studied? Explain.

7. **On the back of this sheet**, construct a food web with the owl at the highest trophic level and with grass and seeds at the base. The intermediate levels included should only be prey found by your class. Label each organism with regard to its trophic level.

Complete problem 8 on another sheet of paper you attach to this report.

8. Pretend you are an ornithologist working for the Louisiana Department of Wildlife and Fisheries. Compose a barn owl population summary to present to the state legislature with regard to this native species. Be sure to include their general characteristics, their habitat and range, your inference of the stability of the population (and justification of same), and a statement on the role and value of the barn owl to the ecosystems of which it is a part.

Does the location of the habitat affect the diet of Barn Owls?

Name _____
Habitat: ____Southeast ____Northwest

Purpose:

Hypothesis:

Rationale: (In one or two well-researched sentences, explain the thinking behind your hypothesis.)

IV: Location of habitat

Levels of the IV	
Northwest	**Southeast**
Number of trials x Sample size	

Dependent variable:

Constants:

Control:

Materials per group:
One owl pellet (either from the Northwest or Southeast)
Gloves
Dissecting needles
Folder containing the resource materials and Bone ID Sheet
Paper towels
Paper plate or large sheet of newsprint
One set of instructions/lab report form per group member

Procedures: Refer to the procedures distributed.

Group's Data: (Alter the table as needed.)
What "our" owl ate:

Name of organism	Number found	% of total

Class Data: (Record the class totals for each of the prey species.)

	Northwest			Southeast	
Organism	Number	%		Number	%
			■		
			■		
			■		
			■		
			■		
			■		

The data collected is: ____continuous ___discrete
The best graph for this type of data is: ___bar ___line___ pie
✪**Be sure to label the axes correctly and to use the appropriate type of graph.**

Graph: (title)

Unit 2, Activity 2, Owl Pellet Inquiry Exercise

Vocabulary:

Define the following terms on *vocabulary cards*: *Predator, Prey, Range, Habitat, Diversity*.

Analysis of data:

9. Generally, how often does a Barn Owl produce a pellet? (You may need to do a little research.) How many does it produce per year?

10. Assuming the pellet from the southeast was collected in Louisiana, how much food does the owl eat in one year?

11. The skeletons in these pellets provide information about the small animal populations in habitats in the American Northwest and Southeast. How accurately do you think information gained from pellet analysis reflects the kind and abundance of ALL the small animal populations in the owl's habitat? (Hint: Think about where/when the owls feed.)

Increased diversity=increased stability: If a predator depends upon one prey type then a decline in that particular prey will lead to a decline in the predator. If the prey is eradicated through disease or over-hunting, the predator must relocate or die. If the predator feeds upon five prey types, a decline in one or two may cause some stress, but the predator may still feed on the remaining types.

12. Which region had the greater diversity of prey? _____
13. Which region has the greater stability? _____
14. Would a crash of the shrew population seriously affect Barn Owls in either region? Explain.

15. Would a crash in the vole population seriously affect Barn Owls in either region? Explain.

16. Compare and contrast the pellets of Barn Owls of the Southeast and Northwest. Does location of the habitat affect the diet of Barn Owls? Explain.

17. Construct a food web with the owl at the highest trophic level and with grass and seeds at the base. The intermediate levels included should only be prey found by your class. Label each organism with regard to its trophic level.

18. Assume that the pellets collected in the Southeast are from Louisiana. Pretend you are an ornithologist working for the Louisiana Department of Wildlife and Fisheries. Compose a barn owl population summary to present to the state legislature with regard to this native species. Be sure to include their general characteristics, their habitat and range, your inference of the stability of the population (and justification of same), and a statement on the role and value of the barn owl to the ecosystems of which it is a part.

Unit 3, Activity 1, Resources — Renewable or Not? Opinionnaire

Directions:
Before each statement, indicate if you
Strongly Agree (SA), Agree (A), Disagree (D), SD (Strongly disagree).
In the space provided, briefly describe the reasons for your opinions.

___1.If a resource is renewable, it will continue to exist forever.
Reasoning: _____

_____

___2.People can use a renewable resource in a way that it cannot renew itself.
Reasoning: _____

_____

___3.Once nonrenewable resources are used up, they are gone forever.
Reasoning: _____

_____

___4.Many resources (renewable or not) can be recycled and reused.
Reasoning: _____

_____

___5.When people recycle or reuse natural resources, they decrease demand on that resource and save energy.
Reasoning: _____

_____

___6.Recycling saves wetlands.
Reasoning: _____

_____

We need Thneeds!

Your RAFT:

*R*ole: Public Relations Team of the Thneeds Corporation
*A*udience: City Council (your classmates)
*F*orm: a public relations campaign
*T*opic: Thneeds production is important to the economics and well-being of the community and can occur without environmental destruction

Scenario:

Through the efforts of the Lorax, action has been taken to establish a Truffula tree nursery to replant the area with young Truffula trees and to care for them. Through the efforts of the new city council, the city was able to secure a FEMA grant to restore the environment and help rebuild the city. Your team has been assigned to develop a public relations campaign to convince the city council that the Thneeds company (now under new management) is an important part of the community and will maintain environmental quality while continuing to make Thneeds.

Your task:

Your public relations campaign should describe how the new managers of the Truffula Tree Company are going to maintain environmental quality and at the same time make Thneeds. The campaign should include the following:

1. An accurate, informative, creative public relations booklet or video (Explain why making Thneeds is good for the city and how your company will protect the environment while doing so.)
2. A report in which your group states

➢ What social and economic implications will the actions suggested in your plan have on ensuring a quality environment? For example, who will pay for the environmental protection?

➢ Who will pay for the damage to the environment if these actions prove unsuccessful?

➢What does the Truffula Tree Company provide the local economy?

➢Who will provide Thneeds if the Truffula Company doesn't?

3. A presentation to the city council (your classmates)

Procedures:

- Before reading (or viewing the video): In the column marked "Before," rank each of the activities listed according to its perceived risk. (Rank the most risky as 1.)

- After reading (or viewing the video): In the column marked "After," rank each of the activities listed according to its perceived risk. (Rank the most risky as 1.) Then, in the space labeled "Support," record information from the video or text that supports your response. Include numerical probabilities where possible.

Risk Activity or Situation	**Before Reading/Viewing**	**After Reading/Viewing**	**Support (include a numerical probability)**
Bicycling			
Riding in a car			
Riding a motorcycle			
Staying in bed			
Swimming			
Traveling by plane			
Traveling by train			

As students complete the anticipation guide:

- Before Reading (or viewing the video) -- **Student answers will vary with their perceptions.**
- After Reading (or viewing the video) – **Answers should be based upon the numerical probabilities stated in the reading or video.**
- Support: **The probabilities listed below are based upon the video.** Remind students that risk varies with age and that odds fluctuate from year to year. Updated probabilities are available via the National Safety Council (www.nsc.org/lrs/statinfo/odds.htm) and other risk analysis sources.

Risk Activity or Technology	Before Reading/Viewing	After Reading/Viewing	Support (include a numerical probability)
Bicycling	*Refer to the note above.*	*Refer to the note above.*	1 in 150
Riding in a car			1 in 150
Riding a motorcycle			1 in 25
Staying in bed			1 in 650
Traveling by bus			1 in 4 million
Traveling by plane			1 in 140,000
Traveling by train			1 in 5 million