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ABSTRACT

This teacher's guide, one of nine teacher packages developed for use in the sequential, hands-on, field-oriented, K-8 environmental education program of the Martin County Schools in Florida, was developed for use with secondary students in grade seven prior to and after a visit to an environmental studies center located near an estuarine area. The field experience for seventh grade is a two-day study of a spoil island. Topics investigated include: succession; soils testing; salinity and dissolved oxygen (DO); and the island water table. This guide contains teacher instructions, scripts, tests with answer keys, and a copy of all student materials. Four slide/tape programs are not included. General and specific program objectives are stated and a program outline, including learning activities to be completed at the school and environmental studies center, is detailed. (BT)

7th Grade

Spoil Island Investigation

Martin County Schools'
ENVIRONMENTAL STUDIES CENTER
2900 NE Indian River Drive, Jensen Beach, Florida 33457

TABLE OF CONTENTS AND CHECKLIST

This packet contains teacher instructions, scripts, test with answer key and a copy of all student materials.

We suggest you cover these materials in the order listed in this packet.

In parenthesis after each item is the quantity you will need for your class and whether it is expendable or to be returned.

* Also listed but not included in this booklet are items such as flash cards, slide/tapes, feltboard and pieces, etc.

CONTENTS:

17. Data sheets (will be furnished at the Center visit)

18. Student test (one for each student-to be returned)

19. Test answer sheet with key (one answer sheet for each student-expendable)

SEVENTH GRADE PROGRAM SUMMARY

GENERAL OBJECTIVE: To acquaint the student with the total ecological relationships within the estuarine environment and provide him evidence that he is an integral part of it resulting in his successful completion of the performance activities for the specific objectives.

SPECIFIC OBJECTIVES: The student will on the test:

1. demonstrate with 70% proficiency knowledge of the interrelationships of the physical and biological factors of the Indian River and surrounding land forms by use of charts, maps and diagrams;
2. demonstrate with 70% proficiency a knowledge of the relationship between himself and the Indian River by identifying ways in which the ecological balance in the Indian River either directly or indirectly affects his life when given a selection from which to choose;
3. match with 70% proficiency changes in the environment with possible pollutant factors when given a description of a change and choice of possible causes;
4. demonstrate with 80% proficiency knowledge of selected vocabulary words relative to an ecological study of a marine environment when given a definition or question and choice of words;
5. identify with 80% proficiency organisms indigenous to the local area when given a pictorial representation with written characterization and choice of names.

PROGRAM OUTLINE:

A. Activities at the home school (three weeks)

1. "Snoopin' on a Spoil Island" booklet
2. Supplementary materials: books, film loops, film strips
3. "A Spoil Island, The River and You" booklet
4. Supplementary materials: books, film loops, filmstrips, slide/tape unit
5. Organism booklet
6. Supplementary materials: books, film loops, filmstrips, slide/tape unit
7. Vocabulary - included as part of each booklet above
8. Mastery of equipment, identification and manipulation with the aid of slide/tape programs
9. A booklet of relevant puzzles, word jumbles, etc. for student use
10. Self-evaluation tests
11. "Alteration of Physical Factors" booklet
12. (Visit to Center)
13. Follow-up discussions
14. Post-test

B. Activities in the field - two day program (4-5 hours each day)

1. First and second day

   a. Students are transported via boat to a spoil island.
   b. Students are divided into 3 teams and do land and water transect line studies.
   c. Each team measures various physical factors.
   d. Each team collects and identifies organisms.
   e. Each compiles data into energy webs.
   f. Each team transfers raw data onto a permanent transect line data sheet.
   g. During the two-day program student teams record data to be correlated and discussed in the classroom.

SEVENTH GRADE TEACHER INSTRUCTIONS

INTRODUCTION: Six objectives have been developed for the Seventh Grade program. The entire preparation by you with your students should require three weeks of class time. This will vary slightly depending on the class.

Your students will not visit the Center but will spend two days on a spoil island in the Indian River. There they will collect data and examine land and river biomes.

If we can be of any assistance to you in the successful presentation of this material, do not hesitate to call us.

MATERIALS

Booklet and slide/tape summary

1. "SNOOPIN' ON A SPOIL ISLAND"
   This booklet presents:

   a. reasons for doing a spoil island investigation
   b. how the investigation is done and what equipment is used

2. "A SPOIL ISLAND IN THE INDIAN RIVER LAGOON: An Organism Guide"
   This is a guide to the identification of the organisms found on a spoil island. A slide and tape presentation also goes with the guide.

3. "A SPOIL ISLAND, THE RIVER AND YOU: Relationships and Environmental Problems"
   This booklet explains some of the ways in which the individual is interrelated with the river. The effect of environmental alterations upon these relationships is developed. For example: the overall effect on the relationship is dependent upon the degree of the alteration. Two slide-tape programs accompany this unit.

4. "ALTERATION OF PHYSICAL FACTORS: LAB"
   This is a LAP of laboratory activities to be done at your school. Physical factors will be altered and the results observed and recorded.

5. Slide/tape presentation - "EQUIPMENT"
   This presentation shows students using the various types of equipment they will be using on the island.

PROGRAM OUTLINE

OBJECTIVE I - The student becomes aware of the interrelationships of the physical and biological factors of the river.

1. Suggested time: 3-5 days
   Student materials:

   a. "SNOOPIN' ON A SPOIL ISLAND" booklet
   b. "ALTERATION OF PHYSICAL FACTORS: LAB" Lap

2. Assign the Foreward and Table of Contents pp. 1-3 in "SNOOPIN' ON A SPOIL ISLAND" and discuss.

3. Next assign Introduction pp. 4-10 to be read and discussed. Be sure the practice problems are done.

4. Assign pp. 11-13 of the "SNOOPIN' ON A SPOIL ISLAND". This explains the two day transect study to be done on the spoil island.

5. Encourage the students to use the Glossary on p. 14.

6. This is an appropriate time to do the "ALTERATION OF PHYSICAL FACTORS: LAB" lap; however, you may elect to do it just before your visit to the spoil island.

7. The following supplementary material is to be used as time allows, or if further subject information is needed.

BOOKS:

a. The Living World of the Sea by W. Cromie - pp. 303-312
b. A Place in the Sun by L. & L. Darling - Chapter 2 & 3

FILM LOOPS:

a. The Everglades: Food Web
b. Mangrove Swamp: Food Web
c. Plankton: Food Webs & Feeding Relations
d. Sargassum Weed Community

FILMSTRIPS:

a. Introduction
b. Energy
c. Habitats & Niches - 51 frames

OBJECTIVE II, III - First, the student discovers how HE is interrelated to the river. Second, he will see how disturbing these relationships by pollutants, natural disasters or man himself causes environmental problems.

1. Suggested time: about one week
Student materials:

a. "A SPOIL ISLAND, THE RIVER AND YOU"
b. Slide and tape sets (2), "Relationships" and Problems"

2. Each section should be done separately: Relationships, then Environmental Problems.

3. The class should answer the posed questions in a group discussion.

4. For review of the material, have the students answer the questions on paper, individually or in small groups.

5. The following supplementary material is to be used as time allows, or if further subject information is needed.

BOOKS:

a. The Living Community by S. Carl Hirsch
b. Wildlife in Danger by Ivah Green (particularly sections on: Great White Heron, Manatee, Sandhill Cranes, Key Deer, Roseate Spoonbills, and Bald Eagle)
c. A Place in the Sun by L. & L. Darling - Chapter 11

FILM LOOPS:

a. Plant & Animal Ecology
b. Garbage Dumps

FILMSTRIPS:

a. Trash Explosion
b. Air Pollution
c. Fusion Energy

OBJECTIVE IV - Students identify organisms indigenous to the spoil island

1. Suggested time: entire preparation time, but on an individual basis
   Student materials:

   a. an organism guide booklet
   b. slide and tape set

2. The slide and tape set should be shown some time soon after receiving the guide. It will help enforce the Energy Web and Interrelationship concepts, Objective II and III.

3. The following supplementary material is to be used as time allows, or if further subject information is needed.

BOOKS:

a. Seashore Life by List
b. Sea and Shore by Hylander
c. Southern Seashores by Stephens
d. The Sea- Time Life Series
e. The Lower Invertebrates by Buschbaum

FILM LOOPS:

a. The Everglades: Food Web
b. Mangrove Swamp: Food Web
c. Plankton: Adult Forms
d. Plankton: Food Webs & Feeding Relations
e. Common American Birds: Shore Birds

FILMSTRIPS:

a. Nature's Balance

OBJECTIVE V - The objective for this unit is mastery of a selected vocabulary.

1. Suggested time: three weeks

2. Each booklet has associated with it a GLOSSARY at the end or as in "A Spoil Island: The River and You", at the end of each section. The student will be utilizing these definitions througout the Environmental Studies Unit. Make sure he utilizes these glossaries.

3. To stimulate interest use games such as baseball, spell down type, substituting word meanings for spelling, etc.

OBJECTIVE VI - The student will identify, manipulate and learn use of equipment.

1. Suggested time - two days inclusive
   Student Materials: slide and tape set

2. Use the slide-tape for discussion in class as to identification of the equipment and how to use it.

3. A "hands on" approach on the island will further help accomplish our goals.

4. The puzzles booklet may be used here or as a follow-up after the island visit.

. . . .

This concludes the classroom Pre-Activities. You should now be fully prepared for a visit to the spoil island. Please let us know which activities were/were not successful, and what activities of your own you may have added. We encourage you to use current newspaper articles and updated material. After your visit to the Center we suggest at least one day of review before giving the test

TEST

To post-test your students for your records, copies of the test and answers are included. The test is to be given after your students visit the Center. The test mean for 1974-75 Martin County Seventh Grade students completing a full program was 62.5.

SEVENTH GRADE FIELD ACTIVITIES

TWO DAYS
5 HOURS EACH DAY

I. DOCKSIDE

Before boarding the boat students don life vests and are given safety rules for the boat. While on the boat, using maps and charts, students are given an orientation to the geography of the area and where they will be going.

Both days students are transported via boat to a spoil island in the Indian River lagoon.

II. GOING ASHORE

The boat is beached on a spoil island and students are briefed on safety rules for their island investigation. All equipment is unloaded and students are divided into three teams of ten each for their island studies.

III. ISLAND INVESTIGATION

TRANSECT LINES - Each team collects data along a transect line both in the water and on the island. The teams elect which line to do on each day.

A. Land Transect Study - Students measure physical and biological factors along a 10 meter line.

At various intervals they dig down to the water table and measure depth, salinity, temperature and dissolved oxygen of the water.

They also use a soil corer and take core samples at intervals along the line. On these, they measure and record the depths of various soil types and organic layers.

Using thermometers and anemometers students measure and record the temperature of the soil and air, wind speed, and wind direction.

Organisms are identified along each meter of the line and recorded on data sheets.

A record is made of the exact location of the transect line on the island.

B. Water Transect Study - Students measure physical and biological factors along a 10 meter line in the water.

Using meter sticks students measure the depth of the water at one meter intervals.

Measurements are made and recorded of water temperature, salinity and dissolved oxygen.

Wind direction and speed and air temperature are measured and recorded.

Organisms along the water transect line are sampled by seining in the area. Three sweeps are made. After each sweep the entire group helps identify and count the number of each organism.

ENERGY WEBS - Students use the data collected in the area to construct energy flow webs for the spoil island and surrounding water.

COMPILING DATA - Students use raw data collected during the day's activities to construct a permanent record of their transect line. They make up their own symbols for each item sampled and construct a key for their permanent record.

DISCUSSION GROUPS - Discussion within the teams points out the relationships on the island as well as those between the student and the river.

EXPLORING - Students are taken with the teacher around the island. If the tide is low enough investigations are made of the exposed flats. Discussion of relationships, succession and other ecological concepts is held.

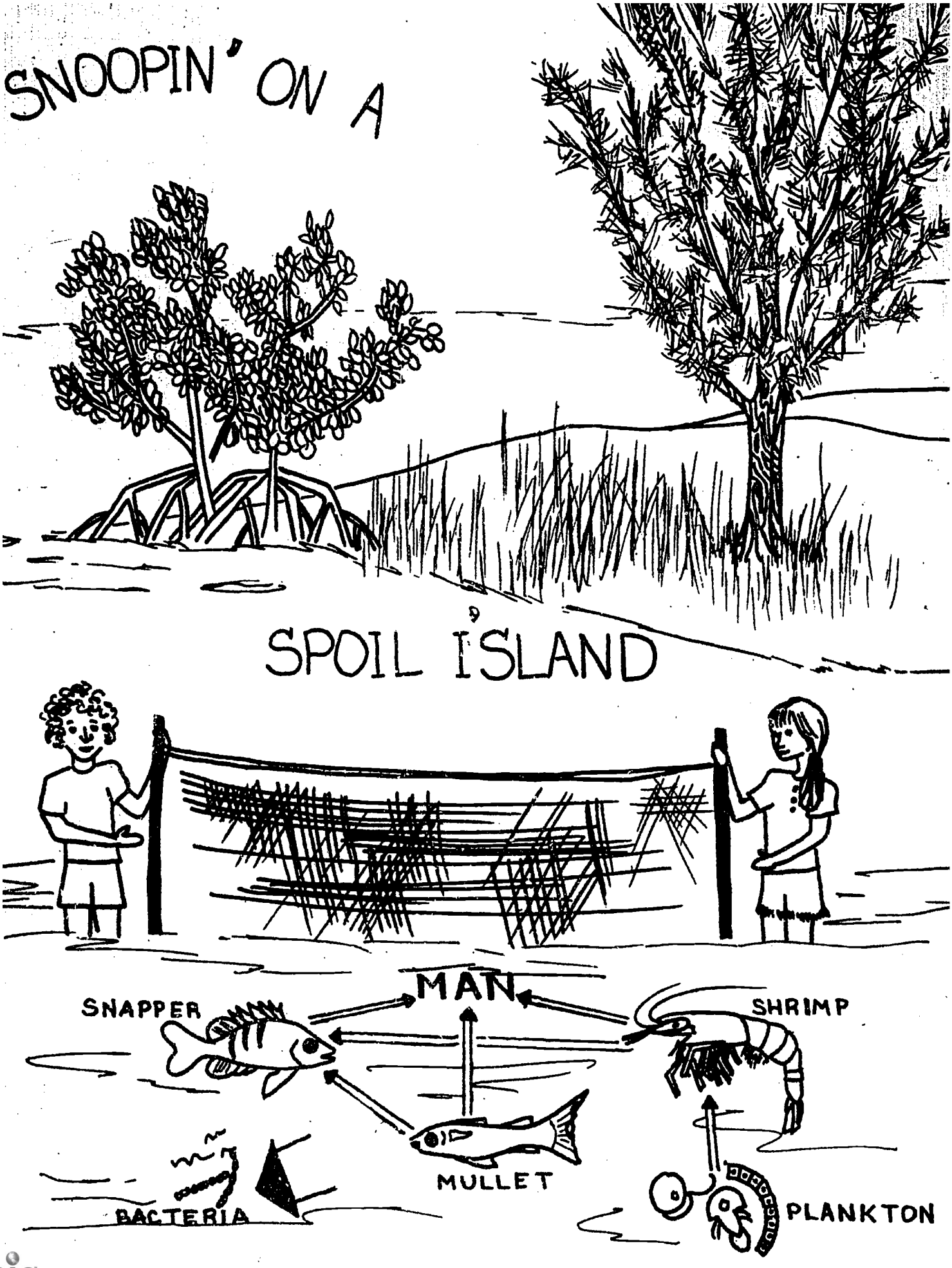
IV. LUNCH

At an appropriate time all students break for lunch. They bring their own lunches and have a picnic on the island.

V. BACK TO THE MAINLAND

Students don their life vests and all equipment is loaded back on board the boat. They are then transported via boat back to the dock where the bus picks them up and returns them directly to the home school.

SNOOPIN' ON A SPOIL ISLAND



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SNOOPIN' ON A SPOIL ISLAND

A. FOREWARD

This booklet presents to you the reasons for conducting an investigation of a spoil island in the Indian River. Your investigation will be concerned with:

1. physical factors or conditions of the island environment
2. organisms related to this environment
3. energy transfers (food webs) upon which the island environment depends
4. Environmental Center activities
5. transect lines: what, where, and how

A. Foreward (cont'd)

The materials that are necessary for you to do the three-day investigation are:

1. "SNOOPIN' ON A SPOIL ISLAND", to be read first because you are introduced to the unit and the procedures for the investigation.

2. "A SPOIL ISLAND IN THE INDIAN RIVER LAGOON", introduces you to the organisms you will find on the spoil island. Each organism is pictured and a brief natural history presented. The organisms are classified by their relationships to each other. A slide and tape set will accompany the booklet. It will help you identify the organisms.

3. "A SPOIL ISLAND, THE RIVER AND YOU: Relationships and Environmental Problems", discusses how you are interrelated to the river and what can develop if there is an alteration in the environment. There is also a slide and tape set to be used by the whole class when you first begin this booklet.

4. "ALTERATION OF PHYSICAL FACTORS: LAB", is the LAP you should use in your school before you come to the Center. You will actually alter various factors and observe the results.

5. DATA sheets for the actual spoil island investigation will be given to you on the island.

6. All the BOLD type and <u>underlined</u> words are the vocabulary words you must know. There are glossaries at the end of sections of the booklets. It is most <u>important</u> that you use these glossaries. If you do not know the words that are part of the investigations it will be difficult for you to understand what the investigation is all about.

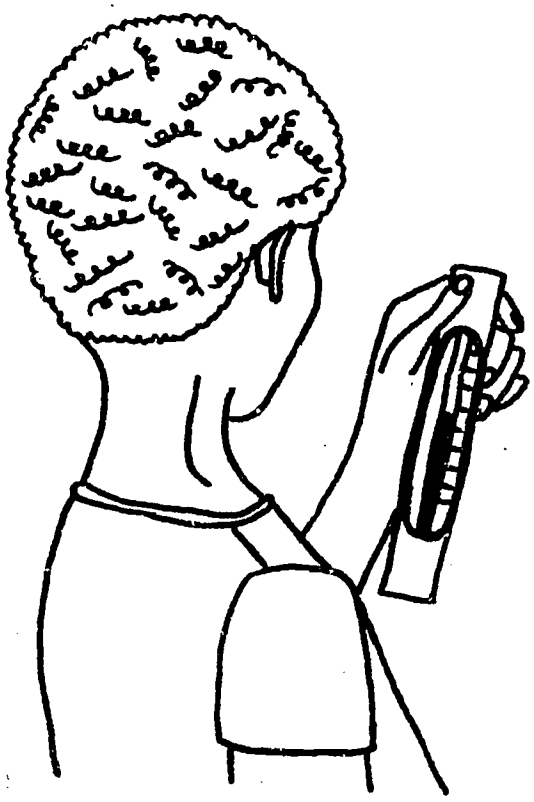
We hope you will enjoy investigating a spoil island.

B. INTRODUCTION TO THE SPOIL ISLAND INVESTIGATION

1. Why You Measure Physical Factors at the Spoil Island.

The spoil island you will study is related to the world about it through tides, currents, sun, winds, salinity, temperature and rainfall. These are physical factors. Every plant and animal is interrelated not only one to the other but to the PHYSICAL ENVIRONMENT as well. You will be asked to measure and record certain PHYSICAL FACTORS on and around the island.

You will be asked to construct a food web after your study of a spoil island. The next few pages will provide you some background information about food webs and INTERRELATIONSHIPS.

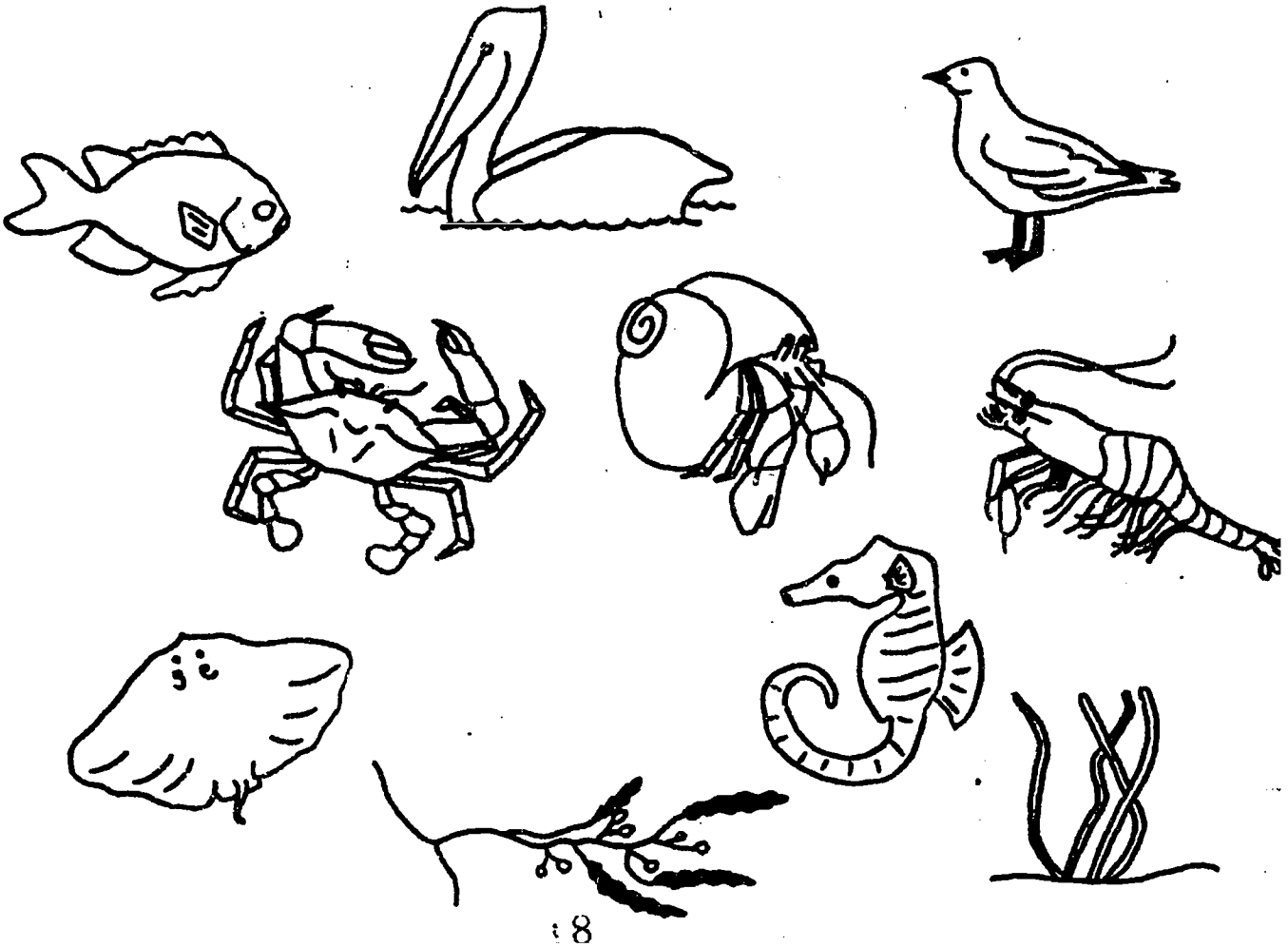


B. Introduction (cont'd)

2. Why You Collect and Identify the Organisms Found on a Spoil Island.

You will be collecting and identifying representative plants and animals you find on the spoil island. They are an important part of a spoil island investigation. The physical factors you will measure are conditions that the organisms find suitable for their existence. Once an organism is established it becomes part of the total environment of the island. Each organism has some relationship to others that find themselves on the island, either as food and/or shelter. All become related with one another and represent the island.

Some of the organisms that you will find are algae, grasses, trees, shrimp, varieties of crabs, birds and fish, etc.



B. Introduction (cont'd)

3. Why Are Certain Organisms on the Spoil Island?

Now if we begin to put our information together we can see not only what plants and animals were on the island but can begin to see why. Do you think it was because there is a certain climate? Salinity? Amount of grass? Number of pinfish? Is there a combination of all physical and biological factors interrelated in such a way that make conditions just right for our island?

If you said yes, of course you are right. The manatee grass is in the river because the temperature, salinity, amount of sun, and water depth are just right for that plant. In turn, the shrimp and pinfish find these conditions just right for them. Good food and a home are provided by the manatee grass.

B. Introduction (cont'd)

4. Why and How You Show Energy Transfers.

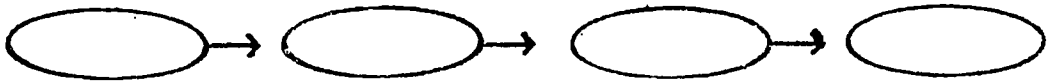
The fate of every animal on or near the island is to eat or be eaten. Plants, as you know, produce their own food through PHOTOSYNTHESIS. Plants are called PRODUCERS and the animals that eat the plants, PRIMARY CONSUMERS (herbivores); the animals that eat the primary consumers are SECONDARY CONSUMERS (carnivores) and so on. There are some animals and plants that live on dead organisms - these are SCAVENGERS or DECOMPOSERS. To show dependency relationships among some organisms on the island we can construct a food chain.

What is a food chain? First we simply consider food as an energy source. The pattern of transfer of energy from organism to organism is known as a food chain or even better an energy chain. Suppose in our seine net we find some shrimp, algae and fish. Who eats whom? The primary producer (green plant) is the algae. Shrimp eat algae. Fish eat shrimp, so we have a simple food or energy chain. We can designate an energy chain as below.

Note the arrow points to the consumer. A simple energy chain on land would be

See if you can put these four organisms into an energy chain.

man --- blue crab --- grass --- shrimp



Look at the last page to see if you were correct.

a. Which organism is the producer?

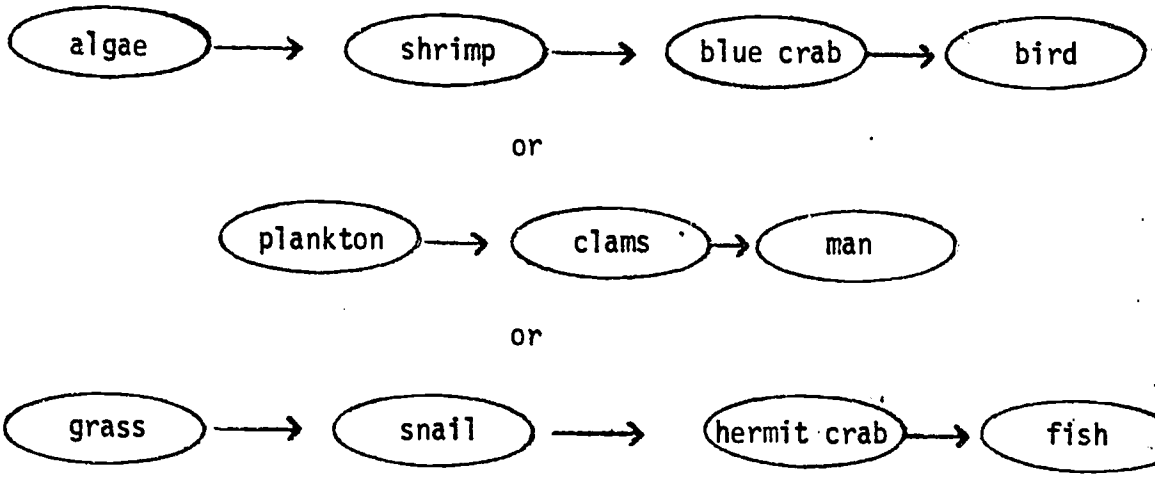
b. Which organism is the primary consumer?

c. Which organism is an herbivore?

CHECK YOUR ANSWERS ON PAGE 14.

B. Introduction (cont'd)

Suppose the organisms were:



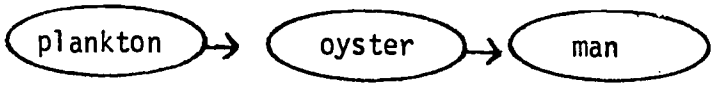
Look carefully at the food or energy chains above. Couldn't the bird also eat a crab or fish? Doesn't man also eat shrimp, crabs, fish and clams?

In other words some of the organisms could eat not only one organism, but several kinds. Actually in nature we have a group of energy chains linked (interrelated) and this we call a food or energy web.

B. Introduction (cont'd)

Below are two energy chains. Draw lines connecting the chains with any combination of producer, consumer and scavenger you can. Remember the arrow will point to the consumer.

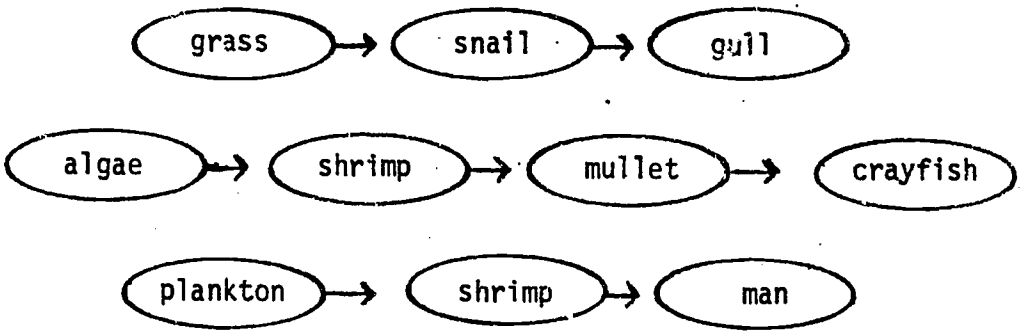
Example: shrimp → man



CHECK YOUR ANSWERS ON PAGE 14.

B. Introduction (cont'd)

Now that you have practiced try another one.



BASIC RAW MATERIALS BACTERIA, FUNGI DEAD ANIMALS, PLANTS

After you have connected all the organisms doesn't it resemble a web?

CHECK YOUR ANSWERS ON PAGE 14.

C. Environmental Center Activities

Transect Lines: What, Where and How:

On the first and second days of your visit the River Scout will take your class to the spoil island. There you will be divided into three groups of ten to do the measuring and data collecting. The groups choose either a water or land transect to do that day.

A transect is a line that crosses a fixed area along which measurements are made at intervals. You will use a 10 meter line marked in one meter intervals.

Transect Line

1 2 3 4 5 6 7 8 9 10

10 meters

You will measure and record physical factors and living organisms found along each meter.

The following equipment will be distributed depending on which type of transect you do that day.

Equipment:

thermometers
corers
hydrometers
seives
refractometer
buckets
dissolved oxygen kit
meter sticks
10 meter lines
anemometers
seine nets
clip boards with data sheets and pencils

a. Land Transect Study

(1) The physical factors you will be measuring are:

water table depth
water table salinity
water table temperature
water table dissolved oxygen
organic layer depth
soil temperature
air temperature
wind speed
wind direction
transect location

(2) The organisms are identified along each meter of the line and recorded on data sheets.

(3) After completing the entire land transect investigation all the land data is combined and recorded on a data sheet which represents the entire 10 meter transect line.

C. Environmental Center Activities (cont'd)

b. Water Transect Study:

(1) The physical factors you will be investigating are:

water depth	wind direction
water temperature	wind speed
salinity	air temperature
dissolved oxygen	

(2) The organisms along the water transect are sampled by seining in the area. Three sweeps are made. After each sweep the entire group helps identify and count the number of each organism. The identity and population of each organism is recorded on the data sheet for seining sweeps.

(3) After completing the water transect investigation all the water data is to be used to construct an ENERGY WEB. You will have to use a KEY using letter or picture symbols.

Example: Salinity .....S
Fiddler Crab .....FC
Cord Grass .....

The keyed data can easily be put on the Transect Line Data Sheet.

Example:

S 30 ppt T 80° F	0	M	FC 3
	1	M	
S 35 ppt T 81° F	2	M	FC 1
	3	M	
S 35 ppt	4	M	FC 10

Sampling

This kind of investigation is called sampling. You would not have time in the two days to collect and record information for the whole island. By sampling various areas and putting the information together you can get a pretty good idea of the island charactetistics. The transect line is only one of many ways we could do a sample.

C. Environmental Center Activities (cont'd)

ANSWER KEY

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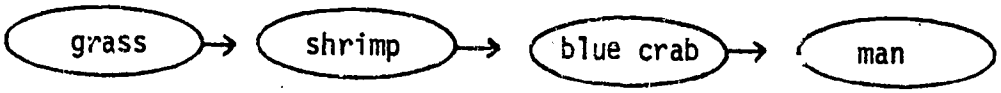

a. producer - grass

b. primary consumer - shrimp

c. herbivore - shrimp

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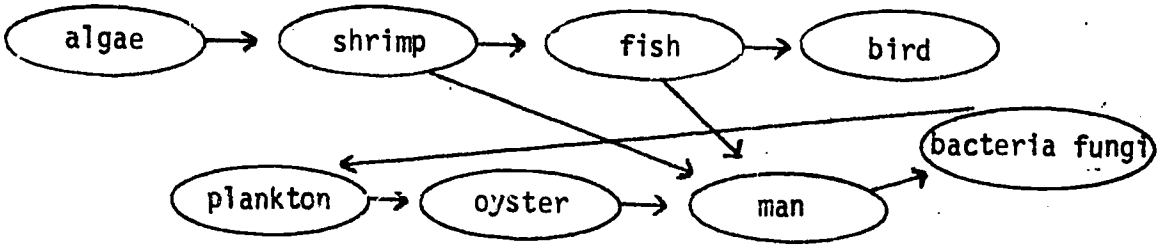

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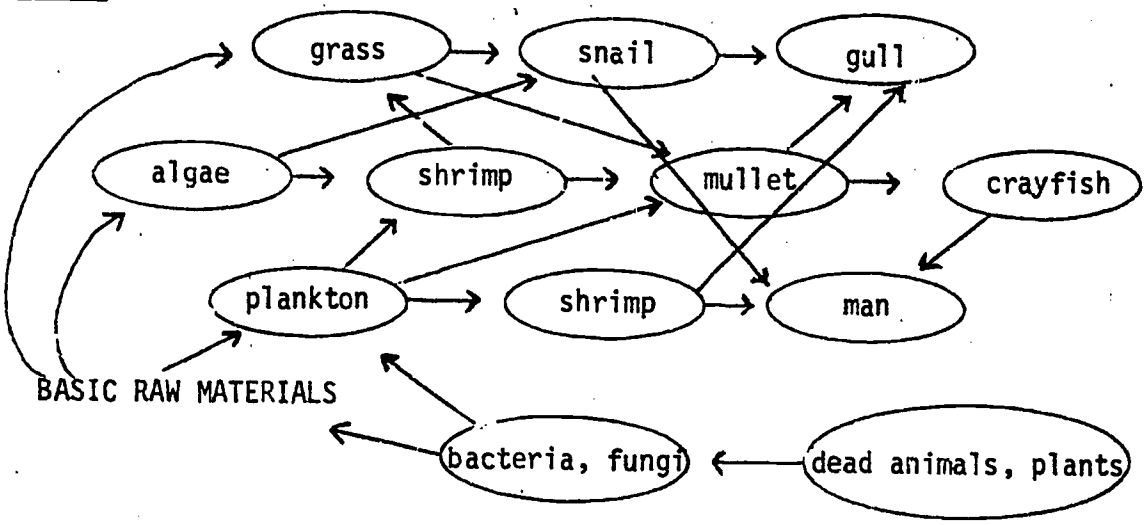

C. Environmental Center Activities (cont'd)

5. GLOSSARY

DATA - information organized for analysis

DECOMPOSERS - organisms such as bacteria and fungi that cause dead plants and animals to decompose into their chemical parts

ENERGY - forces that maintain life - examples are chemical, heat, electrical, mechanical and nuclear

ENERGY WEB - pattern of transfer of energy within a community

INTERRELATIONSHIP - dependency of one thing on another

METER - a unit of length in the metric system of measurement

ORGANISM - any plant or animal

PHOTOSYNTHESIS - a process of green plants making their own energy

PHYSICAL FACTORS - conditions of an area such as temperature, rainfall, amount of sun, oxygen, that determine an environment

PLANKTON - free floating, generally microscopic, plants and animals found in waters of the world

PREDATOR - an animal that preys or eats other animals for food

PRIMARY CONSUMER - an organism that gets its energy directly from a producer

PRODUCER - an organism that makes its own energy using sunlight, CO_2 and H_2O

SCAVENGER - an animal that feeds on dead animal flesh or plants

SECONDARY CONSUMER - an organism that gets its energy indirectly from a producer. An example would be beef steak -- man

SUCCESSION - living things that follow other living things as the conditions of the environment change.

TRANSECT LINE - a line that crosses a fixed area along which measurements are made at intervals.

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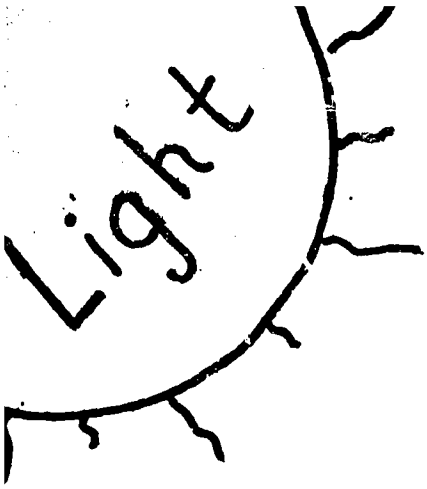
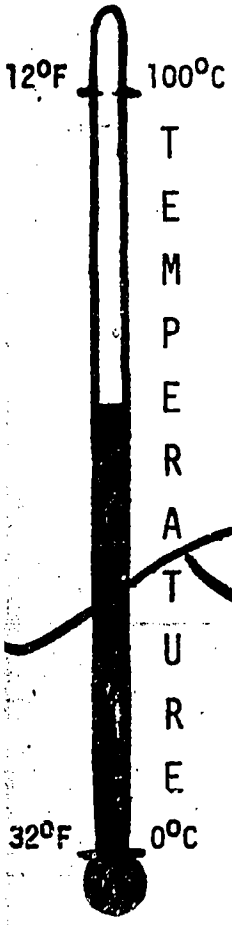


Group _____

Name _____

ALTERATION OF PHYSICAL FACTORS



Air

Water

Soil

Seventh Grade

ALTERATION OF PHYSICAL FACTORS

Physical factors are conditions of an area or place which determine the type of life that develops within the area.

Your class will be divided into four groups and each group assigned to one of four stations in the lab. We will work with only some of the possible physical conditions that affect our environment.

1. We want you to observe some alterations of physical conditions and record your observations. Then draw a conclusion as to the effect of the alteration.

2. You will set up some suggested experiments that will alter the physical environment of a plant or animal. Then draw a conclusion from the experiment.

THE FOUR EXPERIMENT STATIONS

Station A SOIL

1. Does soil type affect plant growth?
2. Do plants grow better with additional minerals and food? If so, how much?
3. What sizes are the particles that make up a measured sample of soil?

Station B WATER

1. What is the effect of water on plant growth?
2. What effect on respiration does changing temperature have on a fish?
3. What are the effects of fresh and salt water on parts of a potato?

Station C TEMPERATURE

1. Does temperature of the soil help determine what organisms will be found?
2. How much energy can various foods provide?

Station D LIGHT

1. How do plants respond to various types of light? No light?
2. Is light necessary for a green leaf to photosynthesize (make starch)?

SOIL

A. Bean seeds are planted in three (3) pots -- each pot containing a different kind of soil. Each potted plant receives equal amounts of light and water.

1. In Centimeters (cm) measure the height of the plant

   Plant A (sand) _____ cm

   Plant B (loamy) _____ cm

   Plant C (clay) _____ cm

2. General condition of each plant

	# of leaves	color of leaves
Plant A	_____	_____
Plant B	_____	_____
Plant C	_____	_____

3. Conclusion (Why?) _____

B. Bean seeds are planted in two (2) pots. Each pot has the same soil and receives the same amount of water and light. Plant A receives fertilizer (6-6-6). Plant B receives no fertilizer.

1. Measure height of each plant

   Plant A _____ cm

   Plant B _____ cm

2. General condition of plants

	# of leaves	color of leaves
Plant A	_____	_____
Plant B	_____	_____

3. Conclusion _____

Alteration of Physical Factors (cont'd.)

C. Sand sieve - The size of the individual particles which make up the soil is determined by a calibrated sieve with five (5) sections. The top section (#1) has the largest mesh to hold coarsest or largest particles. The bottom section (5) has the mesh for the fine or smallest grains.

A 400 ml beaker of soil is placed in the top section. It can be washed through if the sample is wet, or shaken through if the sample is dry. The soil that is left in each section is placed in a baggie and labeled with section #, student name, and collection area.

To determine the percentage of each grain size in the sample:

1. Weigh each sample of soil
2. Record the weight of each soil sample
3. Add all the weights together
4. Divide the weight of each sample by the total weight of all the samples
5. Step 4 will give you a decimal number. Multiply that number by 100 and you will have the percentage of the total weight for each section.

#1 weight _____ % _____ very coarse

#2 weight _____ % _____ coarse

#3 weight _____ % _____ medium fine

#4 weight _____ % _____ fine

#5 weight _____ % _____ very fine

Total weight _____ Total % 100%

WATER

A. 2 plants under identical conditions except one with a continual supply of water.

1. Measure in cm the height of each plant

Plant A (regulated watering) _____ cm

Plant B (continual watering) _____ cm

2. General condition of plants

	number of leaves	color of leaves
Plant A	_____	_____
Plant B	_____	_____

3. Conclusion _____

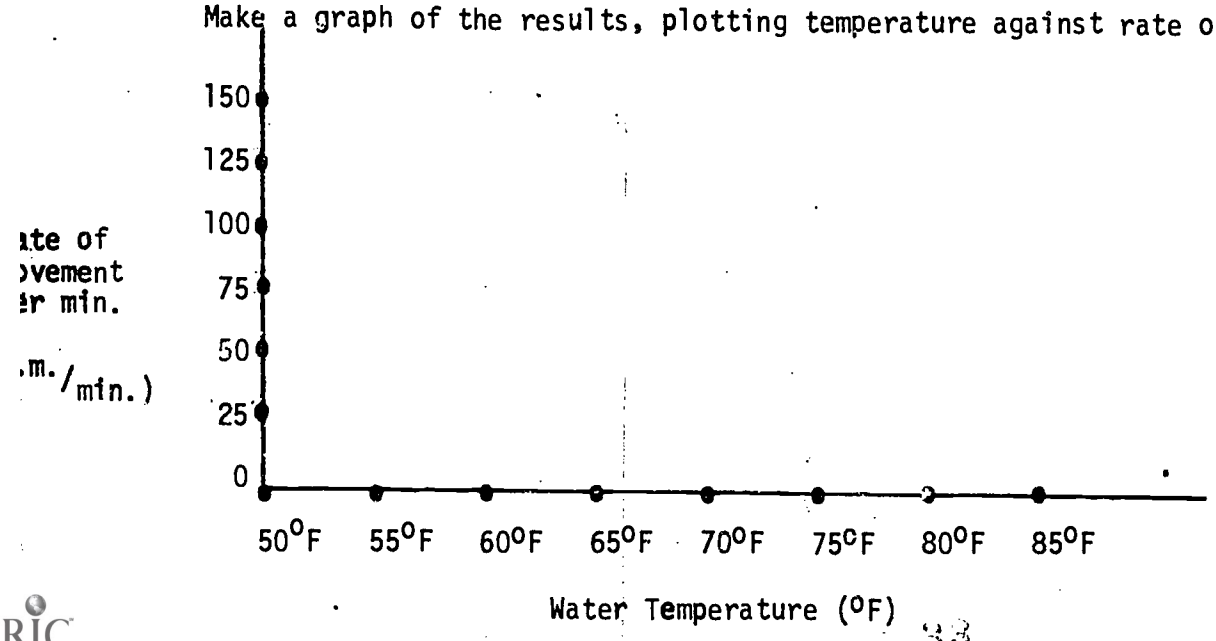
B. Fish adjustment to water temperature change

1. Before doing anything to the water the fish is in, take the temperature. Record. Count the number of gill movements in one (1) minute. Record the number of movements.

2. Now lower the termperature 5 - 10° by slowly adding pieces of ice. Make sure not to hit the fish with the ice or the thermometer. Count the number of gill movements. Record.

3. Repeat the above procedure at least once more. Record your results. Make sure not to lower the temperature much below 50° F.

Make a graph of the results, plotting temperature against rate of movement.



C. The effect of fresh and salt water on parts of a potato is compared -

1. Slice a potato into three parts (sections)
2. Weigh the two (2) outer sections together. Record.

   Weight the center section. Record
3. Place the outer two (2) sections in fresh water and the center section in salt water.
4. After 15 minutes, try to assemble the potato into its original shape.
5. Record your results.

Weight of Outer Section	Weight of Center Section
(before being placed in fresh water) _____ g (after being placed in water) _____ g	(before being placed in salt water) _____ g (after being placed in water) _____ g
Condition of Potato	Condition of Potato

6. Conclusions _____

* If time permits:

1. Reverse the potato sections: place the two (2) outer sections in the salt water and the center in the fresh. Leave in water 15 minutes.
2. Record the results.

   a. weight of two (2) sections (in salt water)

   _____

   b. weight of center (in fresh water)

   _____
3. Try to explain your observations.

TEMPERATURE

A. Soil temperature in three different soil locations

1. Pick up your thermometers and data sheets. On campus, select several areas such as sunny, shady and partial shade. Take the temperature of the soil in each area and record below.

2. Record your readings.

Shade	Sun	Partial Shade
1. _____	1. _____	1. _____
2. _____	2. _____	2. _____
3. _____	3. _____	3. _____
Total _____	Total _____	Total _____
Average _____	Average _____	Average _____

3. Answer the following questions.

a. Would removal of the trees change the environment? _____

b. In which area did the plants grow best? _____

c. Which area had most evidence of animal life? _____

d. What factors other than temperature could have caused the environment to be different?

_____

_____

_____

B. Measuring energy in food (READ CAREFULLY)

How much energy can various food provide? One way to measure energy in food is to determine the amount of heat produced when a food is burned. Heat energy is measured in units called calories.

A calorie is defined as the amount of heat needed to raise temperature of 1 g of water 1^{o} C.

How many calories are required to raise the temperature of 25 ml of water 4^{o} C. Since 1 ml of water weighs 1 g you simply multiply 25 x 4 = 100 calories.

Because a calorie is such a small unit of heat, scientists also use a larger unit called a kilocalorie. A kilocalorie is sometimes written Calorie (capital C) and is equal to 1000 calories. To convert calories to kilocalories, divide by 1000. Most people really mean kilocalories when they speak of food energy, using the word calorie.

1. Select a sample of nut that weighs about 0.3 g and record its weight

   Actual weight of nut _____ g

2. Pour 50 ml of water into the flask. Put the flask in the top of the can and hold with a test tube holder.

3. Put a weighed sample on the pin.

4. Measure and record the temperature of the water in the flask.

   Water temperature _____ ^{o} C

5. Use a match to light the sample. Put it under the flask about 2 cm from the bottom. When the food is burned, measure and record the temperature of the water in the flask.

   Water temperature (after burning) _____ ^{o} C

6. To find the number of calories, multiply the amount of water heated times the degree of temperature change.

_____ ^{o} C Water temperature after burning

_____ ^{o} C Water temperature before burning

_____ ^{o} C Amount of heat change

Amount of heat change		Amount of water heated	
_____ ^{o} C	x	_____ ml of H_2O	= _____ cal/g

7. To convert calories/gram to kilocalories/gram, divide your answer from #6 by 1000. This answer then is the approximate # of calories in 3/10 gram of nut.

Calories/gram

_____ cal/g ÷ 1000 = _____ kilocalories (C)

8. Why might your calorie value not agree with calorie values in a book?

LIGHT

A. 3 plants in which conditions are all the same except light in which they grew

Plant A - in normal light

Plant B - in the dark

Plant C - in black light

1. Measure in cm the height of each plant

Plant A	Plant B	Plant C
_____ cm	_____ cm	_____ cm

2. General condition of plants

Plant A	Plant B	Plant C
# of leaves _____	# of leaves _____	# of leaves _____
color _____	color _____	color _____

3. Conclusions:

_____

_____

B. Is light necessary for the leaf to make starch?

Some of the geranium leaves on the plant outside have been partly covered with foil for 1 day. You will test the leaves for starch.

1. Get one of these covered leaves and remove the foil.
2. Place the leaf in a beaker and add 100 ml of water. Bring the water to a boil. Remove the leaf when it softens. Turn off the burner.
3. Place the soft leaf in a smaller beaker. Add enough alcohol in the beaker to cover the leaf.
4. Place the smaller beaker containing the leaf and alcohol into the larger beaker o hot water.

   Caution: DO NOT heat the alcohol directly on the hot plate; alcohol is flammable
5. Heat until the water begins to boil.
6. Remove the smaller beaker.

7. Gently swirl the leaf in the alcohol. When the alcohol turns green, remove the leaf. (Repeat Step #3). If the leaf is still green the leaf will be brittle, so handle with care.

8. Now place the leaf in a dish and cover with iodine.

9. Allow the leaf to remain a minute or so, then remove to let dry.

   Iodine is a test for starch. If starch is present in the leaf it will stain blue-black. If no starch the leaf will stain brown.

10. Results of iodine test:

    a. leaf with no light _____

    b. leaf with light _____

11. Conclusion:

_____

_____

_____

Seventh Grade

A SPOIL ISLAND, THE RIVER AND YOU

Relationships and Environmental Problems

TABLE OF CONTENTS: RELATIONSHIP TOPICS

INTRODUCTION

The animal and plant life that has developed in the Indian River environment is dependent upon the PHYSICAL FACTORS or CONDITIONS of the river for its survival. (Physical Conditions are the non-living factors.)

The relationship between the river conditions and the life it contains is a dependent one. For example: mangroves grow along salt water shores. The mangrove is dependent upon a certain amount of salt in the water. Alter the amount of salt (the SALINITY) and the mangrove is affected. This is a RELATIONSHIP.

You depend on the river for certain kinds of fish. These kinds of fish need the salty waters of the Indian River to begin life. Alter the amount of salt (SALINITY) and these fish are affected. At the same time you are also affected. If these fish are not as available as they were, fishing for them is changed. This is a relationship.

The first part of "A SPOIL ISLAND, THE RIVER AND YOU" is the development of some of the relationships between you and the Indian River.

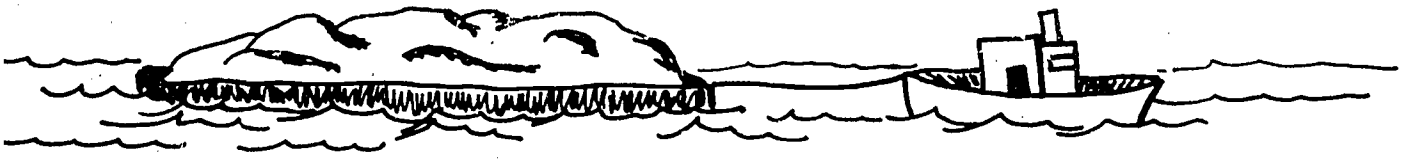
The second part of the booklet presents problems that have or can develop from altering some of the PHYSICAL CONDITIONS of the river. When these conditions are altered it means that the environment has been altered or interfered with. Interference will affect relationships established in the river environment as well as those between man and the river. This same effect is dependent on the degree of the alteration.

Now begin the RELATIONSHIPS!

Make sure to read the TABLE OF CONTENTS. Think about each topic.

The words in BOLD type and/or underlined are words you should know. They are explained at the end of each section.

TRANSPORTATION

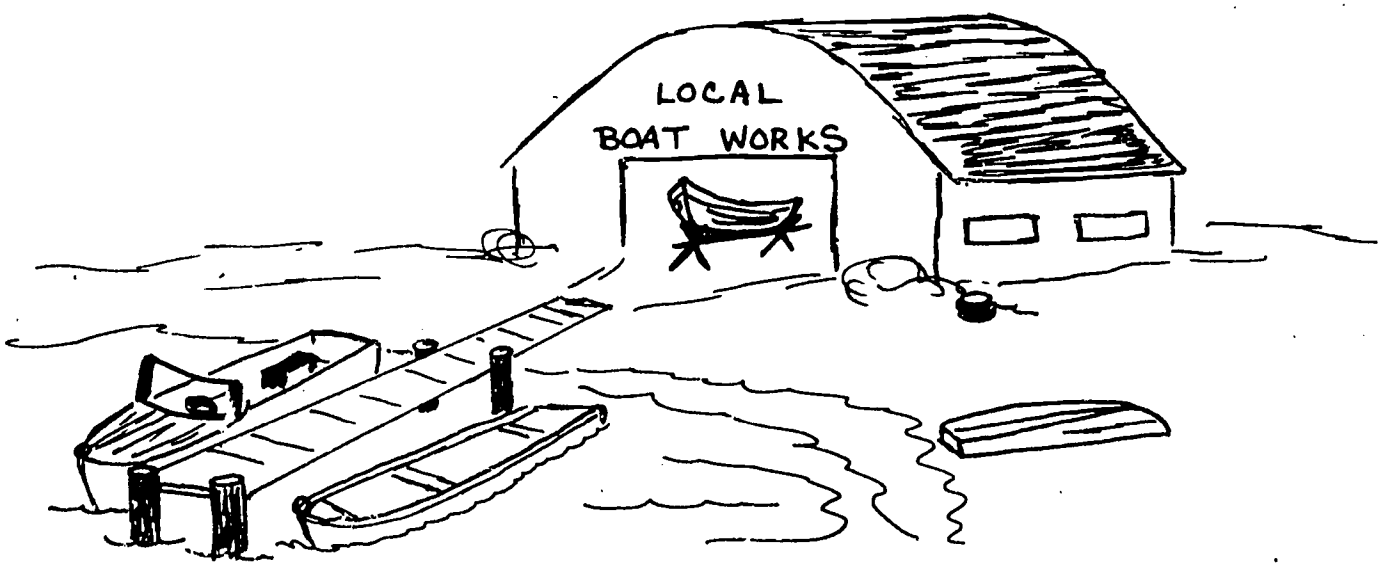


How do you get to the spoil island?

How did people get to Hutchinson Island before the causeways were built across the river?

The Indian River is part of the Intracoastal Waterway. What else is it used for?

INDUSTRY

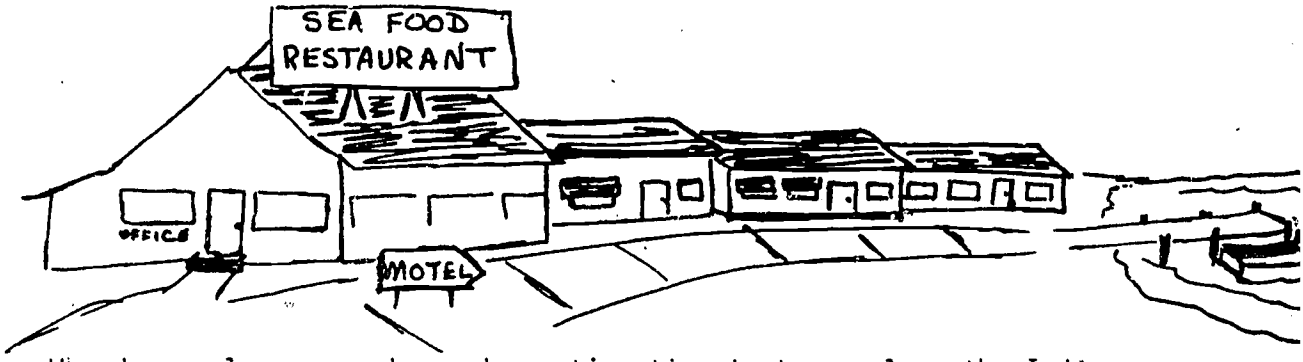


Who makes a living from the Indian River, and why?

An INDUSTRY is any business that for profit, provides products or services needed and wanted by people.

What industries have developed because of the Indian River?

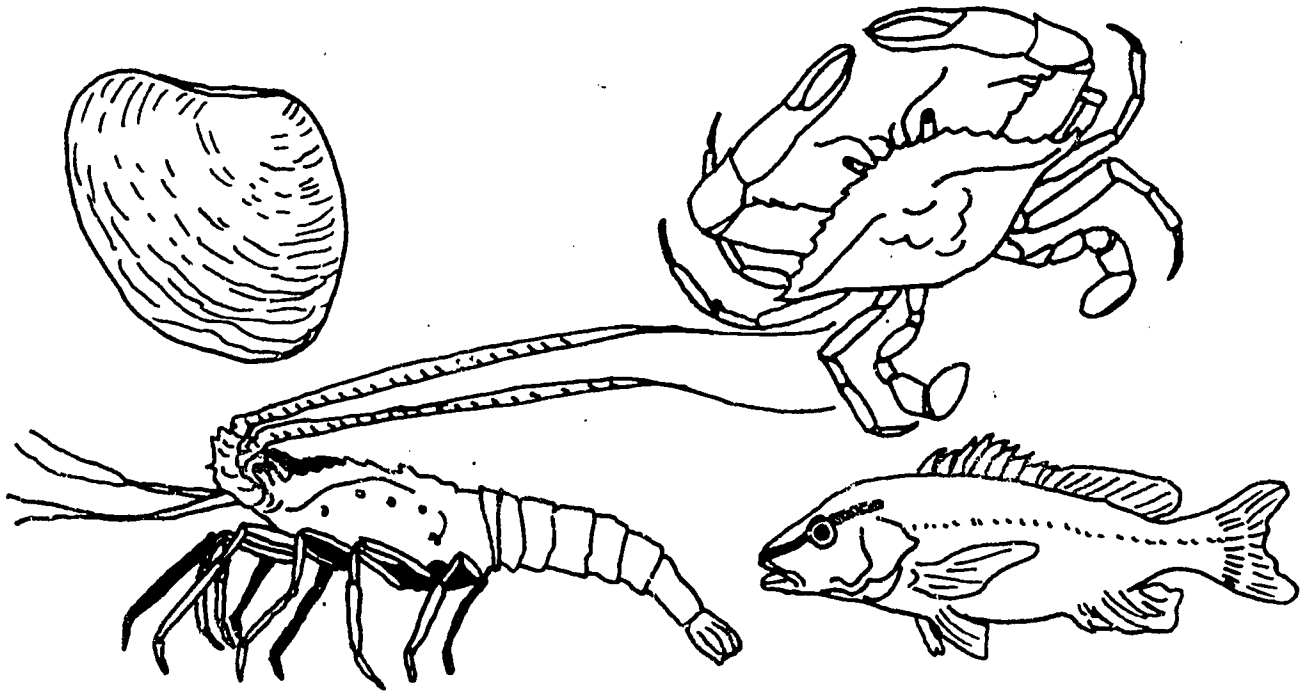
TOURISM



Why do people come and spend vacation time in towns along the Indian River?

What do the tourists provide the towns in return when they visit?

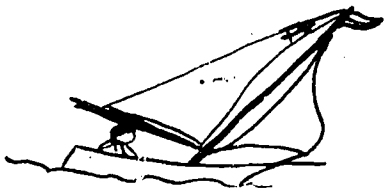
FOOD

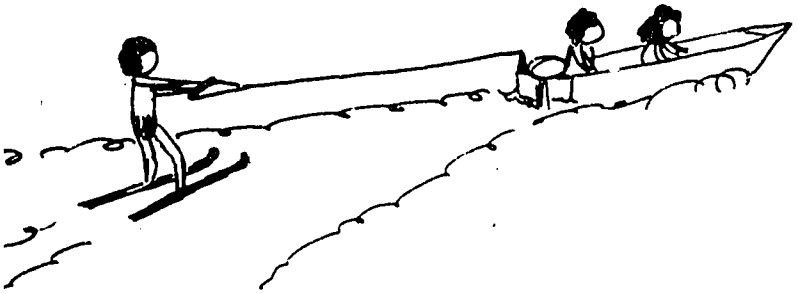


What foods are obtained from the Indian River? Name some.

Now think! Where are these foods found? Do the animals you eat for food live in the river all the time <u>OR</u> do some migrate to the ocean when grown?

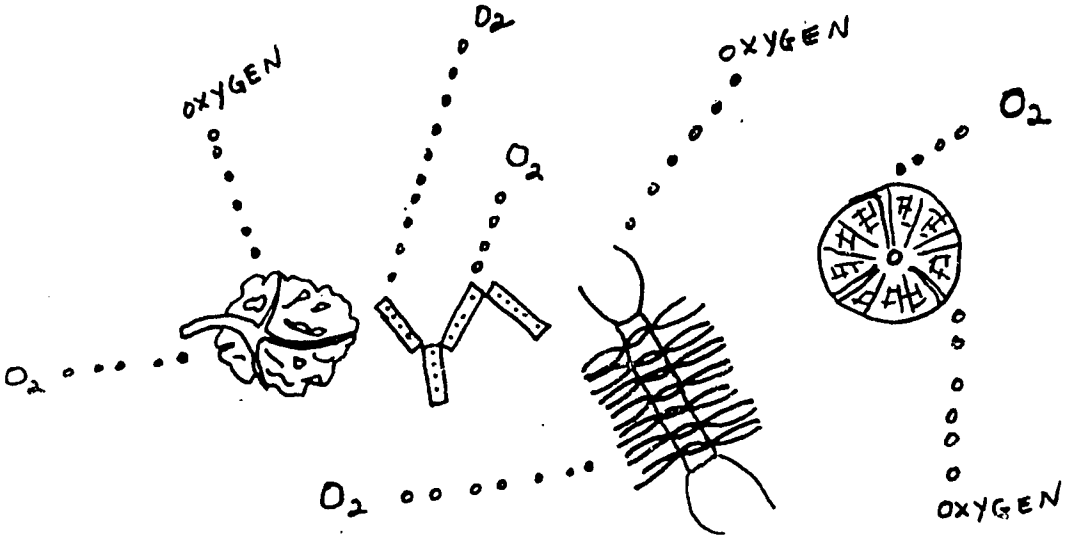
RECREATION





What fun or enjoyment is available because of the river?

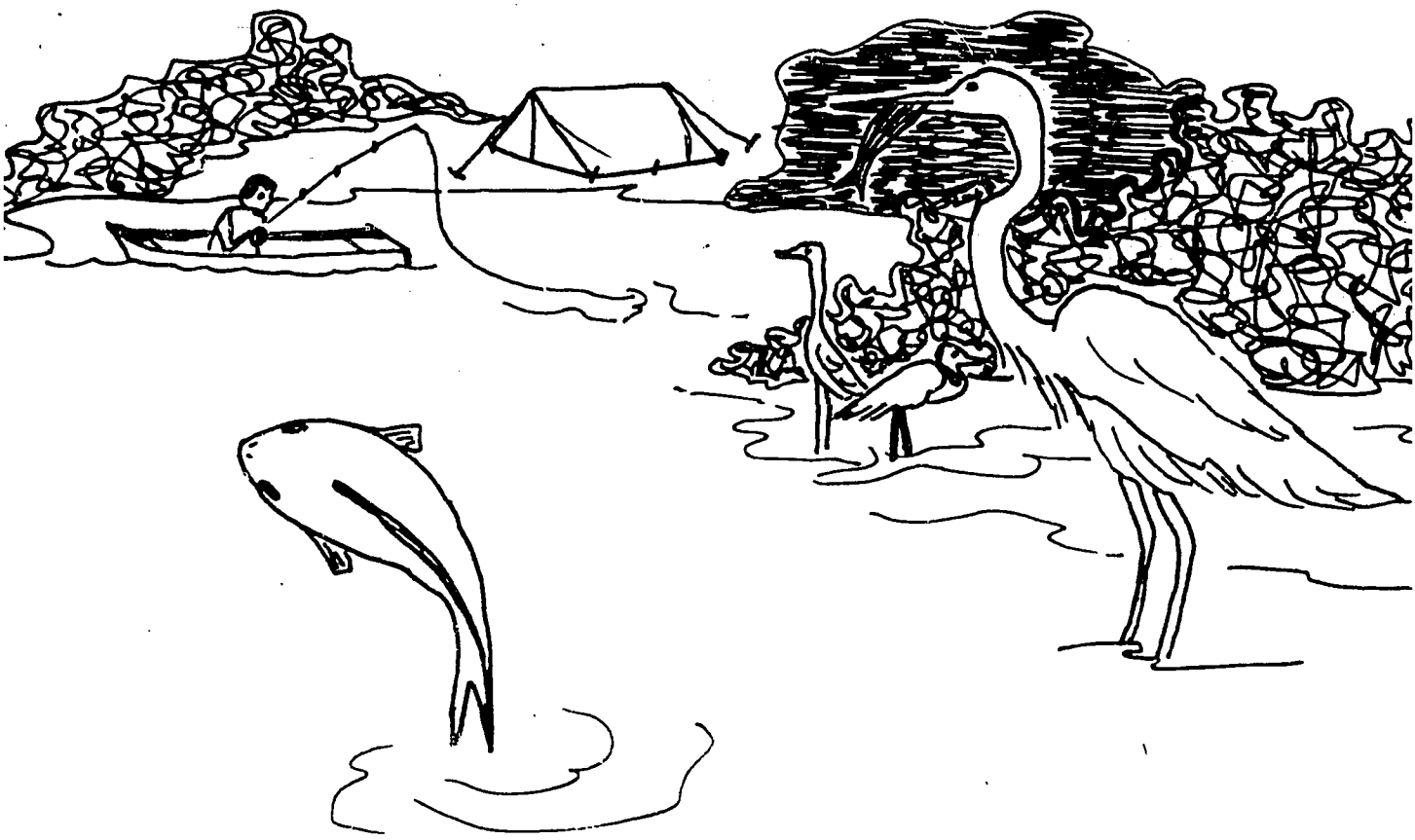
OXYGEN



Most of the oxygen you and all other life uses is released by plankton. Much of PLANKTON lives in waters like the Indian River.

All of the NUTRIENTS needed by plankton are provided by water that naturally runs off the land. The Indian River receives much water run-off naturally along its banks. NUTRIENTS are also brought into the Indian River by the flushing of the banks by the tides.

ASTHETIC



An asthetic relationship is explained by asking you questions.

How do you "feel" about the Indian River or the Spoil Island? Do you see beauty there?

Why would you or anyone camp on a spoil island? Why would anyone want to?

Do you see any beauty in the life forms in the river or along its banks?

Do you have any feeling for these living things? Why?

SUMMARY OF RELATIONSHIPS

So far we have explored RELATIONSHIPS by seeing how the river relates to you.

How are you related to the Indian River?

Do you depend on the river for anything?

Does the Indian River depend on you? On man?

What are some of the relationships?

VOCABULARY: Relationships

ASTHETIC..... what is considered beautiful

BRACKISH ..... fresh water that has salt water intrusion

ENERGY ..... the ability to do work; any force or power

ENVIRONMENT ..... the surroundings in which a thing exists

HABITAT ..... the area an organism lives in

INDUSTRY ..... a business where a product is sold for profit

NUTRIENTS ..... anything that helps growth or development; food

PHYSICAL FACTORS ..... the non-living conditions of an environment that affects its life

PLANKTON ..... the free floating or drifting life of the water

RELATIONSHIPS ..... a logical or natural association between two or more things

SALINITY RANGE ..... the amount that the salt changes in one area

SPOIL ISLAND ..... an island made in the Indian River as a result of dredging the intracoastal waterway

TABLE OF CONTENTS: ENVIRONMENTAL PROBLEMS TOPICS

ENVIRONMENTAL PROBLEMS

What happens to the grassflats that provide the HABITAT for the young gamefish, etc. IF their normal physical conditions are altered by pollution?

What happens to the oxygen supply if the NUTRIENTS the grassflats need to survive, are CONTAMINATED?

If there is destruction of grassflat and mangrove areas by any means, how will this affect the

TOURISM?

BAIT SHOPS?

BOAT BUILDING?

SEA FOOD RESTAURANTS?

Begin Environmental Problems. Read the TABLE OF CONTENTS. Think how each topic could affect a relationship.

The BOLD TYPED and/or underlined vocabulary words are at the end of the section.

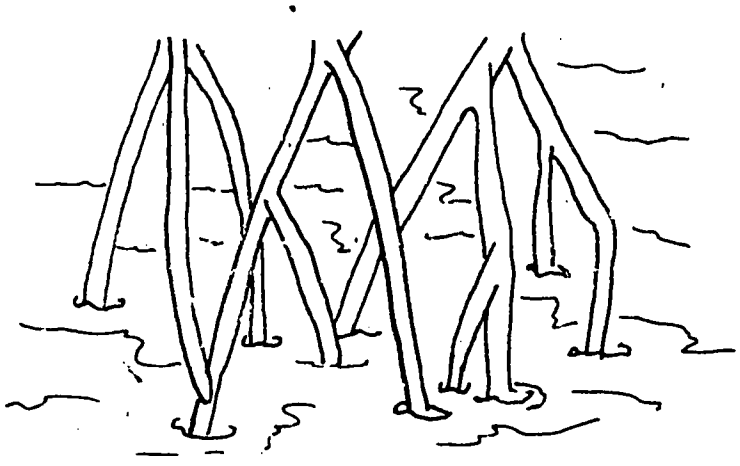
MANGROVE DESTRUCTION

The dominant land building plants along the Florida shores are the MANGROVES. They develop here because of the tropical climate and the limestone above which they grow. This limestone is the result of compression of layers of bones and shells from the sea life that once lived above the Florida peninsula when it lay beneath the sea. But the unique quality of the mangrove is that it must grow in or near salty waters.

The mangroves are trees. There are three trees grouped as mangroves -- the red, black and white. Their main link is that they need salt to grow. Red mangroves are usually along the intertidal zone. Black mangroves are in the area of the outlying shores reached by the high tides or in the shallow pools left by the receding tide. These areas are exposed to the sun. The sun evaporates the water leaving the salt behind. The salinity around the black mangrove is higher than the river water. White mangroves tolerate the least amount of salt so are more often seen along shores of most brackish waters. Let's take a closer look at each of these unique land securing plants.

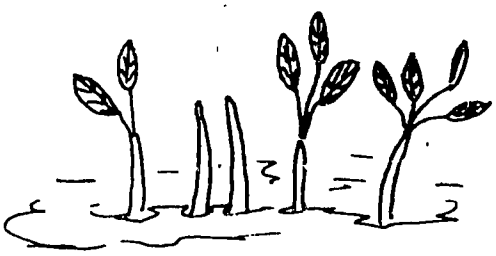
RED

The red mangrove can be easily recognized by the prop roots that reach like long winding fingers into the waters along the banks. These long aerial roots growing from the tree limbs reach out and down into the water.



Surrounding these roots is a thick, rich muck full of detritus, the trapped decaying remains of animals and plants. The nutrients needed by algae etc. are returned to the soil and water by this decaying process. The building and layering of this detritus may form peat to a depth of 10 to 20 feet.

The leaves are long and a dark waxy green. The long bean shaped seeds hang from the leaf stem.

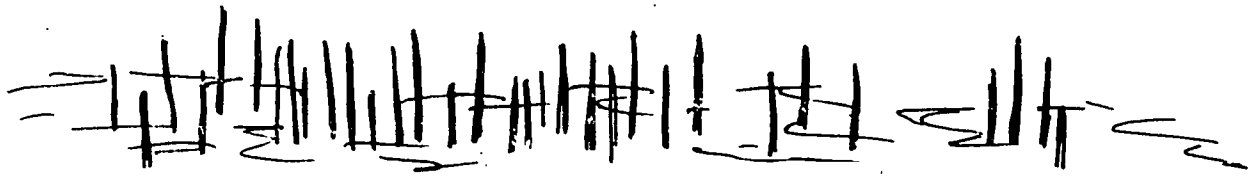


When they are about one foot in length the young seedlings drop into the water below the tree. In the water the seeds float along until the sharp root tip is trapped in the bottom and can begin to root.

The bark is smooth and has a dark reddish cast. The size of the tree depends on how well it can establish itself. It can range from scattered shrubs to thick jungly masses.

BLACK

The black mangrove is easily distinguished from the other mangroves by the pneumatophores. These are breathing, tube-like roots which surround the tree. These "breathers" stick straight up about 5 to 6 inches from the ground or to the water's surface when the tide is high.



Like the red mangrove's prop roots, the breathers of the black mangrove trap the detritus and in time build up the land.

The leaves are shorter and a darker green than the leaves of the red. But when you look at the tree you will notice some of the leaves look gray or silvery. These silvery leaves are really the black mangrove leaf-backs. It is caused by salt deposited there by the tree.

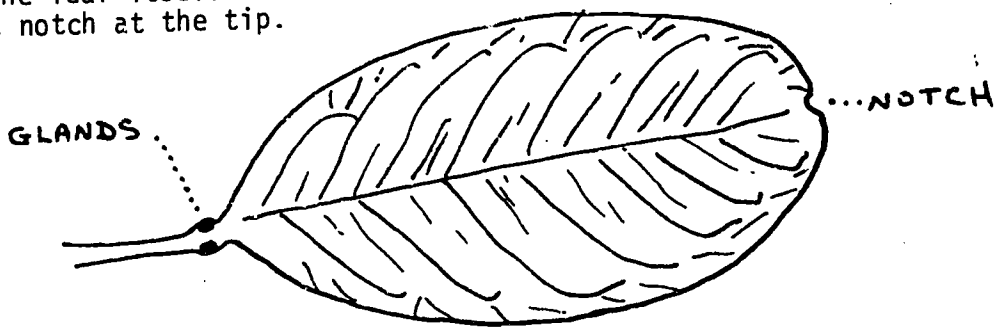
The bark is dark and rough. The size of the tree can range from a shrub to a heavy trunked shading giant.

WHITE

The white mangrove is distinguished from the others by a close look at the leaves. At a distance you can pick out the white mangrove along the brackish waters by the yellow green leaves. They stand out against the darker greens of the red and black.

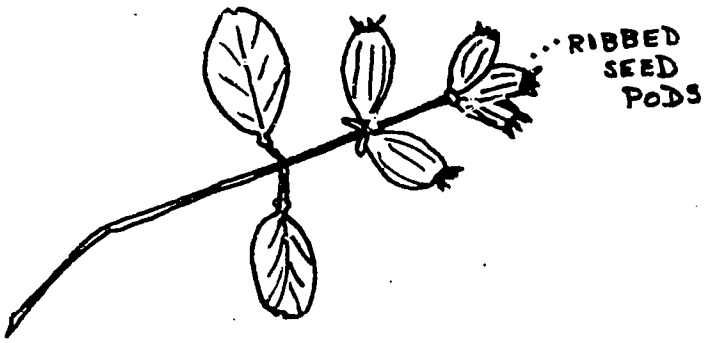
There are a few prop or breathing roots to flag your attention. But along the banks on which they grow the subground roots brace against the eroding soil.

The leaf itself is distinctive. The shape is rounder and waxy and has a slight notch at the tip.



At the base of the leaf are two swellings. These are glands that rid the white mangrove of its salt.

The bark is smooth and a yellowish gray. The tree is usually shrub-like but when large, the white mangrove is lean and tall.



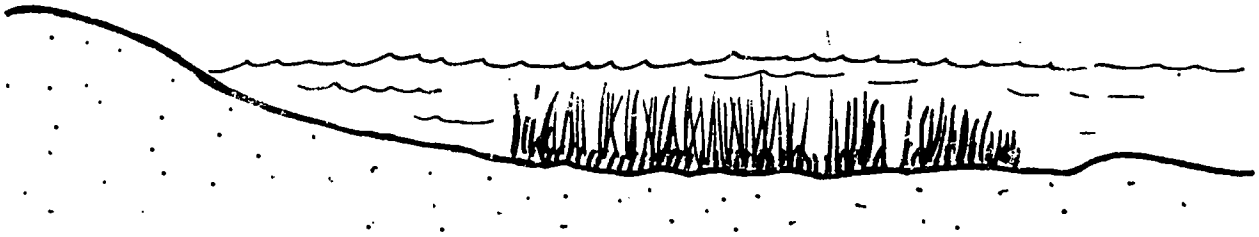
If you were asked, "Of what importance are the mangrove trees to you, to Martin County, to Florida, to the land?" What would you say?

GRASSFLAT HABITAT AND ALTERATION

What are grassflats? Actually nothing but areas in a water environment where grass grows. Two requirements are necessary, though, for these flats of grass to grow.

1. Grass is a green plant that has roots, so, of course it needs a place for the roots to secure themselves, like soil or a substrata of mud, sand and/or broken shells.

2. Grassflat grass is found in water, so, water must be present. How much? Remember green plants need the sunlight ENERGY to manufacture food (photosynthesis). Therefore, water must be shallow enough for the sunlight to reach the grass, but deep enough to cover most of the grass all of the time.



Now what are the two conditions necessary for grass to grow in the Indian River?

These are PHYSICAL FACTORS of grassflat development:

1. some type of soil for the grass root to anchor

2. water deep enough to cover the grass but shallow enough to allow sunlight to reach the green blades

What are PHYSICAL FACTORS?

Physical factors are conditions of an area or place which influence the type of life that develps within the area - or HABITAT.

For example the kinds or types of grass that grow in the Indian River habitat are determined by the physical factors of the river:

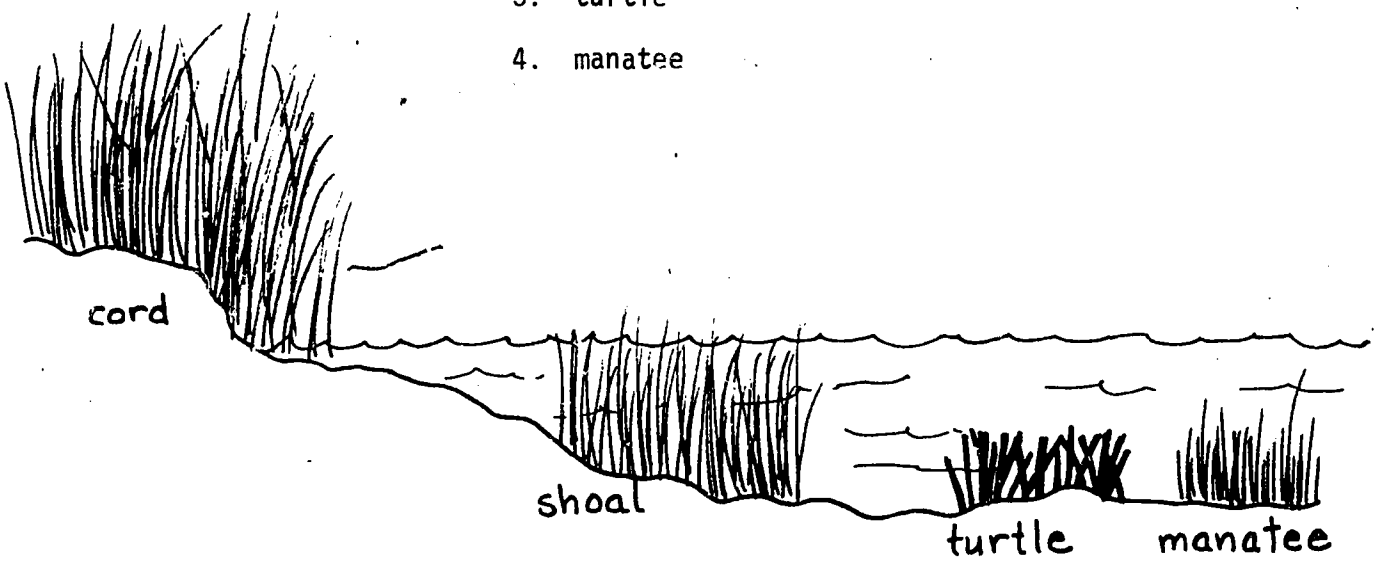
1. Current speed
2. Temperature range of water and air
3. Pressure
4. Salinity range
5. Oxygen dissolved in water
6. CO_2
7. Minerals available

The kinds of grass growing in the Indian River area you'll be investigating depend for development on the following physical factors.

1. slow current
2. tropic temperatures
3. salt water
4. depth (generally shallow)

The types of grass growing on the Indian River bottom and their approximate locations are shown below:

1. cord grass (long & short)
2. shoal
3. turtle
4. manatee



What kind of habitat or home do you think is offered by the grassflats?

What do you think lives in this grassflat habitat? Remember, the water is shallow enough for the sunlight to reach the grass and the current is slow. The tides and rainwater run-off constantly alters the salinity.

Do you think grassflat animals are large or small?

Why is the grassflat habitat often refered to as a <u>nursery</u>?

The animal life ranges from the micrcscopic zoo plankton to crustaceans (blue crabs, lobsters, horseshoe crabs, shrimp, barnacles), mollusks (snails, nudibranchs, clams), immature fish forms (snappers, blues, pompano, barracuda, cat, flounders, snook, groupers) tc the adult fish forms (sea horses, pipefish, stingrays, mullet, minnows, puffers). Egg masses of much of the animal life just mentioned are often attached to the grass blades, while the larva form of many others swim among them. Other plant forms also develop in the grass-flat habitats - phytoplankton and larger algae (sea lettuce, sargassum, etc.)

If these grassflats are altered, what could result?

For example:

1. lowered salinity
2. dredging of a nearby area
3. construction of a structure which reduces or prevents light from reaching the grass
4. daming or obstruction of the water flow

Many of the animals inhabiting the grassflat are sources of food for you and me.

Do you know why? What is provided in their meat?

What happens to the inhabitants of the grassflat when the physical factors are altered?

FRESH WATER INTRUSION

Did you know fresh water could be considered a POLLUTANT?

Suppose you were a baby lobster that had been hatched in the Indian River nursery. You can TOLERATE a SALINITY RANGE of 20 ppt to 40 ppt.

What do you think happens if for some reason the salinity is greatly reduced?

There are many organisms such as the lobster living in the river that cannot tolerate a drastically reduced salt content.

ST. LUCIE LOCK

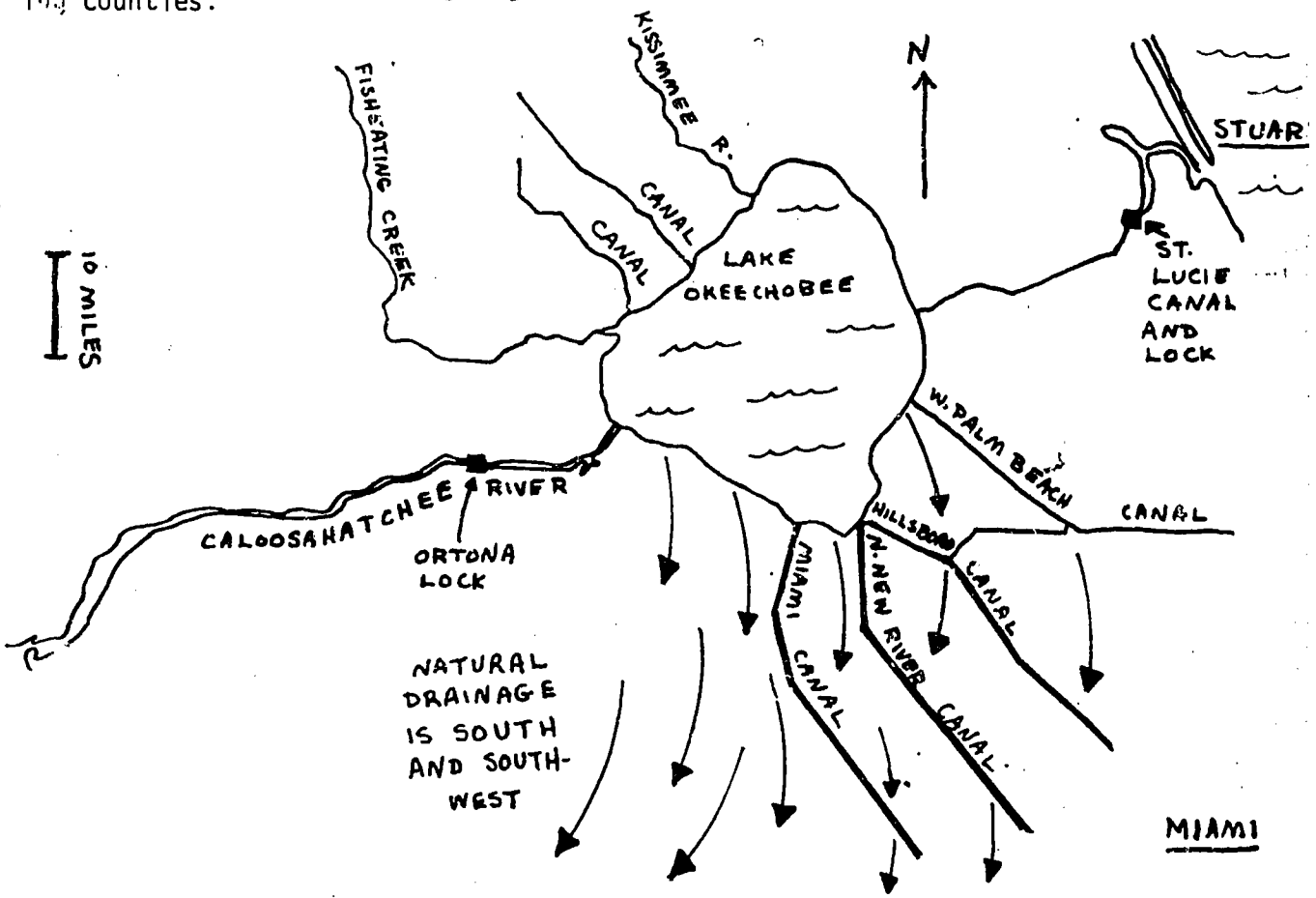
Some organisms such as a Snook or Mullet can quite easily move from a fresh water environment to a marine environment. They can tolerate either system.

Other organisms might adapt to a changing environment over a period of time.

It would take a very large amount of fresh water to reduce the salinity of the Indian River.

In the past the F.C.D. (Flood Control District) and Army Corps of Engineers have built a series of drainage canals. These drain the land for agricultural use. The drainage as you might suppose eventually ends up in the river on the way to the ocean. However, land drainage as does rainfall, plays only a relatively minor part in changing salinity of the river.

Sometimes Lake Okeechobee must be lowered for the safety of the surrounding counties.



Government agencies have built a series of canals and locks to accomplish this lowering. Gates at the St. Lucie Lock are opened when necessary to lower the level of the lake. When these gates are open, more than three million gallons of fresh water every minute are dumped into the St. Lucie River. Along with this water, tons of mud and silt are also washed under the flood gates into the river.

Do you see a problem?

Look at the map. Can you see a possible solution?

Construction of higher dikes around the lake and new larger locks which will be built at Port Mayaca are supposed to reduce frequency of lowering the lake level.

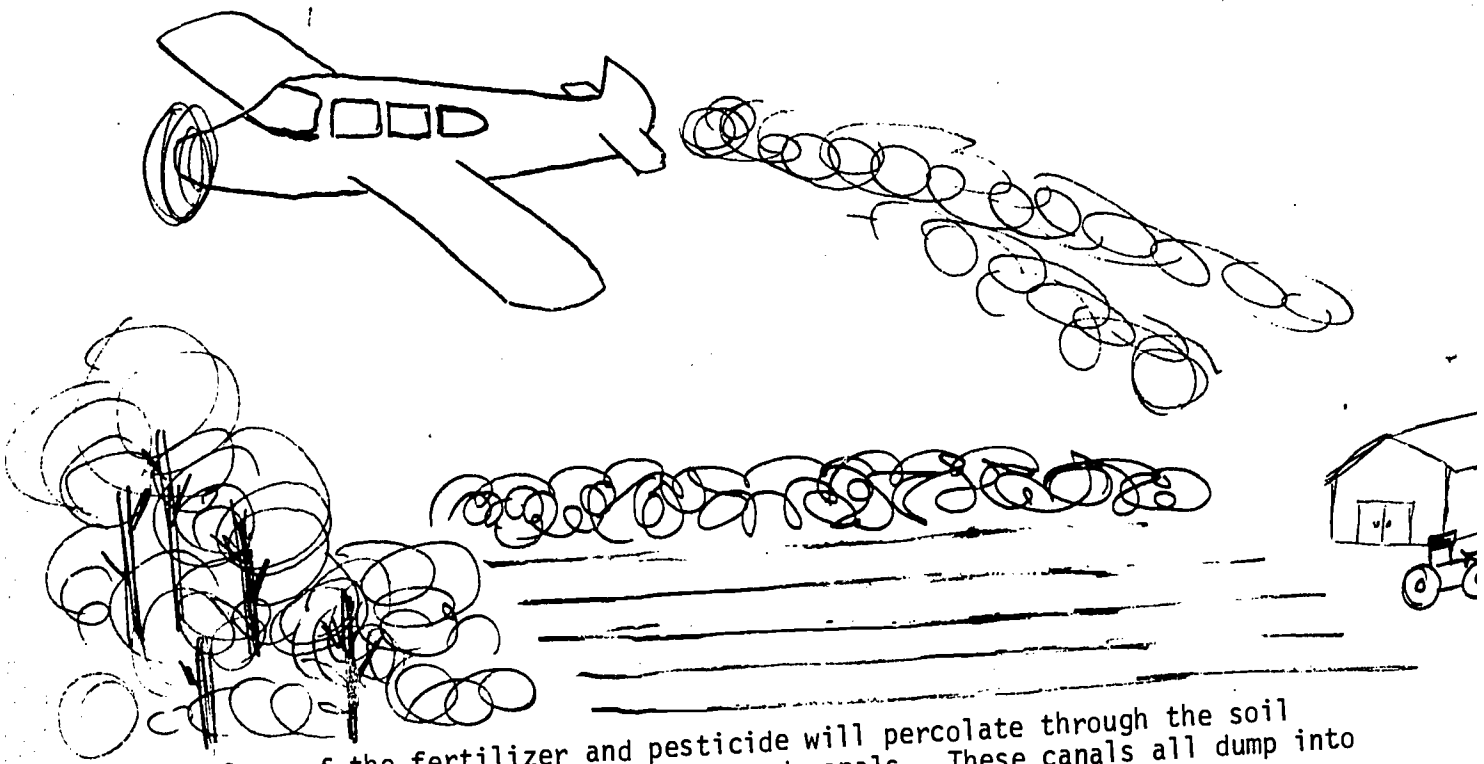
AGRICULTURAL RUNOFF

Agriculture is the most important INDUSTRY in western Martin County and many areas of Okeechobee County. You might logically ask what does that have to do with a SPOIL ISLAND and the river?

Let's consider some of the farmer's problems.

Citrus trees, tomatoes and watermelons need water to grow. During our dry winter months in particular the farmers depend on natural streams or man made drainage canals to irrigate their crops.

Most of the soil is not very good for crops so the farmer must add fertilizers to replace the missing elements in the soil. Harmful insects and various fungi sometimes attack the farmer's crop. He must use pesticides to protect his crop and investment.

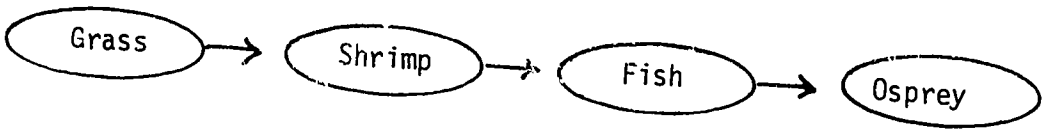


Some of the fertilizer and pesticide will percolate through the soil and drain or run off into the streams and canals. These canals all dump into the river on the journey to the ocean.

Most residents in our urban areas have well-cared-for lawns and shrubs. They fertilize and spray their plants for the same reason the farmer does. This too eventually runs off into the streams and river.

If we add fertilizer to the river can you see that this could cause the plants such as algae and grasses to grow? This actually happens sometimes to the point that the river turns green with so much algae. This massive build-up of plants actually requires more oxygen than the plants themselves can produce. Thus they may use up the available oxygen in the water and cause a "fish kill".

The pesticides tend to build up in the body cells (tissue) of organisms living in the river. Consider a typical food chain in the river.



The Osprey eats the most so he gets more of the pesticide in his cells. Scientists now know that one pesticide (D.D.T.), caused Osprey and Eagle egg shells to be very thin or non-existent. Very few eggs could hatch.

This has caused these animals to be among the Endangered Species. The United States government has outlawed use of D.D.T. except by special permission.

Should man consider the type of pesticide he uses?

Should fertilizer be used in only certain areas and at certain times of the year?

What do you think?

SOLID WASTE: (Garbage and Sewage)

SOLID WASTE is a material which has no use in its present form and location.

A long time ago we could throw our garbage and sewage into the river or streams with no apparent harm. "Dilution was the solution to POLLUTION."

Until 1973 partially treated sewage in Stuart was discharged into the St. Lucie River. This sewage, though treated, still produced contaminating elements.

Today, Martin County residents cannot harvest or eat the clams and oysters in our rivers. Drainage from agricultural lands, septic tank run-off and boats have contributed to the polluted river.

Shellfish (oysters and clams) are plankton eaters. During the feeding process the PLANKTON washes over the gill structures which traps the food and oxygen. Harmful BACTERIA and viral substances in the water tend to concentrate in the shellfish bodies. This concentration does not harm the shellfish. However, humans who eat these CONTAMINATED shellfish can become seriously ill.

Improved sewage disposal will further prevent this type of contamination. Cities like Stuart have changed their methods of sewage disposal. The material now will be disposed of by deep well injection in deep pockets in the ground.

Cities and counties provide garbage and trash collection for citizens, however, some residents fail to take advantage of this service.

When you are at the Spoil Island or along the river, note the trash and garbage.

Does it improve the island scenery?

Can you think of a solution to our garbage and sewage problems?

Think about this! In nature RECYCLING is a natural process.

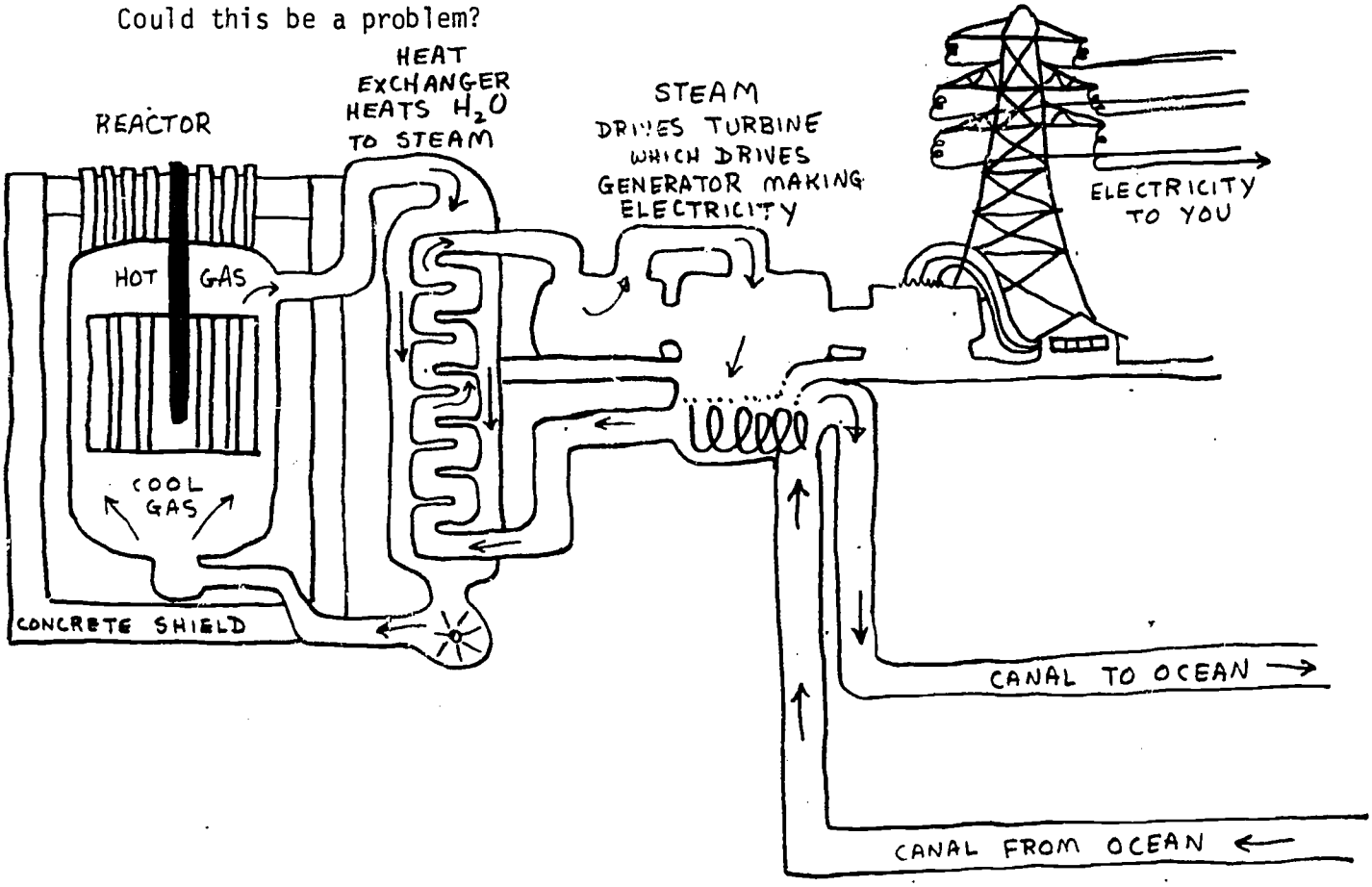
THERMAL POLLUTION

The nuclear power plant located on Hutchinson Island is being built by Florida Power and Light Company to help provide electricity for Stuart, Florida. The tremendous increase of population in this area has made the need great.

Originally the huge condensers were to be cooled by water from the Indian River. Due to conservationists' efforts, water from the ocean is now to be used. Millions of gallons per hour of ocean water are piped through the machinery and returned to the ocean several degrees higher.

In fact there will be 530,000 gal/min of water going through the power plant. How many gal/hr?

Could this be a problem?



Why do you suppose the conservationists did not want Florida Power and Light to use the Indian River to cool the condensers?

Suppose you were an organism adapted to a maximum 85°F temperature and the area you now live in is 90°F. List three possible actions that you could take if you were that organism.

The Atomic Energy Commission requires a back-up cooling system. Twice a year for short periods of time water from the Indian River will be used to cool the condensers.

VOCABULARY: Environmental Problems

AERIAL	anything extended into the air
BACTERIA	single celled organism (Protist) that is associated with fermentation, disease, decomposition or nitrogen conversion
BIOLOGICAL FACTORS	the living parts of an environment that affect the life within that environment
CONTAMINATION	process of fouling - making something impure
CRUSTACEAN	an arthropod invertebrate that has an exoskeleton and jointed legs
DETRITUS	dead and decaying material
GLAND	organ that secretes something
INTRUSION	something that invades
MOLLUSK	an invertebrate that has a soft gut and usually a calcium carbonate shell
POLLUTION	the harmful contamination of the soil, water or air by various means
POLLUTANT	that which causes pollution
PHOTOSYNTHESIS	the process by which green plants convert the sunlight energy into a form that can sustain life
PHYTOPLANKTON	the "plant" type plankton
RECYCLING	converting something into another form for use
SOLID WASTE	material that has no use in its present form and location
TOLERATE	the limit or range of conditions a thing can stand
ZOOPLANKTON	"animal" plankton

Martin County Schools'
Environmental Studies Center
2900 N.E. Indian River Drive
Jensen Beach, Fla. 33457

7th Grade Slide Presentation

"Relationships"

TEACHER - Turn slide projector to "Focus" slide. Start tape. Advance the slides at the audible tone or, if you're reading this aloud, where indicated by the asterisk (*). The narrative is in CAPITAL letters.

1. "Focus" slide. *

2. "Credits" slide *

3. "An Environmental Study Unit on a Spoil Island Investigation." *

4. "Relationships" -- RELATIONSHIPS MEAN A CONNECTION BETWEEN TWO THINGS. THE RELATIONSHIP BETWEEN A RIVER'S PHYSICAL FACTORS AND THE LIFE A RIVER CONTAINS IS A DEPENDENT ONE. REMEMBER A PHYSICAL FACTOR IS A NON-LIVING CONDITION. THE LIFE THAT DEVELOPS IN A RIVER IS DEPENDENT UPON THE PRESENCE OF CERTAIN CONDITIONS: FOR EXAMPLE, SOIL AND TROPICAL TEMPERATURES. THESE ARE CONDITIONS THAT ARE NECESSARY FOR DEVELOPMENT OF CERTAIN LIFE FORMS. *

5. FOR EXAMPLE, ANHINGAS DEPEND UPON THE INDIAN RIVER FOR FISH. THE FISH IN THE INDIAN RIVER DEPEND UPON A CERTAIN AMOUNT OF SALT OR SALINITY BEING PRESENT IN THE WATER. THERE IS A DEPENDENT RELATIONSHIP BETWEEN THE ANHINGA AND THE FISH, AND THE FISH AND THE SALT. AT THE SAME TIME THERE IS A DEPENDENT RELATIONSHIP BETWEEN THE ANHINGA AND THE RIVER SALINITY. NOW LET'S DEVELOP RELATIONSHIPS BETWEEN PEOPLE AND THE INDIAN RIVER. *

6. THE INDIAN RIVER IS PART OF AN INTRACOASTAL WATERWAY THAT PROVIDES A MEANS OF TRANSPORTATION BY WATER THROUGH CONNECTING STATES ALONG THE EAST COAST. THE RIVER PROVIDES A ROUTE FOR PLEASURE TRAVEL. *

7. AS WELL AS COMMERCIAL TRANSPORT. *

8. THE INDIAN RIVER PROVIDES MUCH INDUSTRY. INDUSTRY IS ANY BUSINESS, THAT FOR PROFIT, PROVIDES PRODUCTS AND SERVICES NEEDED AND WANTED BY PEOPLE. *

9. COMMON BUSINESSES ARE BOAT BUILDING, MAINTENANCE, AND REPAIR SERVICES. *

10. BAIT AND TACKLE SHOPS....AND....*

11. STORES THAT SELL THE MARINE FOOD PRODUCTS TO THE PUBLIC....*

12. PEOPLE USE THE RIVER FOR RECREATION. RECKEATION IS HAVING A GOOD TIME SAILING...*

13. SWIMMING...*

14. CANOEING... *

15. FISHING... *

16. AND PLEASURE BOATING. *

17. MANY PEOPLE COME TO THE INDIAN RIVER AREA DURING THE WINTER MONTHS FOR THE SAME "RECREATION" THAT LOCAL RESIDENTS ENJOY YEAR 'ROUND. MOST OF THESE PEOPLE COME FROM THE COLDER CLIMATES OF THE NORTHERN STATES. THE INDIAN RIVER PROVIDES A PEACEFUL ATMOSPHERE - A CHANCE TO GET AWAY FROM IT ALL. *

18. THERE ARE MANY BUSINESSES AROUND THE INDIAN RIVER THAT CATER TO TOURISM. ONE OF THEM IS THE SPORT FISHING INDUSTRY. *

19. SEAFOOD RESTAURANTS ARE PARTICULARLY POPULAR WITH THOSE TOURISTS WHO LIVE INLAND AND SELDOM EAT FRESH SEAFOOD. *

20. SOME OF YOU AT SOME TIME MAY HAVE SAMPLED THE FOOD PROVIDED BY THE INDIAN RIVER. THE SHRIMP, A FAVORITE FOOD FOR MANY FISH....*

21. WILL ALSO MAKE A TASTY DINNER. *

22. THE INDIAN RIVER WAS AT ONE TIME THE HOME OF THIS 24-POUND SNOOK NOW ON ITS WAY TO SOMEONE'S DINNER TABLE. THE SNOOK HAS PROBABLY EATEN MORE SHRIMP THAN YOU WILL IN YOUR ENTIRE LIFETIME. *

23. ONE OF THE MOST IMPORTANT RELATIONSHIPS BETWEEN PEOPLE AND THE RIVER IS THEIR DEPENDENCE UPON THE OXYGEN RELEASED BY THE PLANKTON IN THE RIVER. *

24. PLANKTON IS THE NAME GIVEN TO FREE-FLOATING LIFE FOUND IN THE WATER. THIS LIFE IS USUALLY MICROSCOPIC YET 80 PERCENT OF THE OXYGEN USED BY ALL LIVING THINGS IS RELEASED BY THE PLANT PLANKTON LIVING IN THE INLAND AND COASTAL WATERS. *

25. WHAT ARE AESTHETICS? AESTHETICS ARE THE FEELINGS OR EXPRESSIONS OF WHAT PEOPLE CONSIDER BEAUTIFUL. *

26. THE INDIAN RIVER CAN BE CONSIDERED BEAUTIFUL FROM MANY ASPECTS. FOR MANY PEOPLE THE GREEN OF THE MANGROVES THAT OUTLINE THE INDIAN RIVER PRODUCE FEELINGS OF BEAUTY. *

27. FOR OTHERS, THE UNIQUE CHARACTER OF THE PELICAN, MERGING WITH THE TROPICAL HABITAT HE MAINTAINS, PRODUCES A SENSE OF SATISFACTION, EVEN COMFORT. *

28. FOR MANY OTHERS THE RIVER BRINGS TO LIFE A SENSE OF PEACE, LOVE AND ONENESS WITH NATURE.

The End.

TEACHER - Please rewind the tape for next use. Thanks

7th Grade Slide Presentation

"Problems"

TEACHER - Turn projector on to "Focus" slide. Start tape, advancing slides at the audible tone or, if you are reading this aloud, where indicated by the asterisk (*). The narrative is in CAPITAL letters.

1. "Focus" *
2. "Credits" slide *
3. "An Environmental Study Unit on a Spoil Island Investigation" *
4. "Problems". WE HAVE SO FAR EXPLORED WAYS IN WHICH THE INDIAN RIVER RELATES TO YOU. NOW WE WILL EXPLORE PROBLEMS THAT CAN DEVELOP WITHIN THESE RELATIONSHIPS. *
5. THE MANGROVE TREES ARE FOUND ALONG THE SHORES OF THE INDIAN RIVER. *
6. THE PROP ROOTS OF THE RED MANGROVE ACT AS LAND BUILDERS. THESE ROOTS HOLD THE SOIL AND DETRITUS THAT FLOW THROUGH THEM. *
7. THE RED MANGROVE HAS THICK, POINTED, FLESHY, REDDISH-GREEN LEAVES. THE HANGING CIGAR-SHAPED SEED FALLS INTO THE WATER AND WILL FLOAT UNTIL IT IS CAUGHT IN THE SOIL AND STARTS TO GROW. *
8. THE ROSEATE SPOONBILL AND SNOWY EGRET ARE TWO OF THE MANY WATERBIRDS THAT FEED AND NEST IN THE MANGROVES. OYSTERS, MUSSLES, FISH, SNAILS AND CRABS ARE JUST A FEW OTHER ANIMALS THAT CAN BE FOUND AROUND THESE TREES. *
9. THE BLACK MANGROVE TREE IS FOUND IN THE MORE SALTY AREAS OF THE RIVER. *
10. THE LEAVES ARE POINTED, THIN AND DARK GREEN. THE BACKS OF THE LEAVES ARE GREY AND LEND A SILVER CAST TO THE TREE. *
11. THE BLACK MANGROVE, LIVING IN SUCH SALTY SOIL, HAS TO "SWEAT" SALT OUT OF PORES IN ITS LEAVES. *

12. BLACK MANGROVES HAVE FINGER-LIKE ROOTS OR BREATHING TUBES. THESE ARE FOUND AROUND THE BASE OF THE TRUNK.....*

13. THESE FINGER-LIKE BREATHING TUBES, LIKE THE PROP ROOTS OF THE RED MANGROVE, CATCH MUCH OF THE DEBRIS THAT FLOATS BY.....*

14. THE WHITE MANGROVE TREE IS FOUND BACK FROM THE SHORE. THESE TREES TOLERATE THE LEAST AMOUNT OF SALT. *

15. THE LEAVES ARE FLESHY AND YELLOW-GREEN. THE LEAF IS ROUNDED AND OFTEN NOTCHED AT THE TOP. *

16. THERE ARE TWO GLANDS AT THE BASE OF THE LEAF. *

17. WHAT HAPPENS IF THE MANGROVES ARE DESTROYED?.....REMEMBER THE MANGROVE BUILDS LAND. MANY FISH, CRABS, OYSTERS AND SHRIMP LIVE AMONG THE ROOTS. THE BRANCHES ARE USED BY MANY BIRDS AS ROOSTS AND FOR NESTING....WHAT COULD HAPPEN TO THESE RELATIONSHIPS?.....*

18. GRASSFLATS ARE AREAS IN THE WATER ENVIRONMENT WHERE GRASSES GROW. THE INDIAN RIVER IS SHALLOW AND SUNLIGHT CAN EASILY REACH THE GRASS TO SUPPLY THE NECESSARY ENERGY NEEDED FOR PHOTOSYNTHESIS. THE SANDY AREAS PROVIDE GOOD SOIL FOR THE GRASSES TO ROOT. THE GRASSES ALSO REQUIRE A CERTAIN SALINITY TO GROW....*

19. THREE GRASSES FOUND IN THE INDIAN RIVER ARE TURTLE, MANATEE AND SHOAL. THE TURTLE GRASS HAS WIDE, FLAT BLADES WITH CUT-OFF TIPS. MANATEE GRASS HAS THIN, ROUNDED BLADES. SHOAL GRASS HAS THIN FLAT BLADES AND USUALLY GROWS CLOSEST TO SHORE. ALL THESE GRASSES GROW COMPLETELY UNDER WATER. *

20. IF YOU WERE TO GO SEINING IN THE GRASSFLATS YOU WOULD DISCOVER THAT MANY ORGANISMS LIVE IN THESE GRASSES: SHRIMP, CRABS, PINFISH, SEA HORSES AND SNAILS ALL INHABIT THE GRASSFLATS. *

21. MANY YOUNG GAMEFISH SUCH AS SNAPPERS, GROUPERS, POMPANO, FLOUNDER AND SHEEPSHEAD LIVE IN THE GRASSFLATS UNTIL THEY ARE LARGE ENOUGH TO LIVE IN THE OPEN WATERS. THIS SNAPPER, JUST 4 CENTIMETERS (1½ INCHES) LONG WAS CAUGHT IN A SEINE NET AND THEN RELEASED. WHEN IT GETS LARGER HE MIGHT BE CAUGHT AGAIN AROUND A DOCK OR BRIDGE, THIS TIME READY FOR THE FRYING PAN. *

22. THE CONCH, WORMS AND OTHER SNAILS LAY THEIR EGGS IN AND AROUND THE GRASSFLAT. *

23. WHAT HAPPENS IF THE GRASSFLATS ARE DESTROYED?.....REMEMBER, MANY OF THE FISH WE EAT ARE PROTECTED BY GRASSFLATS. SHRIMP AND CRABS LIVE IN THE GRASSES AND THE HERONS AND EGRETS FEED ON THE GRASSFLAT INHABITANTS.....WHAT COULD HAPPEN TO THESE RELATIONSHIPS? *

24. FRESH WATER INTRUSION IS WHEN FRESH WATER INVADES A NORMALLY SALT WATER AREA. CERTAIN ORGANISMS IN THE SALT WATER ARE USED TO A CERTAIN AMOUNT OF SALT OR SALINITY. THE INVASION OR INTRUSION OF FRESH WATER CAN AFFECT THEIR HABITAT....*

25. THE INDIAN RIVER IS CONSTANTLY INVADED BY FRESH WATER FROM THE DRAINAGE CANALS. FLORIDA FLOOD CONTROL HAS CONSTRUCTED A SERIES OF CANALS LEADING AWAY FROM LAKE OKEECHOBEE. THEY ARE THE DRAINAGE NETWORKS SEEN IN THE PICTURE LEADING AWAY FROM THE LAKE. *

26. THE DRAINAGE CANAL LEADING INTO THE INDIAN RIVER IS THE ST. LUCIE CANAL. THE AMOUNT OF WATER THAT FLOWS ALONG THE CANAL IS CONTROLLED BY A SERIES OF FLOOD CONTROL GATES ADJACENT TO THE ST. LUCIE LOCK. THE LOCK PERMITS BOAT TRAFFIC BETWEEN THE HIGHER WATER LEVEL INLAND AND THE LOWER WATER LEVEL OF THE ST. LUCIE RIVER. *

27. AT CERTAIN TIMES THE WATER LEVEL IS TOO HIGH IN LAKE OKEECHOBEE. THE FLOOD GATES ARE THEN OPENED ALLOWING MILLIONS OF GALLONS OF FRESH WATER TO SURGE THROUGH. WHEN THESE GATES REMAIN OPEN FOR ANY LENGTH OF TIME, THE SALINITY OF THE RIVER IS CONSIDERABLY LOWERED. *

28. WHAT HAPPENS IF THE SALINITY IS LOWERED IN THE RIVER?....REMEMBER MANY OF THE ORGANISMS LIVING IN THE INDIAN RIVER TOLERATE A CERTAIN RANGE OF SALINITY. THE MILLIONS OF GALLONS OF WATER SURGING THROUGH THE GATES PICK UP MUD AND DEBRIS. ALL THE FRESH WATER EVENTUALLY ENDS UP IN THE OCEAN....WHAT COULD HAPPEN TO THE RELATIONSHIP WITHIN THESE WATER ENVIRONMENTS? *

29. AGRICULTURAL RUN-OFF IS THE RUN-OFF RESULTING FROM THE WASHING AWAY OF THE RESIDUES FROM THE FARMS, GROVES AND RANCHES.. TO BEGIN WITH, PESTICIDES AND FERTILIZERS ARE PUT ON THE LAND TO INSURE PRODUCTIVE CROPS. *

30. THESE RESIDUES ALONG WITH THE WASTE FROM LIVESTOCK ARE WASHED INTO THE DRAINAGE DITCHES THAT LEAD INTO THE CANALS....

ANIMAL WASTE, DECAY AND FERTILIZERS INCREASE ALGAE GROWTH, WHILE PESTICIDES OFTEN KILL SOME OF THE ANIMALS AND PLANTS. *

31. ONE SPECIFIC EXAMPLE OF THE EFFECT OF A PESTICIDE ON A SEEMINGLY UNRELATED ORGANISM IS THE EFFECT OF DDT ON THE EGGS LAID BY OSPREYS AND EAGLES. THE PESTICIDE DDT WAS ONCE USED WIDELY. DDT RESIDUES WERE PART OF THE RUN-OFF THAT DRAINED INTO THE DITCHES. OSPREYS AND EAGLES OFTEN FEED ON THE FISH FROM THESE WATERS. WHILE THE RESIDUES HAD NO APPARENT EFFECT ON THE FISH, THE RESIDUES WERE PICKED UP BY THE OSPREY AND EAGLE AND RESULTED IN THE PRODUCTION OF EGGS HAVING THIN SHELLS. THESE CHICKS WERE LUCKY. *

32. WHAT DOES TOO MUCH FERTILIZER AND PESTICIDE DO TO OUR ENVIRONMENT?..... REMEMBER THAT FERTILIZERS CAUSE A RAPID ALGAE GROWTH IN THE DRAINAGE CANALS. THIS OFTEN RESULTS IN A CHOKING OFF OF THE OXYGEN IN THE WATER. THE PESTICIDES CAN KILL THE NORMAL INHABITANTS OF THE CANAL AND RIVER. ALSO THESE SAME PESTICIDES CAN BE PICKED UP BY OTHER ORGANISMS AND AFFECT THEIR VIABILITY. WHAT COULD HAPPEN TO THE RELATIONSHIPS IN THE WATER'S AREAS THAT ARE AFFECTED BY THE RUN-OFF? *

33. SOLID WASTE IS ANY MATERIAL THAT HAS NO USE IN ITS PRESENT FORM AND LOCATION. *

34. AMERICANS ARE WASTERS. AREAS MUST BE PROVIDED TO DISPOSE OF WASTE AND MUCH OF THIS WASTE MATERIAL REALLY COULD BE USED AGAIN. *

35. AT ONE TIME GARBAGE AND SEWAGE COULD BE DEPOSITED IN THE RIVER UNTREATED. THERE WERE FEW PEOPLE AND THE RIVER COULD TAKE CARE OF WHAT WAS PUT THERE. THE WASTE WOULD OXIDIZE. EVEN A FEW YEARS AGO PARTIALLY TREATED SEWAGE WAS BEING DUMPED INTO THE ST. LUCIE RIVER HERE IN MARTIN COUNTY. *

36. THE CONSTANT DEPOSIT OF RAW OR PARTIALLY TREATED SEWAGE IN THE RIVERS IS THE REASON THAT OYSTERS, CLAMS AND OTHER SHELLFISH ARE NO LONGER HARVESTED IN THE MARTIN COUNTY AREA. AS A RESULT OF THE SEWAGE, HARMFUL BACTERIA AND VIRUSES ARE COLLECTED IN THE BODIES OF THESE SHELLFISH. NO HARM WAS DONE TO THESE OYSTERS BUT SERIOUS ILLNESS COULD RESULT IF HUMANS WERE TO EAT THEM. *

37. CAN THERE BE WAYS TO CUT DOWN IN THE PRODUCTION OF ALL THIS TRASH AND GARBAGE? NO - DEPOSIT BOTTLES AND CANS OFTEN END UP ON THE ROADSIDES AND SHORELINES. *

38. THESE SAME PRODUCTS COULD BE PLACED IN RETURNABLE CANS.....AND....*

39. BOTTLES. *

40. WHAT WOULD HAPPEN IF WE TOOK BETTER CARE OF OUR SOLID WASTES? REMEMBER WHEN AN AREA'S POPULATION BEGINS TO EXPAND, THE WASTE THAT ACCUMULATES MUST BE DISPOSED OF OR SERIOUS CONTAMINATION OF THE WATERS IN THAT AREA CAN RESULT. IF MATERIALS THAT CAN BE RECYCLED WERE RECYLCED THE STOCK PILES IN THE AREA DUMPS WOULD HAVE TO DECREASE. *

41. THERMAL POLLUTION IS POLLUTION RESULTING FROM HEAT. *

42. THE TWIN NUCLEAR POWER PLANTS BEING CONSTRUCTED ON THE SOUTH END OF HUTCHINSON ISLAND WILL HELP PROVIDE INCREASED ELECTRICAL POWER DEMANDED BY AN INCREASED POPULATION. *

43. A LARGE CANAL BRINGS IN WATER FROM THE OCEAN TO PROVIDE A COOLANT SOURCE TO THE NUCLEAR PROCESS THAT RELEASES ENERGY FROM THE ATOM. THE COOLANT WATER IS THEN RETURNED TO THE SEA. *

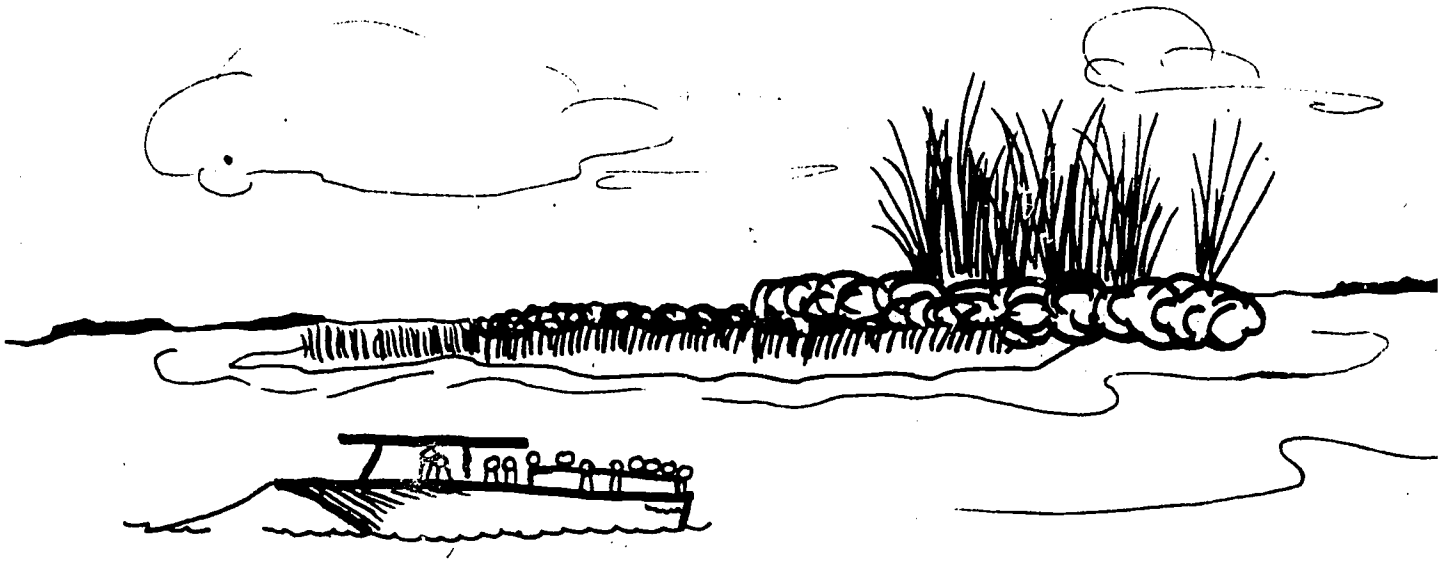
44. THIS RETURNING WATER GOES OUT THIS CANAL NOW UNDER CONSTRUCTION AND WILL BE ABOUT 10 DEGREES WARMER THAN THE SURROUNDING OCEAN WATER. SOME OF THE ORGANISMS IN THESE WATERS CANNOT TOLERATE A CONSTANT CHANGE IN THE WATER TEMPERATURE. CAN THERE BE AN INTERRUPTION ON THE FOOD CHAIN IN THAT AREA? *

45. WHAT CAN HAPPEN TO ORGANISMS IN THE WATER WHEN THE TEMPERATURE OF THE WATER BECOMES TOO WARM?....REMEMBER THAT THE POWER PRODUCTION IS A RESULT OF A DEMAND FOR POWER RESULTING FROM INCREASED POPULATION. THIS POWER IS TO BE SUPPLIED BY THE NUCLEAR POWER PLANT UNDER CONSTRUCTION. AT THE SAME TIME WATER TEMPERATURE IN THE AREA OF THE POWER PLANT WILL BE INCREASED.....WHAT CAN HAPPEN TO THE RELATIONSHIP AMONG THE ORGANISMS THAT INHABIT THE AREA? *

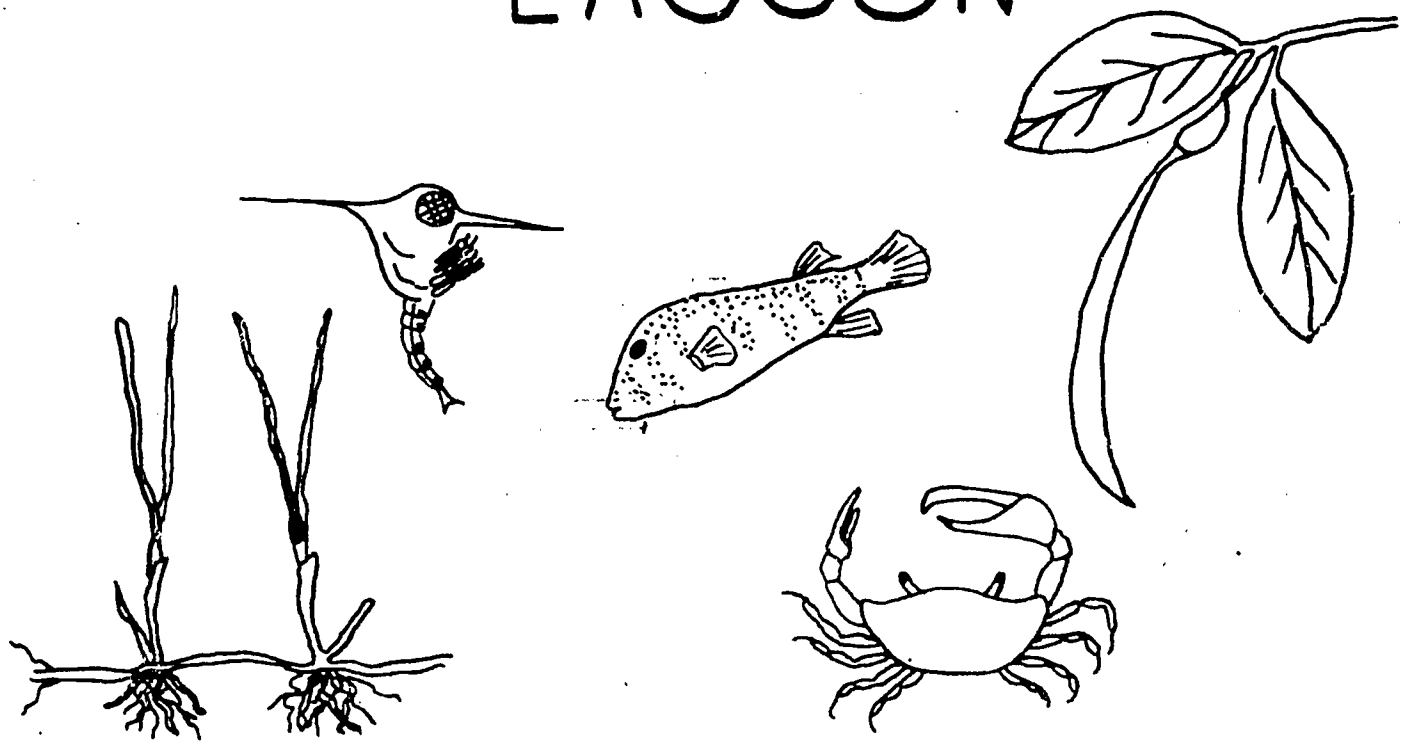
46. REMEMBER EVEN THE SLIGHTEST CHANGE IN ANY PART OF THE ENVIRONMENT CAN AFFECT RELATIONSHIPS BETWEEN YOU AND THE RIVER. *

The end.

TEACHER - Please rewind the tape for its next use. Thanks.



A SPOIL ISLAND IN THE INDIAN RIVER LAGOON



Seventh Grade

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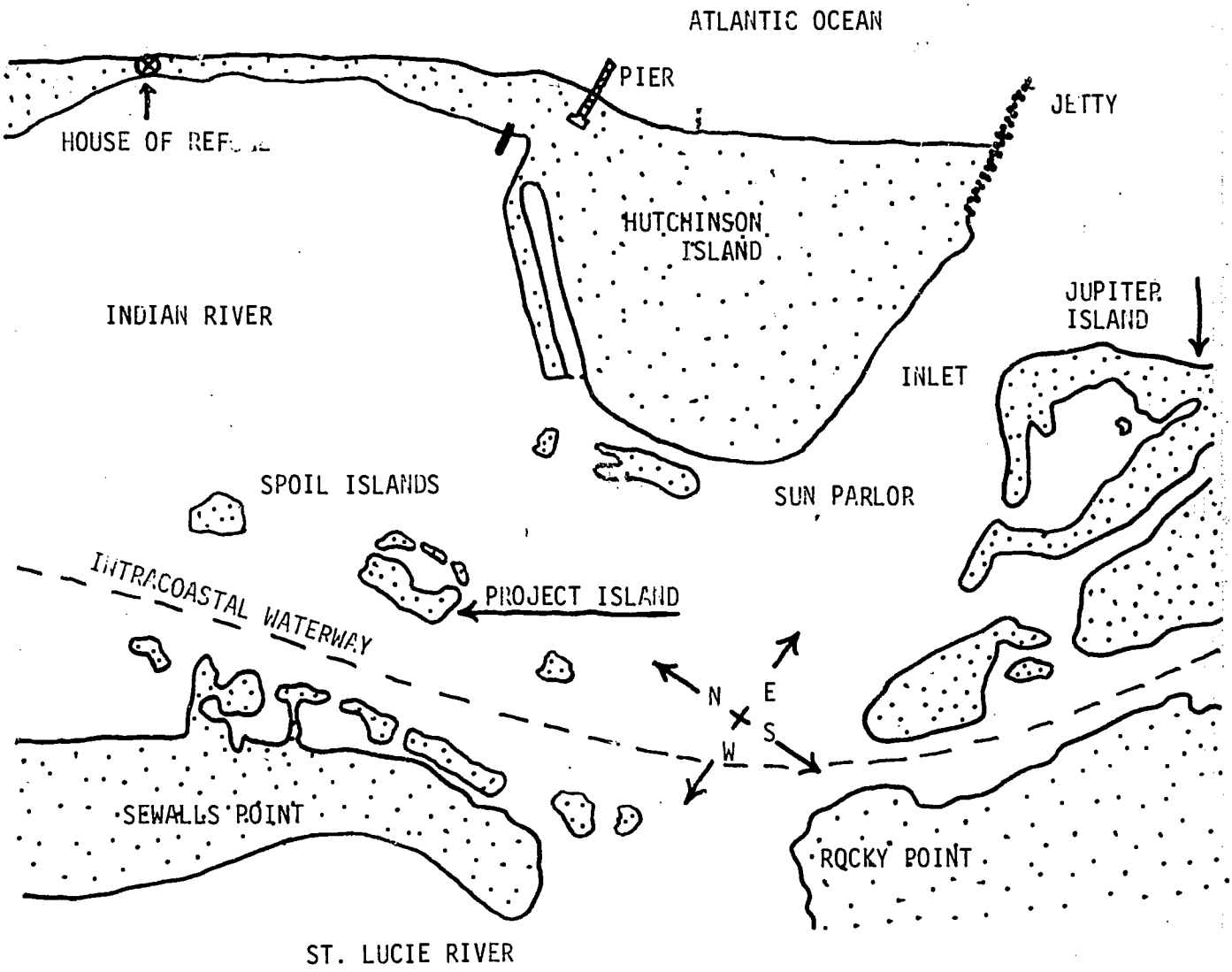
A SPOIL ISLAND IN THE INDIAN RIVER LAGOON



Did you know that the Indian River is actually a LAGOON? A lagoon is a body of water separated from the sea by a sandbar. In this case the sandbar is Hutchinson Island. The lagoon is connected to the ocean by inlets. The lagoon provides an ideal route for the Inland Waterway, a protected "highway" for small boats to travel up and down the coast. The waterway channel is dredged and marked with buoys as guideposts for marine traffic. Have you any idea what happens to the dredged sand, shell and mud? This material is all piled up in many areas along the channel to make up the "spoil" islands in the river.

For two days during your Environmental Center activities, you will be investigating a spoil island. Part of the study is about the plants and animals found on and around the spoil island. This booklet will give you a brief introduction to some of the organisms.

CATALOG OF LIVING THINGS

Living things are classified according to structural, functional, and developmental characteristics.

The living things represented in this unit have been divided into three sections. These three sections represent the three kingdoms of living things -- protists, plants, and animals. Within each kingdom are many organisms similar to each other. These are considered as members of the same group. Each of these general groupings within a kingdom is called a phylum.

In your booklet not all phyla are represented. These will be added at a later date. After each phyla that is represented, the page designation

Kingdom Protista - (pink pages)

Phylum Schizomycophyta - Bacteria
Phylum Cyanophyta - Blue-green algae
Phylum Mastigophora - Flagellates-(Euglena)
Phylum Sarcodina - Amoeba
Phylum Sporozoa - Plasmodium (all are parasites)
Phylum Ciliophora - Paramecium
Phylum Myxomycophyta - Slime molds

Kingdom Plants - (green pages)

Phylum Chlorophyta - Green algae
Phylum Phaeophyta - Brown algae
Phylum Chrysophyta - Diatoms
Phylum Rhodophyta - Red algae
Phylum Mycophyta - Mold, mushrooms
Phylum Bryophyta - Liverwort
Phylum Tracheophyta - Ferns, all plants flowering and non-flowering

Kingdom Animal - (yellow pages)

Phylum Porifera - Sponges
Phylum Coelenterata - Jellyfish, coral
Phylum Ctenophora - Comb jelly venus girdle
Phylum Platyhelminthes - Tapeworm, planaria
Phylum Nematoda - Nematodes, hookworm
Phylum Annelida - Earthworm, sandworm
Phylum Mollusca - Snails, clams, oysters
Phylum Arthropoda - Spiders, crabs, butterflies
Phylum Echinodermata - Starfish, urchin
Phylum Chordata - Sea squirt
Fishes
Amphibians
Reptiles
Birds
Mammals

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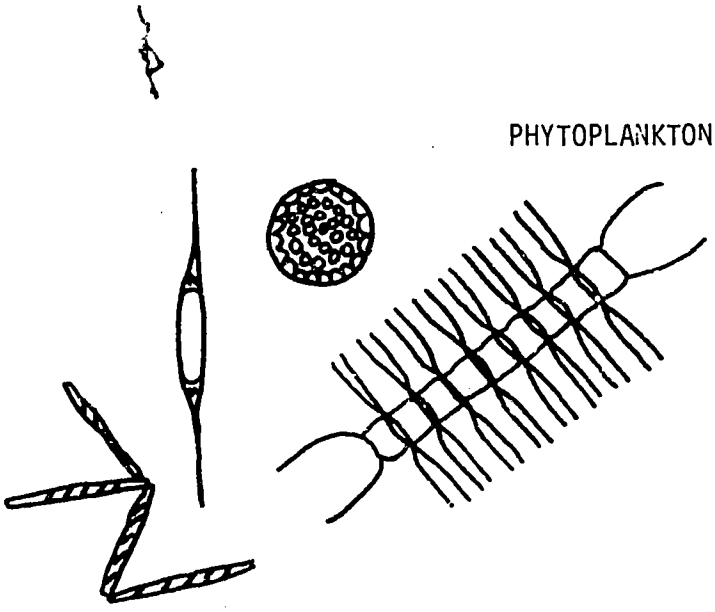
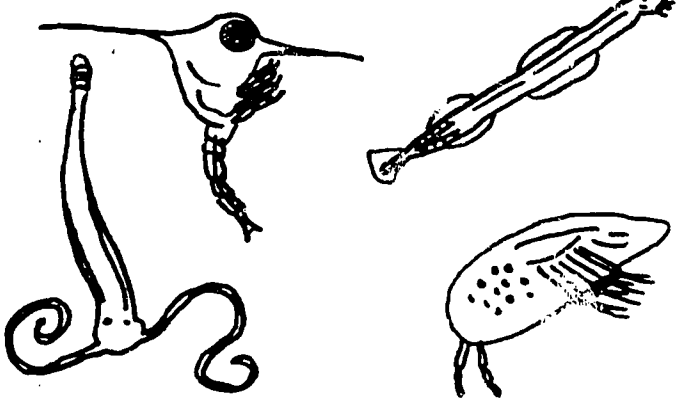
PLANKTON

PLANKTON is a term used for the plants and animals which are found floating or drifting in salt or fresh water. Most plankton are very small and can only be seen with the aid of a microscope.

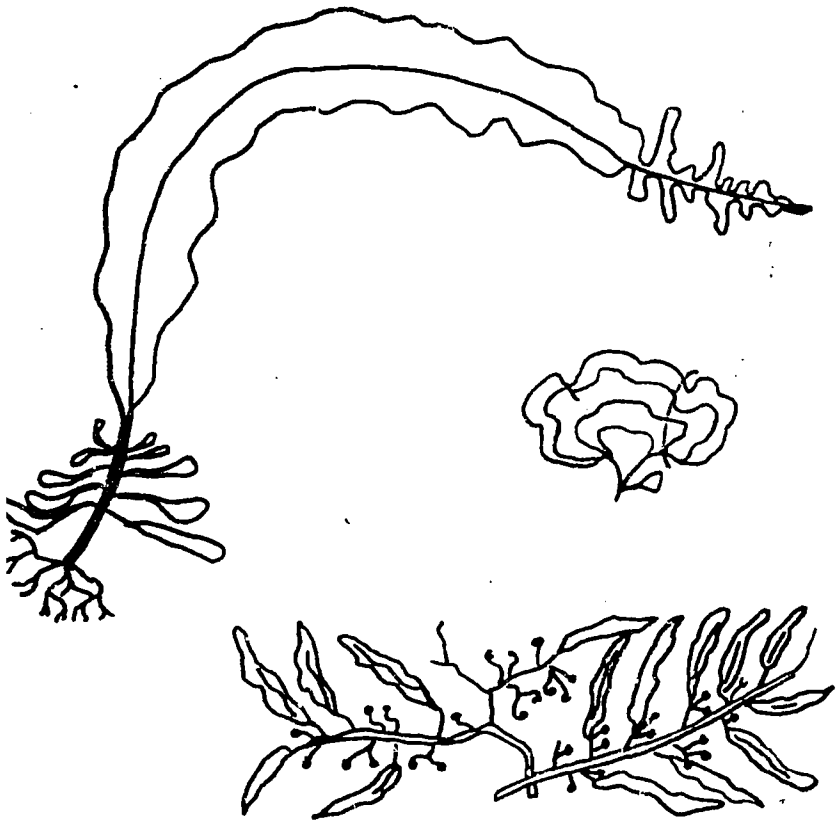


PHYTOPLANKTON - Phytoplankton are tiny, floating water plants. This grouping includes diatoms and other tiny algae forms as well as the small young stages of some of the larger, attached algae.



ZOOPLANKTON - Zooplankton are tiny floating animals. This grouping includes microscopic adult animals as well as the tiny developing stages of other much larger animals.

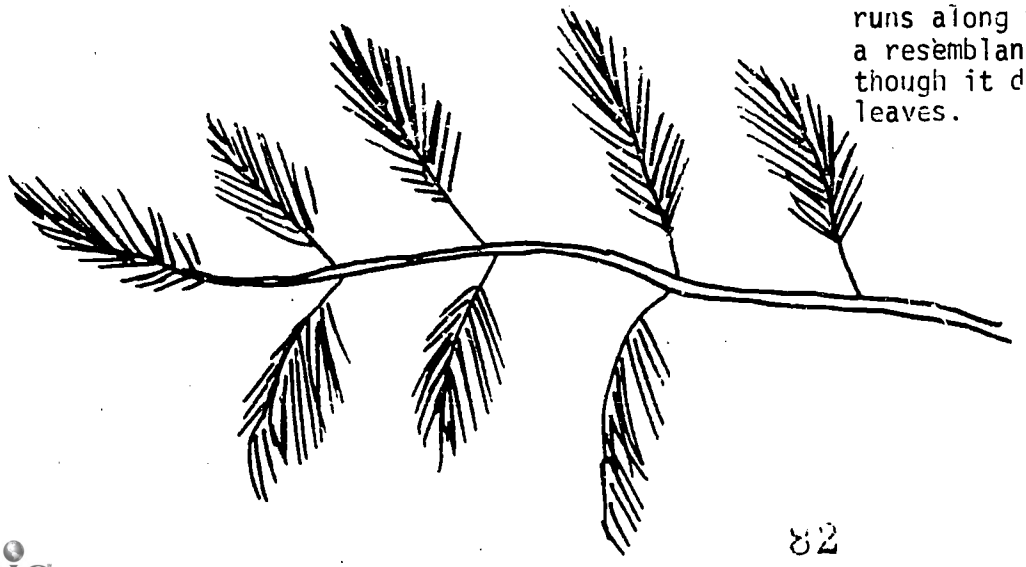
NON-FLOWERING PLANTS



ALGAE - Algae are the simplest of all plant forms having neither roots, stems nor leaves. They range in size from a single cell to plants of 100 feet or more in length. They may float in the water (phytoplankton) or may grow attached to the bottom of a body of water. Forms of algae may also be found on land and in the air. You will find red, brown and green algae on your trip into the river. There will be many different kinds (species) of each. Interested students may bring samples back to the Center for further studies.

Algae serves as food for zooplankton as well as many larger animals.

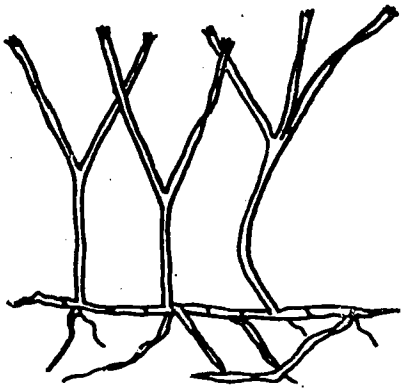
They make their own food by photosynthesis.



CAULERPA - A type of green algae found around the spoil islands. It runs along the sand and has a resemblance to leafy plants though it does not have true leaves.

FLOWERING PLANTS: GRASSES

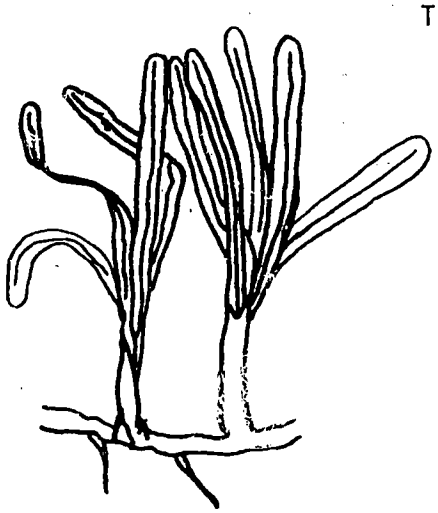
CORD GRASS - Cord grass is a tall coarse grass reaching a height of 10 feet. It is found growing in the intertidal area that is covered by tide LESS than half the time. The leaf base is ½" wide, and heavy. Almost no sun reaches the muddy bottom. Detritus does not collect around the base. The salt concentrate is high in and around this Cord or SPARTINA Grass. This grass is replaced by the Mangrove in the succession of plants along salt water shores.



SHOAL GRASS - Further out from the Cord Grass is this short, thin grass. This grass precedes the grassflats of deeper waters. Though usually covered by the tide, Shoal Grass can withstand seasonal exposure of a short duration.

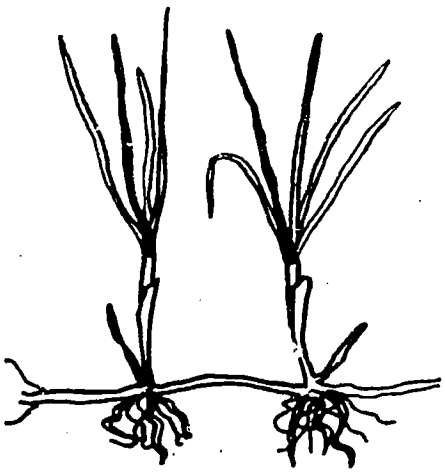
The leaf itself is flat and has a blade end that is straight across with three points along its edge.

FLOWERING PLANTS: GRASSES (cont'd)



TURTLE GRASS - This grass grows in calm, shallow water in a mud, sand or broken shell bottom. Though the water is shallow, it is deep enough to keep the grass covered continuously.

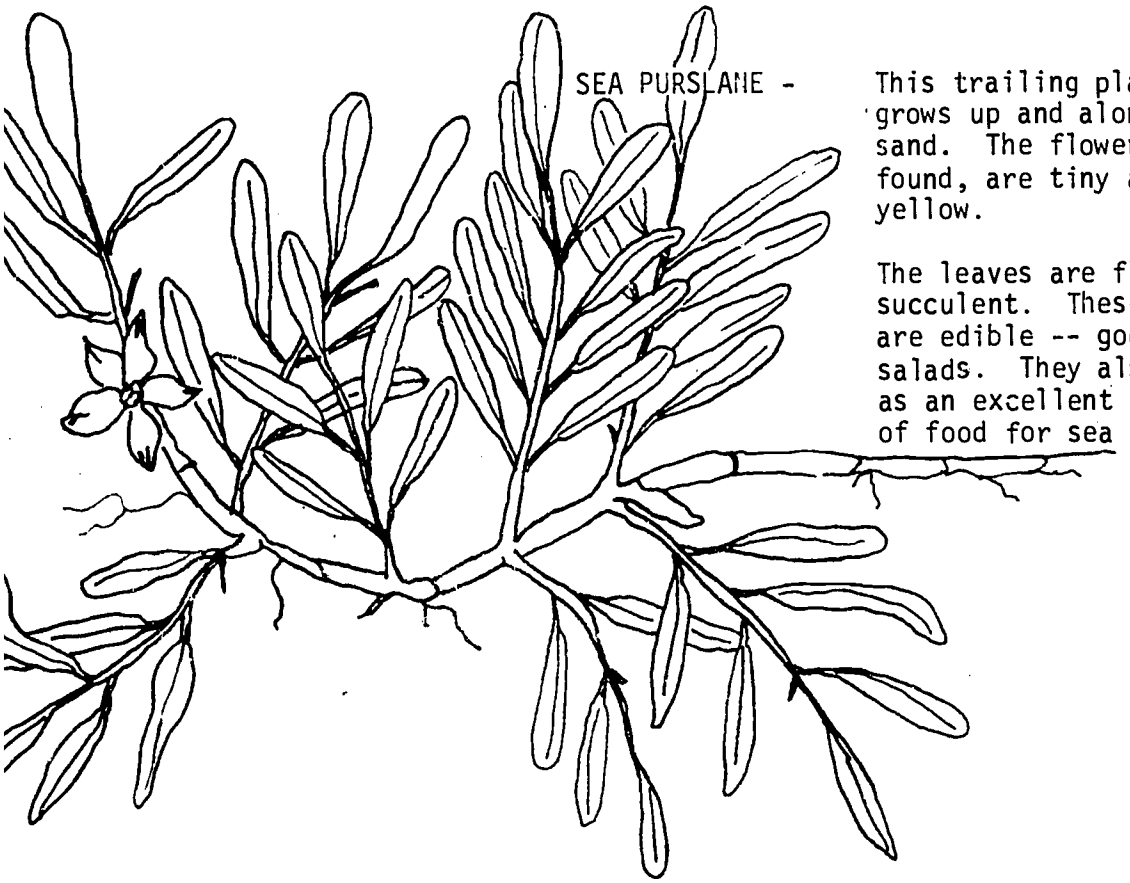
The leaf is wide and flat with 4-5 blades in each whorl.



MANATEE GRASS- This grass is often found in the same areas as that of TURTLE, that is shallow waters and muddy, sandy and broken shell bottoms.

The leaf is narrow and round and there are several blades in a whorl.

FLOWERING PLANTS: VINES



SEA PURSLANE -

This trailing plant grows up and along the sand. The flowers, when found, are tiny and yellow.

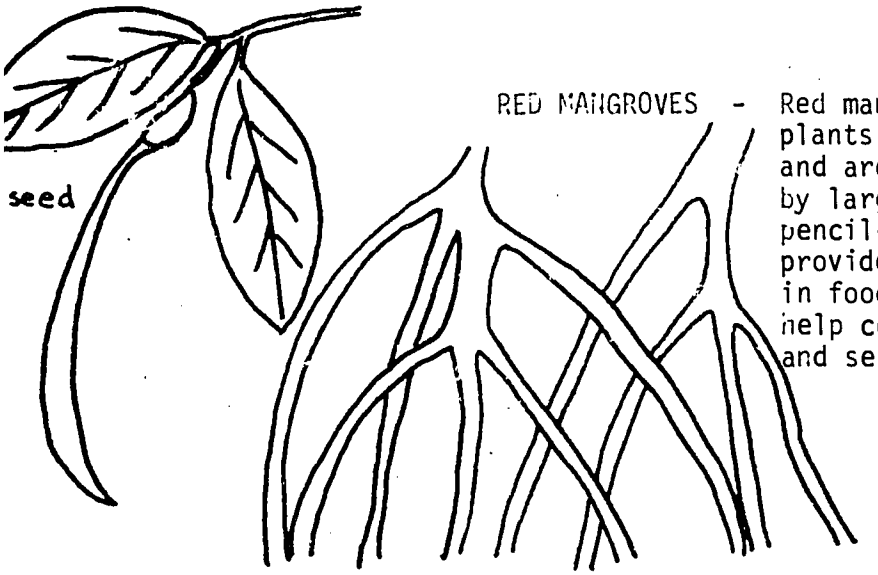
The leaves are fleshy or succulent. These plants are edible -- good in salads. They also serve as an excellent source of food for sea turtles.

RAILROAD VINE -
(or goats foot)

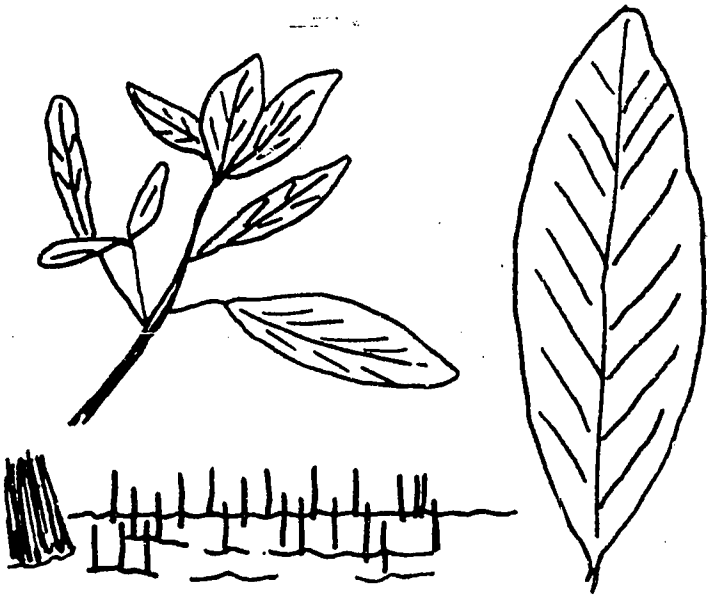
Got this name from growing along railroad tracks. Inhabits other hostile habitats such as ocean beaches, roadsides. Flowers are large and purple; leaves broad, thick and shiny. The leaf tops are notched and the leaf halves folded - shaped like a goats foot, thus the other common name.

SALT BUSH - Composite woody shrub-like herbs, found along coast lines in brackish habitats.

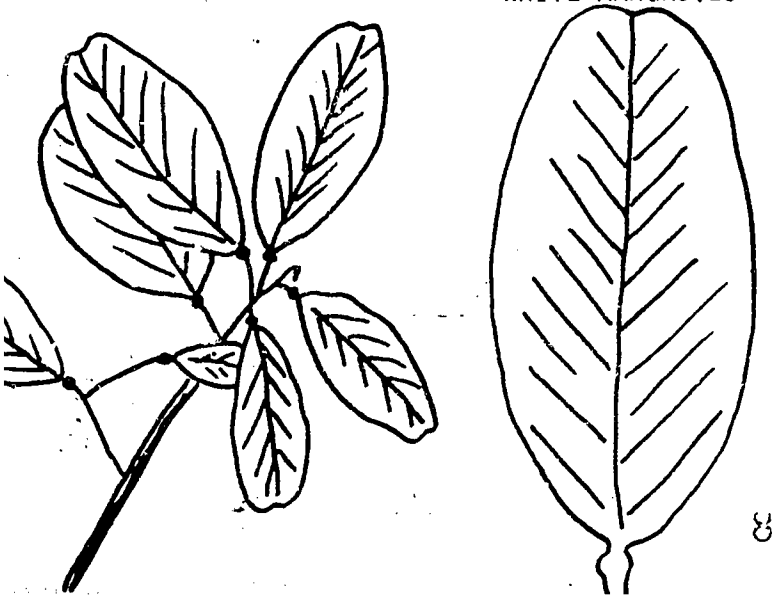
SEA OX-EYE - This shrubby composite has yellow flower heads about one inch across which bloom in May and September. They are found along brackish marshes. The stems are 1 - 4' high. Leaves, paired and lanced shaped 1 - 3" long. The plant is covered with silky white hairs giving it a dusty appearance.



RED MANGROVES - Red mangroves are pioneer plants and land builders, and are easily recognized by large prop roots and pencil-like seeds. They provide a nursery area rich in food for small animals, help control soil erosion, and serve as a bird sanctuary.

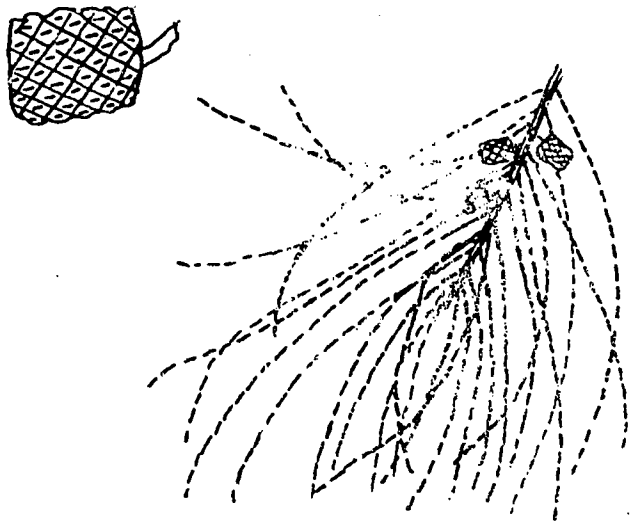


BLACK MANGROVES- The black mangrove grows near the water's edge in an area that is only covered by very high tides. It is recognized by its darker bark and finger-like roots which stick up out of the soil around the base of the tree. Its leaves are green on the top side and silver on the underneath side. Also, if you lick the leaf you should taste salt. The black mangrove provides food for small animals, helps control soil erosion and is a bird sanctuary.



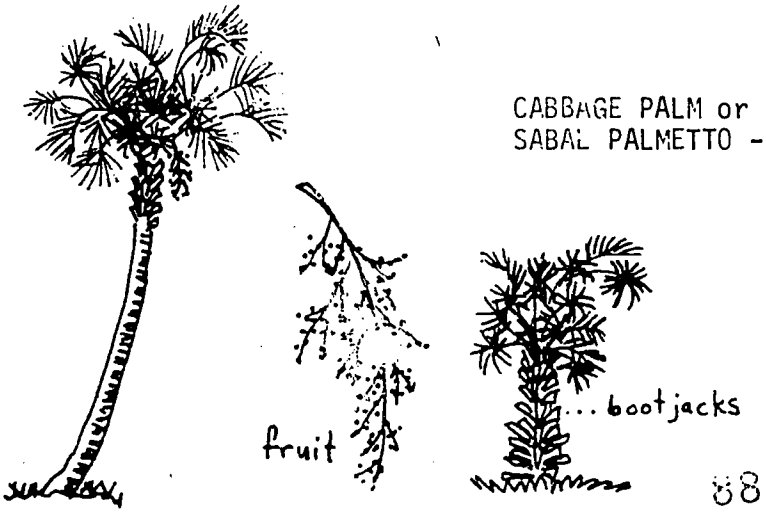
WHITE MANGROVES- The white mangrove usually grows in an area near the red mangrove but not covered by a high tide. It is recognized by its oval leaves. Also, if you look closely you will see little swellings (glands) on the leaf stem at the base of the leaf blade. The white mangrove provides food for small animals, helps control soil erosion and is a bird sanctuary.

FLOWERING PLANTS - TREES



AUSTRALIAN PINE - The Australian pine looks like a true pine tree with gray-green "needles". Their seed cones are about ½" thick and about 1" long. They serve as a wind-break, soil holder, and bird nesting area.

SAW or SCRUB PALMETTO - The commonest palm seen in Florida's Savannas, hammocks, scrub and sand dunes. Stems are usually horizontal and will take root wherever in contact with the soil. Saw Palmetto refers to the sharp tooth-like petioles. Flowers are white and fragrant. Fruits important food to the Indian.



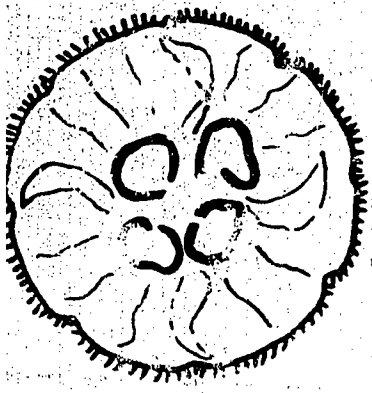
CABBAGE PALM or SABAL PALMETTO - Native to Southeastern United States. Leaves are fan shaped to seven feet long. Petioles not serrated. The leaf bud or heart is an edible delicacy. Tree also a source of honey. Florida's state tree.

INVERTEBRATES

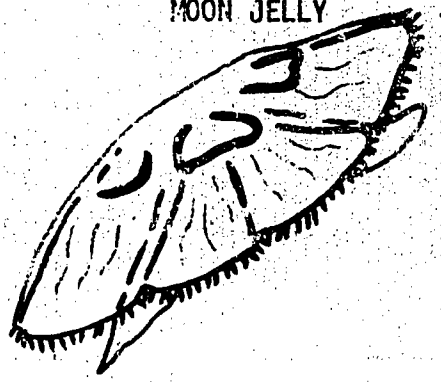
Invertebrates are a large grouping of animals without backbones.

COELENTERATE

Coelenterates are a major grouping of simple invertebrates. They have three tissue layers and a hollow gut. Many coelenterates have tentacles with stinging cells.



MOON JELLY



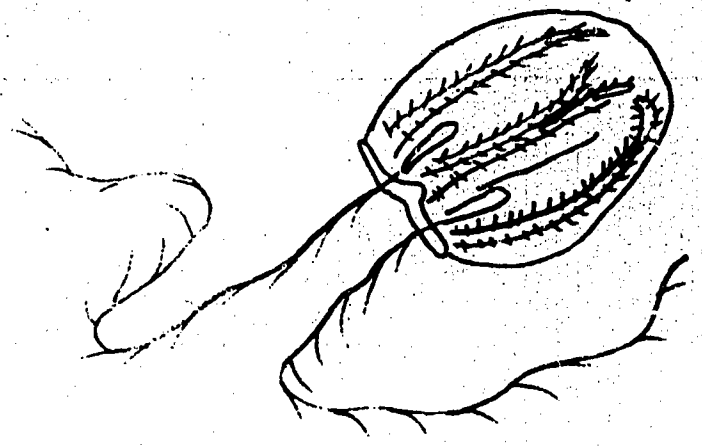
- This jellyfish is common in the Atlantic waters. Its color ranges from pale pink to pale orange. The tentacles are short and have stinging cells. They move through the water in a pulsing fashion.

Feed on - plankton
Food for - turtles

INVERTEBRATES (cont'd)

CTENOPHORE

COMB JELLY



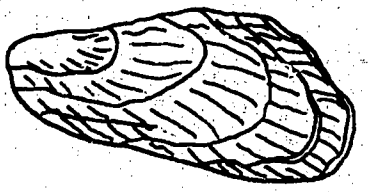
- Though the comb jelly resembles a jelly fish it isn't. The comb has three body layers and a hollow gut cavity. The 1 pair of tentacles does not have stinging cells. There are 4 pair of comb-like plates resembling railroad tracks.

Feed on - plankton
Food for - turtles

INVERTEBRATE: MOLLUSK (bivalves)

MOLLUSKS are invertebrates that have soft bodies. Many have shells. Most live in water and have gills. The adults range in size from tiny slugs and clams to giant squids, which may be more than 50' in length.

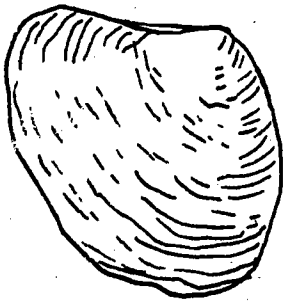
MUSSEL -



These bluish bi-valves are found attached to rocks, pilings and red mangrove roots by strong byssel threads (bysuss). They are a popular food in Europe but not the U.S.A.

Feed on -- plankton
Food for -- raccoon, conch, man

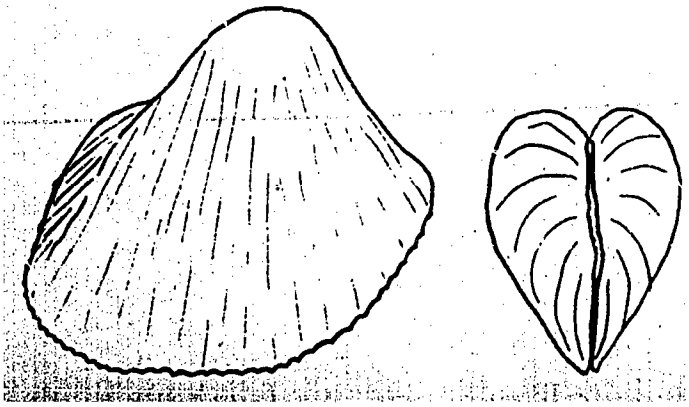
CLAMS -



Clams live buried in the sand or mud of marine and fresh waters. They move by a muscle structure called a foot. This two shelled mollusk gets food and oxygen through siphons. They are an important food industry in some areas. In our area clams cannot be harvested due to polluted water.

Feed on -- plankton
Food for -- man, starfish, some birds, moon snail

COCKLE -

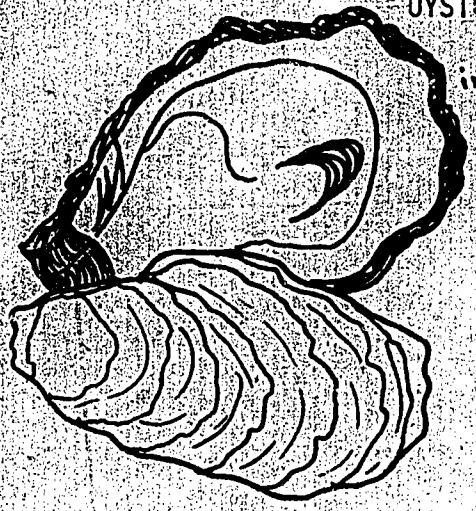


Cockles live near the surface of the sand. They have two short fringed siphons. The "foot" they move with is sickle shaped. You can always recognize the cockle because viewed from the end it's heart shaped. They are a major food in Europe.

Feed on - plankton
Food for - fish and man

MOLLUSK (cont'd)

OYSTER -



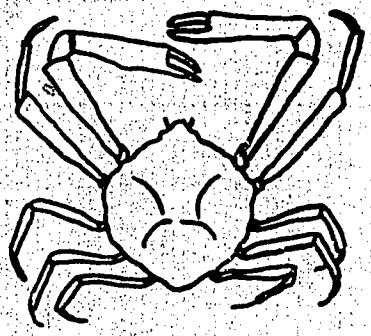
Oysters do not swim but attach themselves to something solid while very young. Oysters are irregularly shaped bi-valves (2 shells) that live in shallow water where there is a mixing of ocean and river. Like the clam, the oysters are off limits for human consumption in our river. They also get their water through siphons.

Feed on -- plankton
Food for -- man, raccoon, birds, conch

ARTHROPODS : CRUSTACEANS

Crustacean is a class of ARTHROPODS, (jointed legged Invertebrates). The crustaceans have 5 pair of jointed legs, gills and 2 pair of antennae.

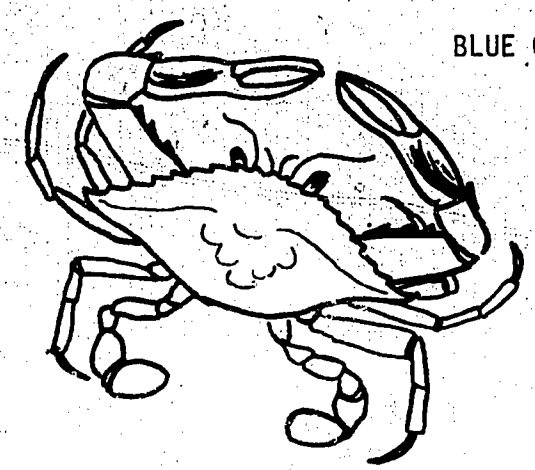
SPIDER CRAB



- Spider crabs are so called because their legs are long and slender in proportion to their bodies. Some of this group have developed the masking instinct and are called decorator crabs. They cover their bodies with bits of seaweed, debris, etc.

Feed on - algae, detritus, shrimp
Food for - octopus, some birds, larger crabs

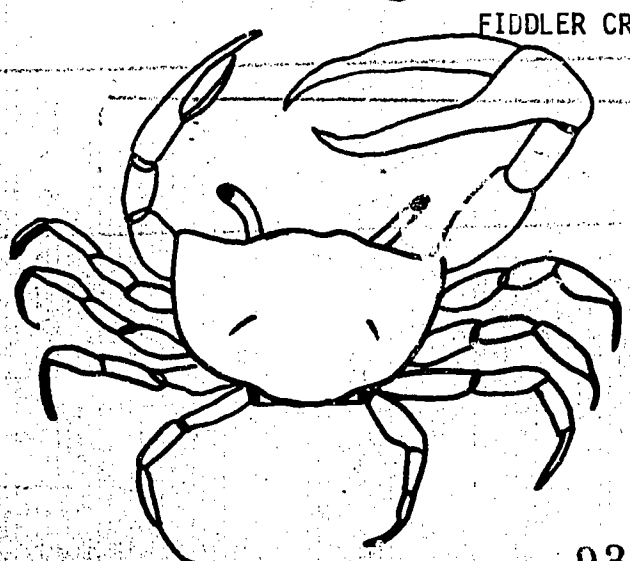
BLUE CRAB



- Blue crabs live on the bottom of the river as well as in the ocean. They are aggressive, excellent swimmers. Note how he swims sideways.

Feed on - anything, they are
Food for - man, octopus, and fish

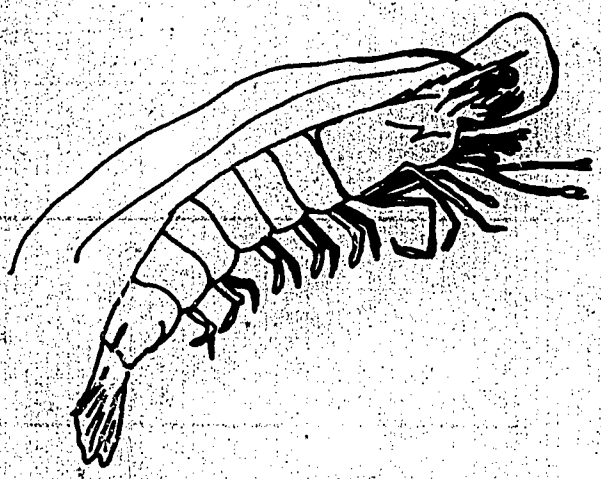
FIDDLER CRAB



- The fiddler burrows in the dryer parts of sandy beaches. Sometimes their burrows reach three feet in length. The male fiddler is the most familiar because he has the enlarged fiddle shaped claw. The claw is used for display during the mating season.

Feed on - detritus
Food for - gulls, fish

SHRIMP



- Shrimp are inhabitants of shallow grassflats and sandy shores. They swim backward by whipping their fan-like tails. Some species are edible. You will likely find several kinds in our river.

(a) broken back - average one inch in length, snappy jumpers

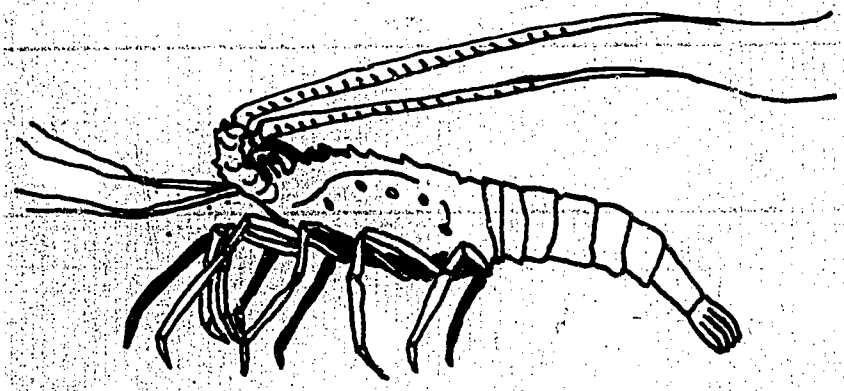
(b) snapping shrimp - enormous claw on one side. By flicking its wrist it makes a loud popping noise.

(c) glass shrimp - nearly transparent small shrimp

(d) edible shrimp - sometimes referred to as a prawn, brown 4-6 inches

Feed on - algae, plankton, detritus
Food for - man, fish, birds, crabs

SPINY LOBSTER

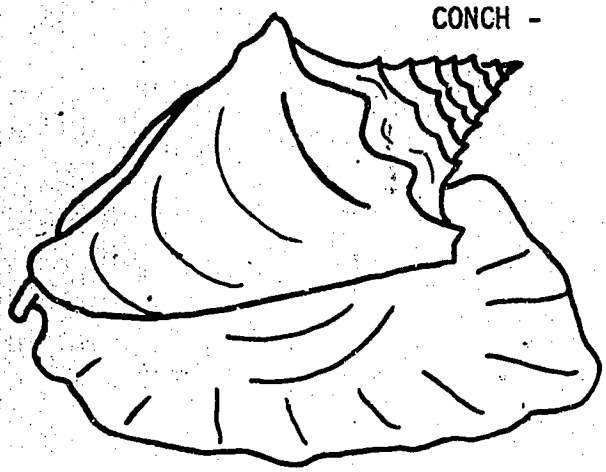


- The spiny lobster, also called the Florida crayfish, lives in rock or reef crevices in the ocean. Adults spawn in the ocean, and the young larval lobsters grow up in the shallow estuaries and lagoons. The spiny lobster's only defense is a body covering which is a heavy armor-like plate with stout, sharp spines.

Feed on - most anything.
Food for - man, large fish, octopus

MOLLUSK - (univalves)

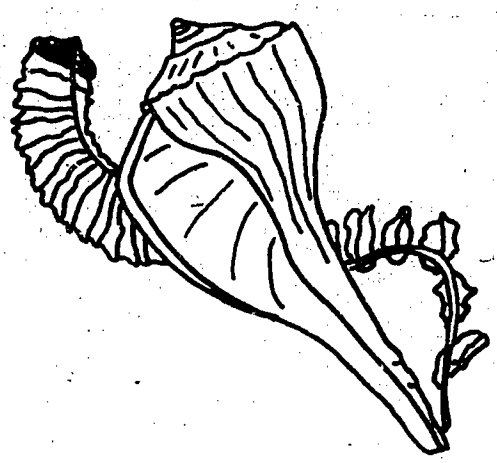
CONCH -



Conchs are found on sandy bottoms of shallow, tropical waters. The conch is more active than most mollusks. The foot is very strong and the shells are usually thick and solid. Some conchs have strong teeth and jaws as well as a keen sense of sight and smell.

Feed on - crabs, fish, algae and some green plants. May be considered scavengers or predators.
Food for - other mollusks, man

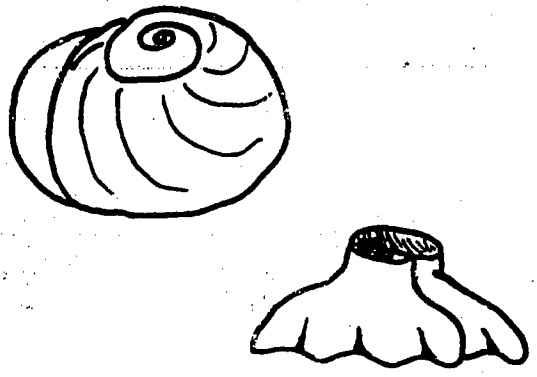
WHELK -



Whelks are found along temperate parts of the Atlantic Coast. All whelks have large shells ranging up to 12 inches. Whelks drill bi-valve shells with a rasping tongue-like structure (radula) and feed on the animal inside. In summer, strings of horny egg cases of these whelks are found on the beach.

Feed on - barnacles and mussels, may be scavengers or predators
Food for - other mollusks

MOON SNAIL - (Atlantic)



Moonsnails have a rounded shell which ranges from grey to tan in color. They are found along the coast in the shallow sandy bottoms. They have a very strong muscular foot which grasps their food; usually clams or cockles. They then secrete an acid and use a RADULA to get into the shell. The moonsnail eggs are recognized for they are held together by sand and shaped into a collar. You find them along the beach.

Feed on - clams (up to 3 a day)
Food for - gulls

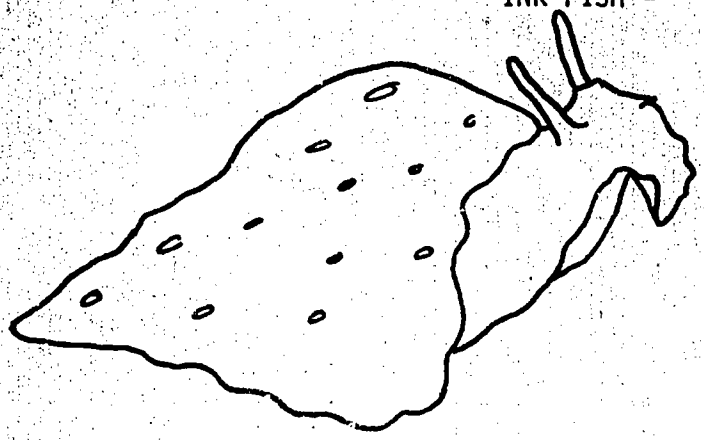
TECTIBRANCH

SEA HARE -

The sea hare is a tectibranch. Adults have NO shell. There is a plume-like gill on the right side of the body, protected by a flap. This ragged sea hare is soft and flappy and greyish. They secrete a gelatin-like material. They live in grassflats of quiet waters. They can give off a deep purple ink.

Feed on - green algae
Food for - turtles will eat them

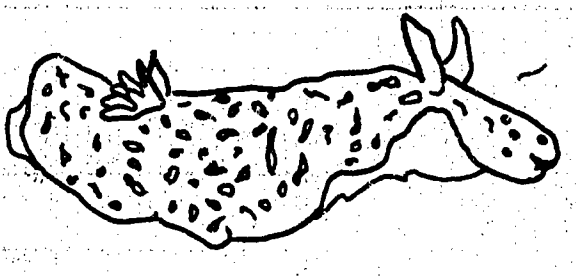
INK FISH -



Another type of sea hare. The adult does have a slight shell. They are purplish-grey brown. They also live in shallow water grassy flats. They eject a purple ink.

Feed on - algae
Food for - turtles

NUDIBRANCH



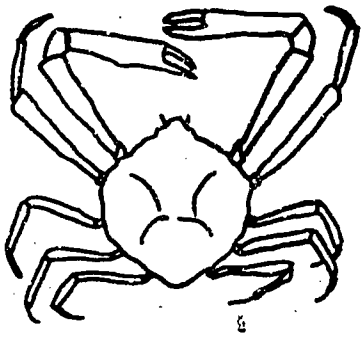
Nudibranchs are odd shaped invertebrates. Nudibranch means "naked gill". They are related to land slugs. Both are snails that have over the centuries lost their shells. They range from an inch to a foot in length and come in many colors, stripes and/or spots. They move on a flat muscular foot and can swim short distances.

Feed on - sponges, sea anemone, algae
Food for - apparently they taste pretty bad as they have no major enemies

ARTHROPODS : CRUSTACEANS

Crustacean is a class of ARTHROPODS, (jointed legged Invertebrates). The crustaceans have 5 pair of jointed legs, gills and 2 pair of antennae.

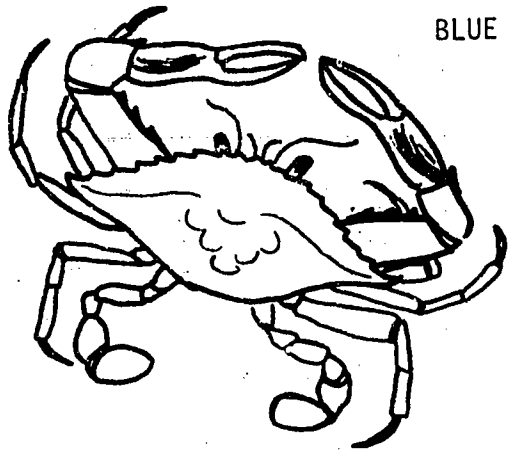
SPIDER CRAB



- Spider crabs are so called because their legs are long and slender in proportion to their bodies. Some of this group have developed the masking instinct and are called decorator crabs. They cover their bodies with bits of seaweed, debris, etc.

  Feed on - algae, detritus, shrimp
  Food for - octopus, some birds, larger crabs

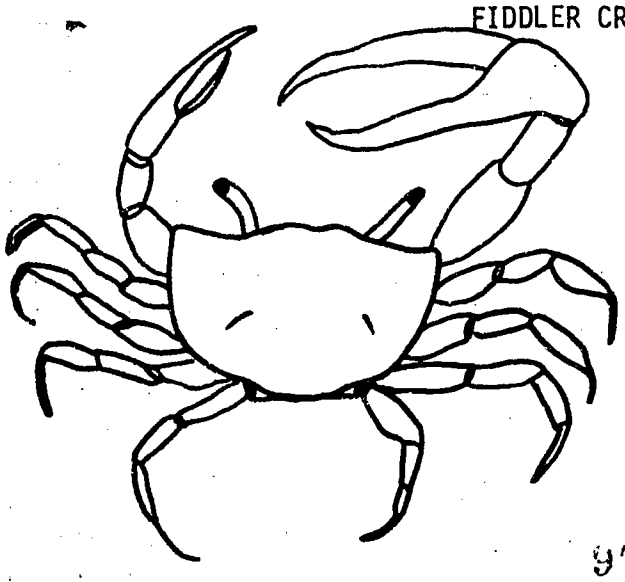
BLUE CRAB



- Blue crabs live on the bottom of the river as well as in the ocean. They are aggressive, excellent swimmers. Note how he swims sideways.

  Feed on - anything, they are
  Food for - man, octopus, and fish

FIDDLER CRAB

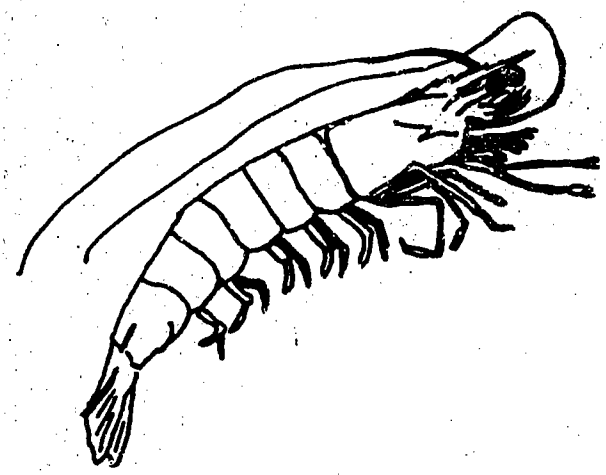


- The fiddler burrows in the dryer parts of sandy beaches. Sometimes their burrows reach three feet in length. The male fiddler is the most familiar because he has the enlarged fiddle shaped claw. The claw is used for display during the mating season.

  Feed on - detritus
  Food for - gulls, fish

ARTHROPODS: CRUSTACEANS (cont'd)

SHRIMP



- Shrimp are inhabitants of shallow grassflats and sandy shores. They swim backward by whipping their fan-like tails. Some species are edible. You will likely find several kinds in our river.

(a) broken back - average one inch in length, snappy jumpers

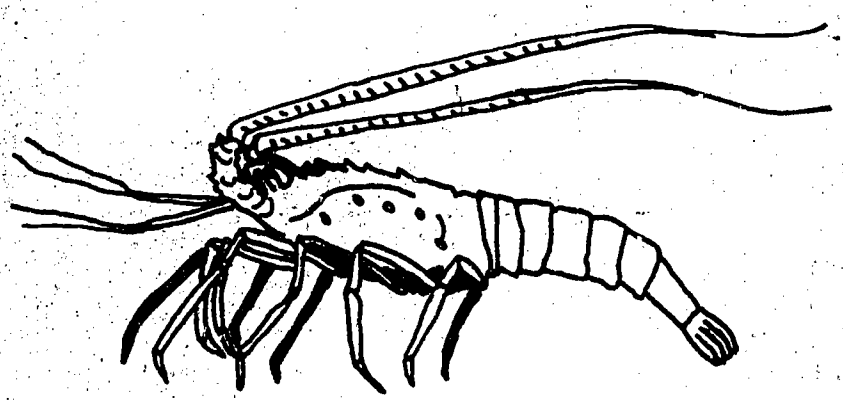
(b) snapping shrimp - enormous claw on one side. By flicking its wrist it makes a loud popping noise.

(c) glass shrimp - nearly transparent small shrimp

(d) edible shrimp - sometimes referred to as a prawn, brown 4-6 inches

Feed on - algae, plankton, detritus
Food for - man, fish, birds, crabs

SPINY LOBSTER

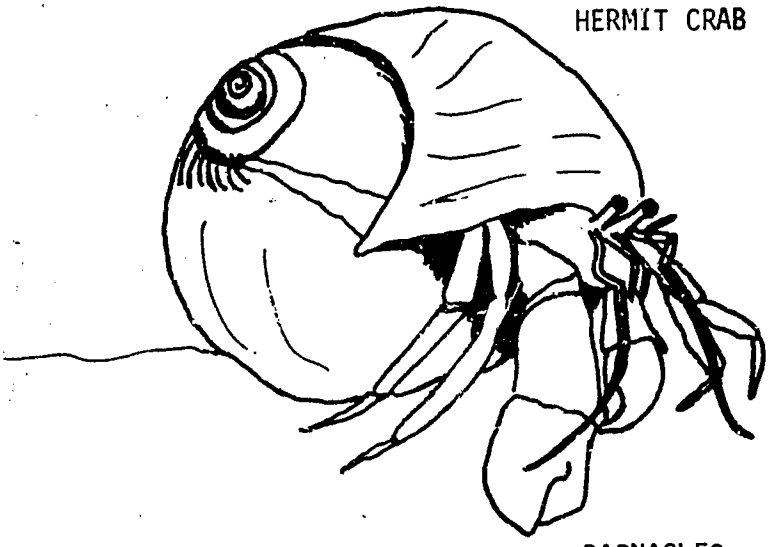


- The spiny lobster, also called the Florida crayfish, lives in rock or reef crevices in the ocean. Adults spawn in the ocean, and the young larval lobsters grow up in the shallow estuaries and lagoons. The spiny lobster's only defense is a body covering which is a heavy armor-like plate with stout, sharp spines.

Feed on - most anything
Food for - man, large fish, octopus

ARTHROPODS: CRUSTACEANS (cont'd)

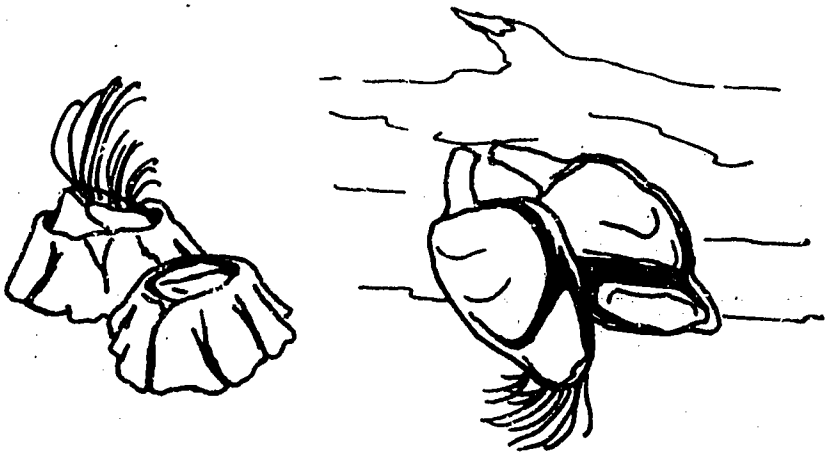
HERMIT CRAB



- The hermit crab is a bottom dweller of mud or sand in the ocean and river. This harmless crab borrows an empty snail shell for his home. His tail and rear legs have been modified to fit into his shell.

Feed on - dead organisms, detritus - a scavenger
Food for - birds, crabs, fish, bait

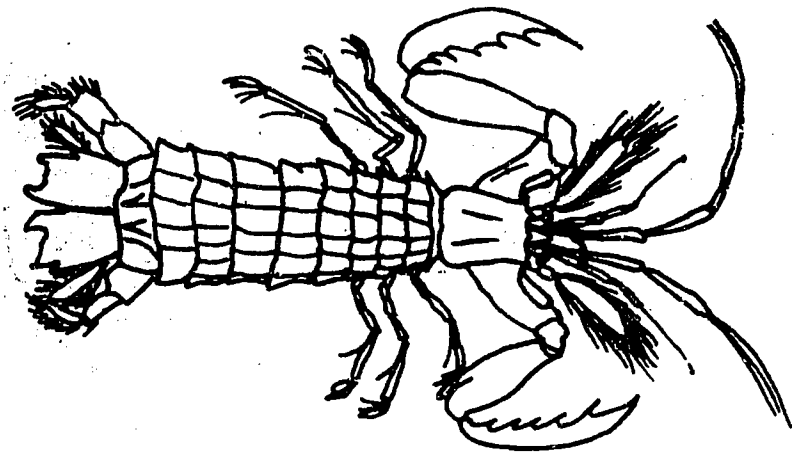
BARNACLES



- Barnacles grow on rocks, wood, shells, etc. Their volcano-shaped homes are attached with a very strong glue-like substance. The small animal lies on its back in the water kicking food into its mouth with its legs.

Feed on - plankton
Food for - file fish, birds, puffers.

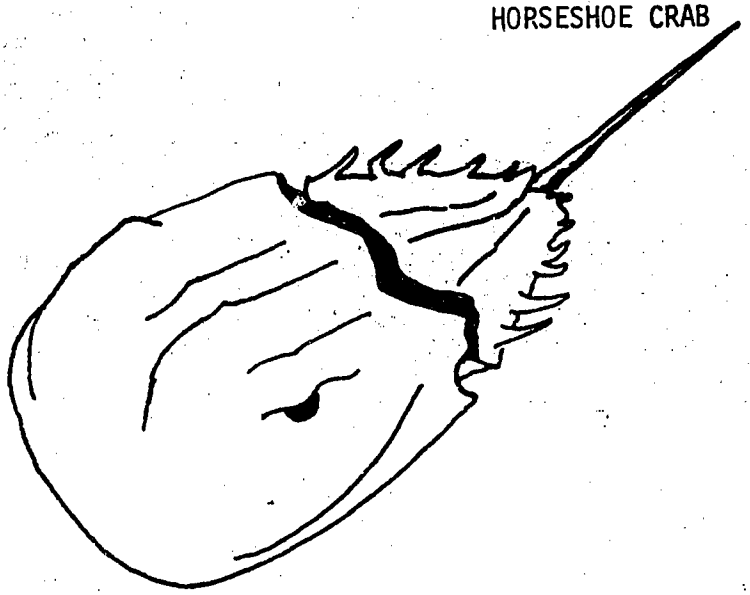
MANTIS SHRIMP



- This is not a true shrimp. He makes shallow burrows in mud between the tides and below the low tide water line. Often each burrow has more than one opening. The mantis shrimp captures his prey with powerful front snatchers. These limbs resemble the insect from which his name originates - the praying mantis.

Feeds on - fish, crabs and shrimp
Food for - man, octopus

ARTHROPODS: CHELEPODS



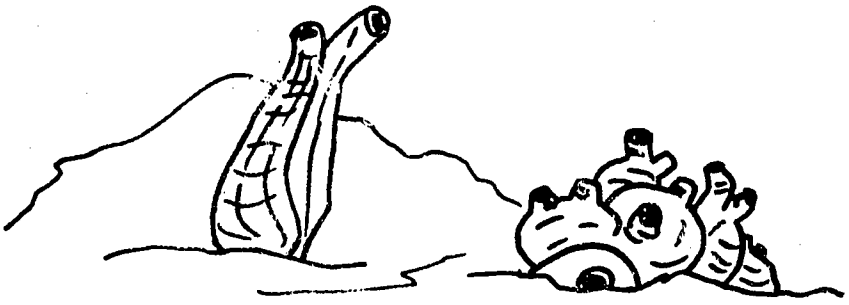
HORSESHOE CRAB - The horseshoe crab is not a crab or a crustacean, but a chelepod, a descendant of another ancient animal. Its nearest living relative is the spider. Horseshoe crabs are harmless. You will find them in the river and ocean along the bottom.

Feed on - small crustaceans, worms
Food for - adults have no natural enemies

INVERTEBRATES: CHORDATES

Chordates are animals which have gill slits and a notochord during at least one stage of their life, and a dorsal tubular nerve cord.

SEA SQUIRT



- The sea squirt belongs to the chordate group the same as you do. They start life free swimming, with a notochord, dorsal nervous system and gill slits, but as they mature they settle down to a sessile life and lose much that they began with. You will find them growing singly or in clumps on pilings, walls and rocks.

Feed on - plankton
Food for - rock crabs

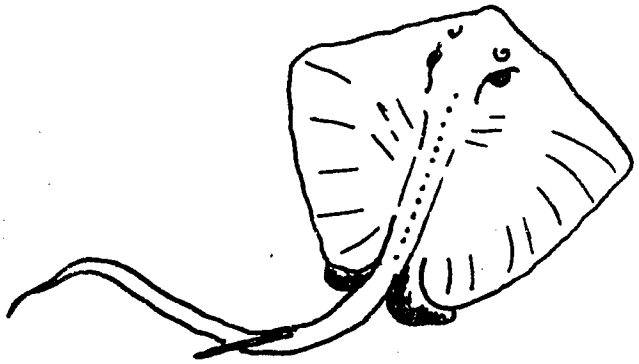
VERTEBRATES: CHORDATE

Vertebrates are the large group of chordate animals that have a backbone or vertebral column.

FISH

Fish - most numerous class of the vertebrates. Most fishes have a body covering of scales. They are equipped with fins for locomotion, gills for getting oxygen out of the water.

STINGRAY



- The stingray is mostly a bottom dweller of river and ocean. It is related to the shark, having a skeleton made of cartilage. It gives birth to live babies. Near the end of its tail is a barbed stinger which can inflict a painful sting.

Feed on - shrimp, clams, mollusks
Food for - adults have no known enemies

BUTTERFLY RAY

- Shaped like a DELTA or triangle, it is easily distinguished from the Stingray. This ray does not possess a stinger. Its tail is very short. It also lives on the bottom of the river and ocean.

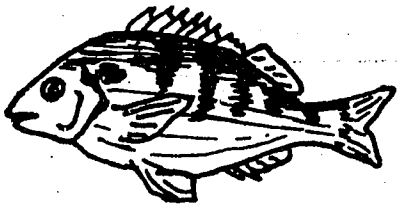
Feed on - shrimp, clams, mollusks
Food for - adults have no known enemies

LIZARD FISH

- Lizard fish are cigar-shaped bottom fishes with large mouths and many sharp teeth. They may sit on the bottom or bury themselves up to their eyeballs in the sand. They are carnivorous and voracious eaters.

Feed on - small fish, crabs, shrimp, worms
Food for - larger fish, birds

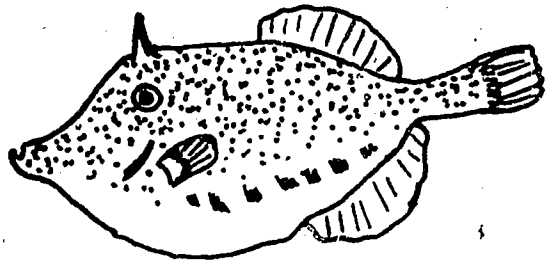
PINFISH



- Pin fish are also called shiners, sailor's choice, bream and porgy. Young pinfish are common and numerous in the grassflat. Adults average less than a pound in weight.

Feed on - smaller fish, shrimp, worms
Food for - larger fish, crabs, birds

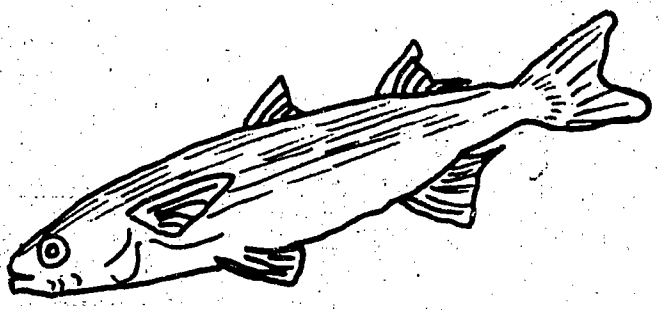
FILEFISH



- The filefish is a slow swimming fish with rough, leather skin. They are found in both the Indian River and ocean. Filefish are generally small, and a one pounder is considered large. They have small mouths with sharp canine type teeth.

Feed on - small barnacles
Food for - larger fish, birds, etc.

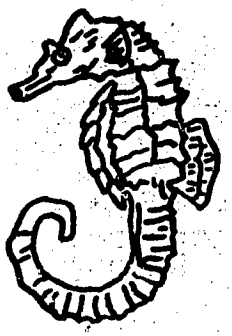
MULLET



- Young mullet live in the ocean. When about an inch long, they come inshore and begin feeding on the bottom. Most are salt water fishes but some live in parts of the estuary where water is almost fresh. The fish you see jumping in the river are apt to be mullet.

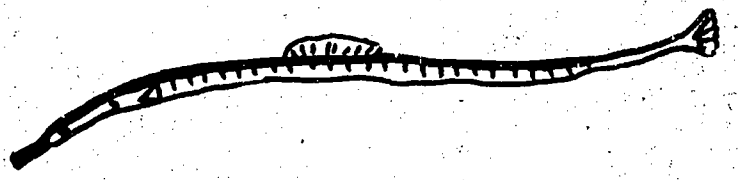
Feed on - vegetable matter gotten from bottom detritus
Food for - man, larger fish

SEAHORSES



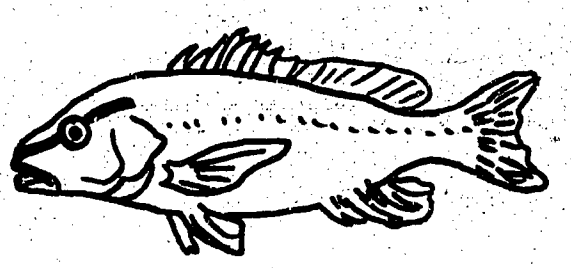
- Seahorses have segmented bodies encased in bony rings. Their protective coloring and slow motion make them difficult to see in the shallow grassflats. The female deposits eggs into a broad pouch on the male's underbelly where they incubate about 10-36 days. He gives birth to 20 - 500 live babies, depending on species. Some species live in the ocean. A close relative is the pipefish.

PIPEFISH



Feed on - plankton, tiny shrimp and fish
Food for - larger fish

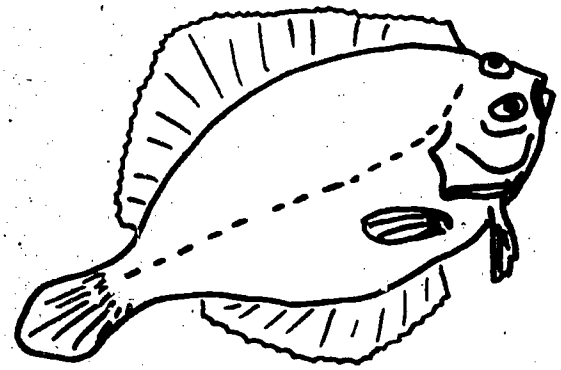
MANGROVE SNAPPER



- There are several species of snappers in our area but the Mangrove Snapper is most common. Easy to recognize by the dark streak which runs from the nose across the eye toward the top (dorsal) fin. They are carnivorous animals.

Feed on - small fish, shrimp
Food for - man, larger fish, birds

FLOUNDER

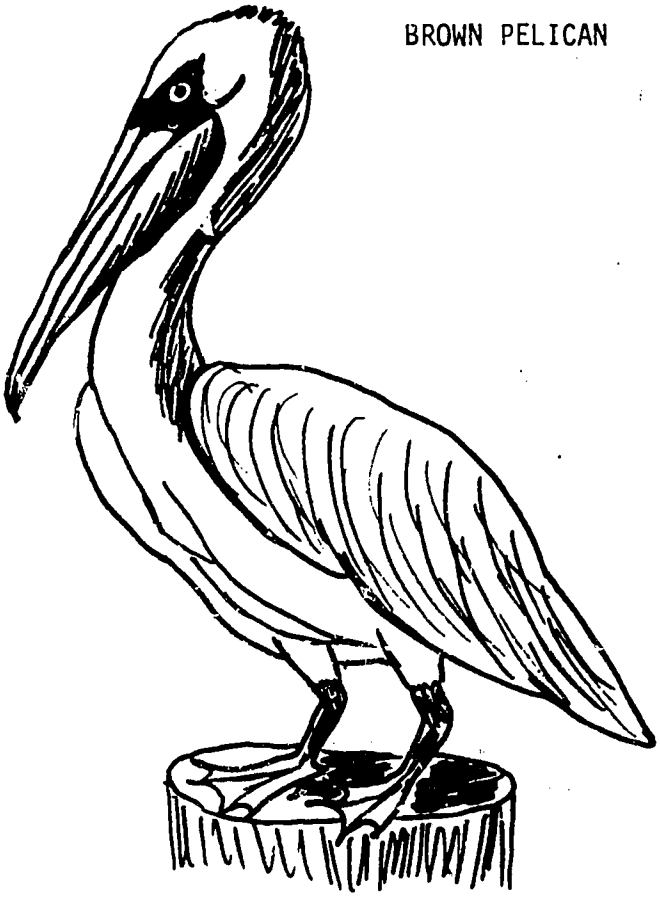


- Flounder spend their life on the bottom. Only one side of their body is marked. The bottom side is white. Both eyes are on one side - the top.

Feed on - small minnows, crabs
Food for - excellent food fish for man, sharks

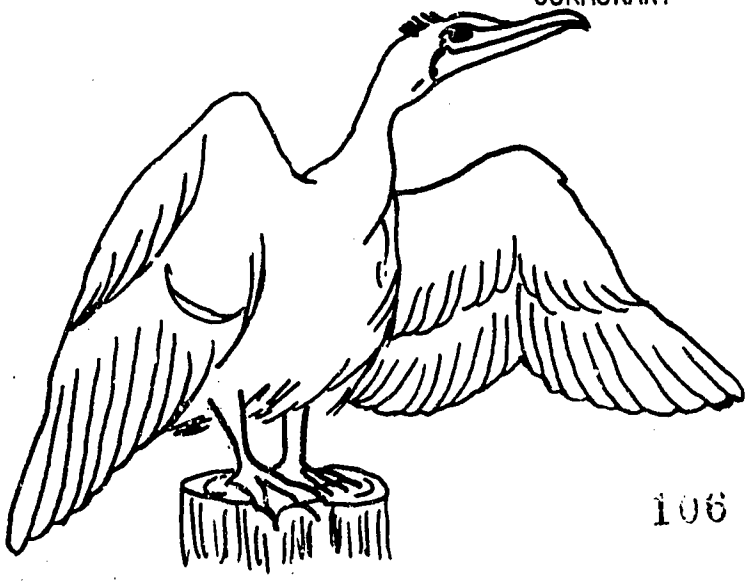
BIRDS

Birds - warm blooded vertebrates designed for flight. The skeleton is compact, light in weight and yet very strong. Their most unique characteristic is a covering of feathers used for flight and insulation.



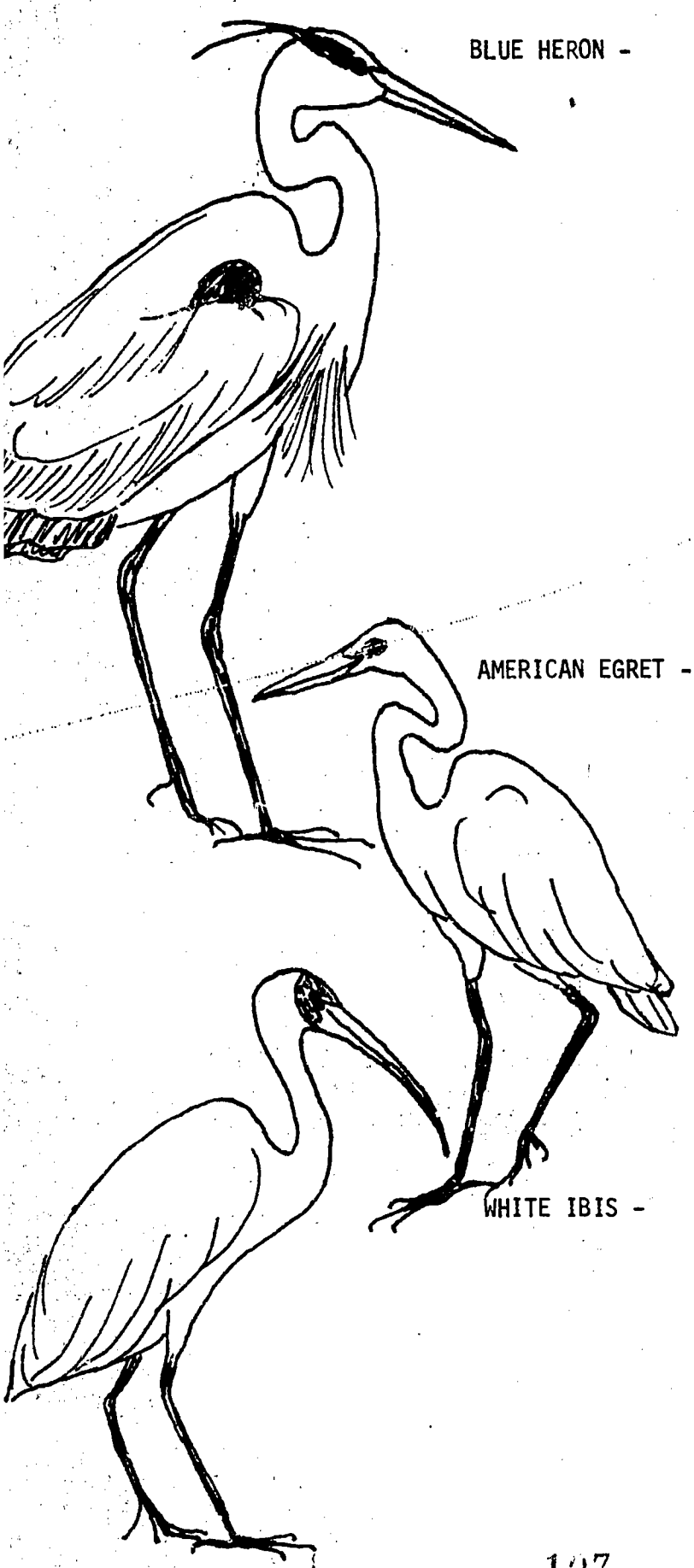
BROWN PELICAN - The brown pelican is a large dark gray-brown water bird found on Atlantic and Gulf Coasts from North Carolina to Texas. The adult is white about the head and neck with wing spread of 10 ½ feet. They nest on spoil islands in the Indian River. These birds have unique pouches for feeding. They dive into the water much like a falling rock. This stuns the fish just long enough for the bird to gather a catch along with 2 or 3 gallons of water. The water must drain out of the pouch before the pelican can again fly.

Feed on - fish
Food for - top predator - only enemy is man and his pesticides



CORMORANT - This excelient swimming and diving water bird is large and black. It is easily recognized when it perches and spreads its wings to dry. They do not secrete wax to prevent water logging and therefore must dry their wings after they dive.

Feed on - fish
Food for - a top predator



BLUE HERON - The blue heron is a solitary gray-blue wetland bird. He stalks the shallow grassflats, shores and marshes on "stick" like legs. The bird is about 4 feet tall but weighs only 5 - 6 lbs. He feeds early morning and evening.

Feed on - fish, crabs, frogs, mice and grasshoppers.
Food for - top predator, occasionally may be victim of an alligator, water snake, or the encroachment of man on their feeding territory.

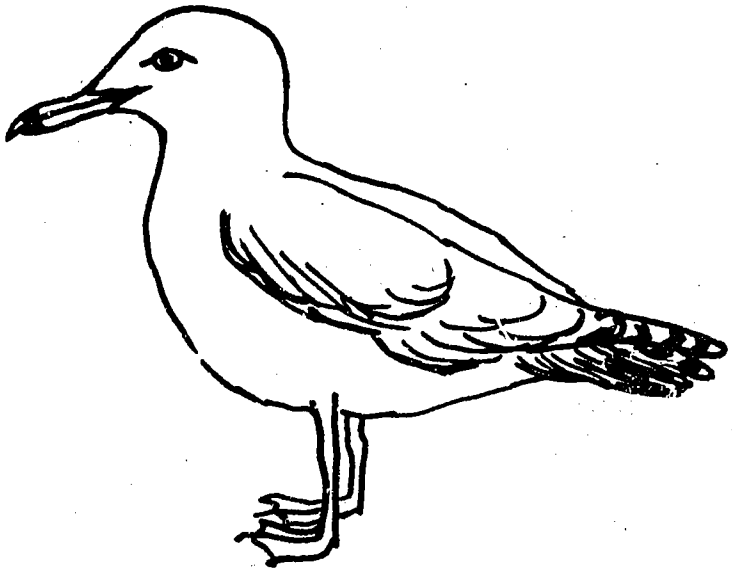
AMERICAN EGRET - This white bird is recognized striding along shores in shallow waters. His bill is yellow and legs dark.

Feeds on - fish, small crabs, etc.
Food for - top predator

WHITE IBIS - This bird is usually found in coastal locations. The adult has red face and bill. They are often seen in large flocks.

Feed on - little crustaceans, etc.
Food for - top predator

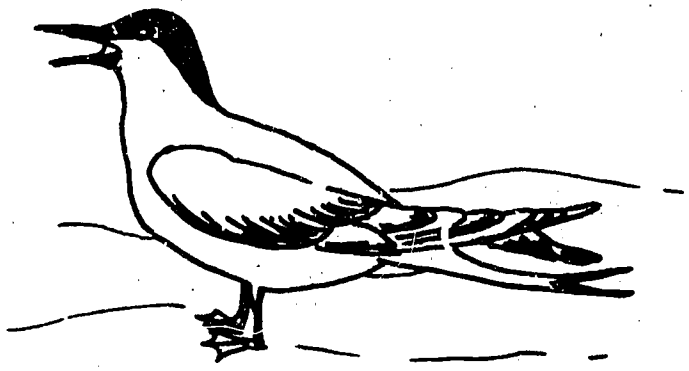
GULL



- Sea gull is a misnomer. Gulls are not restricted to the sea. Some types of gulls are found in prairies of the west. The most common gull along the Indian River is the Ring Billed Gull. Gulls are sturdy birds with webbed feet, long pointed wings, and a fat hooked bill. They fre - quent dumps, fishing docks and boat wakes. They do not dive under the water for food, but light on the water to seize food.

Feed on - scavengers
Food for - top predator

TERN



- The tern is a slender bird with a long narrow wing, forked tail, and pointed bill. Terns float easily through the air and when fishing go like a "dive bomber" into the waters of ocean or river. The most familiar tern in this area is the Common Tern.

Feed on - small fish, insects
Food for - top predator

7th Grade Slide Presentation

"Organisms"

TEACHER - Turn projector on to "Focus" slide. Start tape. Advance slides at the audible tone or, if you are reading this aloud, where indicated by the asterisk (*). The narrative is in CAPITAL letters.

1. "Focus" *

2. "Credits" slide *

3. "An Environmental Study Unit on A Spoil Island Investigation" *

4. "Organisms." IN THE FOLLOWING SLIDES YOU WILL BECOME ACQUAINTED WITH SOME OF THE ORGANISMS ON OR AROUND A SPOIL ISLAND IN THE INDIAN RIVER LAGOON. *

5. SEA PURSLANE - SEA PURSLANE IS A TRAILING PLANT THAT GROWS IN THE SAND. THE LEAVES ARE FLESHY OR SUCCULENT. THEY ARE DELICIOUS IN A GREEN SALAD. SEA TURTLES IN CAPTIVITY ALSO LIKE SEA PURSLANE TO EAT. *

6. RED MANGROVES ARE PIONEER PLANTS AND LAND BUILDERS. THEY ARE EASILY RECOGNIZED BY THE LARGE PROP ROOTS AND PENCIL LIKE SEEDS. THE RED MANGROVES PROVIDE A NURSERY AREA RICH IN FOOD FOR SMALL ANIMALS, HELP CONTROL SOIL EROSION, AND SERVE AS A BIRD SANCTUARY.

7. PLANKTON IS A TERM USED FOR THE PLANTS AND ANIMALS WHICH ARE FOUND FLOATING OR DRIFTING IN SALT OR FRESH WATER. MOST PLANKTON ARE VERY SMALL AND CAN ONLY BE SEEN WITH THE AID OF A MICROSCOPE. PLANKTON IS VERY IMPORTANT TO LIFE. IT IS THE BEGINNING OF ALL WATER FOOD WEBS. OCEANIC PLANKTON PRODUCES OVER 70% OF EARTH'S OXYGEN. *

8. THE CONCH IS AN INVERTEBRATE. IT BELONGS TO THE PHYLUM MOLLUSCA. CONCHS ARE FOUND ON SANDY BOTTOMS OF SHALLOW TROPICAL WATERS. THE FOOT (PART OF THE BODY) IS VERY STRONG AND THE SHELL IS USUALLY THICK AND SOLID. THE TYPE OF CONCH DETERMINES HIS DIET. SOME FEED ON CRABS AND FISH, OTHERS ALGAE AND GREEN PLANTS. THE CONCH IS FOOD FOR OTHER MOLLUSKS AND MAN. *

9. THE FIDDLER CRAB IS AN INVERTEBRATE. IT BELONGS TO THE PHYLUM ARTHROPODA. FIDDLER CRABS BURROW IN THE DRIER PARTS OF SANDY BEACHES. THE MALE FIDDLER HAS AN ENLARGED CLAW. THE MALE USES THE LARGE CLAW TO ATTRACT THE FEMALE DURING THE MATING SEASON. FIDDLERS FEED ON DETRITUS. THESE CRABS ARE FOOD FOR GULLS. *

10. THE SEA SQUIRT BELONGS TO THE MOST ADVANCED PHYLUM OF ANIMALS, THE CHORDATES. THE YOUNG SEA SQUIRTS START LIFE AS FREE SWIMMING ORGANISMS. THEY HAVE A NOTOCHORD, DORSAL NERVOUS SYSTEM AND GILL SLITS. AS THE SQUIRT MATURES HIS BODY CHANGES AND IT SETTLES DOWN IN ONE SPOT AND BECOMES ATTACHED EITHER SINGLY OR IN CLUMPS TO PILINGS AND SEA WALLS. THE SEA SQUIRT IS REFERRED TO AS A SESSILE ANIMAL - MEANING IT DOES NOT MOVE. THE SEA SQUIRT FEEDS ON PLANKTON. IT IS FOOD FOR ROCK CRABS. *

11. PIPEFISH ARE VERTEBRATES AND BELONG TO THE PHYLUM CHORDATA ALSO. THIS ANIMAL IS A CLOSE RELATIVE OF THE SEAHORSE. THE FEMALE DEPOSITS EGGS INTO A BROOD POUCH ON THE UNDERBELLY OF THE MALE. THERE THE EGGS INCUBATE OVER VARYING PERIODS OF TIME. HE GIVES BIRTH TO LIVE BABIES.

    PIPEFISH FEED ON PLANKTON, TINY FISH AND SHRIMP. THEY ARE FOOD FOR LARGER FISH AND OTHER ANIMALS IN THE RIVER. *

12. FILEFISH ARE SLOW MOVING FISH WITH ROUGH LEATHERY SKINS. THEY HAVE SMALL MOUTHS WITH SHARP CANINE TYPE TEETH. FILEFISH FEED ON BARNACLES. THEY ARE FOOD FOR LARGER FISH, BIRDS, ETC. *

13. YOUNG MULLET LIVE IN THE OCEAN. WHEN ABOUT AN INCH LONG THEY COME INSHORE AND BEGIN FEEDING ON THE BOTTOM.

MOST ARE SALTWATER FISHES BUT SOME LIVE IN PARTS OF THE ESTUARY AND RIVER WHERE WATER IS ALMOST FRESH. THE FISH YOU SEE JUMPING IN THE RIVER ARE APT TO BE MULLET. MULLET FEED ON VEGETABLE MATTER EXCLUSIVELY. THEY ARE FOOD FOR MAN AND LARGER FISH. *

14. The End.

TEACHER - Please rewind tape for next use. Thanks

7th Grade Slide Presentation

"Equipment"

TEACHER - Turn projector on to "Focus" slide. Start tape, advancing slides at the audible tone or, if you are reading this aloud, where indicated by the asterisk (*). The narrative is in CAPITAL letters.

1. "Focus" *
2. "Credits" slide *
3. "An Environmental Study Unit on a Spoil Island Investigation" *
4. "Equipment". THE FOLLOWING SLIDES FAMILIARIZE YOU WITH FIELD EQUIPMENT USED FOR A SPOIL ISLAND STUDY. *
5. CORE SAMPLER - THE CORE SAMPLER IS USED TO TAKE SOIL SAMPLES. *
6. THE CORE SAMPLER IS PUSHED AND TURNED INTO THE SOIL 30 - 50 CENTIMETERS. THESE STUDENTS ARE PULLING THE CORE SAMPLER OUT. NOTICE THE STUDENTS ARE TIPPING THE CORER AT AN ANGLE AS IT IS WITHDRAWN FROM THE SOIL. THIS IS THE CORRECT TECHNIQUE. *
7. THE CORE SAMPLER IS PLACED IN THE SIEVE AS SEEN IN THE PICTURE. THE STUDENTS ARE MEASURING THE DEPTH OF THE SOIL SAMPLE, DETERMINING TYPE OF SOIL AND PLANTS AND ANIMALS FOUND IN THE CORE SAMPLE. THIS INFORMATION IS RECORDED ON A DATA SHEET. *
8. TRANSECT LINE - A TRANSECT LINE IS USED AS A METHOD OF SAMPLING A LARGE AREA. IN THE SLIDE THE STUDENTS HAVE A 10 METER LINE STRETCHED OUT IN THE WATER. THE LINE IS MARKED OFF IN 1 METER LENGTHS. ALONG EACH METER THEY ARE MEASURING THE PHYSICAL FACTORS OF THE SAMPLING AREA. FOR EXAMPLE, IN THIS PICTURE THEY ARE MEASURING THE DEPTH OF THE WATER. THE TEMPERATURE AND SALINITY IS ALSO MEASURED AND THE PLANT AND ANIMAL LIFE IN THE AREA SAMPLED. *

9. A TRANSECT LINE IS ALSO DONE ON A LAND AREA OF THE ISLAND. AT SELECTED METER INTERVALS ALONG THE TRANSECT LINE THE DEPTH OF THE WATER TABLE, SALINITY, TEMPERATURE IS MEASURED: THE TYPE OF SOIL DETERMINED AND PLANTS AND ANIMALS ALONG THE LINE IDENTIFIED. THIS SAMPLING TECHNIQUE GIVES YOU AN IDEA OF RELATIONSHIPS FOUND ON THE ISALND. *

10. SEINE NET - THE SEINE NET IS USED TO SAMPLE PLANTS AND ANIMALS ALONG A WATER TRANSECT SAMPLING AREA. NOTICE IN THE PICTURE THE FLOATS ARE ON TOP OF THE NET AND WEIGHTS ARE ON THE BOTTOM. THE SEINE NET IS PUSHED THROUGH THE WATER AS IF PUSHING A BROOM. THE POLES ARE PUSHED THROUGH THE SUBSTRATE IN FRONT OF THE STUDENT'S FEET. THE POLE PLACEMENT AND THE SHUFFLING OF FEET HELP SCARE AWAY STINGRAYS AND CRABS. *

11. THE NET IS THEN BROUGHT TO SHORE WHERE IT IS EXAMINED FOR CRITTERS. BE CAREFUL NOT TO STEP ON THE NET AS NO ONE LIKES CRUNCED CRITTERS, ESPECIALLY THE CRITTER.

12. DISSOLVED OXYGEN KIT - THIS IS A KIT THAT DETERMINES THE AMOUNT OF OXYGEN IN A WATER SAMPLE. AS YOU KNOW MOST ALL ORGANISMS NEED OXYGEN TO CARRY ON LIFE PROCESSES. THE DIRECTIONS TO USE THE KIT ARE LOCATED ON THE INSIDE COVER OF THE KIT. *

13. IN THIS PICTURE SOME STUDENTS ARE DOING A PART OF THE TEST TO FIND THE AMOUNT OF OXYGEN. NORMALLY LIFE IS SUPPORTED WHEN THERE IS 6 - 10 (PPM) PARTS PER MILLION OF OXYGEN. *

14. REFRACTOMETER - THE REFRACTOMETER IS AN INSTRUMENT USED TO MEASURE SALINITY. A DROP OF THE WATER TO BE SAMPLED IS PLACED ON THE CLEAN PLATE LABELED SPECIAL SCALE. THE PRINCIPLE OF THE REFRACTOMER IS THAT LIGHT RAYS ARE BENT IN WATER. THIS IS CALLED REFRACTION. SALT PARTICLES IN THE WATER CAUSE THE LIGHT RAYS TO BEND MORE. *

15. YOU LOOK INTO A REFRACTOMETER AS IF IT WERE A TELESCOPE. INSIDE IS A SCALE WHICH MEASURES THE AMOUNT OF REFRACTION. THIS IS EXPRESSED IN PARTS PER THOUSAND (PPT) OF SALT IN YOUR SAMPLE. FOR EXAMPLE THE OCEAN HAS ABOUT 35 PPT. WHAT DO YOU THINK IS THE SALINITY OF THE INDIAN RIVER? *

16. HYDROMETER - THE HYDROMETER IS ANOTHER TYPE OF INSTRUMENT USED TO MEASURE SALINITY. THERE ARE TWO SCALES IN THIS INSTRUMENT. THE TOP SCALE WILL HELP TELL SALINITY BY INDICATING HOW DEEP IT SINKS IN THE WATER. THE BOTTOM SCALE IS A SIMPLE THERMOMETER GIVING US TEMPERATURE OF THE WATER. TO USE, THE HYDROMETER IS PUT IN A CYLINDER OF WATER AS SEEN IN PICTURE "B". *

17. IN THIS PICTURE THE HYDROMETER SCALE READS APPROXIMATELY 1.025. *

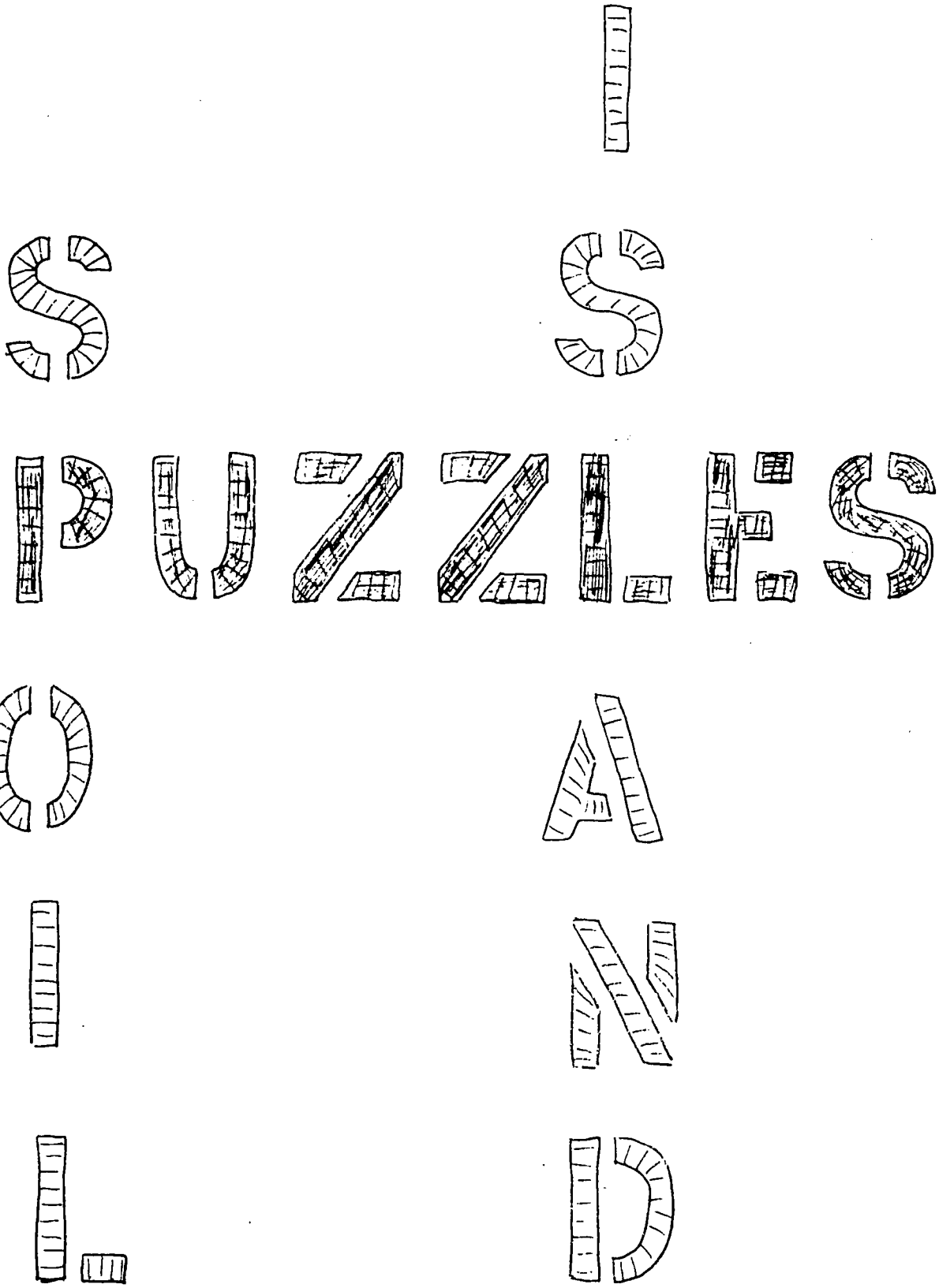
18. THE TEMPERATURE READS 80^{o} FAHRENHEIT. *

19. BOTH OF THESE READINGS ARE NECESSARY TO DETERMINE THE SALINITY OF THE WATER. USING THE SALINITY CHART READ ACROSS FROM THE HYDROMETER READING OF 1.025 AND DOWN FROM THE TEMPERATURE READING OF 80^{o}. WHERE THESE TWO INTERSECT GIVES YOU AN APPROXIMATE SALINITY READING. IN THIS EXAMPLE THE SALINITY IS 37.6 PARTS PER THOUSAND. *

20. THIS INVESTIGATION OF A SPOIL ISLAND IS ONLY A PART OF THE ENVIRONMENTAL INTERRELATIONSHIPS TO BE EXPLORED AND DISCOVERED.

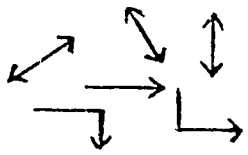
The end.

TEACHER - Please rewind the tape for its next use. Thanks.


PUZZLES
AND

LIFE OF A SPOIL ISLAND

DIRECTIONS: Find the listed words in the diagram. They run in all directions - forward, backward, up, down, diagonally. (See below)



A	R	M	A	N	T	I	S	I	C	P	U	M	B	S	
O	U	T	P	W	I	O	H	O	N	E	B	A	S	T	
Z	C	S	E	A	P	U	R	S	E	L	A	N	F	I	
B	M	Q	T	E	L	D	I	E	N	I	R	G	A	N	
O	R	C	U	R	G	M	M	N	P	C	C	R	G	G	
D	X	B	R	R	A	R	P	I	M	A	T	O	R	R	
P	G	R	A	S	S	L	J	V	T	N	S	V	A	A	
I	X	S	S	R	K	L	I	D	H	D	O	E	P	Y	
N	S	T	Y	V	C	T	Q	A	C	V	H	C	E	B	
F	I	S	H	P	O	I	S	O	N	A	G	F	T	L	
I	B	Z	Q	W	C	X	G	R	O	P	X	J	I	P	
S	I	B	R	J	K	Y	C	L	C	A	I	A	U	T	
H	K	X	S	S	L	U	Q	I	L	R	N	N	T	S	
T	U	R	T	L	E	G	R	A	S	S	K	P	E	B	
K	U	T	U	B	E	W	O	R	M	T	F	I	S	H	

australian pine
mangrove
cord grass
sea purselane
fish poison
ghost crab
tube worm
turtle grass
stingray
seagrape

conch
pelican
ibis
cockle
railroad vine
snail
palm
pinfish
inkfish
mantis shrimp

JOLLY JUMBLES

L U G L
G U L L

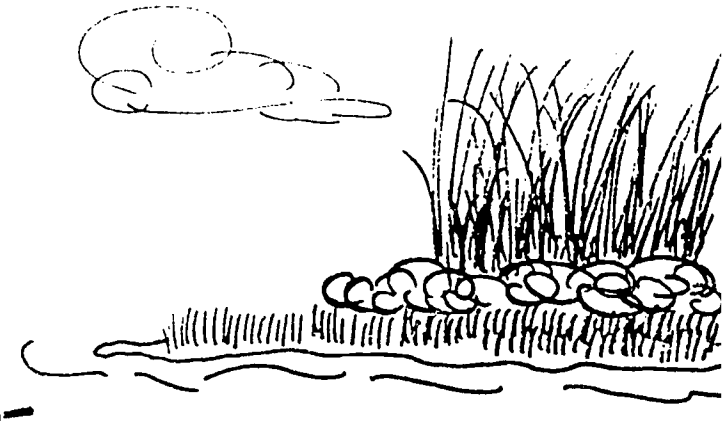
O D F O
F O O D

S N I E E
S E I N E

S G S A R
G R A S S

F P E F U R
P U F F E R

R S H M R I
S H R I M P



CLUE :
INVESTIGATION
LOCATION

SURPRISE ANSWER

S P O I L I S L A N D

WHAT IS IT?

All the following are organisms found on or around the Spoil Island. See if you can figure out what they are.

1. What is a triangle that seeks soft sand -- but beware!! STING RAY

2. What is a hard body trimmed in blue, snatching arms, gray brown upper and white lowers? BLUE CRAB

3. What has two salt vents and a notched top? WHITE MANGROVE LEAF

4. What by its name could play a stringed instrument? FIDDLER CRAB

5. What is filmy and tall and looks like what it is not? AUSTRAILIAN PINE

6. What totes a shell but shifts around? HERMIT CRAB

7. What is big, tall, thick and branched with a silver green top that is wide and fluttery? BLACK MANGROVE

8. What scoops like a drag line, but dives like a World War II bomber? PELICAN

9. What can be seen on some street corners, has a row of blue eyes, snaps like false teeth, and is good to eat? SCALLOP

10. What animal is oval and steel gray, with two long black sticks coming out of one end and a snake on the other? The snake has a pointed black cap and a sharp yellow spike to help it feed. GREAT BLUE HERON

SPOIL ISLAND ADVENTURE

CROSSWORD

ACROSS

1. sea mammal
5. hours, abbreviated
7. Officers Candidate School, abbreviated
10. large bird of prey
12. common small saltwater fish
16. a hidden home; den
17. long-legged, water bird
19. prefix meaning one
21. prolonged unconsciousness
23. large shrimp-like crustacean
25. life energy source
26. eat, past tense
27. larger than #17 across
29. preposition
30. to chart, graph or lay out
31. indefinite article
33. sampling method
34. South Carolina, abbreviation
35. slang word for sister
37. House of Lords, abbreviation
38. ancient crab-like Arthropod
42. "in regard to"
43. mid-day
44. you and me; plural
45. a grassflat sampler
46. a crustacean
47. epoch
49. a state
51. amount of salt in water
53. pesticide
54. musical scale note
56. a fossil fuel
59. a cormorant is a good one
62. ground water level
66. a state, N.W.
68. not yes
69. pigeon-like bird
70. opening to the sea
71. a common bait fish

DOWN

1. black mangrove breathing tubes
2. possess
3. tall marsh grass
4. primate
5. personal pronoun
6. type of grain
8. mollusk
9. South America, abbreviation
11. football position
12. evergreen tree
13. spoil island shrub
14. institute of learning
15. horizontal, abbreviation
18. jellyfish appendages
20. North Alliance Treaty Organization, abbreviation
22. in between
24. scale used to measure ACID-BASE
28. single
32. cartilaginous fish
34. many stemmed woody plant
35. elderly citizen
36. footwear
39. preposition
40. saltwater tree
41. recluse
45. NaCl
48. Rural Free Delivery, abbreviation
50. to be; 3rd person singular
52. rhythmic ocean movement
55. photogenetic energy
57. preposition
58. beach composition
59. Astronaut Slayton's first name
60. flexible stem
61. continuous flowing body of water
62. not too hot
63. indefinite article
64. end appendage
65. a bound volume
67. only

???????? ????

1. Movement of water caused by moon and sun
2. Water from the sky
3. A fish who carries his own baited pole on the top of his head
4. Water snail without a shell
5. NACL
6. Snowy bird
7. Direction finder
8. Instructor
9. Fish with reptile name
10. Land surrounded by water
11. Storms that damage beaches
12. It comes from the sun

Write the one word meaning of the phrases above in the spaces provided below. The first letter in each word will spell out an activity you will do on the Spoil Island.

1. T I D E
2. R A I N
3. A N G L E R
4. N U D I B R A N C H
5. S A L T
6. E G R E T
7. C O M P A S S
8. T E A C H E R
9. L I Z A R D
10. I S L A N D
11. N O R T H E A S T E R S
12. E N E R G Y

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7th Grade

WORK DATA SHEET

Date _____ Location _____ Group _____ Time _____

10 M Transect Line (water)

	M	M	M	M	M
Depth of Water in cm					
Wind Speed mph					
Wind Direction					
Distance from shore in M					
Temperature °F					
Surface					
Bottom					
Air					
Salinity ppt					
Refractometer					
Hydrometer Temp.					
Specific Gravity					
Salinity					
Dissolved Oxygen (O_2)					
Depth (in cm)					
Am't of O_2 (Oxygen)					

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7th Grade

DATA SHEET

Date _____ Location _____ Group _____

SEINING a 10 M Area

	Sweep 1	#	Sweep 2	#	Sweep 3	#	Each Specie Total
ANIMALS							
PLANTS							
OTHER							

CONSTRUCT A FOOD WEB ON BACK

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7th Grade

WORK DATA SHEET

Transect Line (Land)

Date_____ Location _____ Group _____ Time _____

Transect Line Meter	M		M		M
Distance from water (H_2O) in Meters (m)					
Air Temp. (°F)					
Shoulder height					
Surface					
	Begin	End	Begin	End	River Salinity (ppt)
Wind Speed (mph) Lowest					
Highest					
Total					
Average					
Wind Direction					
Water Table					
Depth of Water (H_2O) Table					
Temp. of H_2O					
Salinity ppt					
Am't. of Oxygen (O_2)					
Core Sample					
Depth in cm					
Soil type					
Depth of organic layer (in cm)					
ANIMALS					
PLANTS					
OTHER					

DATA SHEET

Organisms found along each meter on the transect	PLANTS	ANIMALS
0 M		
1 M		
2 M		
3 M		
4 M		
5 M		

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DATA SHEET (cont'd.)

Organisms found along each meter on the transect	PLANTS	ANIMALS
6 M		
7 M		
8 M		
9 M		
10 M		

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7th Grade

10 m Transect DATA SHEET

Date _____ Location _____ Group _____

Transect # _____ Compass Bearing Sighted Object

_____ _____

_____ _____

_____ _____

On the back of the sheet is a line which represents one 10 m Transect line. You are to fill in along each meter the physical measurements and organisms noted.

To conserve space and energy, devise symbols where needed. You may use colors too.

For example -- Australian Pine 

Put your code or key below

The data will come from your work sheets

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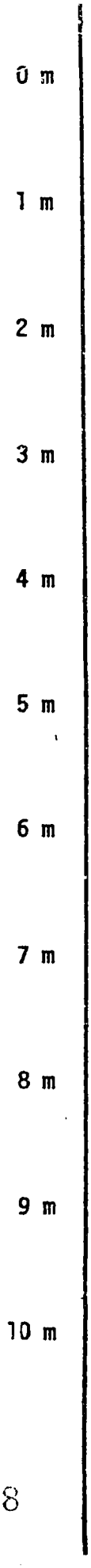

0 m
1 m
2 m
3 m
4 m
5 m
6 m
7 m
8 m
9 m
10 m

7TH GRADE - OVERALL TEST

READ THE DIRECTIONS CAREFULLY

Listed below are some direct relationships that exist in the Indian River between various organisms. Some questions will also include your relationship with the river. You are to select the correct pair of words that will answer each question.

For example:

All of the following are direct relationships in the Indian River except one.

a. fish - tourists
b. fish - oxygen
c. fish - water
d. fish - pine tree

If you selected letter "d" pine tree, you were correct. The pine tree and fish show no direct relationship.

Mark the letter of the correct answer on the answer sheet. Do NOT mark on the test booklet.

- - - - - -

1. All of the following are direct relationships except one.

a. plankton - shark
b. plankton - jellyfish
c. plankton - oysters
d. plankton - oxygen

2. All of the following are direct relationships except one.

a. tourists - fish
b. tourists - building
c. tourists - grassflat
d. tourists - tides

3. All of the following are direct relationships except one.

a. transportation - dredge
b. transportation - intracoastal waterway
c. transportation - salinity
d. transportation - boats

4. Which of the following is a direct relationship between you and the Indian River?

a. plankton supply - O_2
b. O_2-fresh water
c. drinking fresh water - mangrove
d. high tides - thermal pollution

5. Which of the following is a direct relationship between you and the Indian River?

   a. seasons - mangroves
   b. food - grassflats
   c. sunlight - high tides
   d. water skiing - salinity

6. Which of the following shows a direct relationship between you and the Indian River?

   a. mangroves - fresh water
   b. clams - rocky bottom
   c. birds - transportation
   d. swimming - fun

7. What relationship is affected by grassflat alteration?

   a. fishing - tourism
   b. tides - season
   c. salinity - tourism
   d. tides - tourism

8. What relationship is affected by sewage disposal?

   a. boating - water-skiing
   b. transportation - shipping
   c. high tides - seasons
   d. oyster industry - food

9. What relationship is affected by thermal pollution?

   a. game fish development - grassflat
   b. salinity - tides
   c. tides - seasons
   d. transportation - shipping

10. An aesthetic relationship could be ruined by:

   a. sailboat - sunset
   b. seahorse - grass
   c. man - beer cans
   d. snails - shells

READ THE DIRECTIONS CAREFULLY

Select the answer which best completes the question. Mark the letter of the correct answer on the answer sheet. Do NOT mark on the test.

What would be the most probabe cause of these environmental changes?

11. Soft, fragile egg shells laid by ospreys and eagles
    a. overhunting
    b. DDT
    c. increase in natural predators
    d. severe winter

12. Contaminated oysters in Indian River of Martin County
    a. sewage disposal
    b. industrial waste
    c. mangrove removal
    d. constant tide change

13. Rapid increase in the algae growth in the rivers and streams
    a. salt intrusion
    b. fertilizer runoff
    c. increased fish population
    d. drought

14. Unnatural temperature increase of river, lake, or ocean water
    a. salinity increase
    b. nuclear power plant
    c. seasons
    d. diurnal tides

15. Fresh water pollution of the St. Lucie River
    a. Lake Okeechobee - being too high
    b. Lake Okeechobee - being too low
    c. dredge and fill
    d. drought

15. Pollution of rivers and air
    a. overpopulation
    b. people living in harmony with their environment
    c. dead plants and animals laying around
    d. too many birds

17. Mangroves destruction along brackish shorelines
    a. high tides
    b. low tides
    c. detritus
    d. fresh water flooding

VOCABULARY TEST

21. What is the diagram called that shows the transfer of energy throughout a community of organisms?
    a. communication flow
    b. food chain
    c. energy web
    d. succession chart

22. What PHYSICAL FACTOR of the water does a REFRACTOMETER measure?
    a. temperature
    b. salinity
    c. depth
    d. current

23. What are the organisms called that drift or float free in water?
    a. scavengers
    b. plankton
    c. saprophytes
    d. parasites

24. What is the process called that changes light energy from the sun into a form that can maintain life?
    a. decomposition
    b. succession
    c. chlorophyll
    d. photosynthesis

25. What are the organisms called that can change sunlight energy into a form that maintains life?
    a. producers
    b. consumers
    c. predators
    d. animals

26. What are the organisms called that break down dead matter to obtain their energy?
    a. consumers
    b. green plants
    c. producers
    d. decomposers

27. What is the continuous change in plant and animal life in a certain area over a period of time called?
    a. succession
    b. environment
    c. community
    d. interrelationship

28. Which of the following is a predator?

a. algae
b. shrimp
c. pelican
d. oyster

29. What is a line called along which physical and biological characteristics are surveyed?

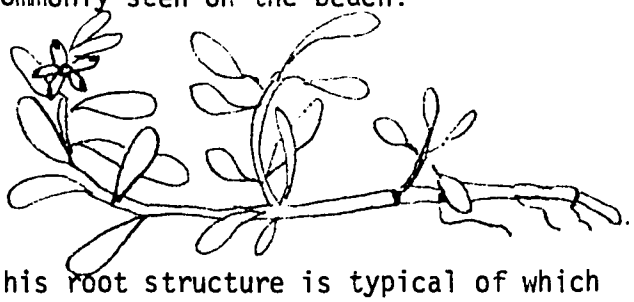
a. transport
b. transect
c. meter
d. yard

30. What is a name for any living thing?

a. animal
b. plant
c. organism
d. plankton

ORGANISM TEST

31. This is a typical leaf from which plant commonly seen on the beach?

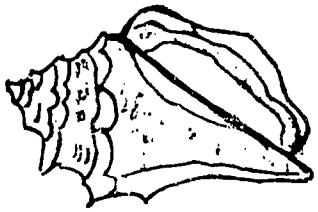


a. sea purselane
b. culerpa
c. cord grass
d. fish poison

32. This root structure is typical of which tree?

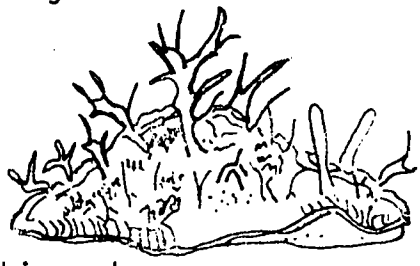
a. White Mangrove
b. Black Mangrove
c. Red Mangrove
d. Australian Pine

33. What large snail-like mollusk drills into clams for food with rasping tongue-like structure?



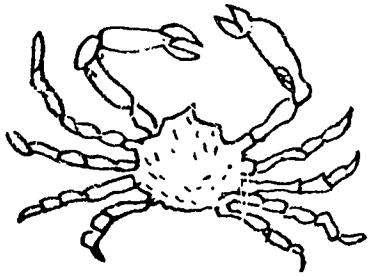
a. conch
b. cowry
c. mangrove snail
d. whelk

34. What mollusk related to land slugs in the adult stage has no shell?



a. cowry
b. sea hare
c. whelk
d. sea squirt

35. Name this crab.

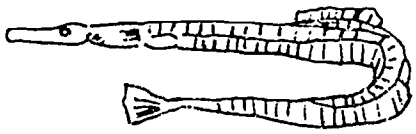


a. blue
b. spider
c. fiddler
d. mangrove

36. What is the name of this chordate?

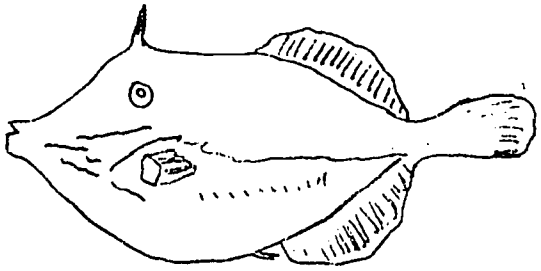
a. sea urchin
b. sea squirt
c. sea hare
d. sea cucumber

37. Identify the following fish.



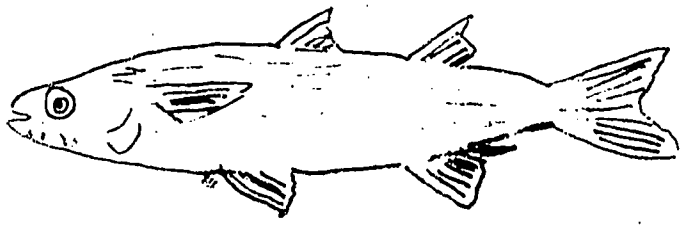
a. eel
b. pipe fish
c. lizardfish
d. gar

38. Identify the following fish.



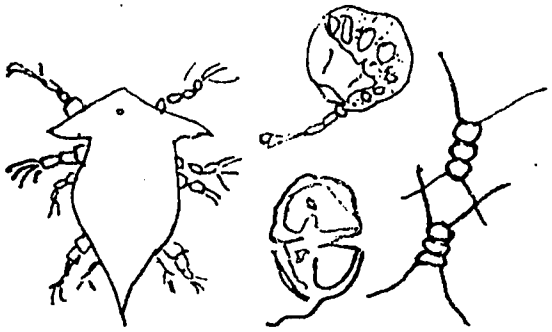
a. pin
b. puffer
c. file
d. flounder

39. Identify the following fish.



a. snook
b. snapper
c. mullet
d. pin

40. What is drifting microscopic sea life called collectively?



a. diatoms
b. photosynthetic
c. plankton
d. phylum

READ THE FOLLOWING CAREFULLY

Questions 41 - 50

A 5 meter transect line was run from the shoreline into the water. The shoreline end of the transect line is the "0" meter point. The following data was found along the line.

salinity	35 ppt	meter 2
water temperature	75°F	meter 3
	79°F	meter 5
shoal grass	heavy	meter 4 thru 5
	light	meter 3
bottom type	sandy	meter 3 thru 5
	mud & sand	meter 1 & 2

You are to transfer this data to a permanent transect line record sheet.

MAKE SURE YOU MAKE A KEY.

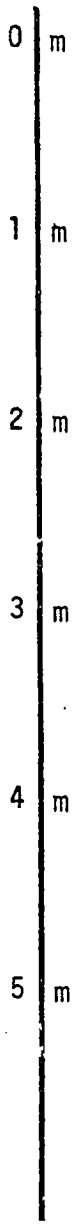
For example:

water temperature - wt

heavy shoal grass - ▬▬

light shoal grass - ////

KEY:



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TEST KEY

1. a
2. d
3. c
4. a
5. b
6. d
7. a
8. d
9. a
10. c
11. b
12. a
13. b
14. b
15. a
16. a
17. d
18. b
19. b
20. d
21. c
22. b
23. b
24. d
25. a
26. d
27. a
28. c
29. b
30. c
31. a
32. c
33. a
34. b
35. b
36. b
37. b
38. c
39. c
40. c

Transect Line Key

water temperature - wt
salinity - s

shoal grass heavy -

shoal grass light -

sandy bottom -

mud & sand bottom -

note: students must construct their own key and may use different symbols