

*EcoVentures*TM:

Learning in Florida's Environment

Field Notebook

**Interactive Media Science Project
Florida State University
Tallahassee, Florida**

HOW TO USE YOUR FIELD NOTEBOOK

Scientists often work out in the field, observing and collecting data. Even in this day of notebook computers, it is not always easy to use a computer on a research vessel, at the beach, or along the river. Scientists still take lots of notes by hand, in a field notebook. As you explore *EcoVentures*, you will use this book as your Field Notebook. You can use it to read about the *EcoVentures* on each side of the disc. Each *EcoVenture* asks you to collect data or take notes on the work (and play!) you do at the site. You can record that data, do calculations, and take notes in the spaces provided in your Field Notebook. You can work on the *EcoVentures* in any order. Your teacher may assign you to work in a particular area, such as the woodlands region. When you select an *EcoVenture*, turn to that section of the Field Notebook. The *EcoVentures* are labeled at the top of the page and you can look up the page numbers in the Table of Contents.

After you have completed each on-line *EcoVenture*, you can answer questions related to the work you have completed. The information you gather at the *EcoVenture* sites will be used to develop a management plan for R. U. Green Park. These questions will challenge you to apply what you have learned to the plan for managing R. U. Green Park. Think about the recommendations you will make for making the park a safe haven for wildlife and a fun place for people to visit and learn about Florida's environment.

Good luck and have fun!

WELCOME TO EcoVentures™: LEARNING IN FLORIDA'S ENVIRONMENT

The future site of R. U. Green Park includes part of a barrier island and Snapper Bay as well as upland areas near Fishee River. As you begin the program, you will be asked to choose a site to begin your investigations. A movie introduces you to the different ecosystems in each site and the issues you will explore in each. The movie also introduces you to the *EcoVenture* team of which you will be a part!



At each site you can:

- watch movies explaining the research being done in various habitats;
- click on *EcoVentures* to see where you can perform activities;
- click on EcoTours to explore the organisms found in the various habitats at the site;
- use Info in the pull-down menu bar to access background on the issues at each site, get help in working through an *EcoVenture*, and preview questions to help guide your research;
- use References in the pull-down menu bar to gather additional information. References are always available as you move through your *EcoVentures*. These references include the Video Encyclopedia, Field Guides, and Consultants. The consultants may be particularly helpful in working through *EcoVentures*.

Section 1



At this site you will work on the section of the new park that includes Snapper Bay and Chickee Island.

Snapper Bay Region:

- Trawl
- Frame Up
- Manatee Tracking
- Sink The Reef

Chickee Island Region:

- Fiddling Around
- Signs of Life
- The Sludge Factor

Trawl EcoVenture

What You Will Do.

In this *EcoVenture*, you are on board a pontoon boat performing scientific trawls of waters in the shallow seagrass meadows and the open bay. From these samples, you will count and classify the common pinfish (a species of porgy fish) and various species of zooplankton and phytoplankton.

Why It's Important.

Many of the animals which live in the bay depend upon seagrass meadows for shelter. Smaller fishes would be easy prey to larger fish in the open bay waters where there is less protective cover. Zooplankton (animals) and phytoplankton (plants) are other important organisms found in the bay. These microscopic creatures are fundamental building blocks of the marine food chain. Edible fish caught in the bay ultimately rely on these kinds of microscopic plants and animals.



Ready? Begin.

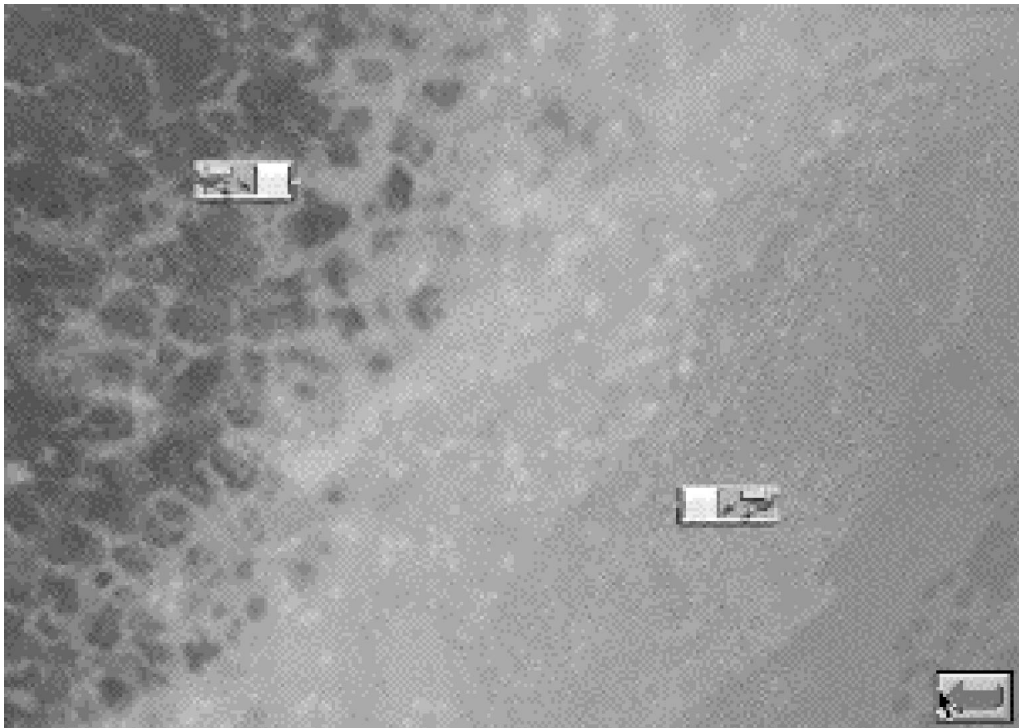
Trawl is located on the Marine Site Screen. Click on the Trawler icon to reach the activity.

Tip: Have you watched the seagrass meadows movie on the Marine Site Screen? If not, you might wish to watch it. The EcoVenture team is on board a pontoon boat with Dr. Pinfish. Watching the movie will give you a good idea of what you will be doing in the Trawl EcoVenture.

As you work through this EcoVenture, think about these questions:

- *How do the numbers and sizes of pinfish caught in the seagrass meadows compare with those caught in the open bay?*
- *Explain the differences in the number and variety of phytoplankton, copepods, and invertebrate larvae found in the open bay compared to the number and variety in the grass beds.*

Click the forward arrow to begin your research.



To learn about sea life in Snapper Bay, select one of the pontoon boats. One will trawl in the open bay and the other over the seagrass meadows. After you choose an area to trawl, select the type of organism you wish to investigate first—fish (pinfish) or microorganisms. Then click “Trawl” to bring up your first sample.

Pinfish

If you are sampling pinfish, count and categorize the fish by size. With your first sample, you will need to operationally define the categories large, medium, and small. Operational defining is a science process, like observing, inferring, and collecting information. Scientists and nonscientists alike use operational definitions. For example, you may talk about an athlete being fast or big. What is big? 100 kilograms? What is fast? Running the 100-meter dash in 10 seconds? You must define characteristics in terms that mean something to others to whom you talk and write.

Use the measuring tape to measure the fish in centimeters. Make your operational definitions of pinfish. How many centimeters is a: *Answers for the Trawls will vary as will their definition of a large or small Pinfish (Porgy).*

Large pinfish? _____

Medium pinfish? _____

Small pinfish ? _____

Before proceeding, record whether you are trawling in the open bay or over the meadows. _____

With each sample, observe the fish on a table and three buckets below the table. Count the fish by clicking them and dragging them to the proper bucket. The letters on the buckets are for small, medium and large pinfish. If you are in doubt about the fish being large, medium, or small using your operational definition, first drag them to the ruler to determine the proper classification and then drag them to the buckets.

Record the number of pinfish captured during the first trawl.

Trawl #1

<u>Size</u>	<u>Number</u>
Large	_____
Medium	_____
Small	_____

Next, follow up with two more trawls in the same area. Record the numbers of pinfish based on fish size here:

Trawl #2

<u>Size</u>	<u>Number</u>
Large	_____
Medium	_____
Small	_____

Trawl #3

<u>Size</u>	<u>Number</u>
Large	_____
Medium	_____
Small	_____

Record the total number of fish by size in the spaces below:

Total for this site:

<u>Size</u>	<u>Number</u>
Large	_____
Medium	_____
Small	_____

Now you may travel to another site in the bay. Record the trawling location here: _____

Classify and record the number of pinfish captured in three trawls.

Trawl #1

<u>Size</u>	<u>Number</u>
Large	_____
Medium	_____
Small	_____

Trawl #2

<u>Size</u>	<u>Number</u>
Large	_____
Medium	_____
Small	_____

Trawl #3

<u>Size</u>	<u>Number</u>
Large	_____
Medium	_____
Small	_____

Total for this site:

<u>Size</u>	<u>Number</u>
Large	_____
Medium	_____
Small	_____

After you have completed this portion of the EcoVenture (counting pinfish), answer these questions.

Why is it important to take more than one sample from the open water and seagrass meadow sites?

Replicate samples to ensure that enough data is collected to create a statistical average and make sure that one really successful or one poorly deployed trawl does not bias the count.

Which area, the open bay or the seagrass meadow, contains the most numbers of large pinfish?

Bay

Which area, the open bay or the seagrass meadow, contains the most numbers of medium pinfish?

Seagrass

Which area, the open bay or the seagrass meadow, contains the most numbers of small pinfish?

Seagrass

From which area was the greatest number of pinfish collected?

Seagrass

Write your ideas of why the numbers of fish of certain sizes are different from area to area.

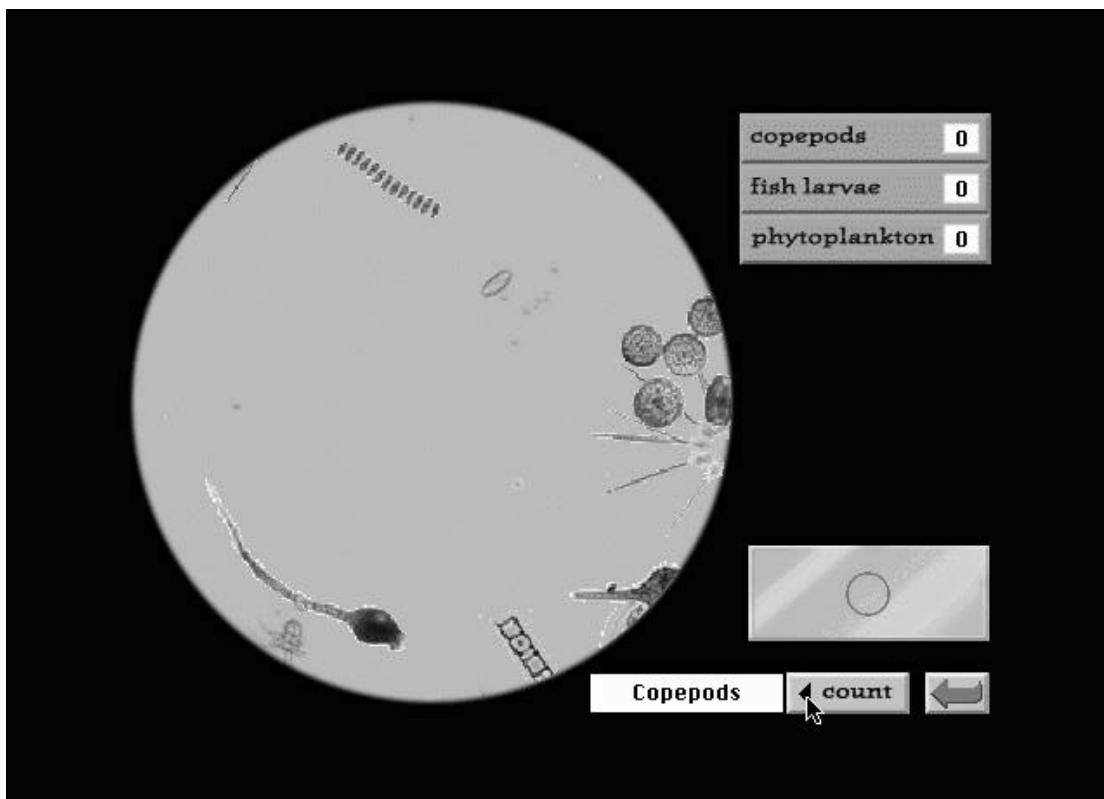
The immature pinfish seem to be concentrated in the seagrass. More adults are found in the open bay. There is more shelter and food in the seagrasses for the young fish.

Plankton

Plankton is the major category used to classify both zooplankton and phytoplankton including different kinds of larvae and copepods. If you are sampling plankton, you will capture these microscopic marine animals in a jar attached to the bottom of the trawl net. This net funnels the organisms into the jar.

You should collect one trawl sample from both the seagrass meadows and open bay. You will observe the plankton you sample through a microscope. Count the kinds and numbers of organisms for 5 different locations on the microscope slide. Record the number and type of organisms in the table on the following page.

How can you identify the types of plankton if you're unfamiliar with them? One of the first things scientists have to do when studying a group of organisms is to learn to identify what they are examining. A good way for you to do this is to go to the References in the menu bar and open the Field Guide. Then select the Plankton book from the shelf. Look at a number of plankton and become familiar with them. You will have to spend some time learning the variety of organisms that we classify as copepods, larvae, and phytoplankton. Once you are familiar with these organisms you are ready to find out how many there are in a field of view through a microscope. To get back to the microscope, select it from the Return file on the menu bar.



Click Count and select the organism you wish to count. Using your mouse, move the circle to a location on the slide. A good idea is to count in the four corners and the center of the slide. Count the organism you've selected by clicking on it. You will see the numbers increase on the counter in

the upper right hand corner of the screen. When you have counted all organisms in that category, return to the Count button at the bottom of the screen and select another type to count. Keep going until you have counted all the organisms in this view. Record your data. Move the circle and repeat the steps for counting. Do this until you have counted five locations on the slide.

Table of Plankton. Area: (Seagrass Meadow or Open Bay) bay

<u>Organism</u>	<u>Location 1</u>	<u>Location 2</u>	<u>Location 3</u>	<u>Location 4</u>	<u>Location 5</u>
Copepods	<u>0</u>	<u>2</u>	<u>3</u>	<u>0</u>	<u>0</u>
Larvae	<u>1</u>	<u>1</u>	<u>3</u>	<u>1</u>	<u>2</u>
Phytoplankton	<u>4</u>	<u>3</u>	<u>3</u>	<u>5</u>	<u>3</u>

What is the average number of Copepods in this area? 1
 Larvae? $8/5 = 1.6$ Phytoplankton? $18/5 = 3.6$

Repeat the above steps for a trawl in the other bay area.

(The following is a sample count)

Table of Plankton. Area: (Seagrass Meadow or Open Bay) grass

<u>Organism</u>	<u>Location 1</u>	<u>Location 2</u>	<u>Location 3</u>	<u>Location 4</u>	<u>Location 5</u>
Copepods	<u>2</u>	<u>3</u>	<u>1</u>	<u>1</u>	<u>1</u>
Larvae	<u>2</u>	<u>0</u>	<u>3</u>	<u>4</u>	<u>5</u>
Phytoplankton	<u>6</u>	<u>7</u>	<u>4</u>	<u>5</u>	<u>5</u>

What is the average number of Copepods in this area? $8/5 = 1.6$
 Larvae? $14/5 = 2.8$ Phytoplankton? $27/5 = 5.4$

From which area, the open bay or the seagrass meadows, were the greatest numbers of plankton found? seagrass

After you have completed the on-line EcoVenture, answer these questions and complete the activities.

From what you have learned from this activity, would you limit the amount of boat traffic through seagrass meadows in Snapper Bay? Explain why or why not.

The answer should include the notion that since the juvenile pinfish and plankton seem to be concentrated in the seagrass meadows, they would try to protect the grass beds by routing traffic around these important nursery areas.

From what you have learned from this activity, would you limit the amount of boat traffic through open waters in Snapper Bay? Explain why or why not.

The open waters of snapper bay do not have the populations of plankton and juvenile pinfish the seagrass meadows support. They should express the idea that boat traffic would likely not harm the productivity of this area.

EcoChallenge

After completing one trawl in both the open bay and seagrass meadows, you observe the following number of pinfish:

<u>Open Water Area</u>	<u>Seagrass Meadows Area</u>
Large 13	Large 8
Medium 5	Medium 18
Small 2	Small 34

List the total pinfish counted at each area:

Total at Open Water Area: 20

Total at Seagrass Meadows Area: 60

What is the ratio of the number of pinfish at the seagrass meadows area compared to the open water area? 3:1

What is the ratio of the number of small pinfish found at the seagrass meadows area compared to the open water area? 17:1

What is the ratio of the number of medium pinfish found at the seagrass meadow area compared to the open water site? 3.6:1

What is the ratio of the number of large pinfish found at the seagrass meadow area compared to the open water area? 0.62

Extensions

This activity is similar to that performed by a marine biologist on a regular basis. A marine biologist does not just travel the world, ride in boats and swim around taking pictures. See if you can invite a marine biologist to come and talk to your class about his or her work.

If you have a spreadsheet on a computer, plot the counts you have made and make a graph.

Frame Up EcoVenture

What You Will Do.

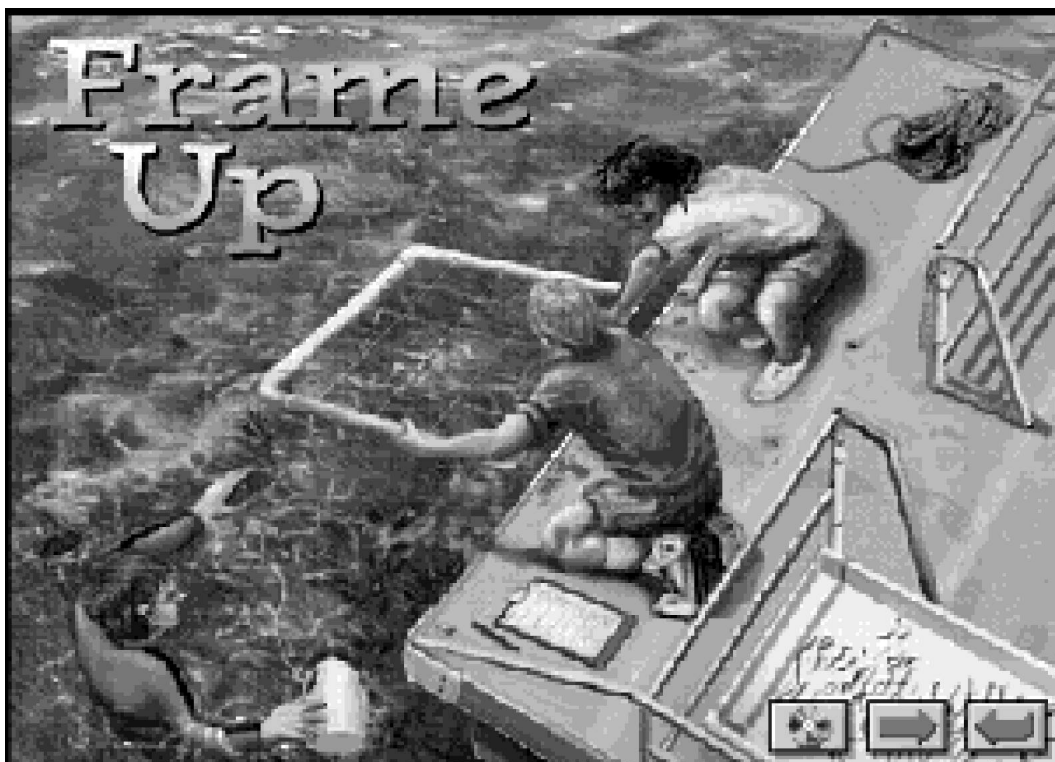
To gain a better understanding of the seagrass meadows, you will count and record the number of blades of seagrass in a given area. You will then measure the density of the seagrasses in Snapper Bay.

In other *EcoVentures*, such as Trawl and Manatee Tracking, you learn about the significant role of seagrasses in maintaining small fish, plankton, and manatee populations. In this activity, your calculations will provide a baseline understanding of the density of the seagrass bed in the bay portion of the proposed state park. You will use this information to make recommendations about the kinds of activities to allow in this area.

Why It's Important.

Productivity of seagrass meadows is influenced by many natural and human created conditions. For example, natural environmental conditions affect seagrass growth. Sunlight, which is required for seagrasses to grow, cannot penetrate murky, clear (organics) or deep water. Seagrass density is affected by animals, such as manatees, that feed on aquatic plants. Boat engine propellers and wake disturbances can also damage seagrasses.

Scientists often do research much like you will do here to monitor the density of seagrass meadows and to see what changes occur over time.

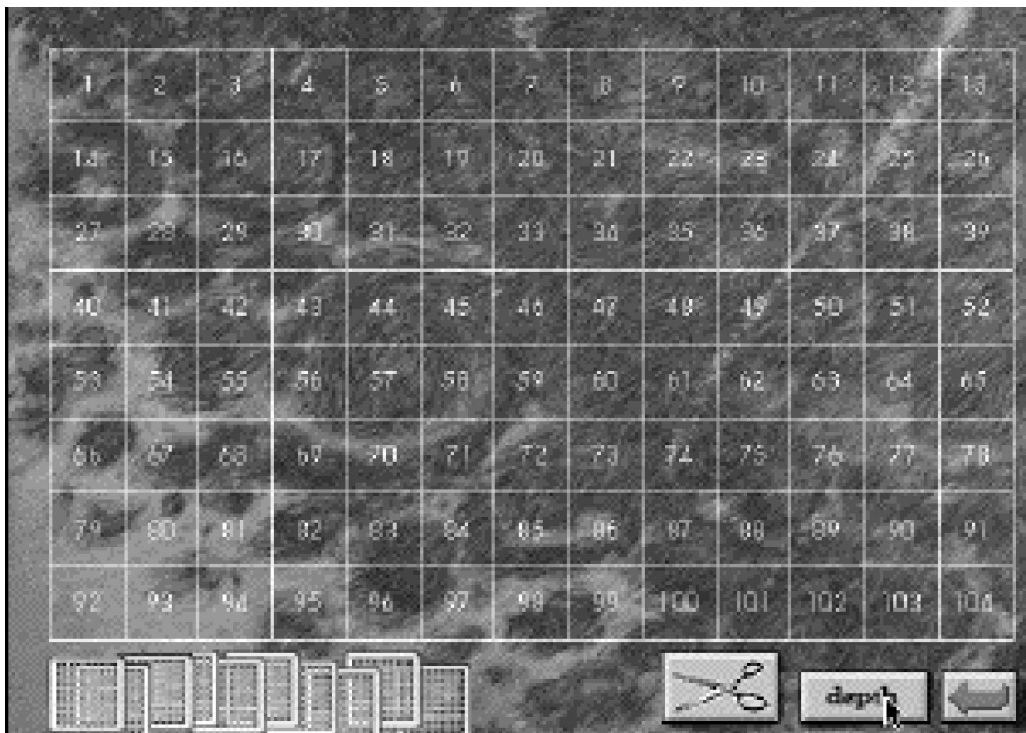


Ready? Begin.

The Frame Up *EcoVenture* is located on the Marine Site screen. Begin this activity by clicking on the seagrass icon. Watch the movie to see a demonstration of the sampling method you will be using.

As you complete this EcoVenture, think about these questions:

- *What do scientists mean by random sampling?*
- *How do scientists measure the density of the seagrass meadows?*
- *How is density related to the productivity of seagrass meadows?*
- *What percentage of seagrass meadows have been lost due to motor boat activity?*



Step 1: Collect Samples. The *EcoVenture* team has been asked to help estimate the amount of seagrass in this meadow. You will collect samples in at least five of the ten available seagrass meadow sites.

Why Scientists Sample. *To determine the number of items in a large area, scientists often use a method called sampling. For example, officials estimating the number of people attending the Macy's Thanksgiving Day Parade couldn't count all the hundreds of people lined up for many city blocks. But they could count the people in a few city blocks and make an estimate based on the total number of city blocks on the parade route.*

Using the same method, scientists often estimate animal populations, seagrass density, and other

populations. In this *EcoVenture*, it would be impossible to count accurately all the blades of grass in the entire seagrass meadow! Instead, you will take samples in several areas, counting the grass blades in those small samples. You will use those counts to estimate the amount of grass in the whole area.

Notice the square frames below the numbered grid. These frames are 1 meter square, divided into 100 smaller squares. To collect a sample, drag a frame to a numbered section of the grid. Then, drag the scissors to the frame and click. A window will appear showing your sample of grass blades. This sample is taken by cutting the grass blades in one of the 100 small frame squares. So, these grass blades represent 1/100 of the area of the frame. Multiply your sample count by 100 to get the estimated number of grass blades in the square meter plot.

There are three species of grass in this meadow. You will count two of them—turtle grass and manatee grass. The third, shoal grass, was counted by an earlier team. That team’s information is provided for you on screen as you work through the activity. You will count turtle and manatee grass. Record the number of shoal grasses from the screen and place your counts in the spaces provided below. Be sure to select sites that are scattered across the seagrass meadow.

The answers will vary as your students have many plots to select from for their research.



Turtle Grass



Manatee Grass

Record the number of blades of grass for each of the species of seagrass.

Grid # _____ Number of Blades Counted _____

Times 100

Manatee grass _____

Shoal grass _____

Turtle grass _____

Now select a second site and record the number of blades of grass for each of the three kinds of seagrass.

Grid # _____ Number of Blades Counted _____

Times 100

Manatee grass _____

Shoal grass _____

Turtle grass _____

Select a third site and record the number of blades of grass.

Grid # _____ *Number of Blades Counted* _____

Times 100

Manatee grass _____

Shoal grass _____

Turtle grass _____

Select a fourth site and record the number of blades of grass.

Grid # _____ *Number of Blades Counted* _____

Times 100

Manatee grass _____

Shoal grass _____

Turtle grass _____

Select a fifth site and record the numbers of blades of grass.

Grid # _____ *Number of Blades Counted* _____

Times 100

Manatee grass _____

Shoal grass _____

Turtle grass _____

Go to the next page to continue your investigation. OR, collect up to five additional samples if you have time. The more samples you collect, the greater the accuracy of your estimate. Record data from your additional samples below.

Site 6

Grid # _____ *Number of Blades Counted* _____

Times 100

Manatee grass _____

Shoal grass _____

Turtle grass _____

Site 7

Grid # _____ *Number of Blades Counted* _____

Times 100

Manatee grass _____

Shoal grass _____

Turtle grass _____

Site 8

Grid # _____ *Number of Blades Counted* _____

Times 100

Manatee grass _____

Shoal grass _____

Turtle grass _____

Site 9

Grid # _____ *Number of Blades Counted* _____

Times 100

Manatee grass _____

Shoal grass _____

Turtle grass _____

Site 10

Grid # _____ *Number of Blades Counted* _____

Times 100

Manatee grass _____

Shoal grass _____

Turtle grass _____

Step 2: Estimate the Average. What is the average number of blades per meter square for each of the species of seagrasses? To determine the average:

a. Add the number of blades of each species.

Total blades of manatee grass _____

Total blades of shoal grass _____

Total blades of turtle grass _____

b. Divide the total blades of each species by the number of sampling sites in your study. Record the average number below.

Average Number of Blades of Seagrass per Square Meter

Manatee grass _____

Shoal grass _____

Turtle grass _____

After you have completed the on-line EcoVenture, answer these questions and complete the activities.

How many meters square is the total area of the study site?

13 X 8 = 104 sq. meters To see how big this is, you could mark off an equal area on the school ground.

What kind of pattern can you determine from your samples concerning the abundance of the three species of seagrasses collected at your sites?

All three grasses can grow in water up to 10 meters in depth. Shoal grasses are found in more shallow water than turtle and manatee grasses.

Shoal grasses can survive turbulent conditions due to storms. Shoal grasses are also more tolerant of brackish water conditions.

Density is the amount of something per unit of measure. In this case, you will measure the amount of seagrass per square meter. To determine the density of the seagrass, divide the average number of blades by one square meter. Record the density of each of the three species of seagrasses for the sites included in your study.

Density of Seagrasses (include the density unit with the number)

Manatee grass Answers vary.

Shoal grass Answers vary.

Turtle grass Answers vary.

Compare the density of your sites with those of other teams. Why do some areas of the seagrass meadows have a greater density than other areas?

Water depth and clarity affect the amount of light available to the seagrasses. Sedimentation may reduce water clarity. Extreme temperatures and salinities can negatively impact seagrasses. Only a few grazers (sea urchins, green sea turtles, few fish and bird species) directly consume the seagrasses.

What do you suppose caused the straight line gaps in the seagrass meadows?

Very likely boats made them.

You had the option of choosing five or more sites to collect data for this activity. Did you notice how the sites were scattered across the seagrass meadows region of Snapper Bay. How might the results of your study be different if the sites were right next to each other?

Different sites might yield different densities because the conditions for growth would probably differ.

In comparing the two ways to select sites for study, which method is more correct for selecting sites to obtain seagrasses. Method #1 which is called random sampling where you randomly selected sites from all regions of the seagrass meadows, or Method #2 where you selected sites in only one area of the seagrass meadows. Explain why you think a scientist would prefer either Method #1 or Method #2.

Method #1 would be used if you wanted an estimate of the entire population of seagrass under consideration, By randomly selecting plots, any bias by the investigator is removed. Method #2 would be used when you wanted to look at a specific area. As an example of selecting sites in only one area, you would look only at the grasses in a damaged area.

EcoChallenge

After completing one sample in the seagrass, you collect the following numbers of grass blades:

Manatee Grass 10

Shoal Grass 10

Turtle Grass 5

How many blades of the three species are there in one meter plot?

Manatee Grass 1000

Shoal Grass 1000

Turtle Grass 500

What is the ratio of manatee to shoal grass? 1:1

What is the ratio of shoal to turtle grass? 2:1

What is the ratio of manatee to turtle grass? 2:1

Extensions

Go outside to study grass in your school yard. Are there different species of grass? Suggest reasons for the variety.

In a 10 cm X 10 cm plot count the number of blades of grass of each species.

Manatee Tracking EcoVenture

What You Will Do.

In this *EcoVenture*, you will monitor the movement of three manatees in the Snapper Bay region. To monitor manatees, scientists attach a temporary transmitter device to the mammal's body. In this activity, you will be "on board" a research vessel in Snapper Bay. The boat has a radio receiver that you can adjust to pick up the signals of the three manatees. Each manatee emits a unique signal. You will monitor each manatee's movements throughout the year.

Why It's Important.

Manatees are endangered marine mammals. So, scientists like to monitor their movements to learn more about them. What they learn might help to protect the manatee population. Understanding manatee movements throughout the year can help scientists locate their food sources and their approximate age.

TIP: Watch the movie by selecting the Videodisc icon on the screen below to learn more about how scientists "tag" and track manatees.

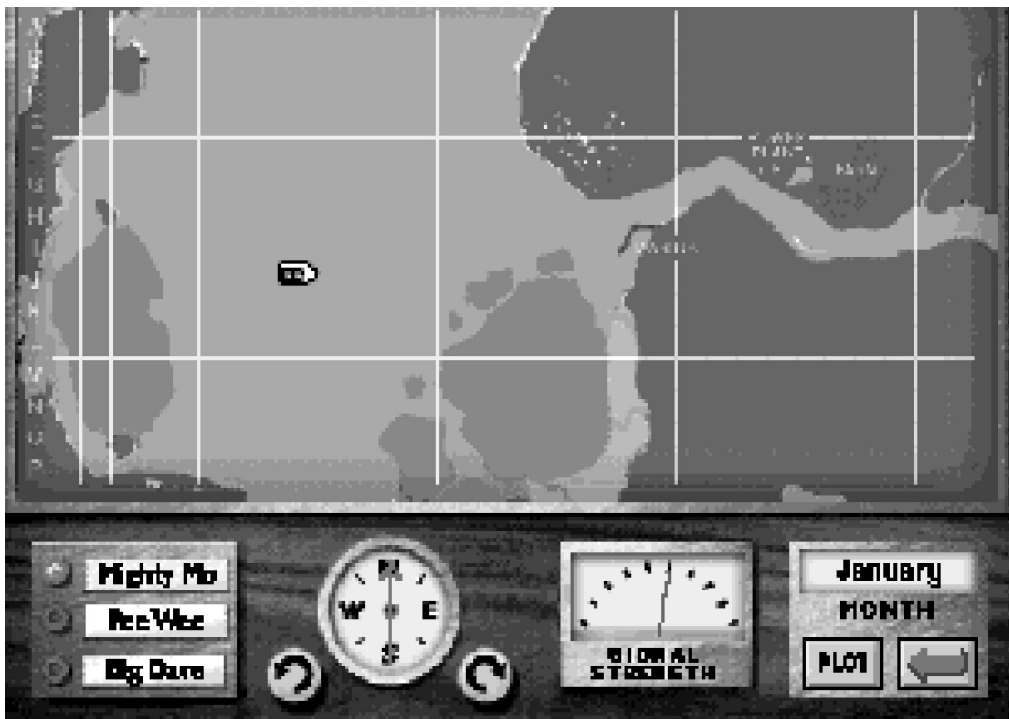


Ready? Begin.

Manatee Tracking is located in Snapper Bay on the Marine Site screen. Begin the activity by selecting a manatee and clicking on the manatee's icon. Watch the movie or select the forward arrow to begin your manatee research.

As you work through this EcoVenture, think about these questions:

- *How might the power plant, farm, marina, seagrass meadows, and open bay waters affect the migration patterns of the manatees?*
- *Do the manatees move together or separately from month to month?*
- *How might the information you discover during this activity be used to help protect the manatees?*
- *What Park regulations might be needed to protect the manatees?*



Select the month in which you wish to locate that manatee. Now, drag the research boat to a different location in the bay or the mouth of the river. Be careful not to run your boat too close to land!

After selecting a position for the boat, you are ready to begin tracking the manatee. To pick up your manatee's signal, click on the curved-arrow knobs on each side of the compass. This action points the radio antennae in the direction you choose. Notice that the signal strength meter will increase (move to the right) or decrease (move to the left) as you rotate the directional arrow. The manatee is in the direction where the signal is the strongest on the meter. Once you have pinpointed the strongest signal direction, click on the PLOT button. This draws a line from the boat in the direction of the manatee.



Now you know the direction of your manatee. Do you know how to pinpoint its exact location? Read on.

Drag the boat to a new location and rotate the radar compass towards the manatee as you did before. Plot another line. A manatee will appear at the intersection of the two lines. You found it! Be careful—don't move the boat too close to the manatee. Plot the grid coordinates of the manatee on the Snapper Bay map on the page. Notice landmarks near the manatee, such as the power plant, marina, farm, underwater seagrass, or other land or sea features.

You may change the month of the year by clicking on the month box and continue tracking the same manatee in different months. Or, you may decide to select another manatee and search for it during the same month. Which research method will you use? If you track all three manatees in each month, you will record a total of 36 positions. If your teacher has you follow the movements of only one manatee, you will record twelve positions.

After you complete the EcoVenture answer the following questions.

How do we track the movements of the manatees?

Manatee locations are tracked with a radio receiver that detects the signal from a transmitter attached to the manatee.

What can we learn by tracking the movements of animals?

Seasonal migration, day-night movements.

Record the seasonal pattern of migration for the manatees:

Winter

Mighty Mo

Jan. - G24

Feb. - G23

March - G24

Pee Wee

Jan. - G24

Feb. - G23

March - G24

Big Dave

Jan. - G24

Feb. - G24

March - G23

Spring

Mighty Mo

April - G21

May - I17

June - G10

Pee Wee

April - G21

May - I18

June - G10

Big Dave

April - G21

May - M13

June - P15

Summer

Mighty Mo

July - N14

August - O17

Sept. - N19

Pee Wee

July - N14

August - O17

Sept. - N19

Big Dave

July - B16

August - J19

Sept. - F16

Fall

Mighty Mo

Oct. - H17

Nov. - H21

Dec. - H26

Pee Wee

Oct. - J15

Nov. - H20

Dec. - F23

Big Dave

Oct. - K16

Nov. - I11

Dec. - G22

During which months are the manatees found in the seagrass beds?

Mighty Mo-July, August, September

Pee Wee-July, August, September, October

Big Dave-May, June, August, October

What kind of plan would you propose to boaters and others in the area to help preserve the endangered manatees?

Slow speed in river and marina area Nov.-March

Slow speed in seagrasses meadows May-Oct.

How might closing the power plant affect the manatees in the area?

They might not swim up river during the winter months.

Might the manatees ever be in danger from the research vessel performing the radar tracking in this activity? Explain.

Yes, if the signal is very high and the manatees are nearby.

Here is a tough question: How would you go about finding out the approximate age of Pee Wee?

Mighty Moe and Big Dave are a mother-son couple. According to the Field Guide for Mammals, manatees are weaned at about 2 years of age. The plotted data from Manatee Tracking shows them separating in October, hence he is weaned. To answer this question will take some detective work.

EcoChallenge

If the side of each grid box on the activity screen is one-fifth of a kilometer in length, then how many kilometers do the three manatees travel in their annual migrations? Record your answer in kilometers.

Mighty Mo: + -10 km

Pee Wee: + -10 km

Big Dave: + -11.5 km

What is the greatest distance that each of the manatees travels from land during the year? Record your answer in kilometers.

Mighty Mo: 1.6 km

Pee Wee: 1.6 km

Big Dave: 1.8 km

What is the greatest distance that any of the three manatees travels apart from one another during the year? Record your answer in kilometers and identify the two manatees.

Big Dave is 2.6 km from Mighty Mo and Pee Wee during July.

Extensions

Contact the Department of Environmental Protection for more information about manatees.

Wildlife biologists use radio tracking to learn about the movements of many species of wildlife.

Visit your school media center and discover more information about this technique for tracking animals.

Fiddling Around EcoVenture

What You Will Do.

In this *EcoVenture*, you will observe one of the most interesting and easily observed animals along the southeast marine coast—the fiddler crab.

Male fiddler crabs exhibit rather unique courtship and territorial behavior. During this courtship, female fiddler crabs travel about the muddy or sandy coast while males remain close to their dens. Males attract females by shaking their large pincer claw in a distinctive pattern that is recognized by female crabs of the same species. If the female chooses to mate with a male, she will follow the male crab into its den. In *Fiddling Around* you will learn more about the different kinds of courting behaviors that male and female crabs exhibit. You will have to observe very carefully to see differences among the three species.

Why It's Important.

Observation is one of the most important tools scientists use. In observing many species of organisms, scientists must observe very carefully, looking for the smallest differences in behavior between different species. This *EcoVenture* helps you develop your skills of observation and comparison while learning more about an interesting organism of the salt marsh habitat.



Ready? Begin.

Fiddling Around is located in the salt marsh at the north end of Chickee Island. Begin this activity by clicking on the Fiddler Crab icon. Watch the movie and observe the differences in the fiddler crabs' behavior.

As you complete this EcoVenture, think about these questions:

- *What behaviors do male fiddler crabs exhibit to court a female?*
- *What behaviors do male fiddler crabs exhibit to defend their territory?*
- *How do you tell the difference between a male and a female fiddler crab?*
- *How do fiddler crabs of different species differ?*



Click on any of the crabs pictured to identify its species. Click again to “deselect” a species. You may wish to go to the Field Guides in the References Menu for more information. Video clips of the three species are available when a videodisc icon appears.

To see how fiddler crabs interact, click on any two crabs. A videodisc icon appears when a video demonstration of the interaction is available.

As you observe the fiddler crabs and learn their behavioral, color, and pattern differences, complete the following:

Describe the body characteristics of the three different species of fiddler crabs.

Uca panacea

male large claw held at 45 degrees, eyes stocked

female smaller claws, eyes not as stocked

Uca pugilator

male bluish "cape" on head

female stands on back legs, more round than Panacea male

Uca minax

male (no video available) uniform blackish, squat (flatter than other males)

female uniform blackish, larger than other species

Select a male *Uca panacea* and watch its behavior. Then do the same for *Uca pugilator*. Observe carefully and then have one of your team try to mimic the motion of one of the males and another student play the role of the other male. Can they do this well enough for you to tell the difference?

Did You Know... Another name for a boxer is "pugilist?" Pugilist is similar to the species name "pugilator." How do you think this species got its name?

Observe the interaction of the following combinations and record your observations.

Pugilator male with *Pugilator* male. One of these males has lost its large claw and is regenerating the claw. Females have two small claws as does one of these males. Watch the reaction of the large clawed male. Record your observations below.

Answers will vary.

Panacea male with *Panacea* female

Answers will vary.

Panacea male with *Minax* female

Answers will vary.

Pugilator male with *Panacea* male

Answers will vary.

Pugilator male and *Pugilator* female

Answers will vary.

Describe what happens when males of the same species are placed together.

Fight.

Describe what happens when males of different species are placed together.

Fight.

Describe what happens when males and females of the same species are placed together.

Males wave.

Describe what happens when males and females of different species are placed together.

Males wave.

Why do males wave their large claw?

To attract the female and to threaten other males.

What role does behavior play in the courtship behavior of fiddler crabs?

As in all species, courtship behavior is important to attract a mate.

Based on your research in the salt marsh, answer the following questions:

The salt marsh is located in R. U. Green State Park. What are some other organisms that live in the salt marsh? (Hint: if you need more information, take the salt marsh EcoTour from the Marine Site Screen.) What effect might the following activities/developments have on these organisms, including fiddler crabs?

Building a boat launch in wet, sandy area of marsh

This activity would reduce the habitat of the fiddler crabs, thus reducing their numbers. A channel would also have to be dug through the shallow marsh.

Building a boardwalk over sandy areas out to a sheltered picnic deck over the water

This would not have much of an effect on the populations in the area, as the boardwalk has very little impact on the environment. Some animals make use of a boardwalk for shelter.

Filling in sandy areas with additional dirt to prevent flooding and building a picnic area

Such alterations of wetlands should be avoided, since filling in reduces the amount of wetlands available. Wetlands are valuable as habitats for many important species.

Building a boardwalk through parts of salt marsh for a nature trail

A boardwalk, with a required permit, could be constructed with little impact on the environment and will provide a way of educating people about the importance of wetlands.

In the park management plan, what kinds of activities would you recommend be allowed in this part of R. U. Green State Park?

Answers should include the notion of providing access to this part of the park for educational and recreational activities of low impact on the ecosystem, such as animal watching, plant studies and photography.

EcoChallenge

One female fiddler crab is capable of producing 10,000 eggs. If only 1 percent of the eggs actually reach maturity, then how many mature fiddler crabs can be produced by 1 fertile female fiddler crab?

100

How many eggs could be produced by 47 female fiddler crabs?

470,000

Extensions

Study the life history of fiddler crabs. What other behaviors do they practice?

Signs of Life EcoVenture

What You Will Do.

In this *EcoVenture*, you will walk along an island trail and look for tracks left behind by animals. Chickee Island is home to many different kinds of animals. Many of them are rarely seen because they are nocturnal. The soft beach sand of Chickee Island often shows evidence of animals which inhabit the island.

Why It's Important.

An understanding of the kinds of animals which inhabit Chickee Island will help you make recommendations about the kinds of activities and developments to allow on this part of the island. These recommendations will be included in your park management plan.

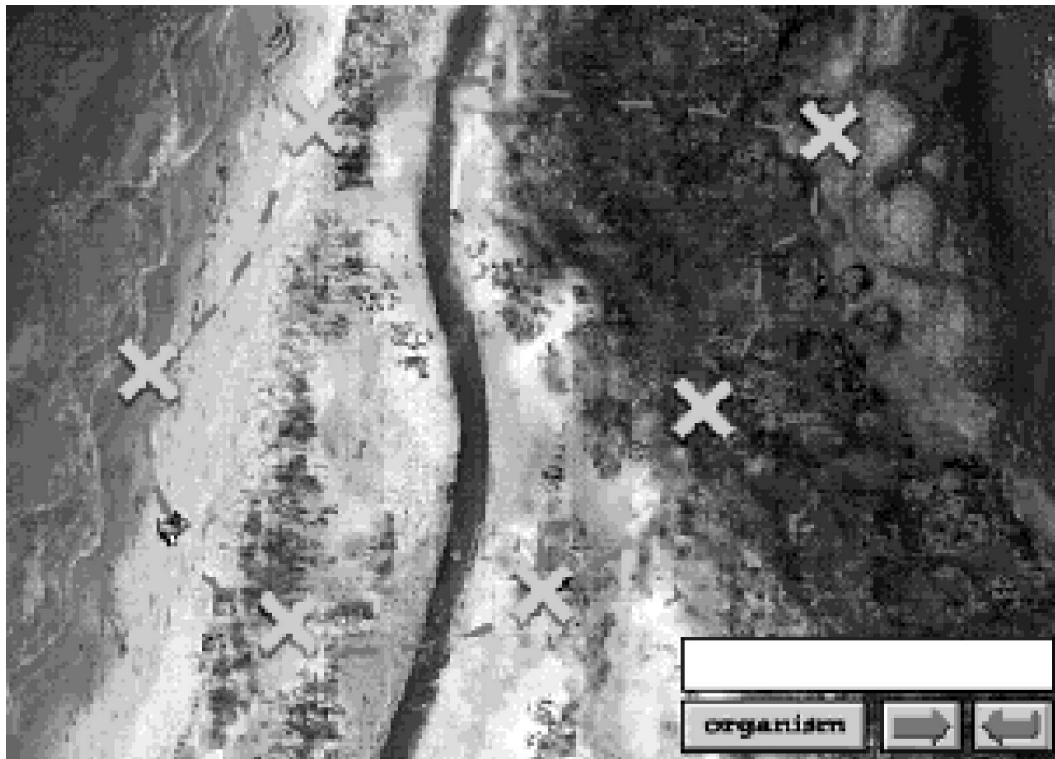


Ready? Begin.

Signs of Life is located on the west side of Chickee Island. To begin the activity, click on the Track icon.

As you complete this EcoVenture, think about these questions:

- *What animals can be identified without seeing them?*
- *What habitat relationship can you discover between sea turtles and ghost crabs?*
- *How do your observations about life on Barrier Beach compare with observations about life in Green Village and in other subsites?*
- *How do you think development in the dunes area of the island will affect the organisms that live there?*



To learn about the animals of Chickee Island, click on the path you wish to hike. While hiking on the island stop at marked points to see tracks and evidence of animals. Click on a magnifying glass. The video monitor displays a still image of the track or marking. Select “organism” to see the animal that made the sign of life, and “sign” to see an image of the tracks/marking/burrow on the screen.

After completing the hike, you may click on the Critter Concentration game and attempt to match the organisms with their tracks/markings.

List the different kinds of animals you identified from their tracks, markings or burrows.

- | | | | |
|-----------------------------|----------|----------|----------|
| 1 <i>Answers will vary.</i> | 6 _____ | 11 _____ | 16 _____ |
| 2 _____ | 7 _____ | 12 _____ | 17 _____ |
| 3 _____ | 8 _____ | 13 _____ | 18 _____ |
| 4 _____ | 9 _____ | 14 _____ | 19 _____ |
| 5 _____ | 10 _____ | 15 _____ | 20 _____ |

After you have completed the on-line EcoVenture, answer these questions and complete the activities.

What is the relationship between sea turtles and ghost crabs?

Ghost crabs may eat turtle eggs and even young hatchlings.

Ghost crabs are predators.

Where would you expect to find the greatest amount of diversity, in the state park or in a developed area like Green Village? Explain.

In the state park, where there are a large number of different undisturbed habitats.

What kinds of animals would be affected if:

a) the dunes area of the island underwent development?

Ghost crabs, raccoons, deer, panthers, beach mice

b) the beach area of the island underwent development?

Sea turtles, ghost crabs, shore birds

What recommendations would you make concerning construction on this part of the island?

Answers will vary but should include limiting construction and lighting in the foredune area. Lights can disorient turtle hatchlings and cause them to not head toward the sea.

EcoChallenge

A female sea turtle deposits about 120 eggs in her sandy nest. Ghost crabs, fish, birds, racoons, dogs, and sharks feed on the hatchlings. If only 70 - 80% of the eggs in a nest hatch, how many hatchlings would there be on a beach with 5 nests?

answer $\frac{420 - 480}{(120 \text{ eggs} \times (70 - 80\%)) \times 5 \text{ nests}}$

Suppose 5 sea turtles lay eggs on the proposed state park on Chickee Island. If 50% of the hatchlings were eaten by racoons, how many would make it to the sea.

answer $\frac{210 - 240}{(5 \text{ turtles} \times 120 \text{ eggs} \times (70 - 80\%)) \times 50\%}$

Extensions

Find out what is being done to help restore the sea turtle population in Florida waters.

Sink the Reef EcoVenture

What You Will Do.

In this *EcoVenture*, you will experiment with different artificial reef designs. Your objective is to see which design, if any, is the most effective for catching fish. The factors *possibly* affecting the number of fish attracted to the reef include:

- *height of the reef above the surrounding sea floor,*
- *size of holes in the reef structure,*
- *the spacing among the reef blocks,*
- *the speed and direction of the current,*
- *the depth of the water.*

You can change these factors. Different combinations may produce different amounts of fish. This *EcoVenture* also uses the term **Catch**. It is a term that refers to the kilograms of edible fish that are caught around the reef and brought back to the dock.

Why It's Important.

The people of Green Village are interested in placing an artificial reef to attract fish for anglers. Since the artificial reef would also serve anglers who visit R. U. Green Park, the *EcoVenture* team has been asked to participate in researching various reef designs.



Ready? Begin.

Sink the Reef is located off Chickee Island on the Marine Site screen. Begin the activity by clicking on the Block icon.

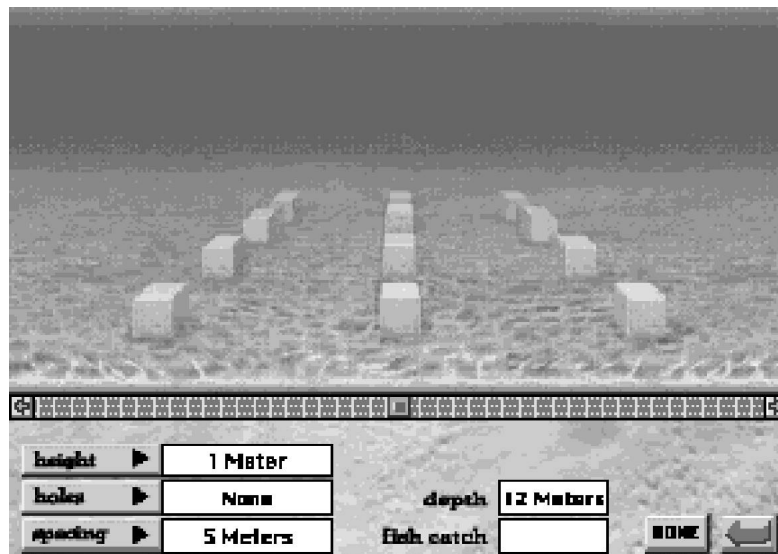
As you complete this EcoVenture, think about these questions:

- *How do the various reef factors including height, holes, and spacing affect catch?*
- *How does water depth affect catch?*



First, study the current and the depth of the water and determine where to place your reef. To continue the investigation, go on to the next screen by selecting the forward arrow.

***TIP:** When scientists design experiments to see how different factors affect an outcome, they control a single variable. For example, if you wanted to see how reef height affects catch, you would experiment with different heights while keeping the other factors the same.*



From this screen, you can manipulate the height of the reef by clicking on the Height box. You will see a menu of choices. Drag the cursor to the desired height. Adjust the hole size and spacing of the reef blocks in the same way. Watch your experimental reef change with each selection! When you have selected the desired set of factors, click DONE. The catch resulting from your reef design will appear in the Catch box. Record the catch in your Field Notebook. Note the specific conditions of the reef including depth, height, holes, and spacing.

Record the data from your reef design experiments below.

Reef Design Data:

	<u>Height</u>	<u>Holes</u>	<u>Spacing</u>	<u>Depth</u>	<u>Catch</u>
1.	_____	_____	_____	_____	_____
2.	_____	_____	_____	_____	_____
3.	_____	_____	_____	_____	_____
4.	_____	_____	_____	_____	_____
5.	_____	_____	_____	_____	_____
6.	_____	_____	_____	_____	_____
7.	_____	_____	_____	_____	_____
8.	_____	_____	_____	_____	_____
9.	_____	_____	_____	_____	_____
10.	_____	_____	_____	_____	_____
11.	_____	_____	_____	_____	_____
12.	_____	_____	_____	_____	_____
13.	_____	_____	_____	_____	_____
14.	_____	_____	_____	_____	_____
15.	_____	_____	_____	_____	_____
16.	_____	_____	_____	_____	_____
17.	_____	_____	_____	_____	_____
18.	_____	_____	_____	_____	_____

Teacher Note: See the Appendix for answers.

After you have completed the on-line EcoVenture, answer these questions and complete the activities.

How does reef height affect catch?

A larger catch results from an increase in reef height.

How does reef hole size affect catch?

A combination of large and small holes seems to increase the catch.

How does reef spacing affect catch?

Spacing the reef blocks at 10 and 20 meters produces more catch than spacing at 5 meters

How does reef depth affect catch?

Reef depth is not as important as other factors (hole size, height of reef, spacing of blocks).

How might the placement of the reef be included in the park's management plan?

Answers will vary.

EcoChallenge

On a pleasant day, 125 anglers catch an average of 8 fish each near the artificial reefs. How many total fish are caught that day?

Total number of fish 1000

If these same anglers had been fishing in another area with no reef and averaged 3 fish per angler, how many total fish would be caught by these 125 anglers?

Total number of fish 375

Compare the number of fish caught over the reef with the number caught away from the reef. What is the ratio of fish caught away from the reef to those caught with your best design?

Ratio $1000/375 = 2.7 \text{ to } 1$

Extensions

Artificial reefs are being built throughout the world. What kinds of materials are being used in their construction?

Find out what the requirements are for the building of artificial reefs in the state of Florida. For what reasons do people invest in the development of artificial reefs in this state?

How does the introduction of artificial reefs affect the diversity of fish populations in the coastal waters of Florida?

The Sludge Factor EcoVenture

What You Will Do.

The *EcoVenture* team has been asked to review a number of building permit applications for Chickee Island. Additional buildings will create an increased demand on the wastewater treatment plant on the island. Your team will review each application and estimate the additional volume of wastewater the development would create. For each application, you will recommend approval, disapproval, or approval with modifications.

Why It's Important.

With the development of R. U. Green Park on the island, Green Village expects more visitors. More visitors will help the economy. Several businesses want to build or expand to take advantage of the expected increase in visitors. But the new building will also add to the volume of wastewater the treatment plant must handle. R. U. Green Park also wants to hook into the system! Approving all building applications would increase the amount of wastewater beyond the capacity of the water treatment facility. If this happens, untreated sewage could flow into the bay. The Department of Environmental Protection will not allow overflow because it would be harmful to people and marine life. This *EcoVenture* gives you a good idea of the difficult decisions local officials face in a growing area.



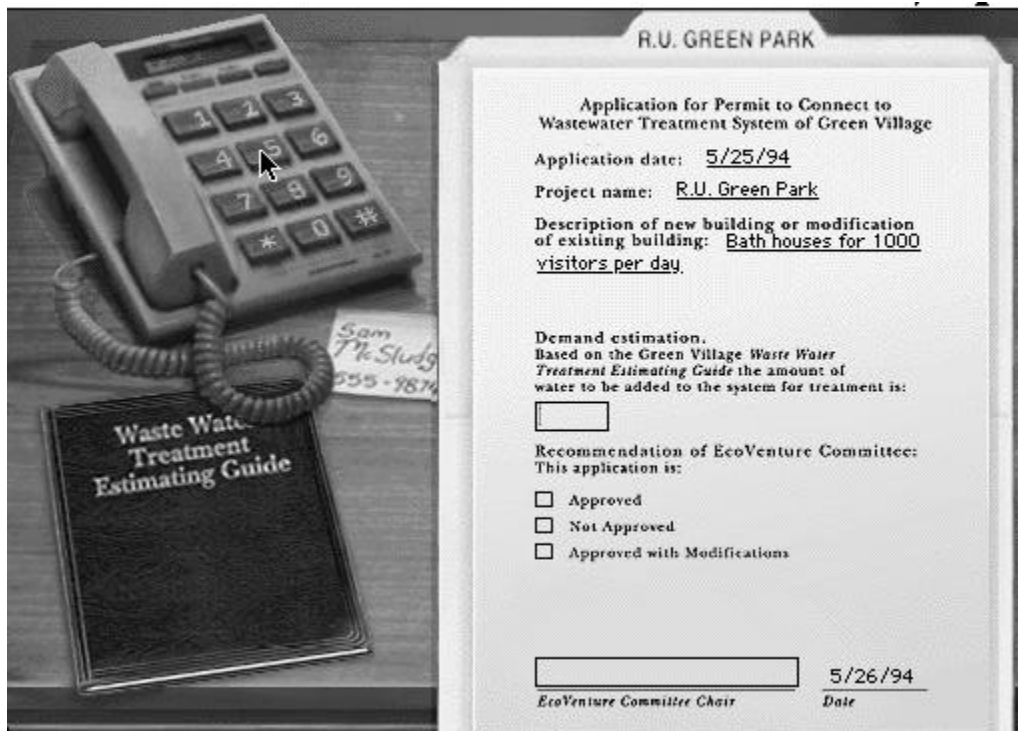
Ready? Begin.

The Sludge Factor is located in Green Village on the Marine Site screen. Begin the activity by clicking on the Toilet icon.

As you work through this EcoVenture, think about these questions:

- *In reviewing applications for construction, what are some things a local official should consider?*
- *What would be the effect of exceeding the capacity of the wastewater treatment facility?*
- *How will this new construction affect the management plan of R. U. Green?*

TIP: *Before you complete your recommendation, you might want to calculate the total demand if all applications were approved. Are you over the limit? Now what will you do?*



From the entry screen, click the forward arrow to begin your review of applications. The folders on the desk contain the building applications. Click on the folder tab to open it. Click again to close it. You may want to review all the applications and calculate the additional volume they will add to the treatment facility before deciding whether or not to approve them. Click on the Wastewater Treatment Estimating Guide for information to help you with these calculations. You can also “call” Sam McSludge by clicking the buttons on the phone—make sure you have the right phone number! Mr. McSludge, the wastewater consultant, can give you some important information.

It is important to the people of Chickee Island to develop more services on the island. However, it is also important to maintain clean water in the bay. How will you decide which applications to approve? If you decide to take the applications on a first-come, first-served basis, then check the application dates. Keep in mind that R. U. Green Park is responsible for the increased interest in building on the island. What are some other criteria for deciding which applications to approve? Discuss with your team. Use the space below to do your figuring.

Are you ready to make your recommendations? Click on a folder and review the application. In the space provided on the screen, record the volume of water that will be added by this construction.

Answers will vary based upon their recommendations.

Each of the applications must be either approved, disapproved, or approved with modifications. If you decide to approve with modifications, type in the desired modifications and enter the water quantity that would be added after modifications. Be prepared for phone calls from irate people if you disapprove their application!

After you have completed the on-line EcoVenture, answer these questions and complete the activities.

Were you able to please all the builders as well as the Department of Environmental Protection staff after making your decisions? Explain.

No, the total liters requested was almost 65,000 and the allowable capacity was 40,000.

Fishing and swimming could be severely curtailed if you exceeded the capacity of the wastewater treatment facility. What are some other effects on the plants and fish of the bay if untreated sewage flowed directly into the bay?

They could become contaminated and cause problems to humans and other organisms that depend on the bay. The sewage might trigger algae blooms.

Why not simply build a larger wastewater treatment facility to meet the demands of all of the builders?

- 1. It might take up too much land.*
- 2. Nobody wants a treatment plant near his or her home.*
- 3. These plants are very costly; more taxes would be needed*

What are some options for sewage treatment you should include in the park's management plan?

Using composting toilets; providing a "packaged" treatment system for the park.

EcoChallenge

If a person using the bath house uses 40 liters of water per day, then how many liters of water would be used by 634 people?

Answer 25,360 liters

If a restaurant averages 200 liters of wastewater per day for each seat, then how many seats would be necessary to generate 16,000 liters of wastewater?

Answer 80

If a house or hotel averages 600 liters per day per bedroom, then how many liters of wastewater will be generated by a community of 25 three-bedroom houses?

Answer 45,000

Extensions

The Wastewater Treatment Estimating Guide is based on current technology. How would improved water conserving devices affect the estimates in the Guide?

What are some alternative methods of wastewater treatment that might reduce the loads on the water treatment plant?

How would the dumping of untreated sewage into the bay affect fish species and their habitats in general? How might this type of water pollution specifically affect the fisheries industry in the state of Florida, and how would such pollution also then indirectly affect you?

What effects might the dumping of untreated sewage into a bay have on the weekend angler who fishes in the bay and then takes the catch home to his family for dinner?

Section 2



At this site you will work on the section of the new park that includes Fishee River and Woodlands.

Fishee River Region:

- Clean Up Your Act
- Litteritis
- Feed Me
- Hot Water

Woodlands Region:

- Forest BMPs
- Fire Power
- Hidden Midden
- Pitch That Tent

Birnam BMPs EcoVenture

What You Will Do.

Birnam Woods is a forestry business that grows, manages and harvests pine trees. Some of the trees are sold to make paper (pulp wood) and some are harvested for construction grade lumber. The people at Birnam Woods are proud of the way they manage the forest. They provide forest products and jobs, and they still protect wildlife and the watershed.

In this *EcoVenture*, you will explore Birnam Woods and learn about the Best Management Practices, or BMPs, that foresters use. You will also learn how trees can be harvested without damaging the watershed.

Why It's Important.

Watershed management is critical to maintaining high water quality. Upland areas contain small marshes, creeks and streams. When it rains, water seeps into these areas to begin a downstream journey to rivers and estuaries. If the watershed is not carefully managed, valuable soil is lost. One way we can protect the watershed is by purchasing these lands and limiting activity in them. However, the public cannot possibly afford to buy every important piece of land around parks. So, government scientists work with private landowners to find methods that allow businesses to continue to operate in the watershed.

You will use the information you collect to make recommendations about watershed management in the Park Plan.



Ready? Begin.

Birnam Woods is located on the River Site Screen. Click on the Eagle icon to begin the EcoVenture.

As you complete this activity, think about the following questions:

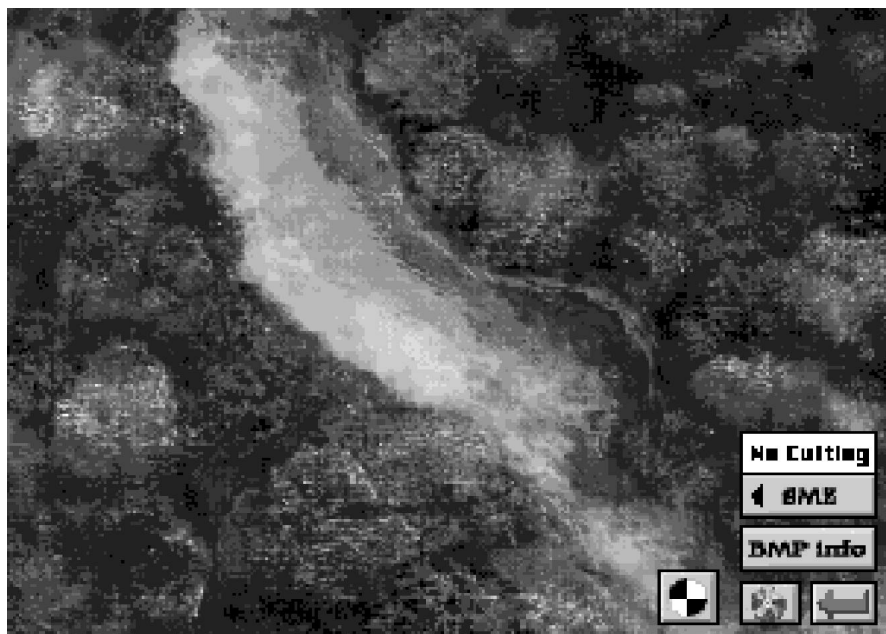
- *What are forest BMPs? Can you describe some?*
- *What is sustained yield from a forest?*
- *Why is a watershed important to fish and wildlife?*
- *Why is the area near streams or lakes only selectively harvested?*
- *Do BMPs cost landowners any money?*



The Magnifying Glass icons represent sites where you can gather information on Forest BMPs and the ways they protect the watershed. Record your data in the Forest BMPs' Chart. Click on the Secchi disc icon to investigate how the width of the Special Management Zone protects water quality in a stream and, ultimately, in Fishee River.

Forest BMPs Chart

BMP	Purpose
1. <u>Eagle</u>	<i>Answers will vary. These answers can be found by clicking on the BMP info for each BMP.</i>
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____
6. _____	_____



You can test the water quality in Birnam Creek by using a device called a Secchi disc. A Secchi disc is designed to measure the turbidity, or the level of cloudiness, in water. Click on the Videodisc icon to see a video demonstration of a Secchi disc measurement. Vary the width of the Special Management Zone along Birnam Creek by clicking on the SMZ button. Then, click on the Secchi disc icon to measure turbidity for each width you select. Record your information in the Special Management Zone chart.

Special Management Zone Chart: Precipitation 5.1 cm

<u>Width (M)</u>	<u>Disc Reading</u>	
	<u>Depth (cm)</u>	<u>Quality</u>
No cutting	<u>100</u>	<u>Excellent</u>
5	<u>5</u>	<u>Poor</u>
10	<u>30</u>	<u>Poor</u>
15	<u>60</u>	<u>Fair</u>
20	<u>100</u>	<u>Excellent</u>
25	<u>100</u>	<u>Excellent</u>

After you have completed the on-line EcoVenture, answer these questions and complete the activities.

Based on your measurements, what width would you recommend for the Special Management Zone along Birnam Creek? Give reasons for your recommendation.

Answers will vary but should reflect an understanding that widths greater than 25 meters do not affect water quality.

Eagle BMP: There are two zones around the eagles nest. What is the difference between the two zones?

Primary Zone: No human activity is permitted.

Secondary Zone: Limited human activity is permitted.

Limited activity would include bird watching.

Why have two zones around the eagle's nest instead of one wide zone? Why do you think it is important to protect the places where eagle's nest?

Two zones provide protection for the eagles while also allowing people to take advantage of the area. Eagles are an endangered specie. If actions aren't taken to protect those that are left, the species may become extinct.

What are some reasons for protecting trees that produce mast or have cavities?

They provide food to insect eating birds such as woodpeckers. The larvae and adult insects feed on dead trees. Also these trees are excellent for creating nests in cavities made by birds and other animals. Mast (pine seed or acorns from oaks) is food for wildlife and helps to regenerate forests.

Forest roads must be carefully designed to avoid causing drainage problems. How would topographic and soil maps be useful tools to help plan roads?

To identify higher ground and sinkholes, steep areas and other obstacles that should be avoided if possible. Soil maps would identify soils such as "pipe clay", that expand/contract with changes in moisture. Such soils will cause a road bed to crack.

Timber harvesting is very important to the people who live around R. U. Green Park and Birnam Woods. What is being done to see that new trees will replace old trees?

Reseeding and burning to remove competition from other trees.

Why would sinkholes be considered Special Management Zones for foresters?

They usually contain water and serve as shelter for a number of animals.

EcoChallenge

Build a Secchi disc and measure the turbidity of streams and lakes around your home before and after a heavy rain. A Secchi disc is a circle 10 cm in diameter cut from metal or plastic and attached to a line. The line is usually marked at one centimeter intervals. What could account for the different measurements?

How would you measure water quality in water that is heavily stained with tannic acid?

Extensions

Turbidity is only one measure of water quality. Make a chart showing some of the other measures of water quality. There are clues in the EcoVentures. Can you find them?

Fire Power! EcoVenture

What You Will Do.

Before R. U. Green State Park was donated to the state, one section was planted with pine trees. The pine trees were harvested and sold. The Park's Management Plan will require the site to be restored to its natural community. Historically, the site supported longleaf pine and wiregrass. Scientists have recommended a controlled, or prescribed, burn to restore this site. This prescribed fire will remove unwanted species of plants and allow longleaf pine and wiregrass to become reestablished in the area. In this *EcoVenture*, you will simulate different kinds of prescribed burns to find out which one is best for this part of R. U. Green.

Why It's Important.

Scientists in Florida and around the world have researched the important role of fire as a habitat management tool. The Tall Timbers Fire Ecology Research Station near Tallahassee, Florida is one well-known research site.

Certain fire-dependent ecosystems evolved over long periods of time. Many organisms in these ecosystems have adapted to fires that occur naturally. Some endangered and threatened species of animals and plants live in these areas. If fire is kept out, the habitat changes, and these organisms may not be able to live there anymore. Flora Goode-Burns, a forester, is working as a consultant to the *EcoVenture* team. She can provide helpful information about the role of fire in forest management.



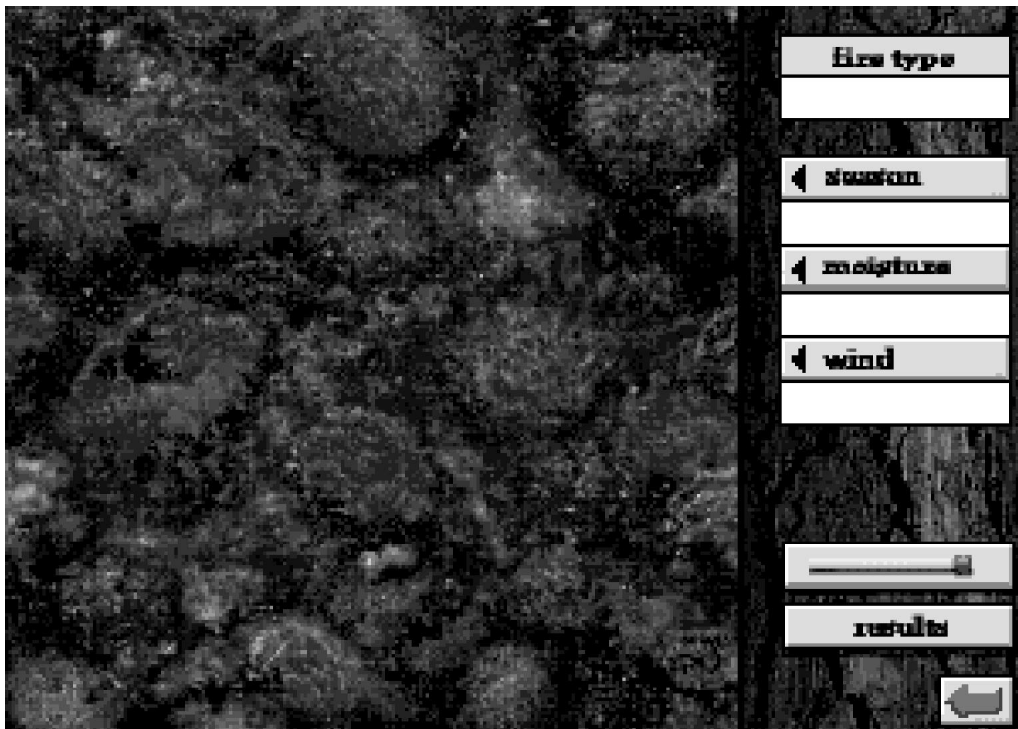
You will use the information you gather to make recommendations in the R. U. Green Management Plan for restoring this site.

Ready? Begin.

Fire Power! is located in R. U. Green State Park on the River Site Screen. Click on the Fire icon to begin the EcoVenture.

As you complete this activity think about the following questions:

- *Why would land managers prescribe fire for a woodlands site?*
- *What are some things you need to consider before prescribing a burn?*
- *How long will it take to restore this site to its original condition?*
- *How will the burn affect the watershed around Fishee River?*



This is the forest area the *EcoVenture* team wants to restore to its original community of longleaf pine and wiregrass. Begin your investigation of how fires can shape this community. The vegetation overlays in the Tools Menu will help you identify the four kinds of plants growing here: longleaf pine, myrtle, turkey oak, and wiregrass. Flora Goode-Burns can also provide you with helpful information.

When you are ready to prescribe a burn:

- *Select the variables (season, moisture, wind) you think will produce the desired fire.*
- *Record your choices and the reasons for them in the table below.*
- *Select the Match icon to start the fire and watch the animated burn.*
- *After the burn, select the Results button for information about the burn you prescribed.*
- *Use the overlays in Tools Menu to see the results of the prescribed burn on the vegetation. You will have to observe carefully to see if the fire you prescribed had an effect on these various plants.*
- *Describe the results of your burn in the table.*
- *Continue setting controlled fires until you have completed the table or are ready to make Management Plan recommendations on how to restore this site.*

After you have set the conditions for your prescribed burn, record your choices in the table and give the reasons for your choices. Use the tools to see the results of the prescribed burn on the vegetation. Record your “results” in the table.

Continue setting controlled fires until you have completed the table or are ready to make Management Plan recommendations on how to restore this site.

Fire Power Data

<u>Trial 1</u>	<u>Season</u>	<u>Reason</u> <i>Answers will vary based upon the variables selected.</i>
	<u>Moisture</u>	
	<u>Wind</u>	
		<u>Result</u>

Trial 2

Season

Reason *Answers will vary.*

Moisture

Wind

Result

Trial 3

Season

Reason *Answers will vary.*

Moisture

Wind

Result

Trial 4

Season

Reason *Answers will vary.*

Moisture

Wind

Result

Trial 5

Season

Reason *Answers will vary.*

Moisture

Wind

Result

If you need to conduct more trials, record your data on a separate sheet of paper.

Management Plan Recommendation *Answers will vary.*

After you have completed the on-line EcoVenture, answer these questions and complete the activities.

What are some things foresters need to consider before prescribing a controlled burn?

The amount of wind, humidity, and species of plants to be burned or restored would need to be considered.

What happens to a pine forest when a low or cool fire is prescribed?

Very little effect on the trees and shrubs when grass is burned. Grasses regenerate very quickly.

What happens to a pine forest site when a hot fire is prescribed?

Nearly everything is burned except the pine.

Are prescribed burns in the summer more effective at controlling oaks than prescribed burns in the winter? Yes _____ No _____ Maybe _____

Explain your answer.

The young growing oaks of summer are more easily killed by fire this time of year.

Why would managers try to prevent or exclude fire in an oak forest?

To keep pine growth down and maintain the hardwoods. If there was a fire, pines would regenerate faster and prevent oaks from re-establishing themselves.

How can wildfires pollute water?

Burn material can run into a stream. Hot fires may kill the plants including grasses and their roots which hold the soil. With rain the ground erodes and soils wash into the streams.

Why can fire be used as a management tool for all forests?

*Fire plays a role in all ecosystems. Therefore we can use fire as
a tool of management.*

EcoChallenge

How would you design a plant that was “fire proof?” Build a model and share it with your team or the class. Do they agree it is protected from fire?

Extensions

Investigate the use of fire by Native Americans of Florida prior to the 1800’s. In North Florida they burned the Longleaf Pine/Wiregrass community to increase the diversity of game animals and to reduce hiding places for enemies near their settlements. See what else you can learn about how fire was used.

Hidden Midden EcoVenture

What You Will Do.

While searching for a possible trail location from the campground, you have discovered an oyster shell **midden**. Middens are trash dump sites left behind by some tribes of Native Americans that lived in Florida before and immediately after European cultures arrived here. In this *EcoVenture*, you will explore the midden and uncover artifacts. You will analyze these artifacts in an archaeology laboratory. Here, you will compare the artifacts you have uncovered to those previously found and catalogued. This comparison will help you identify your artifacts and the cultural periods in which they were created.

Why It's Important.

Hundreds of middens can be found throughout Florida. Some of them are very important archaeological sites containing evidence of how the earliest people lived in this region. Because of their importance, we must always have an archaeologist on site when we explore a midden or any archaeological site. Barry R. Beach is working with the *EcoVenture* team exploring the midden in R. U. Green. He is available as a consultant to provide you with some helpful information about this area.



You will use the information you gather to make inferences about the cultural history of this area. You will also make a recommendation about the importance of preserving the midden.

Ready? Begin.

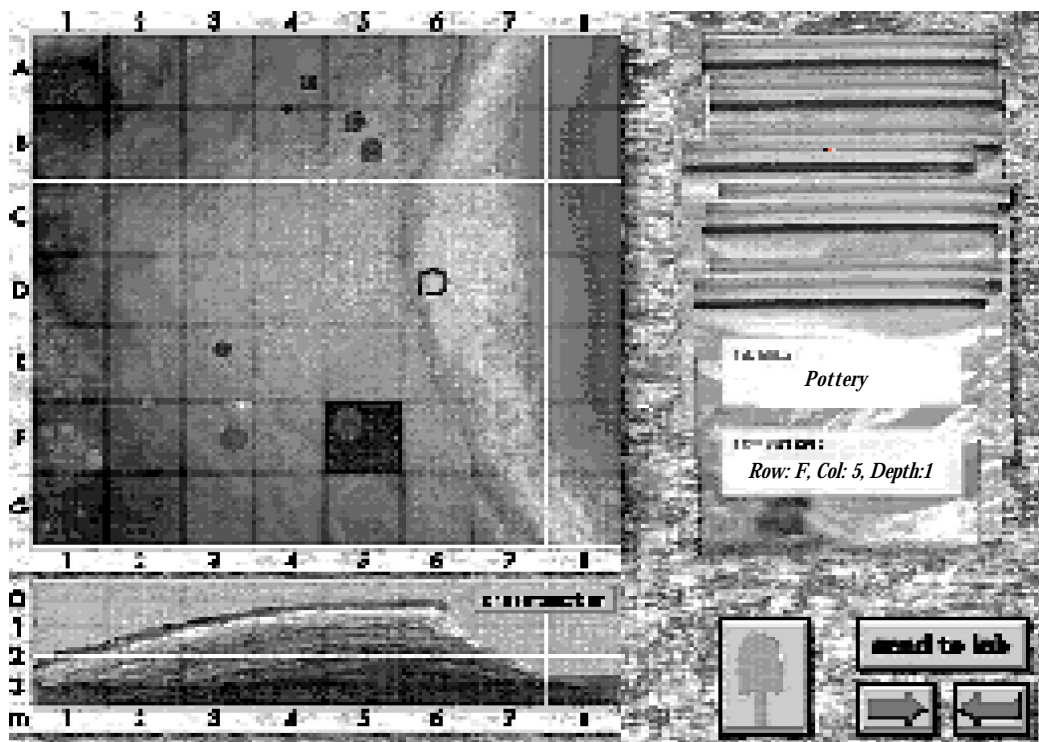
Hidden Midden is located in R. U. Green State Park on the River Site Screen. Click on the Arrow-head icon to begin the EcoVenture.

As you complete this activity think about the following questions:

- *What can be inferred about other cultures by examining artifacts from a midden?*
- *Why do you think it's important to preserve ancient artifacts such as middens?*
- *How might you tell where a midden is located?*

In this *EcoVenture* you will search for artifacts buried within the shell midden. The first activity screen (below) shows an overhead view of the vegetation growing near and on the shell midden. Select overlays from the Tools Menu to help you identify the kinds of trees growing here.

To begin exploring the mound, click on the Shovel icon. You will see a grid overlaying the midden area from the same overhead view (see screen below). Dig deeper by clicking on the section up to three times. The smaller picture beneath the overhead view shows a cross section—or side view—of the midden. This picture will help you locate the depth of artifacts, up to 3 meters.



Click in the grid squares to search for artifacts, signs of human activity. Remember, artifacts may be hidden under several layers! When you uncover an artifact, drag it to a plastic bag. Label the artifact to identify it later in the lab. Enter the artifact grid coordinates and depth. When you analyze your artifacts in the lab, it will be important to know their location in the midden. Send your artifact to the lab for later analysis by clicking on the Send to Lab button. Continue digging for more artifacts. You may collect up to 8 artifacts, although more artifacts may be found within the midden.

Record the artifact's label, grid coordinates, and depth in the table below. You will not be able to complete the last two columns until you have compared your findings to the lab specimens.

Artifact Data

<u>Label</u>	<u>Location</u>			<u>Period</u>	<u>Artifact</u>
	<u>Row</u>	<u>Column</u>	<u>Depth</u>		
1 _____	_____	_____	_____	_____	_____
2 _____	_____	_____	_____	_____	_____
3 _____	_____	_____	_____	_____	_____
4 _____	_____	_____	_____	_____	_____
5 _____	_____	_____	_____	_____	_____
6 _____	_____	_____	_____	_____	_____
7 _____	_____	_____	_____	_____	_____
8 _____	_____	_____	_____	_____	_____

Teacher Note: Location of all artifacts are in the Appendix.

When you have collected the desired number of artifacts, click on the forward arrow to travel to the archaeology laboratory shown on the next page. Notice the cabinet of drawers. These drawers contain laboratory artifacts which have been previously dated to a particular historic and prehistoric cultural period. Take your artifacts out of the bags, one at a time. Then look through the drawers by clicking on them. The contents of the drawer will be displayed on the videodisc monitor. Compare your artifact to those in the drawers until you find a close match. By comparing your sample with the laboratory artifacts, you can determine which period of Native Americans or early Europeans created the item. When you think you have identified the Period and the Artifact, record the information in the appropriate column of the table above.

Continue to analyze your artifacts. As you do, you will gradually find out about the cultural history of the area.



If you want to search for more artifacts, return to the Hidden Midden Entry Screen and click the forward arrow to begin a new search. Record your data on the Additional Artifact table at the end of this *EcoVenture*.

After you have completed the on-line EcoVenture, answer these questions and complete the activities.

What species of trees were found on or near the midden?

Red cedar and live oak. These are found from the tools menu-overlay of tree and other plant species.

Explain the relationship between the depth of the artifacts and the age of the piece.

Generally, the deeper the item the older the item. Notice that the mound is a hill-like structure, thus this item, found at a low depth on the edges of the hill, will be younger than the same depth at the center of the mound.

Explain why an older artifact might be found in a relatively young archaeological site.

Later Indian tribes may have recycled older artifacts especially stone tools.

Why is it important to have an archaeologist present when exploring ancient features like a midden?

It's the law. Tampering with ancient artifacts on public lands is illegal.

Is the midden worth preserving? Defend your answer with reasons.

For students to answer they must present evidence based upon their work in this activity.

If you have time, you may want to return to the midden and complete this table by finding more artifacts.

Additional Artifact Data

<u>Label</u>	<u>Location</u>			<u>Period</u>	<u>Artifact</u>
	<u>Row</u>	<u>Column</u>	<u>Depth</u>		
1 _____	_____	_____	_____	_____	_____
2 _____	_____	_____	_____	_____	_____
3 _____	_____	_____	_____	_____	_____
4 _____	_____	_____	_____	_____	_____
5 _____	_____	_____	_____	_____	_____
6 _____	_____	_____	_____	_____	_____
7 _____	_____	_____	_____	_____	_____
8 _____	_____	_____	_____	_____	_____
9 _____	_____	_____	_____	_____	_____
10 _____	_____	_____	_____	_____	_____

Teacher Note: Location of all artifacts are in the Appendix.

EcoChallenge

Suppose several hundred years into the future, archaeologists discover a trash pile used by your school. What would they find? How much would be completely intact? What inferences could they make about the people who used the items in the trash pile? Write a brief report as if you were the archaeologist in the future.

Extensions

Use the *Atlas of Florida* and other references to locate some of the important Native American sites found in our state.

What type of fish artifacts are found in middens left by pre-European Native Americans of Florida? What does this tell you about the diet, or feeding habits, of these people? (You may want to do further investigations in this *EcoVenture* to discover which additional artifacts you can find that are relevant to these questions.)

Imagine you are fishing and living off the land for your survival. What might archaeologists several hundred years from now discover in a midden that you and your family had left behind?

Pitch That Tent EcoVenture

What You Will Do.

The Green family donated the land that is now known as R. U. Green Park but this will be honored only if it is feasible to place a camp site without disturbing protected species and certain historical sites. You will be asked to think about other factors that need to be considered before allowing a camp site to be built.

In this *EcoVenture*, you will help locate the best sites for camping and include your recommendations in the Management Plan. Some areas of the Park are better suited for camping than others.

Why It's Important.

If the camp site is located in the wrong place it could destroy endangered and threatened species habitats, or important archaeological sites. Care must be taken to avoid places that flood during heavy rains, areas close to the park boundaries, and in vegetation that is too thick or too thin. Consultants Summer Parks and Woody Flats can help you develop a good plan. The Tools Menu also contains helpful information.



Ready? Begin.

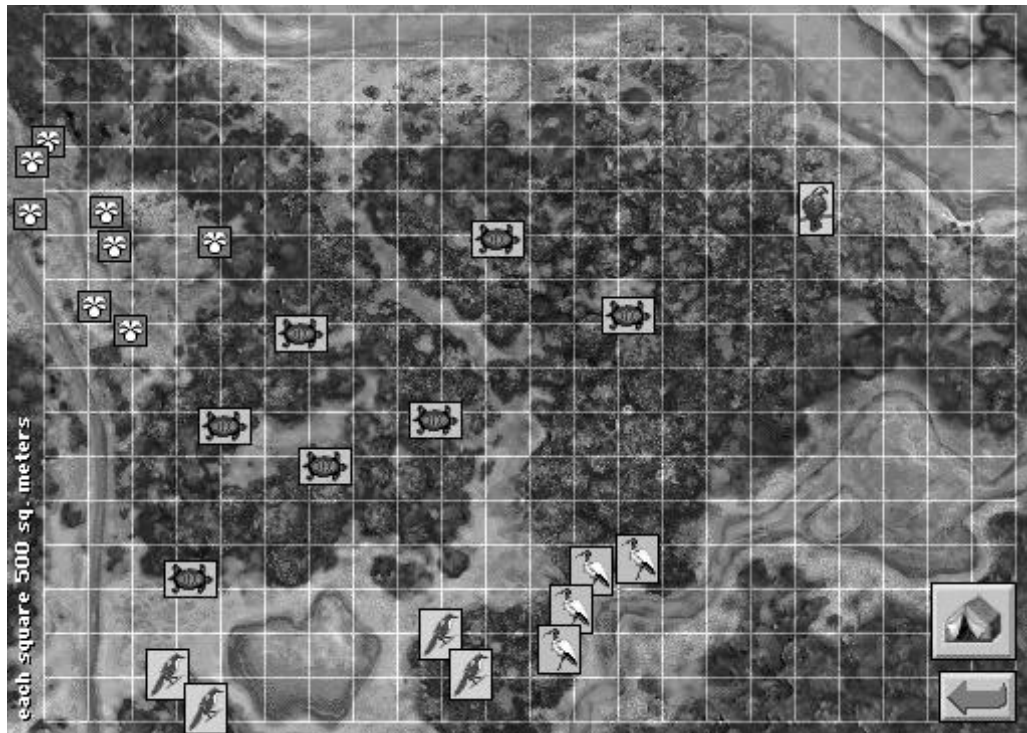
Pitch that Tent is located on the River Site Screen. Click on the Tent icon to begin the EcoVenture.

As you complete the activities, think about the following questions:

- *What criteria should be considered when locating a camp site?*
- *How can you avoid damage to natural resources and still allow people to use an area?*
- *Can resource managers relocate wildlife?*
- *How is the recreational carrying capacity of a site determined?*

Under the Tools Menu are the following overlays: Protected Species, Ground Water, Vegetation, and Other Features. These overlays can be used to display important information about the proposed camp site.

The Protected Species overlay shows the protected species in the general area proposed for the campsite.



Scrub Jay



Gopher Turtle



Wood Stork

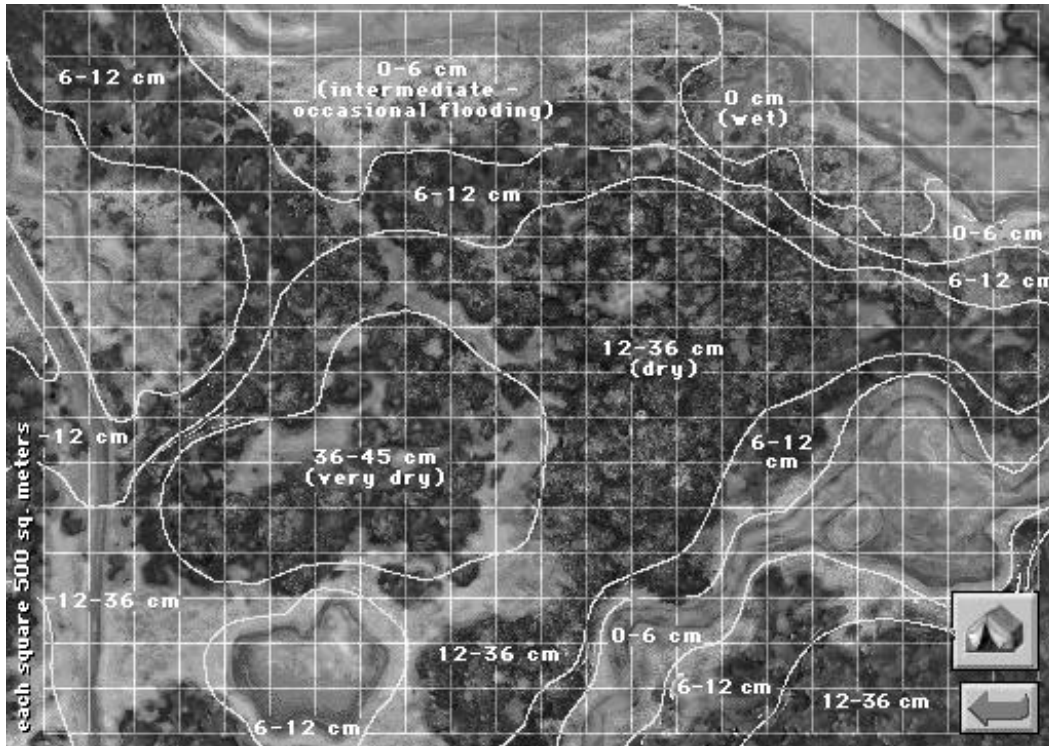


Orchid



Osprey

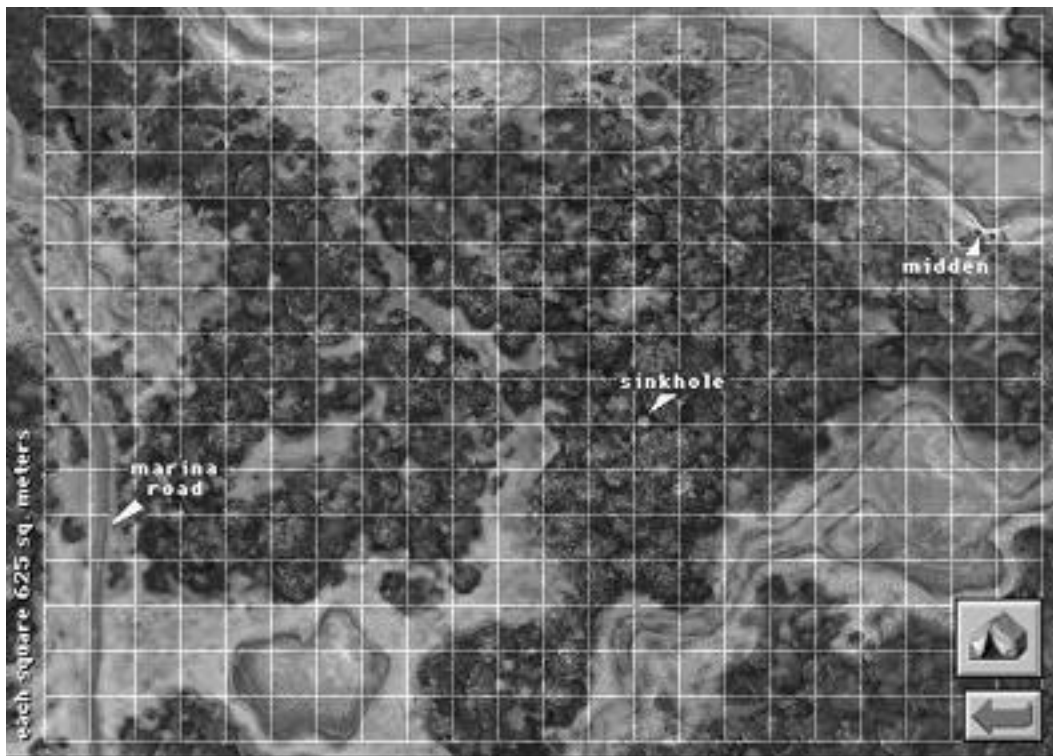
The Ground Water overlay shows (in centimeters) how deep you would have to dig a hole before you hit water.



The Vegetation overlay shows you what plant communities are in the proposed camp site area.



The Other Features overlay locates special features that have to be taken into consideration when deciding to place your camp sites.



Study these maps and decide where to place individual camping sites. Select the Tent icon and click on a location. If you carefully plan before moving the tent, the tent will be set up at that location. If you get an error message, you may want to look at the overlays again. How many tents can your team place? Which team placed the greatest number of tents with the fewest error messages? You must select “none” on the overlays (under the tools menu) before you can place your tent.

After you have completed the on-line EcoVenture, answer these questions and complete the activities.

Why is understanding the water table important when choosing a possible camp site?

The ground may be subject to flooding.

What is the relationship between the water table and the vegetation at R. U. Green State Park?

Pine trees tend to be located on higher, drier ground, while hardwoods are in the lower, more moist areas. This distribution also indicates that the soil is well-drained as pine trees are not as tolerant of moisture as many hardwoods.

How does the presence of protected species influence the selection of potential camp sites?

You cannot and should not interfere with these species.

Identify some of the commensals that use gopher tortoise burrows. Why is it a bad idea to reach into a gopher tortoise hole?

Rattle snakes are common visitors to gopher holes. Animals using the burrow might feel threatened by a hand intruding into their territory and could bite.

What is an archaeological site ?

A place with evidence of earlier human activity.

Why is it important not to disturb archaeological sites?

Disturbances can destroy important evidences useful in learning about earlier inhabitants. Even moving an object can be harmful.

What are some other reasons for not putting the camping area in certain locations?

Too near the road can be too noisy.

May disturb plants and animals.

May disturb archaeological site.

May be too wet due to placement on low ground.

What general conditions make an ideal campsite?

Those which give campers a wilderness experience without greatly affecting the natural environment. For fixed camp sites, water and proper sewage disposal must be available.

Now that you have selected a possible site for camping, you need to determine what type of camping to allow (tent, vehicle, cabins). How many Structures (tents, RVs, etc.) can the site support without damaging the ecosystem. You also need to consider privacy or personal space when you are locating the camp site. People do not want to be too close to each other. Measure the space available in the camp site you have selected, then use the table to determine the largest number of camping sites that will be allowed in the area.

Table 1. Optimum Carrying Capacity for Camping.

<u>Camping Type</u>	<u>Area</u> (sites/hectare)	<u>People/Unit</u> (No./site)
Primitive (Hike in)	5	4
Tent (Short-walk)	4 - 9	4
Vehicle (No hookups)	4 - 9	4
Vehicle (Full hookups)	4 - 11	4
Cabins	3 - 7	4-12

What kinds of camping (primitive, walk-in tent, vehicle, cabins) would you recommend be allowed in this camp site? Why?

Answers will vary. Look for defensible responses.

On the area you have selected, approximately how many hectares are available for camping? (A hectare is an area of 1000 square meters.)

14.5 hectare

How many sites would you recommend for this area of R. U. Green State Park? Give reasons for your recommendation.

Answers will vary due to the combination of camping types the students may choose.

What recommendations for tent camping are you going to include in the Park's Management Plan?

Answers will vary.

EcoChallenge

What are some alternative ways of setting up the camp grounds? Can you develop a way of providing more sites and not hurting the ecosystem?

Extensions

In what ways does camping help and harm the environment? Call a local state park and ask the park ranger for help answering this question. (Include the different kinds of camping for example, primitive, tent, vehicle, and cabin.)

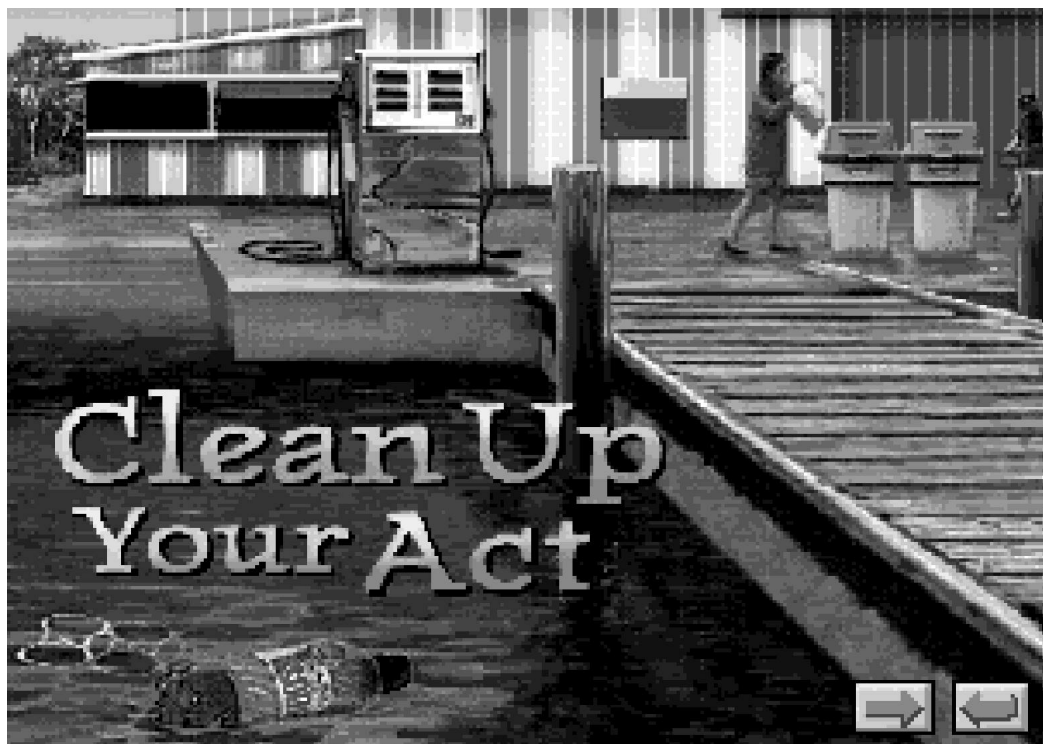
Clean-Up Your Act EcoVenture

What You Will Do.

Fishee River Marina has applied for a permit to continue operating within R. U. Green Park. The problem is the marina has been cited for polluting Fishee River five times in the last two years. In this *EcoVenture* you will discover the sources of pollution coming from Fishee River Marina and will make recommendations to stop the pollution or, perhaps, to close the marina.

Why It's Important.

The Marina is an important place for recreational boaters and anglers. They need to have access to Fishee River and Snapper Bay. The Marina provides this access. Without it, the area would experience some economic problems. Restaurants, bait shops and other stores might close and people would lose their jobs. By properly designing the marina, you can reduce pollution and help the local economy. Consultant Delores Especialista is available to provide helpful information.



You will use the information you gather to make recommendations in the R. U. Green Park Management Plan.

Ready? Begin.

Fishee River Marina is located on the River Site Screen. Click on the Dumpster icon to begin the EcoVenture.

As you complete this activity, think about the following questions:

- *How can the environmental impact of the marina be reduced?*
- *How can we improve the refueling operations?*
- *How can we reduce gas and oil leaks from boats docked at the marina?*
- *How can we eliminate sewage discharge from boats?*
- *Why is gasoline dangerous around boats?*
- *Would it be better to just close the marina?*



When you are ready to begin this *EcoVenture*, click on one of the possible remedies for sources of pollution. These are the fuel tank, dumpster, and toilets. They are inconveniently placed now. Placing these pollution sources in other parts of the marina might increase their use or reduce the chances of causing problems. If your placement is satisfactory, boaters will make use of the facilities.

The Marina Movie on the River Site Screen provides information on additional pollution problems at the marina. And Delores Especialista is a litter expert! You might want to consult her before relocating marina facilities.

Table 1.

<u>Pollution Source</u>	<u>Possible Solution</u>
<i>Garbage Cans</i>	<i>Must be near the docks</i>
_____	_____
_____	_____
_____	_____
<i>Fuel Tanks</i>	<i>Move away from the water</i>
_____	_____
_____	<i>(The proper location is at</i>
_____	<i>the top/left of the screen)</i>
_____	_____
<i>Toilets</i>	<i>Must be near the docks</i>
_____	_____
_____	_____

After you have completed the on-line EcoVenture, answer these questions and complete the activities. Make sure you have checked in with some of the consultants.

Why do people pollute?

*Usually because the convenience of pollution is greater than the
commitment to keep the environment clean. Some people will not
pollute regardless of how inconvenient it is to properly dispose of trash
and other pollutants.*

What are some ways people can work together to stop pollution?

Beach cleanups.

Use less paper and plastic products.

Recycle, reuse.

Do all human activities cause pollution? Explain your answer.

The answer is yes but our impact can be minimized. We alter the environment simply by our presence. Body waste products can be considered pollution. It is the cumulative effect of the human population that creates major problems.

What would be the benefits of closing the marina?

Reduce oil spills and boat traffic

What burdens or problems would closing the marina cause?

More trash might be discarded improperly. Holding tanks might be dumped more frequently. It could take more time and fuel to get to fishing sites. Jobs would be lost.

Why is fueling boats dangerous?

Possibility of fire and increased possibility of oil pollution.

Identify some ways boat fueling can be made safer.

Stop leaks, have shut off valves within reach and working.

Use proper containers.

EcoChallenge

How many cubic centimeters are contained in a 30 liter fuel tank?

Answer 30,000

Extensions

Draft a letter to the Department of Environmental Protection outlining your ideas for cleaning-up Fishee River Marina.

Prepare a letter to the owner of Fishee River Marina outlining your ideas for the cleanup and justify them in both environmental and economic terms.

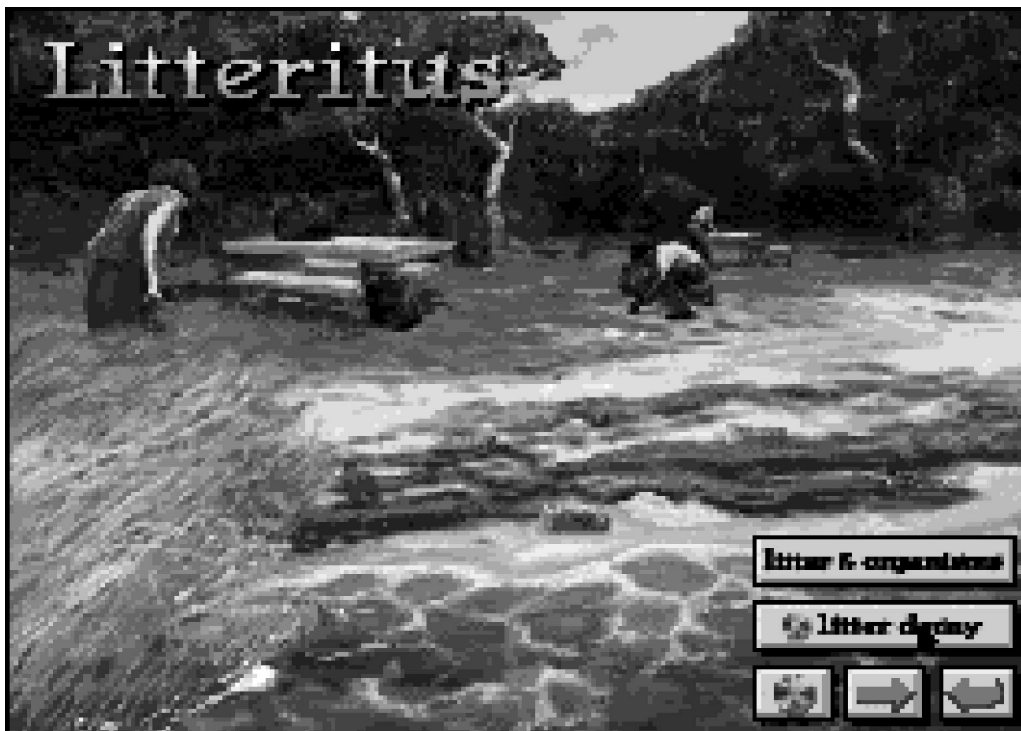
Litteritus EcoVenture

What You Will Do.

Fishee River Marina is suffering from a litter problem. Fishee River brings trash down stream and the tides bring even more trash to the shore beside the marina. According to the Center for Marine Conservation, about 5.5 million containers are dumped into the sea every day. In this *EcoVenture* you will learn what kinds of litter are commonly found along the coast. You will also learn what kinds of litter can be recycled, what kinds cannot be recycled and what kinds of litter are considered hazardous waste. You will be challenged to think up ways to reuse items that are headed for the landfill.

Why It's Important.

These containers and tons of other litter make our beaches and shores unhealthy, unsightly and unsafe for people and wildlife. In a little over three hours, nearly 200 tons of trash were removed from our 1300 miles of Florida shoreline during one of our coastal cleanups. Recycling or reusing many of these items saves valuable landfill space, saves energy, and reduces air and water pollution. Proper disposal of hazardous wastes helps prevent ground water and surface water pollution.



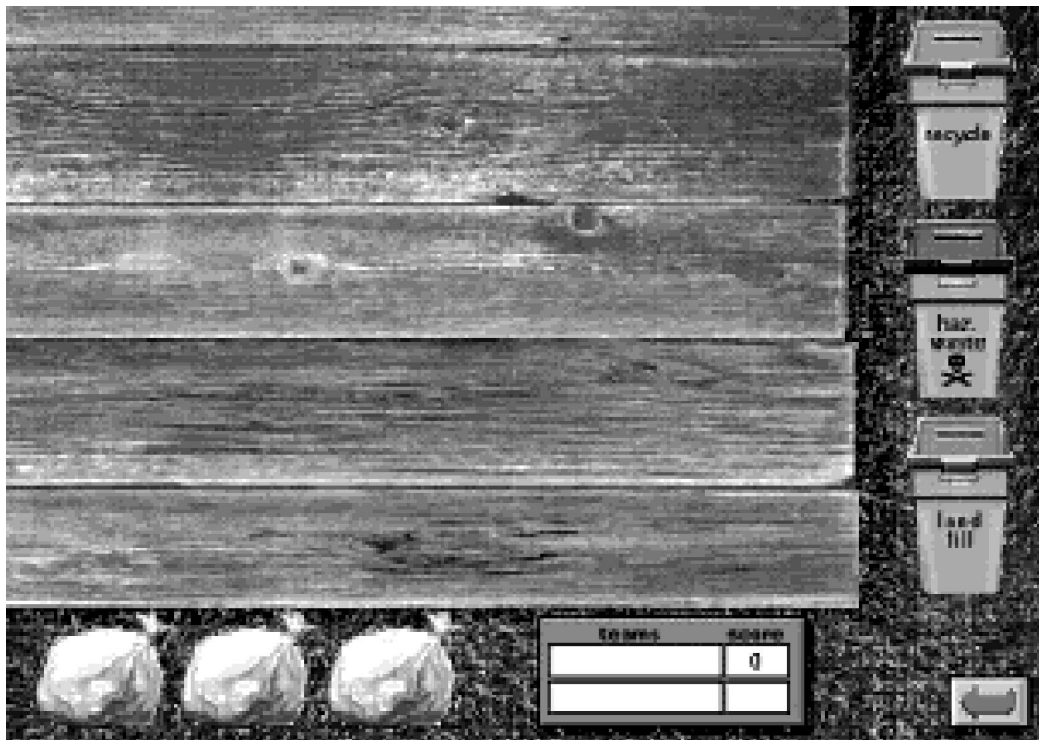
You will use the information you collect to make recommendations about reducing the amount of litter boaters produce.

Ready? Begin.

Litteritus is located on the River Site Screen. Click on the plastic six-pack holder icon to begin the *EcoVenture*.

As you complete this activity, think about the following questions:

- *How does litter harm the environment?*
- *How long does it take for litter to break down?*
- *How can we reduce the amount of litter?*



To learn how litter affects coastal wildlife, click on the Litter & Organisms icon. To observe the process of litter decay and learn how long it takes some kinds of litter to decay, choose the Litter Decay icon. The Forward Arrow will let your team compete with other teams that are sorting trash that was picked up during the annual coastal cleanup.

Decide if your team will compete against itself, whether one team member will challenge another team member, or if your team will compete against another team. Make your selection in the pop-up box. You will get one point for each correct choice and lose a point for an incorrect choice.

Click on a bag to sort. Drag each item of litter to the proper can. If you're not sure where the item goes, you can guess; but if you guess incorrectly, you'll lose a point.

When you have sorted the trash, you will have a chance to "rethink" the items going to the landfill. If you can think of a way to reuse an item, drag it out of the trash and put it in the reuse box. Write the name of the item and its use in the Litteritus Item Reuse table. After you have made your decisions, have the landfill trash hauled away.

Repeat this process until you have sorted the trash from beach cleanup in all three bags.

Litteritus Item Reuse

Answers will vary. Support their creativity.

Item

New Use

Bag 1. _____

Answers will vary.

Bag 2. _____

Answers will vary.

Bag 3. _____

Answers will vary.

Total: _____

After you have completed the on-line EcoVenture, answer these questions and complete the activities.

What are some species of coastal wildlife that are affected by litter?

Any plant or animal could be listed as all are affected by one form of litter or another. Sea turtles often mistake plastics for jellyfish. Many plants and animals become entangled in litter.

What are some other ways litter affects the environment?

It is unsightly. If the litter is glass or metal, cuts and other injuries may result, not to mention the possible effects on wildlife and habitat. Beaches may be closed due to health dangers resulting from litter.

Explain why litter that is made of plastic is being found more frequently.

Plastics are being used for more and more things, so you would expect to find more plastic litter. Plastic is also slow to decay. 450 years or more depending upon the conditions where it is buried.

Why do different kinds of litter take different lengths of time to decay?

They are composed of a variety of materials each with differing decay rates.

What kinds of litter decay quickest? What kinds take the longest?

Organics are the quickest; objects made by people take the longest time.

List some things boaters can do to reduce the amount of litter they produce.

Take regular cups and other utensils on board. Keep disposable items off the boat. Deposit trash in the proper waste receptacles.

Commonly found litter items that can be recycled include:

Plastics, paper, metal, and glass.

Examples of hazardous waste that are found during coastal cleanups include:

Containers of toxic materials such as chemicals, paints, and oils.

What are some litter control recommendations your team will make in the Management Plan?

Place plenty of waste and recycling containers at convenient locations.

Have the student show these locations on their management plans.

EcoChallenge

Duplicating paper comes in boxes that hold about 12 kg of litter. If your coastal cleanup crew collected 225 kilograms of litter per kilometer, how many boxes would be needed to store the litter collected from 4 kilometers of beach?

Answer 75 boxes.

A basketball court is 29 meters long and 15.2 meters wide. The paper boxes are about 45 cm long, 30 cm wide and 24 cm high. How many of the boxes of beach litter could be placed on the court without having to stack them? How many kilometers of litter does this represent?

Answer See below. and $225/12 = 18.75$ boxes per kilometer X 4 kilometers.

Extensions

Contact the local recycling center and find out what kinds of materials are being recycled and how money is being paid for recycling materials?

From this *EcoVenture* you should have gained some insights into how litter can adversely affect coastal wildlife, both aquatic and terrestrial. How does improperly discarded recreational fishing litter (i.e., monofilament fishing line, fish hooks, and other types of fishing tackle) affect fish and other aquatic life?

Find out how you can help to reduce or eliminate litter from our bays and beaches and see if you can find out how these affect the coastal habitats of aquatic life. Find out some agencies who pay for projects that lead to better habitat protection?

Answer to the EcoChallenge #2

This is a tough question. The dimensions needed by the students are the length (45 cm) and the width (30 cm). The bottom of the box is all that is needed. The area of the box bottom is 1350 cm². The area of the basketball court is 440.8 m² or 4,408,000 cm² (There are 10,000 cm² in one square meter.) One square meter is 100 x 100 cm. 100 x 100 = 10,000). Divide 4,408,000 cm²/1350 cm² and you could place 3265 boxes on the court. As there is an average of 18.75 boxes of litter/kilometer, the 3265 boxes of litter represent the litter of 174 km of shore line. If you are interested there are 1320 kilometers of sandy beaches in Florida.

Feed Me EcoVenture

What You Will Do.

The organisms that live in the river and in the bay come together in the Snapper Bay estuary. Their relationships to one another are usually described in terms of predator-prey or energy flows. In this *EcoVenture*, you can participate in an on-line game that lets you explore the many different energy relationships in the estuary.

Why It's Important.

Estuaries are very special places. They provide shelter and protection as well as nourishment for almost every species found in the ocean. Estuaries are one of the most productive ecosystems on Earth. They produce much of the world's seafood. Estuaries are so productive because they receive nutrients from the entire watershed. They also buffer the ocean from pollutants that come from the surrounding watershed. Estuaries are also one of the most frequently used recreational areas in the world. They provide people with excellent fishing, areas for swimming and boating and a place to get away and enjoy nature.



The very things that make estuaries safe and productive also make them sensitive to human activities. Fertilizers and pesticides are washed into rivers and dissolve in the water or attach to sediment particles. Runoff and discharge from some wastewater treatment plants, industries, and cities make their way into rivers. Often, these pollutants are trapped and can build up in the bottom sediments. Over a long period of time, these materials can reach toxic levels and destroy the productivity of the estuary.

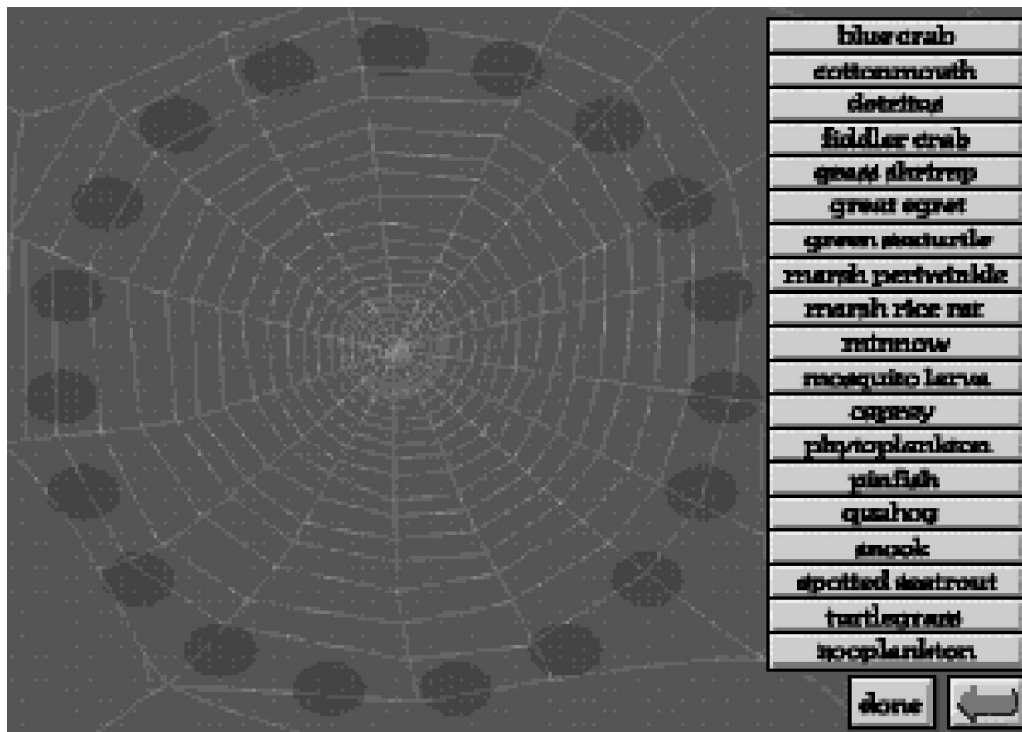
Ready? Begin.

Feed Me! is located on the River Site Screen. Click on the Web icon to begin the EcoVenture.

As you play the Food Web Game, think about these questions:

- *If an entire population of animals or plants was taken from the estuary, how would the ecosystem change?*
- *What are the major sources of energy that fuel the estuarine food web?*
- *Why is understanding the estuary's food web important to managing R. U. Green State Park?*

Click on the Forward Arrow to begin.



Begin your food web by selecting organisms from the list. Double-click on the organism to learn more about it. Start out with just a few organisms. As you learn more about the organisms and energy flow, challenge yourself by building a larger web.

Once your organisms are placed on the web, drag a line from the producer of energy (the food, or prey) to its consumer (predator). Remember, some organisms eat more than one type of food.

After you have completed the on-line EcoVenture, answer these questions.

Explain why some organisms have lines drawn to more than one other organism.

In a food web, many organisms have more than one source of energy.

Why are estuaries sometimes called “the cradle of the ocean?”

This is the place where many juvenile animals live. It is rich with food, shelter and other necessities that allows a young animal to grow and be protected until it reaches an age or size at which it is safe to leave the estuary.

How do chemicals get into the estuary?

Chemicals may enter the estuary from river - run off from agriculture and urban areas are common sources of pollution. As organisms decompose, the chemicals in their bodies are recycled.

Explain the difference between a food chain and a food web.

A food web is made up of two or more interconnected chains. A food chain is the movement of energy through two or more organisms through the various tropic levels. Sunlight → seagrass → manatee is an example of a short food chain.

What would happen if one “link” in a food web disappeared?

The organisms (predators) that depended on the missing link for food would decrease if they did not find another energy source.

Why is it important to maintain the habitats for many different kinds of plants and animals?

So that the plants and animals have alternative food and shelter possibilities if one habitat is damaged.

Using the examples from the estuary’s food web, explain why “diversity contributes to ecosystem stability.”

Diversity contributes to stability because of the opportunities for modifying the links in a web if one or more of the preferred links is removed. This gives a plant or animal an increased chance for survival.

EcoChallenge

Collect pictures of organisms that are commonly found in estuaries and construct a food web mobile. Don’t forget the sun!

Extensions

Use the *Atlas of Florida* or similar reference to locate Florida’s principal estuaries. Use this information to develop a collage showing how estuaries contribute to Florida’s economy.

Hot Water EcoVenture

What You Will Do.

Fishee River seems to be suffering from a lack of fish! Many people are blaming the Fishee River Power Plant. The plant takes in water from the river to cool its machinery and then this same water is put back into the river. What kinds of evidence should you collect to find-out if the warmed water is affecting the fishery? In this *EcoVenture*, you will learn how water quality affects aquatic organisms such as fish. You will also discover the relationship between temperature and dissolved oxygen and learn about biochemical oxygen demand.

Why It's Important.

Thermal pollution from power plants and other industrial processes can harm the aquatic ecosystem around the discharge area. The Department of Environmental Protection regulates these discharges by issuing permits. The permits tell the plant operators the conditions under which they are allowed to discharge the water. Conditions include temperature ranges, oxygen ranges and the size of the mixing zone. Most of Florida's power plants are located near estuaries, rivers or large lakes. To be sure the discharge does not harm the aquatic environment, scientists collect data from sites on a regular basis. The Tools menu contains information about the fish. Robin Reed may help you with your investigation.



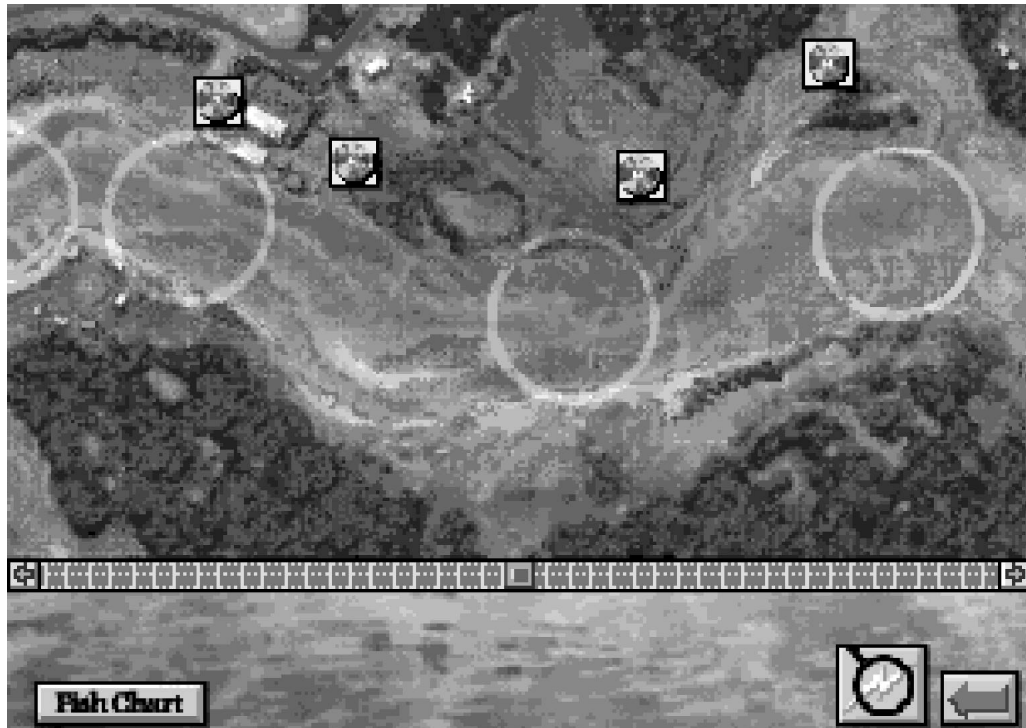
If the power plant is affecting the fishery, it is also affecting R. U. Green State Park. What will you recommend about the plant in the Management Plan? If a power plant does not meet the criteria listed on its permit, it can be fined or shut down. Fortunately, most industries with permits work very hard to help keep the aquatic ecosystem intact.

Ready? Begin.

Hot Water is located on the River Site Screen. Click on the Thermometer icon to begin the *EcoVenture*.

As you complete this activity, think about the following questions:

- *In what ways does the Fishee River Power Plant affect the organisms in the River?*
- *How do cooling ponds work?*
- *What is the relationship between water temperature and oxygen?*
- *How does the biochemical oxygen demand affect fish populations?*
- *How does water runoff affect water quality?*



There are several ways you can collect data to help in your investigation:

- *Video clips at various sites along the river may provide you with clues about activities that might affect water quality. Use the scroll bar on the screen to move up and down the river.*
- *The Fish Chart shows what species live in Fishee River and the dissolved oxygen levels, temperature ranges and salinity levels they require.*
- *Overlays in the Tools menu provide information about the dissolved oxygen level, temperature, and salinity level in various parts of Fishee River.*
- *Click on the Shocker icon at the bottom of your screen to activate the “electrofishing” cursor. Use this shocker to go “electrofishing” in different parts of the river.*

Sampling spots are indicated by light-colored circles. The Diversity Index is a scale showing the variety of fish species in that part of the river. The higher the number, the greater the variety, or diversity, of fish in that area.

Tip: Do you know what “electrofishing” is? If you watched the Fishee River Movie on the River Site Screen, you saw an example of this method of sampling the diversity of fish in various locations. Look at the movie again for an introduction to the “fishy” problem at Fishee River.

Summarize your data in the table below.

Table 1. Data collected from the hydrolab and electrofishing.

<u>Site</u>	<u>Physical Factors</u>	<u>Index</u>	<u>Temp</u>	<u>Oxygen</u>	<u>Salinity</u>
1	_____	_____	_____	_____	_____
2	_____	_____	_____	_____	_____
3	_____	_____	_____	_____	_____
4	_____	_____	_____	_____	_____
5	_____	_____	_____	_____	_____
6	_____	_____	_____	_____	_____

Teacher Note: Answers are in the Appendix.

After you have completed the on-line EcoVenture, answer these questions and complete the activities.

Examine the data in your table carefully. You might want to graph this information. Write your conclusions about the impact of the Fishee River Power Plant here. You will need to include some of this information in the R. U. Green Management Plan.

The power plant does not appear to be influencing the fish in the river.

Explain how cooling ponds work.

Cooling ponds work by placing hot discharge water in a large shallow pool to cool before releasing the discharge water into the river.

Where was the river's water temperature the highest?

In the vicinity of the power plant where warm water is discharged.

Where was the river's water oxygen content the lowest?

Next to the farm, just upstream from the power plant. The runoff can cause an algae bloom. When the algae decomposes, oxygen will be depleted.

Was there a direct relationship between temperature and oxygen content at all the sampling areas? Explain.

No, oxygen levels change while temperatures remain constant in the upper half of river. In lower portion of river, temperatures go up near the power plants and oxygen levels go down, because warm water holds less oxygen. Down river, temperature and oxygen stabilize.

What are factors, other than temperature, that influence the oxygen content of water?

The amount of farm runoff in water. The runoff may contain nitrogen fertilizers which cause an algae bloom. The oxygen levels decrease when the algae decomposes.

Using the data you collected, explain the relationships between fish populations and the physical parameters you measured.

Fish species diversity is the greatest at the mouth of the river. The fish diversity drops in mid-river regions and increases above the farm.

EcoChallenge

Make a set of graphs of Table 1 with one set of points for each of the 5 variables.

Extensions

Find the percentage of salt in seawater and the percentage of salt in estuarine water. Where do fish that live in salty water find fresh water to drink? Explain how fresh and saltwater fish obtain water for drinking and regulate their body fluids.

Appendix

EcoVenture: Artificial Reef

Factors influencing artificial reef fish populations:

Height (reef height above adjacent surface)
Hole Size (size of holes in reef structures)
Spacing (distance between reef sub components)

Options:

Height: 1 meter	Hole Size: a) no holes	Spacing a.) 5 meters
2 meter	b) small holes	b.) 10 meters
3 meter	c) large holes	c.) 20 meters
	d) combination	

Numbers in the chart represent the average number of fish (both benthic and pelagic species) caught during a typical summer 8 hour daylight fishing trip.

Fish Catch Chart

Height (Above surrounding sea floor)

1 meter 2 meters 3 meters

1. Spacing: 5 meters

Hole Size

a	7	6	8
b	8	5	6
c	8	7	8
d	10	9	10

2. Spacing: 10 meters

Hole Size

a	9	8	13
b	12	9	14
c	13	10	14
d	15	12	16

3. Spacing: 20 meters

Hole Size

a	8	10	12
b	10	10	11
c	12	11	16
d	14	13	18

Hidden Midden *EcoVenture*
Artifact Location Index

Artifact	Location (Row x Column x Depth)	Cultural Period	Time Period (BP = Years Before Present)
Archaic Kirk	Cx3x3	Archaic	10,000-3,000 BP
Spear Point	Cx5x3	Archaic	10,000-3,000 BP
Rock Blank or Scraper	Dx3x3	Archaic	10,000-3,000 BP
Fiber Temper Potter	Ex5x3	Archaic	10,000-3,000 BP
Shell Celt	Bx3x3	Deptford	3,000-2,000 BP
Clay Cooking Ball	Ex6x3	Deptford	3,000-2,000 BP
Base Pottery	Ex2x3	Deptford	3,000-2,000 BP
Simple Stamp Pottery	Dx4x2	Deptford	3,000-2,000 BP
Arrowhead	Ex4x2	Formative	2,000-1,000 BP
Punctate Pottery	Cx5x2	Formative	2,000-1,000 BP
Curvilinear Lined Pottery	Gx5x3	Formative	2,000-1,000 BP
Decorative Pottery I	Cx2x2	Mississippian	1,000-500 BP
Decorative Pottery II	Fx6x2	Mississippian	1,000-500 BP
Olive Jar	Ax5x2	Spanish	1500-1763 AD
Metal Piece (ring)	Dx6x0	Spanish	1500-1763 AD

Hot Water *EcoVenture*
Fish Shocking Samples

NUMBER OF FISH AT EACH SITE
and Diversity Index Number

Fish	Site 1 & Number	Site 2 & Number	Site 3 & Number	Site 4 & Number	Site 5 & Number	Site 6 & Number
Bay anchovy	943	720	540	252	249	136
Bluegill					4	6
Brook silverside			6	10	29	
Coastal shiner			1	8	10	46
Eastern mosquitofish		16	88	224	325	259
Florida gar					1	
Gulf flounder	2					
Hogchoker	1	6	34	69	170	300
Largemouth bass						2
Red drum	1	4	2			
Sheepshead	1					
Snook	1	1				
Spotted seatrout	4					
Spotted sunfish						7
Striped mullet	2	6	3			
Tidewater mojarra	46	19	23	12	12	2
Tidewater silverside	29	90	66	16	16	11
DIVERSITY INDEX	8	7	7	5	7.5	8