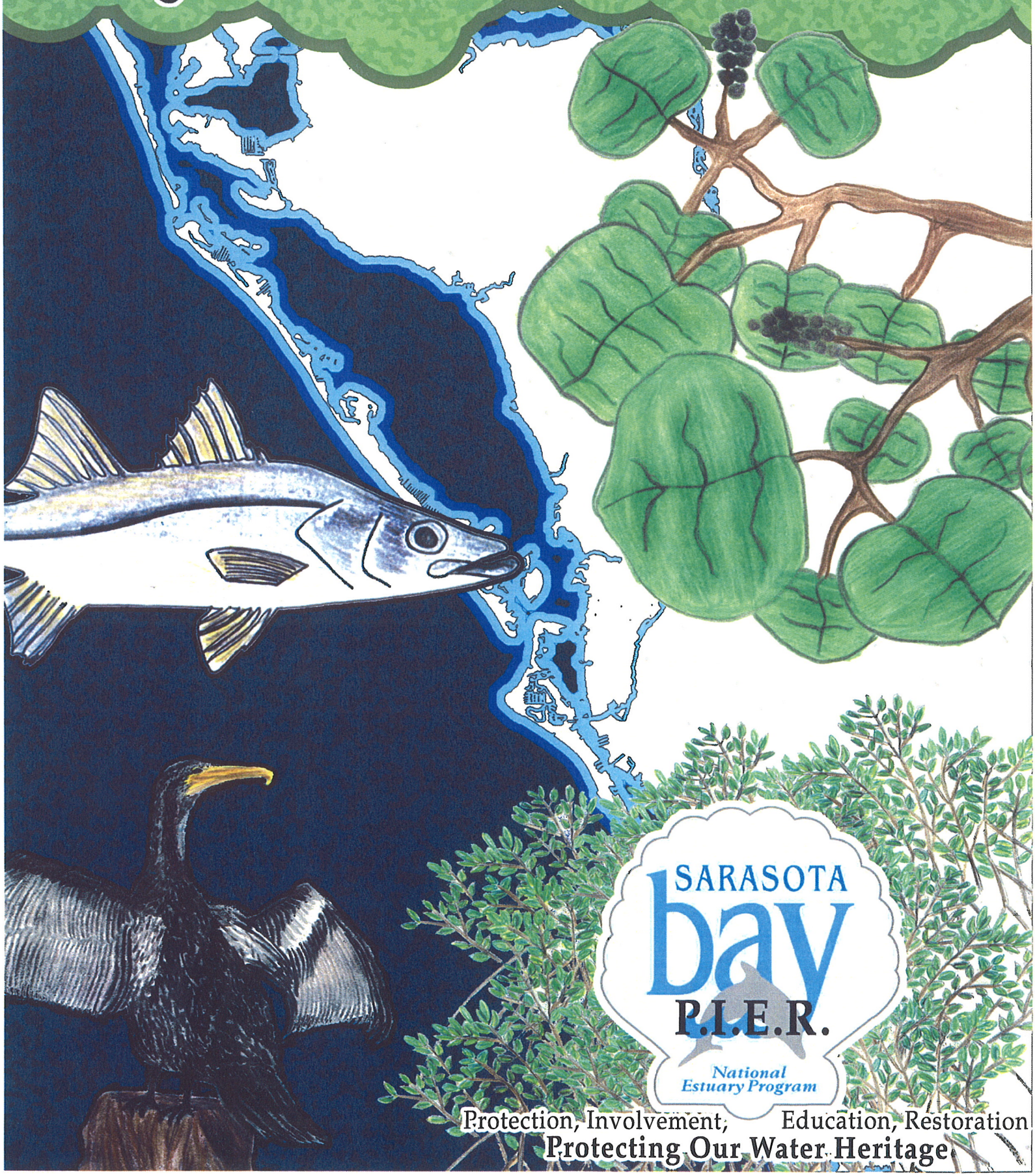
SARASOTA bay COASTAL HABITATS



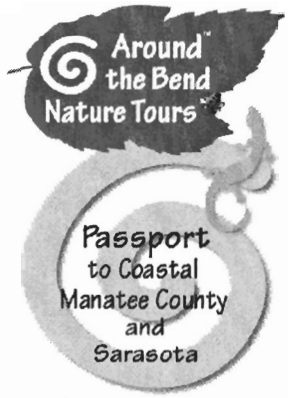
SARASOTA bay P.I.E.R.

National Estuary Program

Protection, Involvement, Education, Restoration

Protecting Our Water Heritage

SARASOTA BAY
ESTUARY PROGRAM
Restoring Our Bay



1815 Palma Sola Blvd.
Bradenton, FL 34209
(941) 794-8773

PIER Fieldtrip Request Form

Sponsored by the Sarasota Bay Estuary Program
Provided by Around the Bend Nature Tours

School/Group Name:_____

Contact Person:_____ **Teacher:**_____

Phone:_____

Email:_____

School/Group Address:

_____

_____

_____

Age/Grade:_____ **Number of students:**_____

County:_____

Number of Adult Chaperones:_____

Any Special Needs?:_____

Date and Time Requested:_____

Alternate Date and Time:_____

Destination (please choose one):

___Emerson Point, Palmetto

___Leffis Key, Bradeton Beach

___Joan Durante Park, Longboat Key

___ South Lido Park, Sarasota

___ Red Bug Slough, Sarasota

___ Oscar Scherer State Park, Nokomis

To schedule a PIER fieldtrip to any of these destinations please complete this form and fax it to 941-794-8773

For more information contact: Karen Fraley

Around the Bend Nature Tours
1815 Palma Sola Blvd.
Bradenton, Florida 34209
941-794-8773
Karen@aroundbend.com
http://www.aroundbend.com

Julia Burch
Public Outreach and Education Coordinator
Sarasota Bay Estuary Program
111 South Orange Avenue
Suite 200W
Sarasota, Florida 34236
941-955-8085
Julia@sarasotabay.org
http://www.sarasotabay.org

SARASOTA BAY
ESTUARY PROGRAM
Restoring Our Bay

Why Volunteer for the Sarasota Bay Estuary Program?

- **Help your community by helping the environment**
- **Get Active!**
- **Discover *natural* Florida**
- **Meet like minded people who value nature**
- **Earn community service hours**
- **Learn new skills**
- **Earn school credit for environmental science projects**

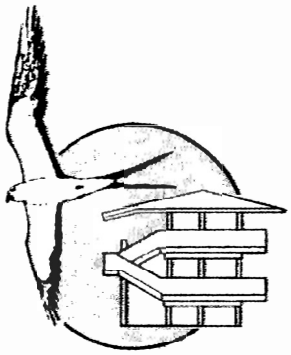
Please contact SBEP offices for more information at 941-955-8085 or info@sarasotabay.org

SARASOTA BAY
ESTUARY PROGRAM
Restoring Our Bay

Are you interested in helping to restore Sarasota Bay? The Sarasota Bay Estuary Program needs volunteers for the following:

- **Festival staff/Event staff**
- **Community organizations contact**
- **Publication delivery and stocking**
- **Stormdrain marking**
- **Restoration monitoring**
- **Exotic plant removal**
- **Native plantings**
- **Bay Buddies – kid friendly**
- **Independent research**
- **Wildlife monitoring**
- **Artificial reef construction & deployment**
- **Trash retrieval**
- **Environmental education & outreach**
- **Other opportunities**

Please contact SBEP offices for more information at 941-955-8085 or info@sarasotabay.org



SARASOTA BAY
ESTUARY PROGRAM
Restoring Our Bay

PIER Fieldtrip Request Form

Sponsored by the Sarasota Bay Estuary Program and Crowley Museum & Nature Center

Destination: Crowley Museum & Nature Center, 6405 Myakka Road, Sarasota, FL 34240

School/Group Name:_____

Contact Person:_____ **Teacher:**_____

Phone:_____

Email:_____

School/Group Address:

_____

_____

_____

Age/Grade:_____ **Number of students:**_____

County:_____

Number of Adult Chaperones:_____

Any Special Needs?:_____

Date and Time Requested:_____

Alternate Date and Time:_____

IMPORTANT: The Sarasota Bay Estuary Program will only pay for the *bussing* costs associated with PIER fieldtrips to Crowley Museum & Nature Center. Schools are responsible for any other fieldtrip costs including, entrance fees to Crowley, food, drink, etc.

To schedule a PIER fieldtrip to Crowley Museum & Nature Center please complete this form and fax it to 941-322-1000.

For more information contact: Crowley Museum & Nature Center
6405 Myakka Road, Sarasota, FL 34240
(941) 322-1000
CMNCPD@aol.com
http://www.crowleymuseumnaturectr.org

Julia Burch
Public Outreach and Education Coordinator
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111 South Orange Avenue
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Sarasota, Florida 34236
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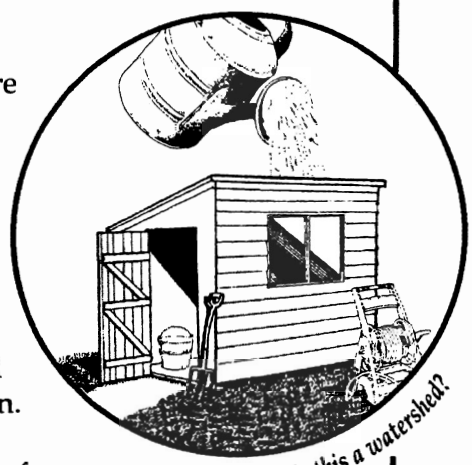
Julia@sarasotabay.org
http://www.sarasotabay.org

What's a Watershed?

Literally, the term **watershed** means the division of water. More generally, it refers to how and where water drains and collects across a given area. As water moves through a watershed, it flows from high elevations to low. These elevations, in turn, define the boundaries of a watershed, along with other topographic features of the land. Smaller watersheds can join together to form larger watersheds and their ultimate size depends on the amount of area or particular waterway one focuses on. The feature that they all share in common is the final destination of their water flow, whether it is to a river or an ocean.



Is this a watershed?

Many things depend on and influence the course and quality of the water that flows through a watershed. Along its way, some of the water can **evaporate**, while some of it can end up stored in groundwater or collected in wetlands. Water can also be taken up by vegetation, which re-releases it back into the atmosphere through **transpiration**. The characteristics of the water can change as it flows, and these changes tend to be magnified as it moves downslope. Watershed management is the attempt to control those things that affect the quality and quantity of water and to make the use of water resources by people more effective.

POTABLE QUOTABLES:

"A watershed is the geographic area from which water in a particular stream, lake or estuary originates. All lands in the watershed drain toward the stream, lake or bay and contribute pollutants to these waters."
<www.swfwmd.state.fl.us/faqgloss/glossary/d_dictsz.htm#W>

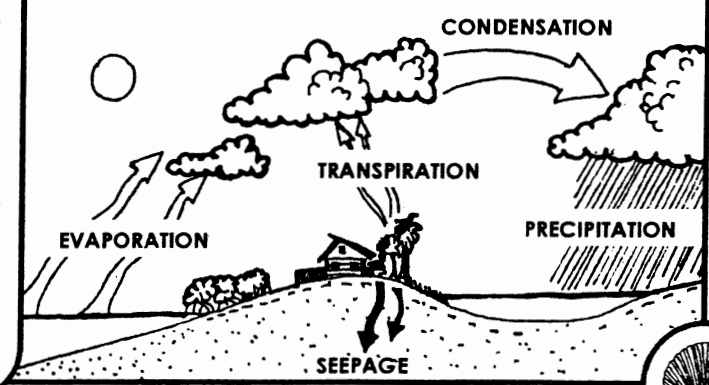
"A watershed is the area of land where all of the water that is under it or drains off of it goes into the same place. John Wesley Powell, scientist geographer, put it best when he said that a watershed is: 'that area of land...within which all living things are inextricably linked by their common water course...'"
<www.epa.gov/owow/watershed/whatis.html>

"It has not been long since the Florida peninsula was under water. Covered with sand, it is a limestone platform...(and now) that it is up in the air, its topography and drainage patterns are somewhat bizarre. For example, it has an east-west divide and a north-south divide. The shorter one crosses the peninsula at the latitude of Tampa Bay. The longer divide, running down the axis of the peninsula, is known locally as the Ridge. Its high domains...rise to an altitude of two hundred and forty feet. For a hundred miles, oranges grow on the Ridge in a broad continuous ribbon."
-The Founding Fish, John McPhee

How does your Water Flow?

Everyone lives in a watershed. It is easy to find out more information about the one you live in by checking out these resources on the Internet:

- ***Know your Watershed***
  <www.ctic.purdue.edu/KYW>
- ***Adopt a Watershed***
  <www.adopt-a-watershed.org>
- ***Surf your Watershed***
  <www.epa.gov/surf>
- ***Science in your Watershed***
  <water.usgs.gov/wsc>



Developed by Mote Marine Laboratory for P.I.E.R., a program of the Sarasota Bay National Estuary Program

P.I.E.R.

PROTECTION, INVOLVEMENT, EDUCATION, RESTORTATION

SARASOTA bay COASTAL HABITATS

FOREWORD

The **Sarasota Bay Estuary Program (SBEP)** is dedicated to improving and protecting the area's greatest and most important natural asset - Sarasota Bay. Its unique program strives to improve water quality, increase habitat and enhance the natural resources of the area for use and enjoyment by the public. Sarasota Bay is one of 28 estuaries in the United States that have been named by the U.S. Congress as an "estuary of national significance." As such, education is an important ingredient in protecting and restoring our Bay.

The **P.I.E.R. Program (Protection, Involvement, Education and Restoration)** was created to get students out of the classroom to experience Sarasota Bay up close and personal. Beautiful assets such as Sarasota Bay should be observed and protected and what better way to do that than to teach people of its significance.

Through local and national grants, the organization has created a comprehensive education program that offers elementary and middle schools funding to acquire this curriculum and cover field trips expenses to habitat restoration sites. To implement the P.I.E.R. Project, SBEP partnered with several local organizations. For curriculum development, SBEP enlisted the help of Mote Marine Laboratory's SeaTrek Distance Learning Program and Karen Fraley of Around the Bend Nature Tours. Together, the group developed the curriculum for grades K - 7. In addition to offering estuary-related lessons for the classroom, SBEP, in conjunction with Around the Bend Nature Tours offers a field trip component to "Coastal Habitats" where students continue to learn about bay ecology at one of SBEP's habitat restoration sites.

We are excited about this program and the messages of Bay stewardship our children will learn. SBEP and its partners recognize that our greatest wealth is a healthy natural environment and our greatest hope is that our children—tomorrow's leaders—having the knowledge and love of the environment to continue the protection and restoration efforts that we've only just begun.

It is our hope that the lessons taught through P.I.E.R. are carried out into adulthood, much like the recycling habits that were taught to us when we were children. Please use the Sarasota Bay Estuary Program and its curriculum to its fullest potential. Enjoy and learn as much as possible from the P.I.E.R. Program and remember to promote a healthy future for Sarasota Bay.

Julia Burch
Public Outreach and Education Coordinator
Sarasota Bay Estuary Program

MOTE MARINE LABORATORY

SARASOTA BAY ESTUARY PROGRAM
Protecting Our Water Heritage

MAIN CURRICULUM OBJECTIVES:

Students will understand the importance of estuaries.
Students will experience Sarasota Bay and witness a functioning estuary.
Students will learn about Sarasota Bay and its watershed, coastal habitats, wildlife, plants and exposure to stormwater run-off and pollution.

MAIN CURRICULUM SUNSHINE STATE SCIENCE STANDARDS:*

[SC.D.1.2 - SC.D.2.2] Processes that Shape the Earth

[SC.F.1.1 - SC.F.2.2] Processes of Life

[SC.G.1.1 - SC.G.2.2.1] How Living Things Interact with Their Environment

*For more detail and a listing of ALL correlating standards, see Grades K—3 Activities, Appendix A for National Standards, Appendix B for Sunshine State Standards and Appendix C for Field Trip Activities for Grades K—8 Sunshine State Standards.

UNIT PRE-QUESTIONS:

1. What features might be present in a watershed?
2. What is a habitat?
3. Who or what falls into the category of wildlife?
4. Why are native plants important and non-native plants detrimental?
5. Where does stormwater run-off and pollution come from?

MOTE MARINE LABORATORY

SARASOTA BAY National Estuary Program

Protecting Our Water Heritage

SARASOTA bay COASTAL HABITATS

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Acknowledgments

The funding for the Sarasota Bay National Estuary Program's P.I.E.R. Program field trips and Coastal Habitats Curriculum is made possible by several grants from The U.S. Environmental Protection Agency, The Southwest Florida Water Management District, Manatee County, Sarasota County and The City of Sarasota. The curriculum and field trip development and production team consisting of staff from Around the Bend Nature Tours, Mote Marine Laboratory and the Sarasota Bay National Estuary Program would like to thank the following people, organizations and agencies for their contribution, effort and professional services.

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U.S. Environmental Protection Agency
Southwest Florida Water Management District
Mote Marine Laboratory
Around the Bend Nature Tours
Manatee County
Sarasota County
City of Sarasota

SARASOTA bay COASTAL HABITATS

Websites

Developer Websites

Sarasota Bay National Estuary Program <www.sarasotabay.org>
Mote Marine Laboratory <www.mote.org>, <www.seatrek.org>
Around the Bend Nature Tours <www.aroundbend.com>

Coastal Watersheds

Know your Watershed <www.ctic.purdue.edu/KYW>
Adopt a Watershed <www.adopt-a-watershed.org>
Surf your Watershed <www.epa.gov/surf>
Science in your Watershed <water.usgs.gov/wsc>
Home Water Check Up <www.ficus.usf.edu/docs/water_calculator calculator.htm>
Florida Springs <www.floridasprings.org/resources>
SWFWMD Waterweb <www.swfwmd.state.fl.us/ppr/publications/files/kids.htm>
EPA Enviromapper for Watersheds <map2.epa.gov/enviromapper>

Coastal Habitats

Florida's Coastal Habitats <www.dep.state.fl.us/coastal/habitats>
Exploring Estuaries <www.epa.gov/owow/estuaries/kids>
USGS SOFIA Kid's Page <sofia.usgs.gov/virtual_tour/kids>
Mangroves <www.nhmi.org/mangroves/index.htm>
FL Seagrasses <www.floridamarine.org/features/category_main.asp?id=1323>
Oyster Ecology <www.csc.noaa.gov/scoysters/html/bio.htm>
Artificial Reefs <www.artificialreefs.org>
Sarasota & Manatee Co. Artificial Reefs <www.floridaconservation.org//marine/ar>

Coastal Wildlife

FNAI, Species and Natural Community Summary <www.fnai.org/cntylist.htm>
FWCC Critter Questions <www.wildflorida.org/critters>
Organisms in the Coastal Ecosystem <webworldwonders.firn.edu/eco/coastal>
Wildlife Viewing in Florida <floridaconservation.org/viewing/regions/wcreg.html>
TX Coastal Wildlife <www.tpwd.state.tx.us/expltx/eft/gulf/cspecies/wildlife.htm>
Food Web Game <www.coolclassroom.org/cool_windows/foodwebgame.html>

Native and Non-native Plants

Bureau of Invasive Plant Management <www.dep.state.fl.us/lands/invaspec>
Center for Aquatic and Invasive Plants <aquat1.ifas.ufl.edu>
FL Invasive Species Interactive Flash Exhibit <www.dep.state.fl.us/lands/invaspec>
Invasive Species <www.invasivespecies.gov>
Atlas of Florida Plants <www.plantatlas.usf.edu>
Sarasota County Seashore Enhancement Program <204.193.117.134/pdf/seashore.pdf>
Native and Naturalized Plants of Florida <www.biologicalresearch.com/Plants>

Stormwater Runoff and Pollution

Nonpoint Source Kid's Page <www.epa.gov/owow/nps/kids>
Sarasota County Public Works <www.co.sarasota.fl.us/public_works_planning>

A NOTE ABOUT WEBSITES: Every effort has been made to provide useful and accurate websites. However, addresses may change after publication. Notification about changes are welcome, but no warranty, expressed or implied, as to the accuracy, reliability or completeness of furnished data is provided. The views expressed on outside sites are not necessarily those of the Sarasota Bay National Estuary Program, Mote Marine Laboratory or Around the Bend Nature Tours, nor have they been endorsed by those organizations.!

Grades K - 3

SARASOTA bay COASTAL HABITATS

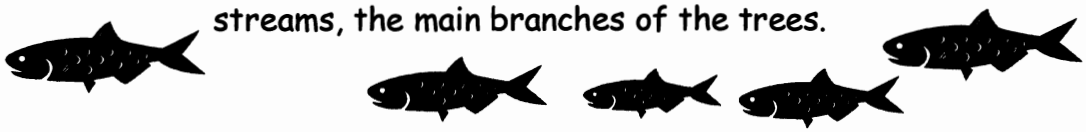
Classroom Activities

Kindergarten, 1st, 2nd and 3rd Grade

As the teacher you are the expert at creating lesson plans that integrate Sarasota Bay materials with your overall curriculum. This section provides suggestions and materials for classroom activities and techniques to get you started, but we encourage you to let your imagination and enthusiasm run WILD!

Lesson 1: Coastal Watersheds What is a Watershed?:

In this activity students become part of the water flow and move around the room as if they are flowing through the watershed. A tree branch is used to introduce the concept. Viewed from high above, drainage patterns in watersheds resemble a network similar to the branching pattern of a tree. Tributaries, similar to twigs and small branches, flow into streams, the main branches of the trees.



Lesson 2: Coastal Habitats Everybody Needs a Home

Students will be able to generalize that people and other animals share a basic need to have a home. Animals need enough space in which to live and find the food, water and shelter they need. "Home" is bigger than a "house". Home is more like a "neighborhood" that has everything in it that is needed for survival.

Developed by Around the Bend Nature Tours for P.I.E.R., a program of the Sarasota Bay National Estuary Program

Kindergarten, 1st, 2nd and 3rd Grade

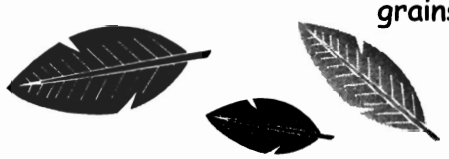
Lesson 3: Coastal Wildlife Is There Wildlife in Your Classroom?:

The major purpose of this activity is for students to understand that people and wildlife share environments. By investigating micro- habitats, the students should be encouraged to generalize from the information they acquire to the entire planet, coming to the understanding that wildlife exists in some form in all areas of the earth.

Lesson 4: Native and Non-Native Plants Nature Journal:

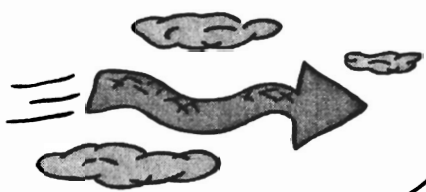
Journals are utilized so that students may observe and describe their surroundings, particularly in outdoor settings, in a variety of ways. This journaling activity can be used effectively as a means to record data and personal observations in combination with any of the activities in this guide.

In addition to recording impressions, feelings, and observations, a journal can become a log of important data to be referred to later. It can show changes in ecosystems, plant types, and animal populations. A journal can hold images as well as words. It can be a great place to keep artifacts such as leaves or grains of sand!



Lesson 5: Stormwater Run-off/ Pollution Where Does it Flow?:

A model watershed is created and students observe water flow to understand surface water runoff and absorption. As water flows downhill it carries particles with it. Some of the water is absorbed or soaked up by the soil; the rest flows across the surface of the earth as run-off and eventually enters a water body (such as Sarasota Bay).



SARASOTA bay COASTAL HABITATS

Lesson 1: Coastal Watersheds

What is a Watershed?

Grade Level: K - 3
Subject: Science, Geography
Duration: 30 minutes
Materials: Small branch.

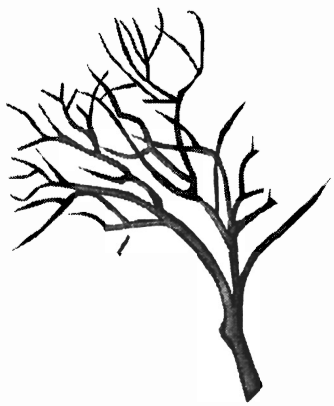
Objectives: Students will predict where water will flow in a watershed.

Overview: In this activity students become part of the water flow and move around the room as if they are flowing through the watershed.

Florida Sunshine State Standards: SC.B.1.3, SC.G.1.1

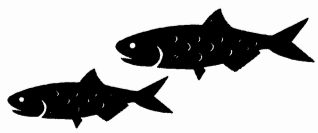
Background: When the ground is saturated due to water during heavy rains, excess water flows over the surface of land as ***runoff***. Eventually, this water collects in channels such as streams. The area of land that drains water into the channels is called the ***watershed*** or ***drainage basin.***

Watersheds are separated from each other by areas of higher elevation. As smaller streams merge together, the width of the channel increases. Eventually, water collects in a larger body of water such as Sarasota Bay. The Sarasota Bay Watershed extends from Terra Ceia Bay in the north, to Lemon Bay in the south.



From the air, drainage patterns in watersheds resemble a network similar to the branching pattern of a tree. Tributaries, similar to twigs and small branches, flow into streams, the main branches of the trees. Streams eventually empty into a large river, comparable to the trunk. Like other branching patterns, the drainage pattern consists of smaller channels merging into larger ones.

Sarasota Bay is an estuary. An ***estuary*** is a coastal area where fresh water from rivers and streams mixes with saltwater from the ocean or gulf. Estuaries are the nurseries of the sea. They provide important spawning grounds and nurseries for the nation's fisheries and bird life.



Suggested Procedure:

1. Gather pruned branches and let students investigate how the main branches "branch out into smaller ones.

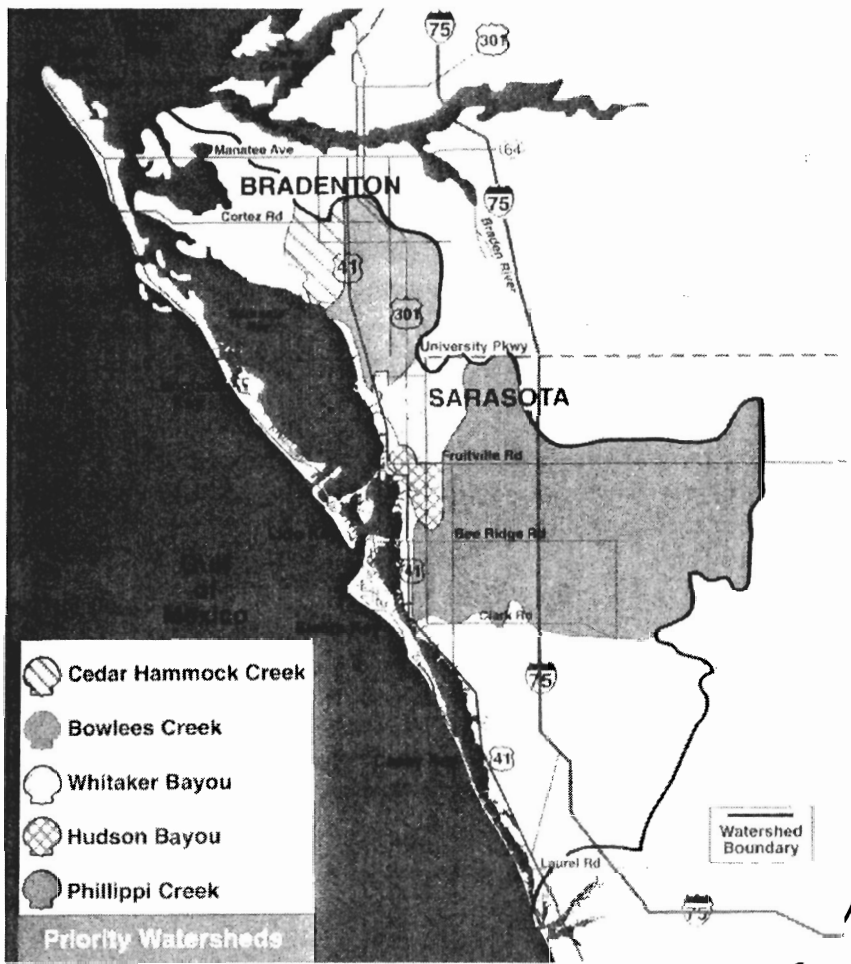
2. Help students imagine a drop of water flowing down the twig to the larger branches and finally to the main branch. Into what body of water might the drop of water (main branch) flow?

Developed by Around the Bend Nature Tours for P.I.E.R., a program of the Sarasota Bay National Estuary Program

3. Relate the branch to a river flowing near or through the community (i.e. Manatee River, Ware's Creek, Philippi Creek).
    - What smaller channels might feed into this river?
    - Where do students think the water in the river goes?
    - Help them to imagine the water flowing into a larger river and finally to Sarasota Bay and the Gulf of Mexico.

Water Flow Activity:

1. A flowing creek (hold arm in front of body and wiggle fingers – ask a few students to join you in the creek's flow)
2. Flows into a small river (place both arms together and wave them in a serpentine motion – ask a few more students to join you in the river's flow)
3. The water from the smaller river flows into a large river (have students merge together in a column – ask a few more to join them)
4. The large river travels to Sarasota Bay (students join together in a place in the room designated as the bay
5. The water from Sarasota Bay merges with the water from the Gulf of Mexico at one of the passes (Longboat Pass, New Pass, Big Pass) (students can dance in the gulf like waves splashing about).



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SARASOTA bay COASTAL HABITATS

Lesson 2: Coastal Habitats

Everybody Needs a Home

Everybody Needs a Home is used with permission from *Project WILD K-12 Curriculum and Activity Guide* 2000 edition p.59. For further information about Project WILD, contact the Florida Project WILD Coordinator at 620 S. Meridian Street, Tallahassee FL 32399 Phone: (877) 450-WILD(9453), Fax: (850) 488-1961

Grade Level: K - 3

Subject: Language Arts, Science

Duration: 30 - 45 minutes

Materials: Drawing paper, crayons, markers, colored pencils, etc.

Objectives: Students will be able to generalize that people and other animals share a basic need to have a home.

Overview: Students draw a floor plan of their home and then compare with an animals home. The major purpose of this activity is for students to identify the components every animal needs in its home: food, water, shelter and space in which to live, arranged in a way so the animal can survive.

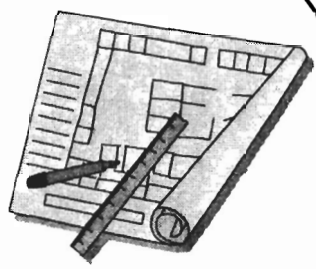
Florida Sunshine State Standards: LA.C.1.1, LA.C.2.1, SC.F.1.1, SC.F.2.2, SC.G.1.1, SC.G.2.1, A.4.A.1.1

Background: Humans and other animals have some of the same basic needs. Every animal needs a home. But that home is not just a "house like those in which people live. Home, for many animals is a much bigger place, and it is outdoors.

The scientific term for an animal's home is "habitat. An animal's habitat includes **food, water, shelter** or cover, and **space**. Because animals need the food, water, shelter and space to be available in a way that meets the animals' needs, we say that these things must be available in a **suitable arrangement**.

Homes are not just houses. A house may be considered shelter. People build houses, apartments, trailers, houseboats and other kinds of shelter in which to live. Animals don't need a home that looks like a house, but they do need some kind of shelter. The shelter might be underground, in a bush, in the bark of a tree, or in some rocks.

Animals need a place in which to find food and water. They also need enough space in which to live and find the food, water and shelter they need. Everybody needs a home! And "home is bigger than a "house . Home is more like a "neighborhood that has everything in it that is needed for survival.



Suggested Procedure:

1. Ask the students to draw a picture, or floor plan, of where they live – or to draw a picture of the place where a person they know lives. The drawing or floor plan should include the things the students need in their home – a place to cook and keep food (food, water), a place to sleep (shelter) and a neighborhood (space).

2. When the drawings are complete, have a discussion with the students about what they drew. Ask the students to point out the things they need to live that they included in their drawings.

3. Ask the students how their homes are similar to animals' homes.

4. Make a "Gallery of Homes out of the drawings. Explain that everyone has a home. All the homes together form a community. A community of animals includes animals (and plants) of different species. How are human communities like animal communities?

5. Ask the students to close their eyes and imagine a bird's home, an ant's home, a raccoon's home, the president's home, and their homes.

6. Show the students pictures of different places that animals live. Discuss the differences and similarities among the homes with the students.

7. Have the students identify the components every animals needs in its home: food, water, shelter and space in which to live, arranged in a way so the animal can survive.

8. Summarize the discussion by emphasizing that although the homes are different, every animal needs a home.

SARASOTA bay COASTAL HABITATS

Lesson 3: Coastal Wildlife

Is There Wildlife in your Classroom?

Grade Level: K - 3

Subject: Language Arts, Science

Duration: 30 - 45 minutes

Materials: Optional: journals for recording observations.

Objectives: Students will compare human and wildlife habitat. Students will generalize that wildlife is present in areas all over the earth.

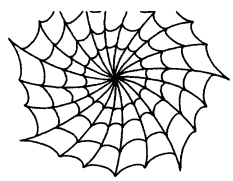
Overview: The major purpose of this activity is for students to understand that people and wildlife share environments. By investigating microhabitats, the students should be encouraged to generalize from the information they acquire to the entire planet, coming to the understanding that wildlife exists in some form in all areas of the earth.

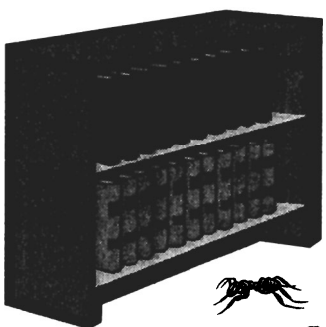
Florida Sunshine State Standards: SC.D.1.2, SC.F.2.2, SC.G.1.1, optional: LA.B.1.2, LA.B.2.1, LA.B.2.2

Background: Many people think of wildlife as the large animals of Africa, such as the lion and elephant, or the large animals of our forests such as the black bear and deer. However, wildlife includes all animals that have not been domesticated by people.

What may be surprising is that wildlife includes the smallest animals – even those that can be seen only through a microscope. Spiders, insects, reptiles, amphibians and most species of fish, birds and mammals may be considered wildlife. Wildlife occurs in a tremendous variety of forms and colors. Even when animals are silent and not visible, they exist somewhere around us. Thousands of organisms live in and on human skin, hair and bodies. Some form of animal life is always near.

The major purpose of this activity is for students to understand that people and wildlife share environments. By investigating microhabitats, the students come to the understanding that wildlife exists in some form in all areas of the earth.





Developed by Around the Bend Nature Tours for P.I.E.R., a program of the Sarasota Bay National Estuary Program

Suggested Procedure:

NOTE: Ask students to observe but not touch or disturb animals they see.

1. Have students explore the classroom, looking for signs of wildlife. Even in the most cleanly swept classrooms, you can usually find some signs of life either past or present. It might be a spider web in a corner, dead insects near lights, or insect holes along base-boards and behind bookshelves.

2. After the classroom search – discuss with students what, if anything, they found. Intro-duce the idea that people and other animals share environments. Sometimes we don't even notice that we are sharing our environment with other living things.

3. Take the search for animals outside. Divide the students into pairs or small groups and give them 5 minutes to find an animal or some sign that an animal has been there. Look for indirect evidence such as tracks, webs, droppings, feathers and nests.

4. Gather the groups together and share what each group discovered. Discuss with the stu-dents what they have learned. Emphasize that the experience shows that people and wildlife share the same environment.

5. Think of other places you can observe wildlife: yards, homes, neighborhoods, and city parks.

6. Predict what wildlife you may find on your field trip. When you return, compare your observations to your predictions.

SARASOTA bay COASTAL HABITATS

Lesson 4: Native and Non-Native Plants

Nature Journal

Grade Level: K - 3

Subject: Language Arts, Science

Duration: Varies

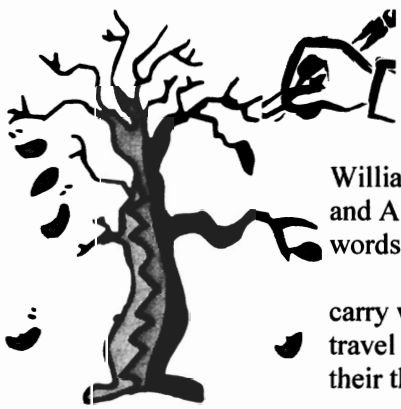
Materials: Journal (construction paper, blank unlined paper, stapler or hole punch and string), pencil (optional: colored pencils, crayons, markers), field guides (see list below).

Objectives: Students will observe and describe their surroundings, particularly in outdoor settings, in a variety of ways.

Overview: This journaling activity can be used effectively as a means to record data and personal observations in combination with any of the activities in this guide. With some activities it may be important to differentiate between field notes and creative journal entries. Field notes are typically factual accounts of nature; journal entries allow for personal and creative interpretation.

Florida Sunshine State Standards: LA.B.1.2, LA.B.2.1, LA.B.2.2, SC.D.1.2, SC.F.1.5, SC.G.1.1, SC.G.1.2, SC.G.1.3, A.VA.B.1.1

Background: A naturalist is a person who studies nature, especially by observing plants, animals and their environments. Naturalists spend a lot of time outdoors, and they often record their observations in forms such as sketches, drawings, paintings and photos, and even poetry and prose. Each student's motivation will be unique and may include sheer joy in learning more about natural systems, interest in contributing to scientific research, love for the art of writing or drawing, or simple satisfaction in being outside.



People benefit today from the insights and observations of those who have delighted in, and been fascinated by the wonders of the natural environment. Henry David Thoreau, Walt Whitman, William Bartram, John Muir, Rachel Carson, Anne Morrow Lindbergh, and Aldo Leopold are among those who have captured their insights in words and offered them to others.

Most naturalists who put their observations in poetry and prose carry with them a small journal as they walk the woods and trails and travel streams, rivers and bays and other natural environments, recording their thoughts as they journey.

Suggested Procedure:

1. Create journals: simply fold blank paper in half with construction paper cover, staple or punch holes and tie with string along the seam. You may purchase journals as well if you prefer.
2. You may prefer to have a class journal instead of, or in addition to individual journals.
3. Take students outside to a pleasant outdoor setting. Ask students to sit quietly and listen carefully for any sounds. ***Hint:*** A good way to calm a group down is to have them close their eyes and take three deep breaths: in through the nose, hold it, and out through the mouth. Instruct students to remain in place with their eyes closed and simply listen to the sounds around them. Smell the scents in the air. Feel the breeze on your skin and in your hair. Open your eyes and use

Developed by Around the Bend Nature Tours for P.I.E.R., a program of the Sarasota Bay National Estuary Program

all of your senses to become aware of your surroundings.

4. After students have become more in tune with the environment, allow them time to draw or write what they experience in their journals. This could become a daily or weekly exercise to observe your nature spot through the seasons.
5. It is important to stress that the journal belongs to the student – to fill with whatever they choose as long as it relates. Journaling is a special way to keep memories and ideas about things in the natural environment. Encourage students to take their journals with them sometimes when they are outside without the class, perhaps tucked in a backpack or purse. One of them might be the next John Muir or Rachel Carson!.
6. Discuss the value of journals. In addition to recording impressions, feelings, and observations, a journal can become a log of important data to be referred to later. It can show changes in ecosystems, plant types, and animal populations. A journal can hold images as well as words. It can even be a great place to keep artifacts such as leaves or grains of sand!.
7. Have students draw a picture of something that they observed or did while on the field trip. Post the pictures in the classroom to extend the field trip experience! Alternatively (or in addition), have students draw a picture in their journal and describe it.

Field Trip Journaling

Lesson 4
Native and Non-Native Plants

1. Before your field trip, have students **predict** what plants you will see at the park you will visit.
2. Record their predictions in the class journal.
3. During the field trip list plants that are **observed** in your class journal.
4. Back in the classroom make a **list** of native and non-native plants found in the habitat you have visited. Refer to suggested references below.
5. On your list of observed plants, which are native? Which are non-native?

Lesson 1
Coastal Wildlife

1. Before your field trip, have students **predict** what wildlife you will see at the park you will visit.
2. Record their predictions in the class journal.
3. During the field trip, make **observations** and record them in your class journal.
4. Upon return to the classroom **discuss** your predictions and observations. Were the original predictions accurate? Can the students make predictions about wildlife activity at different times of the day? Different times of the year?

Field Guides - Suggested References

National Audubon Society Field Guide to Florida by Peter Alden, Frick Cech, Gil Nelson. Alfred A. Knopf, Inc. 1998.

The Guide to Florida Wildflowers by Walter Kingsley Taylor. Taylor Publishing Company, Dallas, Texas 1992.

Florida Wild Flowers and Roadside Plants by C. Ritchie Bell , Bryan J. Taylor. Laurel Hill Press, Chapel Hill, 1982.

Field Guide to the Birds East of the Rockies by Roger Tory Peterson. Houghton Mifflin Company, Boston, Fifth Edition 2002.

Native and Naturalized Plants of Florida photos by Shirley Denton. Biological Research Associates. website only: http://www.biologicalresearch.com/Plants/

SARASOTA bay COASTAL HABITATS

Lesson 5: Stormwater Run-off/ Pollution
Where Does it Flow?

Grade Level: K - 3

Subject: Science, Geography

Duration: 30 - 45 minutes

Materials: cake pan, moist sand, button, small confetti (debris), cup of water.

Objectives: Students will observe and orally explain that water flows downhill. Students will observe and understand surface water absorption and runoff.

Overview: In this activity a model watershed is created and students observe water flow to understand surface water runoff and absorption.

Florida Sunshine State Standards: SC.A.1.1, SC.B.1.3, SC.D.2.1, SC.G.2.2

Background: When the ground is saturated due to water during heavy rains, excess water flows over the surface of land as runoff. Several factors effect surface runoff:

1. Type of soil (some soil types absorb more water than others
2. Conditions of the soil (dry soil will absorb more than wet soil)
3. Slope of the land
4. The number of plants in the soil (more plants mean more roots absorbing water and less runoff)

As water flows downhill it carries particles with it. Some of the water is absorbed or soaked up by the soil much like a sponge absorbs water, this is called *surface water absorption.* The rest of the water flows across the surface of the earth and eventually enters a water body (such as Sarasota Bay).

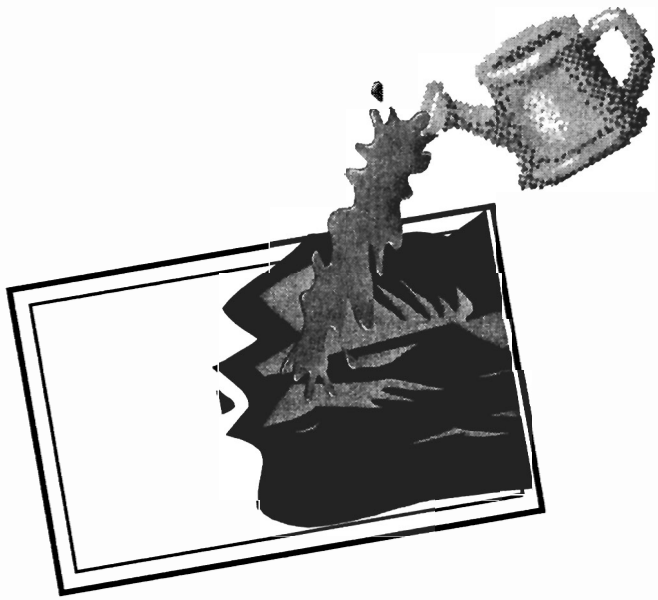
The quality of water can change as it flows over the land. These changes in water quality may be due to natural factors or human activities. Some materials, such as soil or organic matter, become suspended in the water and flow with it. Human activities that effect water may result from moving soil around (as in building development) or from the addition of pollutants. When water is degraded to a point that affects its use for a particular purpose, it has become polluted.

Developed by Around the Bend Nature Tours for P.I.E.R., a program of the Sarasota Bay National Estuary Program

Suggested Procedure:

1. Use wet sand or clay to shape a small hill on a pan.
2. Have the class predict the final destination of the water. Place a button or marker at this spot.
3. Slowly pour one cup of water from a measuring cup on to the top of the hill.
4. Discuss the absorption and runoff that is observed.
5. Repeat the process of pouring water, but this time add confetti to the water representing pollution.

Confetti represents particles/pollution



Grades 4- 8

P.I.E.R.

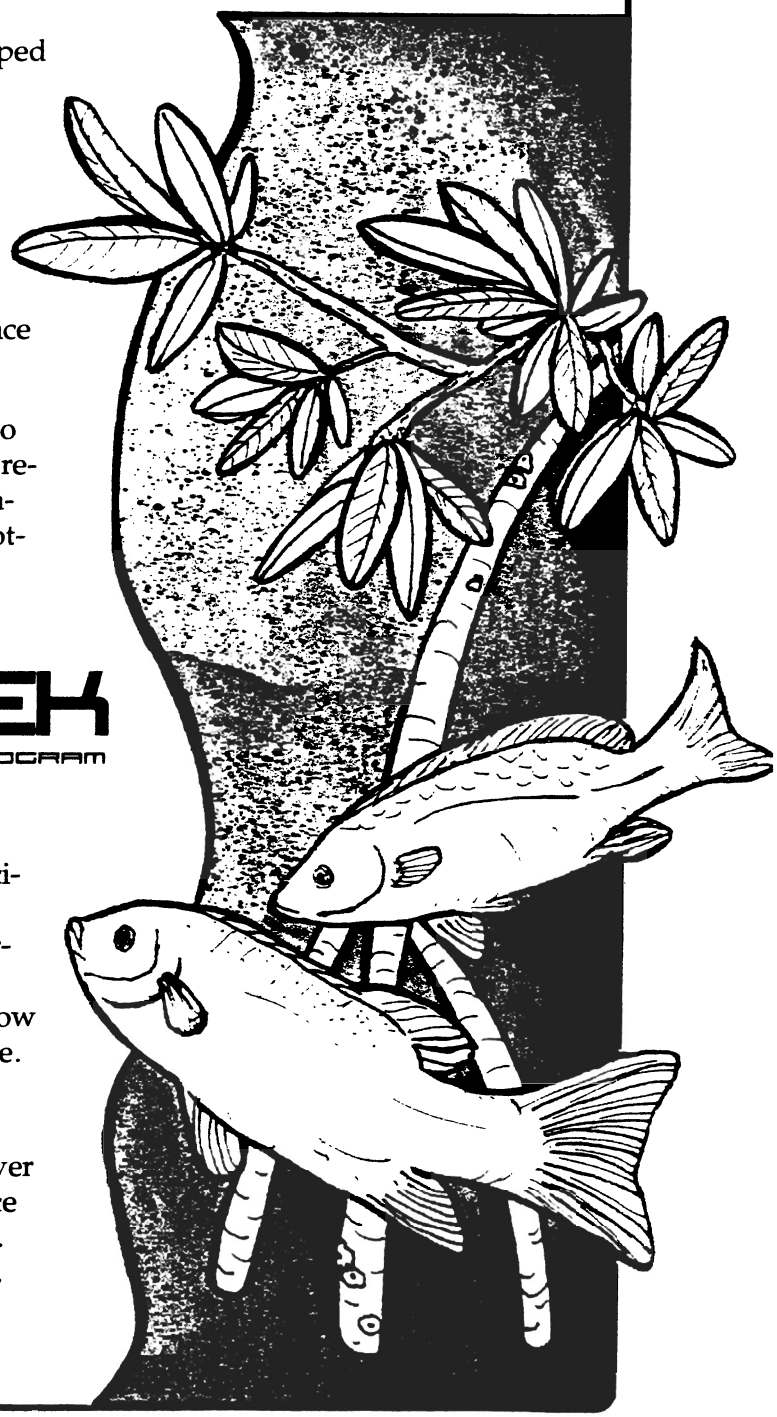
PROTECTION, INVOLVEMENT, EDUCATION, RESTORTATION

SARASOTA bay COASTAL HABITATS

The following section contains material developed by Mote Marine Laboratory's Distance Learning Program (SeaTrek) for P.I.E.R., a program of the Sarasota Bay National Estuary Program.

This material is suitable for **upper elementary** (generally, grades 4-6) and **middle school** (generally, grades 6-8) students and is aligned with National and Sunshine State Science Education Standards (see Appendix A and B).

A companion videoconference program has also been developed by SeaTrek. It features estuary research around Sarasota Bay done by Mote scientist, as well as glimpses of some familiar and not-so-familiar wildlife.



MOTE MARINE LABORATORY

SEATREK

DISTANCE LEARNING PROGRAM

What is SeaTrek?

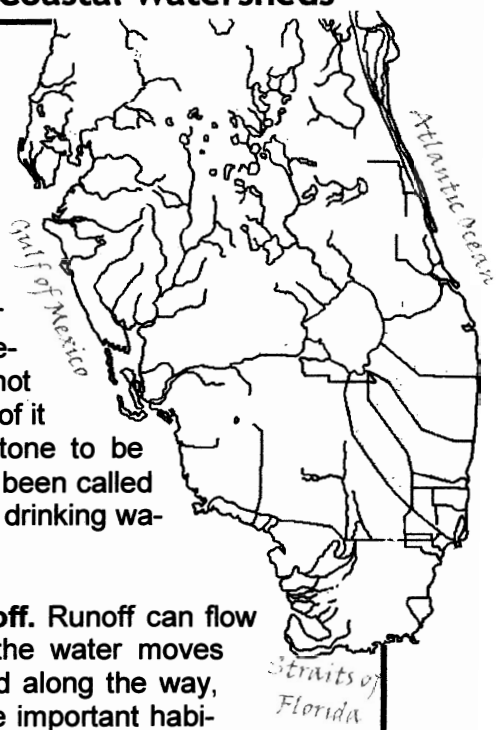
SeaTrek is a high-energy, multimedia marine science program that can come right into your classroom through videoconferencing and Internet technology. Programs feature real scientist working in the field with interviews showing how their interests led them to thier careers in science.

Who can participate?

SeaTrek programs are delivered to schools all over the world. Any school that has a videoconfernece system can connect with us to receive programs. Call **1-800-691-MOTE** or email **seatrek@seatrek.org** for more information. Thank you.

<www.seatrek.org>

A Closer Look: Florida



The Sunshine State is blessed with water, both fresh and salt. Florida is a **peninsula**, surrounded on the east by the Atlantic Ocean, on the west by the Gulf of Mexico and to the south by the Straits of Florida. Some of the fresh water in Florida comes from its neighboring states to the north, in the form of river and groundwater flow. However, the majority of fresh water comes as rainfall. The state averages 50 inches of rain per year, with May through October generally being the wettest period. The landscape of Florida is relatively flat, so water does not drain very quickly compared to more mountainous regions. A lot of it ends up trickling slowly through sandy soil and porous limestone to be stored under the ground in areas called **aquifers.** Aquifers have been called the "rain barrels" of Florida, and a majority of Floridians get their drinking water from this source.

The rain that does not enter the ground becomes surface **runoff.** Runoff can flow into streams and rivers or collect into ponds and lakes. As the water moves through the environment, different kinds of wetlands are formed along the way, such as bogs, sloughs, marshes and swamps. Wetlands provide important habitat for a variety of plants and animals. Wetlands also filter out some of the pollutants that can otherwise build up in the water as it moves downstream.

When the water finally reaches the ocean, it sometimes forms an **estuary.** Estuaries are special kinds of wetlands that are classically defined as semi-enclosed bodies of water where fresh water from the land, usually coming from a river, mixes with salt water from the sea. Because of the sheltered mixing of fresh and salt water, estuaries offer a remarkably rich but ever changing habitat for wildlife. Also, vegetation along the edges of the estuary helps stabilize the shoreline and forms a natural buffer between the land and the eroding energy of the ocean.

Florida Water Fast Facts

- Florida has over 1000 miles of coastline, the most of any of the lower 48 states.
- Florida receives 150 billion gallons of rain fall each day.
- 26 billion gallons of water flow into Florida from neighboring states.
- 70% of the rain fall (approximately 107 billion gallons) returns to the atmosphere through evaporation and transpiration. The remaining rain fall flows into rivers or seeps under the ground.
- Floridians consume 2.7 billion gallons for industrial, agricultural and personal use each day.

Learn more about Florida waters:
<www.swfwmd.state.fl.us/ppr/publications/files/FloridaWatersResources.pdf>

Sarasota Bay, a Florida Estuary

Sarasota Bay, on the southwest coast of Florida, is an example of a semitropical estuary. It first formed about 6,000 years ago, during the most recent sea level rise. The Bay is approximately 56 miles long and includes several smaller embayments (Palma Sola Bay, Sarasota Bay, Roberts Bay, Little Sarasota Bay and Blackburn Bay). It is protected from the Gulf of Mexico by barrier islands (Anna Maria Island, Longboat Key, Lido Key, Siesta Key and Casey Key). The distance across the Bay from the barrier islands to the mainland varies from only 300 feet (around Siesta Key) to 4.5 miles (near the middle of Longboat Key). Most parts of the Bay are shallow

PERCENTAGES TO PONDER

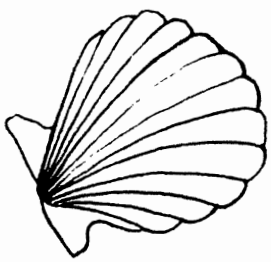
The amount of water on Earth never changes. The same water is here today as there was when the dinosaurs were around or when Chistopher Columbus came to the Americas!

- 97 % of the world's water is in the oceans.
- 3% of the world's water is fresh water.
- Only 1% of the world's water is available for drinking and other human uses.
- 75% of the human body is water!

-low, with an average depth of 5 feet, and a maximum depth (at Longboat Pass) of 27 feet. A series of inlets allow mixing between the Gulf of Mexico and Sarasota Bay (Tampa Bay at Anna Maria Sound, Longboat Pass, New Pass, Big Sarasota Pass, and Venice Inlet), and it is estimated that the water in the bay is totally changed about every 15 days. Much of the rainfall that enters the Bay comes as runoff from creeks and bayous. These mainly include Palma Sola Creek, Bowlees Creek, Whitaker Bayou, Hudson Bayou, Phillippi Creek, Clower Creek, Catfish Creek, North Creek and South Creek.

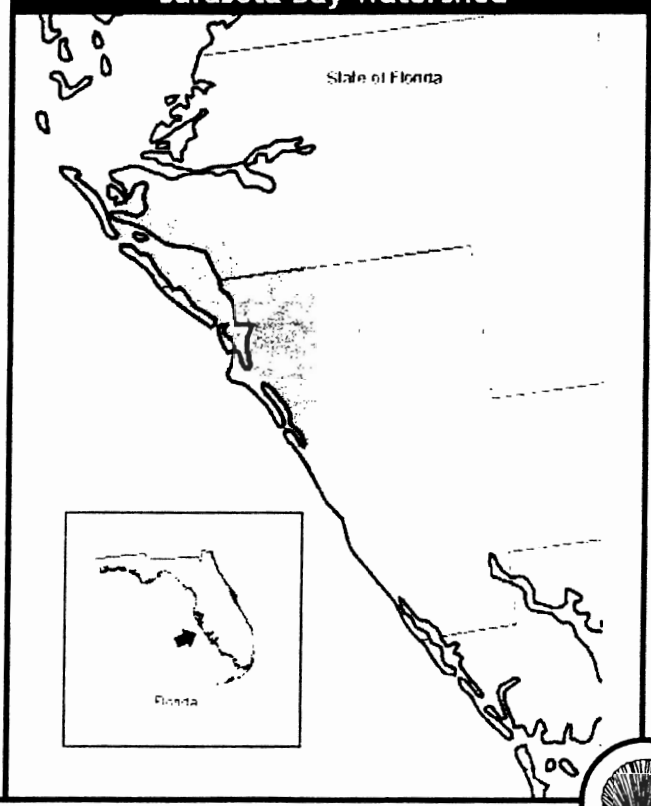
Seagrass meadows, mangrove swamps and other wetlands around the Bay provide habitat for resident and migratory wildlife. People have long been attracted to the natural resources of the coast, both for recreational and commercial purposes. There are burial mounds, middens and other evidence of human habitation in the area that date back over 10,000 years. Modern settlers began arriving in the mid-1800s, mostly in the form of scattered fishing camps. In the 1920s and 30s, the area started to see an increase in population growth that continues today. The increased development of the Bay ultimately led to a decline in the quality of this coastal system. Concern about this decline led to the Bay's inclusion in the National Estuary Program in 1987, and to the formation of the Sarasota Bay National Estuary Program (SBNEP) in June 1989.

The SBNEP is charged with improving and protecting Sarasota Bay. This is accomplished in several ways, principally through monitoring and controlling pollution, restoring and improving natural habitat, researching current and future conditions of the Bay and sharing that knowledge through education. SBNEP works with other governmental and private institutions, as well as concerned citizens, to meet these goals. ♦



The scallop is one of two animals used in the SBNEP logo. Do you know the other one?

Sarasota Bay Watershed



Activity 1.1: Create a Simple Model Watershed

Grade Level: 4-6

Standards: see Appendix A and B.

Time Required: 30 to 50 minutes.

Objective: Students will get a general idea of what happens to the water that flows through a watershed by making a simple model using paper, markers and a spray bottle.

Materials:

- ❑ One sheet of white construction or notebook paper per student
- ❑ Water-based color markers
- ❑ One or more shallow pans
- ❑ One or more spray bottles filled with water

Suggested Procedures:

1) Give each student a sheet of white construction paper or let them use notebook paper. Have them crumple it up a little. It is not necessary to make a ball.

2) Have the students partially smooth out their crumpled sheets, leaving some wrinkles and ridges (represent peaks and valleys).

3) Have them use markers to trace the ridges. They should make a network of lines. They can use different color markers to represent different kinds of pollutants, such as pesticides, litter, soil and fertilizer.

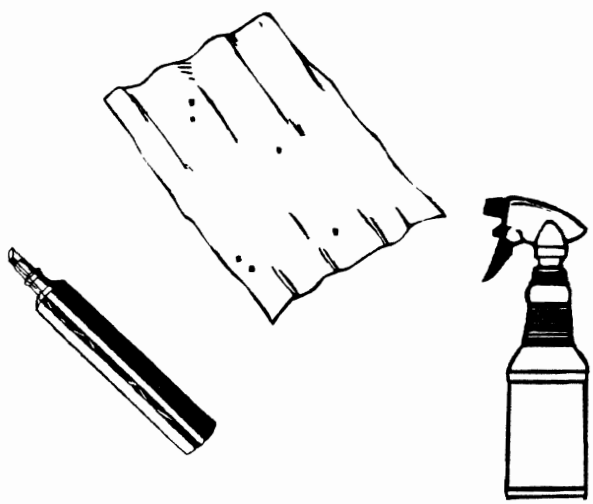
4) Allow each student to place their paper in a shallow pan. If there are enough spray bottles, allow the students to gently spray the top of their papers. Otherwise, the teacher may spray the sheets for the students. The papers should be just wet enough to allow the colors to begin spreading.

Discussion: Have the students describe what happens at the lowest point of their model watershed. Have them identify where the different colors mix together (at the high points or low?). Ask them what they think happens in an actual watershed when pollutants mix together.

Extension: If time and resources allow, student can make more complex models using art supplies such as cardboard, papier mache and foil. Instructions and examples for this kind of activity are available in Activity 5.1 and on the Internet:

- <www.swfwmd.state.fl.us/infoed/waterweb/waterwebwatersheds.pdf>
- <www.coast-nopp.org/resource_guide/elem_mid_school/ma_habitats_acts/journey.html>
- <www.tnrcc.state.tx.us/exec/sbea/tes/lessons99/wetlandwatershed.html>
- <www.heath.k14.mass.edu/water.html>

Adapted in part from: Southwest Florida Water Management District. Watershed Excursions Tabloid, Teacher's Guide. 09/02. <www.swfwmd.state.fl.us/watershd/pdf/teachguide.pdf>



Activity 1.2: Mapping Your Watershed

Grade Level: 6-8

Standards: see Appendix A and B.

Time Required: 30 to 50 minutes.

Objective: Students will identify major waterways and features of the Sarasota Bay Watershed and learn their own geographical relationship to them.

Materials:
- Pencils or pens
- One (1) copy of Activity Sheet 1.2.1 for each student or group of students
- Atlases of Florida, maps of Sarasota and Manatee counties and/or nautical charts of Sarasota Bay
- Access to Internet sites like Mapquest, Mapblast or Terraserver (optional)

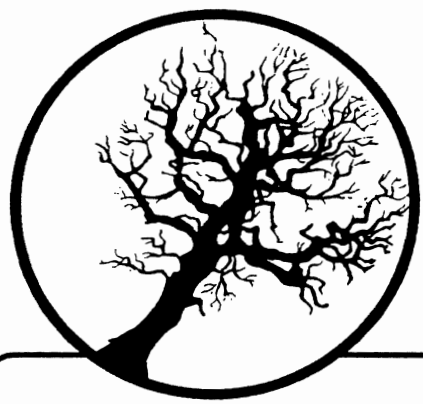
Suggested Procedures:

1) In this activity, students will become familiar with the geography of the Sarasota Bay Watershed. Using atlases of Florida, maps of Sarasota and Manatee counties, nautical navigation charts or Internet-based map sites, have the students locate the land and water features listed on Activity Sheet 1.2.1. Note: students may work in cooperative learning groups if map resources and Internet access are limited.

2) Have the students label these features on Activity Sheet 1.2.1. The location of Palma Sola Bay is already indicated for them, as an example of how to label the map. In addition, have them try to identify the approximate location of their school and/or the location of their house. If they find other waterways or features not listed above, let them include it on their map and share it with their classmates.

3) Review Activity Sheet 1.2.2 with the students and allow them to fill in any areas they may have missed.

Discussion: Ask the students if they have ever been to any of the places on their maps. If they have taken boat trips on the Bay or canoed along its creeks, have them write a page about what it was like to be on the water. Alternatively, let them describe their trips to the rest of the class and learn what aquatic encounters they might have shared with other students who have been to the same place.



IS THIS A TREE OR A WATERSHED?

From the air, the meandering streams and rivers of a watershed sometimes look like the silhouette of a tree. This water systems have also been compared to the intertwining networks of the human nervous system. Can you see the resemblance?

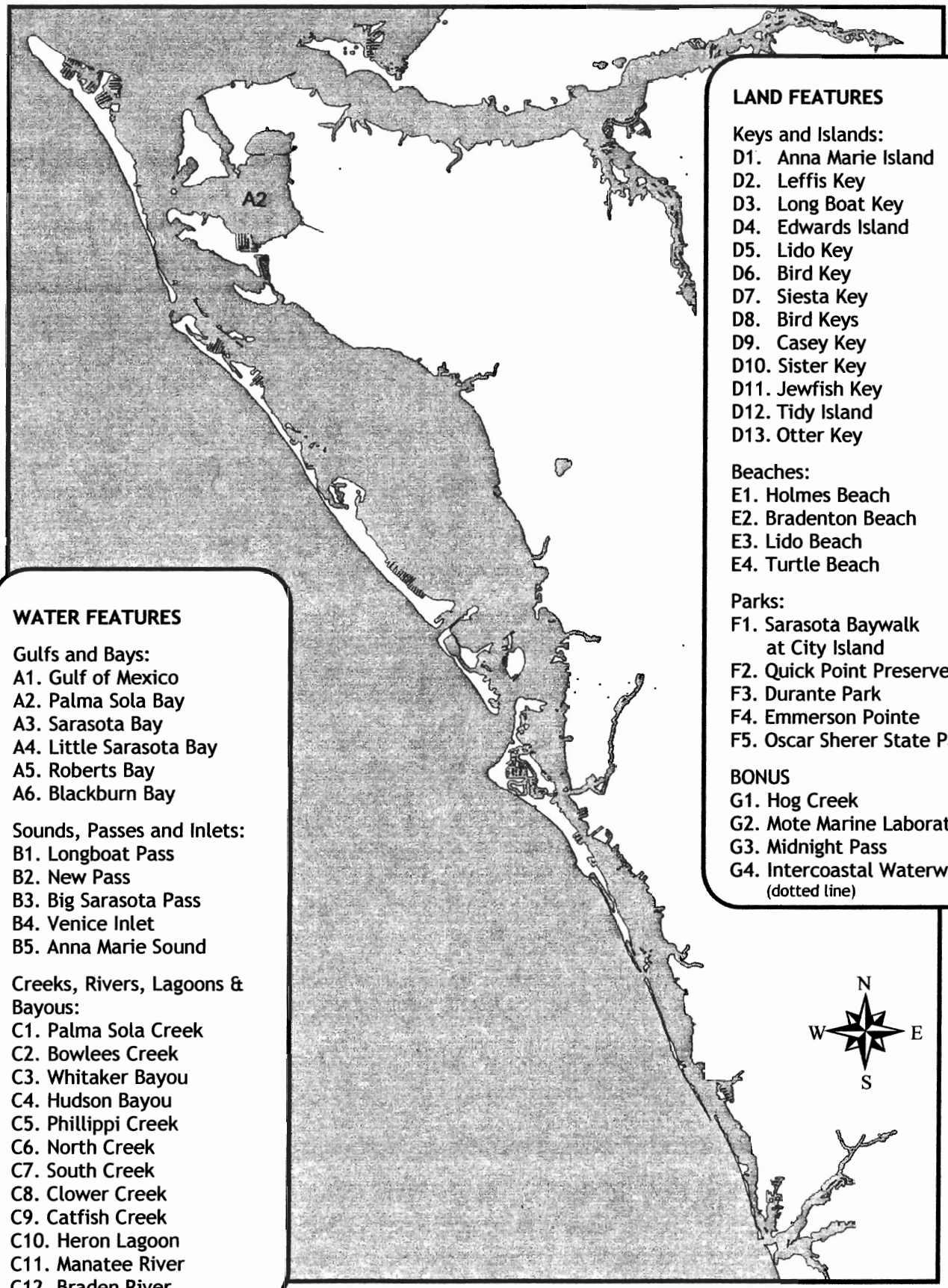
Developed by Mote Marine Laboratory for P.I.E.R., a program of the Sarasota Bay National Estuary Program

SARASOTA bay COASTAL HABITATS

NAME: _____

DATE: _____

Activity Sheet 1.2.1: Sarasota Bay Map (Student Copy)



LAND FEATURES

Keys and Islands:
D1. Anna Marie Island
D2. Leffis Key
D3. Long Boat Key
D4. Edwards Island
D5. Lido Key
D6. Bird Key
D7. Siesta Key
D8. Bird Keys
D9. Casey Key
D10. Sister Key
D11. Jewfish Key
D12. Tidy Island
D13. Otter Key

Beaches:
E1. Holmes Beach
E2. Bradenton Beach
E3. Lido Beach
E4. Turtle Beach

Parks:
F1. Sarasota Baywalk at City Island
F2. Quick Point Preserve
F3. Durante Park
F4. Emmerson Pointe
F5. Oscar Sherer State Park

BONUS
G1. Hog Creek
G2. Mote Marine Laboratory
G3. Midnight Pass
G4. Intercoastal Waterway (dotted line)

WATER FEATURES

Gulfs and Bays:
A1. Gulf of Mexico
A2. Palma Sola Bay
A3. Sarasota Bay
A4. Little Sarasota Bay
A5. Roberts Bay
A6. Blackburn Bay

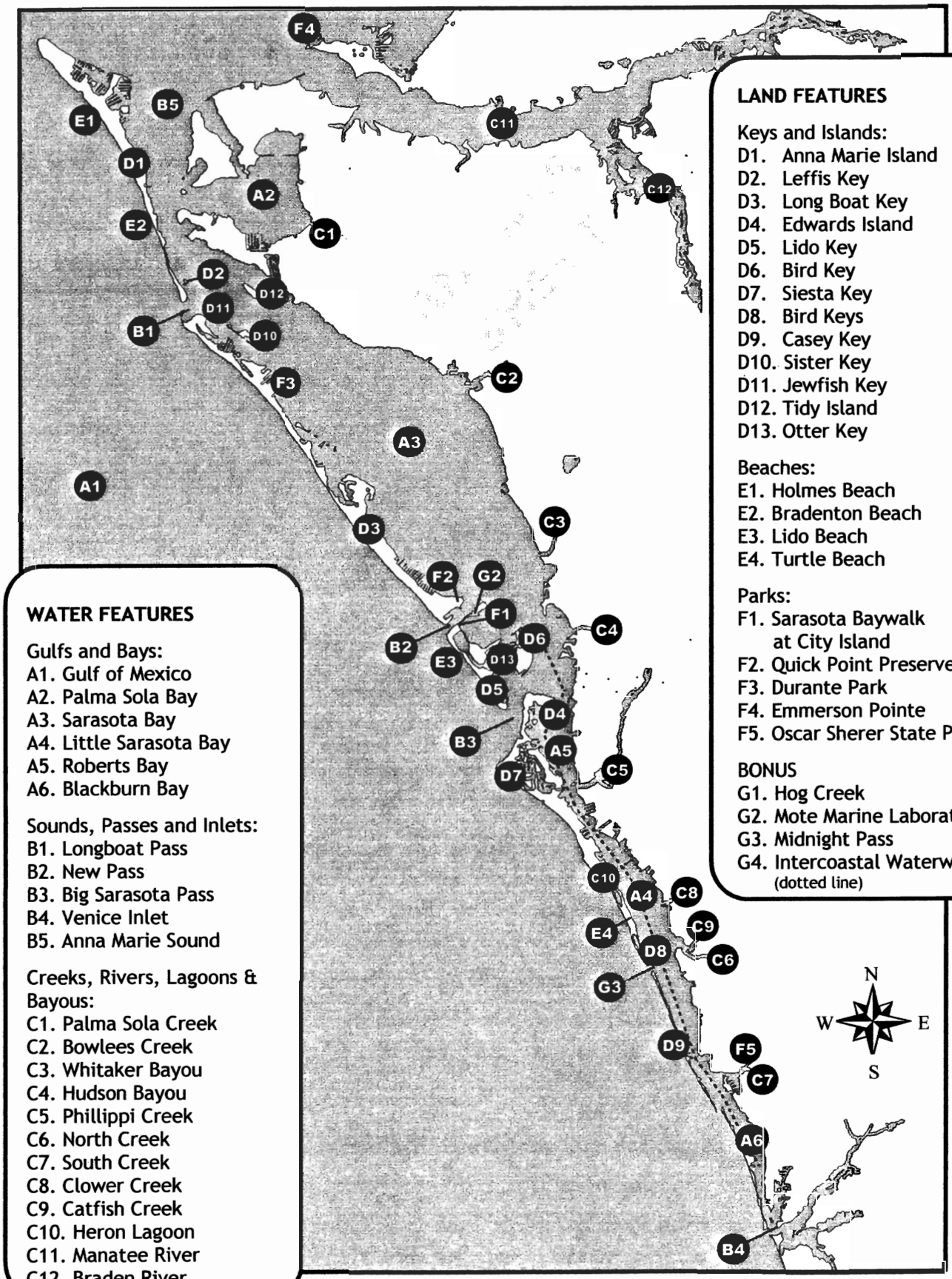
Sounds, Passes and Inlets:
B1. Longboat Pass
B2. New Pass
B3. Big Sarasota Pass
B4. Venice Inlet
B5. Anna Marie Sound

Creeks, Rivers, Lagoons & Bayous:
C1. Palma Sola Creek
C2. Bowlees Creek
C3. Whitaker Bayou
C4. Hudson Bayou
C5. Phillippi Creek
C6. North Creek
C7. South Creek
C8. Clower Creek
C9. Catfish Creek
C10. Heron Lagoon
C11. Manatee River
C12. Braden River

SARASOTA bay COASTAL HABITATS

Lesson 1: Coastal Watersheds

Activity Sheet 1.2.2: Sarasota Bay Map (Teacher Copy)



LAND FEATURES

Keys and Islands:
D1. Anna Marie Island
D2. Leffis Key
D3. Long Boat Key
D4. Edwards Island
D5. Lido Key
D6. Bird Key
D7. Siesta Key
D8. Bird Keys
D9. Casey Key
D10. Sister Key
D11. Jewfish Key
D12. Tidy Island
D13. Otter Key

Beaches:
E1. Holmes Beach
E2. Bradenton Beach
E3. Lido Beach
E4. Turtle Beach

Parks:
F1. Sarasota Baywalk at City Island
F2. Quick Point Preserve
F3. Durante Park
F4. Emmerson Pointe
F5. Oscar Sherer State Park

BONUS
G1. Hog Creek
G2. Mote Marine Laboratory
G3. Midnight Pass
G4. Intercoastal Waterway (dotted line)

WATER FEATURES

Gulfs and Bays:
A1. Gulf of Mexico
A2. Palma Sola Bay
A3. Sarasota Bay
A4. Little Sarasota Bay
A5. Roberts Bay
A6. Blackburn Bay

Sounds, Passes and Inlets:
B1. Longboat Pass
B2. New Pass
B3. Big Sarasota Pass
B4. Venice Inlet
B5. Anna Marie Sound

Creeks, Rivers, Lagoons & Bayous:
C1. Palma Sola Creek
C2. Bowlees Creek
C3. Whitaker Bayou
C4. Hudson Bayou
C5. Phillippi Creek
C6. North Creek
C7. South Creek
C8. Clower Creek
C9. Catfish Creek
C10. Heron Lagoon
C11. Manatee River
C12. Braden River

Habitats are Homes

Habitats are the places where organisms live and find the things they need to survive. This includes food, water, shelter and living space. It can also include things like the right amount of light, temperature or mates. There are many different types and sizes of habitats. For example, the habitat for a bottlenose dolphin may be over 50 square miles of Sarasota Bay, while the habitat of an encrusting tunicate colony may be just a few square inches of a turtle grass blade.

Living on the Edge: Coastal Habitats of Florida

Florida, with its nearly 1200 miles of coastline, has many distinctive habitats along it border with the ocean. These can be found in **natural communities** like maritime forests, beach dunes, salt marshes, mudflats, mangrove swamps, seagrass meadows, oyster bars and coral reefs. The animals, plants and other organisms that live in these areas must constantly adjust to the changing conditions brought about by the tides. This can mean being exposed to both air and water, which affects both salinity and temperature. However, this constant mixing, especially in areas like estuaries, also offers ever-changing opportunities for new food and new places to live and grow. In fact, the brackish water of estuaries are home to an estimated 70 percent of Florida's commercially and recreationally valuable fish and shellfish species during some part of their lives. This makes coastal areas critically important places for a productive environment.

POTABLE QUOTABLES

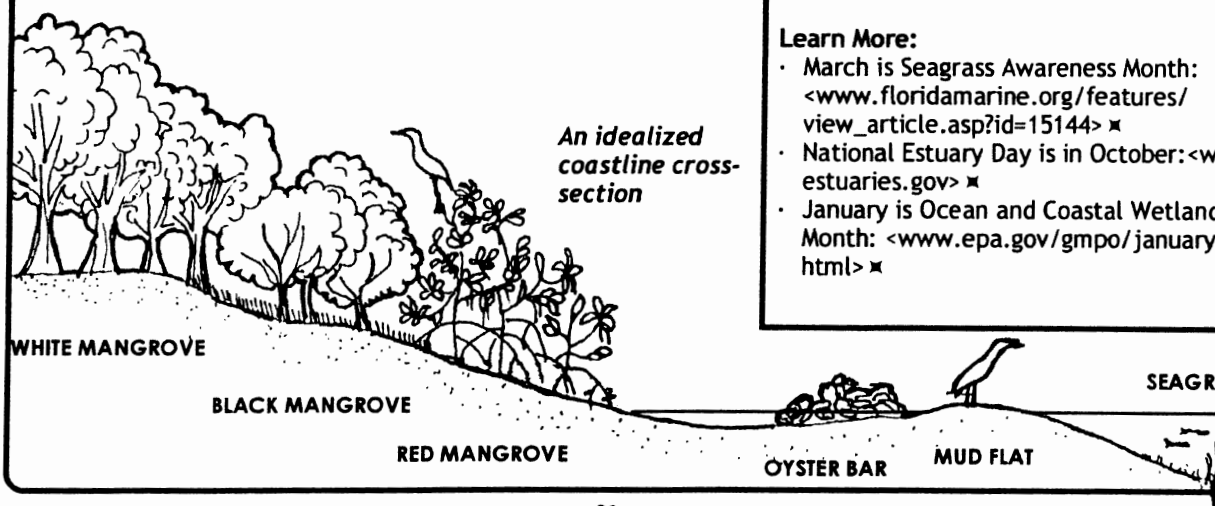
The coast is where the land *littorally* meets the sea.
-Anonymous

HABITAT FAST FACTS

- Intertidal wetlands have decreased by 39% in Sarasota Bay since 1950.
- Seagrass currently covers about 26% of the Bay's 33,000 total bottom acres.
- About 15% (~5,000 acres) of the Bay's bottom has been disturbed to create homesites and boat channels. These areas often do not support diverse aquatic life.
- There are 20 artificial reef sites being implemented by the SBNEP in Sarasota Bay.

Learn More:

- March is Seagrass Awareness Month: <www.floridamarine.org/features/view_article.asp?id=15144>
- National Estuary Day is in October: <www.estuaries.gov>
- January is Ocean and Coastal Wetlands Month: <www.epa.gov/gmpo/january.html>



An idealized coastline cross-section

Developed by Mote Marine Laboratory for P.I.E.R., a program of the Sarasota Bay National Estuary Program

Activity 2.1: Habitat Highlights

Grade Level: 4-6

Standards: see Appendix A and B.

Time Required: 50 minutes.

Objective: Students will use reference materials and/or the Internet to describe different coastal habitats found in Florida and the organisms that live there.

Materials:

- Writing materials (Pen or pencil, paper)
- Colored markers or colored pencils
- Books, field guides, reference material about the FL environment
- Maps or Atlases of Sarasota Bay (alternatively, Activity Sheet 1.2.1)
- One (1) copy of Activity Sheet 2.2.1 per student or group
- Internet access (optional)

Background:

WHAT'S THE DIFFERENCE?

The following terms are sometimes used interchangeably, but each one has a different emphasis or meaning.

Habitat: The place where living things find what they need to survive, such as food, shelter, water and living space. Habitats are kind of like one's home address.

Ecosystem: A living community of plants, animals and other living organisms and their relationship with the environment around them. It refers to groups of organisms interacting with each other and with the areas they live in, kind of like one's town or city.

Natural Communities: A natural community is a distinct and recurring group of organisms that are usually found together in the environment. These communities are often labeled according to the kind of plants that are most common in the area (e.g., mangrove swamp, coastal grassland), and can be thought of kind of like a club or neighborhood association.

Suggested Procedures:

1) For this activity, students may work individually or in small cooperative learning groups of two to three. First, ask the students as a class what they think the word **habitat** means, or what ideas they associate with the word. List their ideas on a blackboard or overhead projection. Afterwards, write out the definition formally listed under *What's the Difference?*, and ask them to copy it on their own paper.

2) Tell the students that they are going to focus on habitats associated with the Florida's coast, and give each student or group a copy of Activity Sheet 2.2.1. Go over the descriptions with them as a class.

3) Assign each student or group a different habitat listed on Activity Sheet 2.2. Using field guides, library books and the Internet, have them research the habitat, and expand on the information already provided. In particular, have them try to identify as many different kinds of animals, plants and other organisms that live in their given habitat. Encourage them to be specific (i.e., not just crabs, but blue crabs, fiddler crabs, ghost crabs; not just birds, but osprey, oystercatchers, laughing gulls).

4) Using reference maps and the knowledge about their assigned habitats, let the students try to locate areas around Sarasota Bay that have these kinds of environments. Access to the internet and publications from the Sarasota Bay National Estuary Program may help. If this information is not readily available, allow the students to make their best guess as to their locations, based on their research (i.e., salt marshes around tidal

Activity 2.1: Habitat Highlights (cont'd)

creeks and rivers, mangroves fringing undeveloped shorelines and islands, seagrass meadows along shallow bay bottoms, oyster bars near tidal creeks, artificial reefs in disturbed areas). If they are using a copy of Activity Sheet 1.2, let them draw or color in the habitats on their maps.

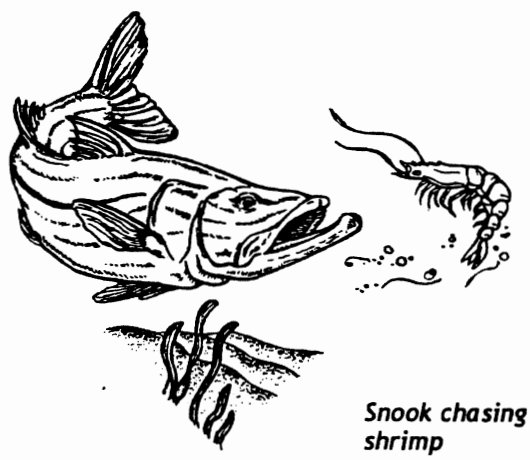
Discussion: What are the characteristics of the highlighted habitats? What other features and creatures of these habitats were the students able to identify? Ask the students if they have ever been to any of these habitats. Encourage them to describe their encounters with the plants and animals that live there.

Extension: Once the students have completed an exhaustive list of organisms, have them re-list them on another sheet of paper. Using the knowledge they have gained about their given habitat and the kinds of organisms that live in them, have the students or groups try to determine which category they think their animals and plants fall into:

a. Organisms that only live in the given habitat and are never found, or never move to anywhere else (permanent residents, 0% of their lives in other places).
b. Organisms that live a majority of their lives in the given habitat, but occasionally grow in, or move in and out of, other places (semi-permanent, about 25% of their lives in other places).
c. Organisms that spend only a portion of their lives in the given habitat, and are often found growing in, or moving freely about other places (temporary or seasonal residents, about 50% of their lives in other places).
d. Organisms that are rarely found in the given habitat, or are only moving through (casual visitors or transients, about 75% or more of their lives in other places).

For animals that move in and out of a given habitat, or spend little time there, have the students research and list at what times those animals are most likely to be seen there. This may mean a certain time of day if the animals are strictly nocturnal or diurnal, or it may mean a certain time of year (especially for migrating birds and manatees). It may also mean only a certain period in the animals life cycle, such as the nesting and hatching of sea turtles on a particular beach.

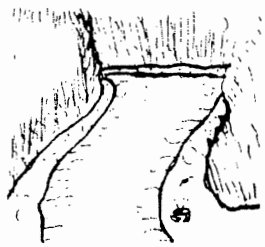
Let the students describe other coastal habitats, such as mudflats, beaches, coral reefs or maritime forests, etc. Alternatively, they could choose inland habitats that may have close hydrologic connections with coastal habitats, such as rivers, freshwater tidal swamps or sinkholes. Have them complete the same exercises listed above.



Snook chasing shrimp

Developed by Mote Marine Laboratory for P.I.E.R., a program of the Sarasota Bay National Estuary Program

Activity Sheet 2.1.1: Habitat Highlights



Salt Marsh: Areas between and above the tide lines occupied mostly by nonwoody, salt-tolerant plants; may include various smaller plants (**epiphytes**) and animals (**epifauna**) growing on them. Highly productive areas that stabilize sediment, offer storm protection and cover for wildlife. Plants grow in zones according to their ability to tolerate salt. This habitat is rare in Sarasota Bay, generally occurring around tidal creeks along the mainland shore.

Plants: Black rush (*Juncus* spp.), cordgrass (*Spartina* spp.), leather fern, glasswort, purslane, seaside goldenrod, saltbush, mangroves.

Animals: Raccoons, marsh rabbits, rodents, fish, birds, fiddler crabs, snails, insects, spiders, worms.

Mangrove Swamps: Large areas between and above the tide line that are occupied mostly by woody plants; may include various epiphytes and epifauna growing on them. Mangroves root structures are adapted to the complex and harsh tidal environment and provide sediment stabilization and storm protection. In general, Red Mangroves are most able to tolerate standing in salt water, and are more common below the tide line. Black Mangroves are found further up, between the tide lines, and White Mangroves are most abundant farther away from shore. Leaves, stems and flowers produce litterfall throughout the year, which is a major source of food for this community. Found all along the undeveloped shoreline and barrier islands of Sarasota Bay.

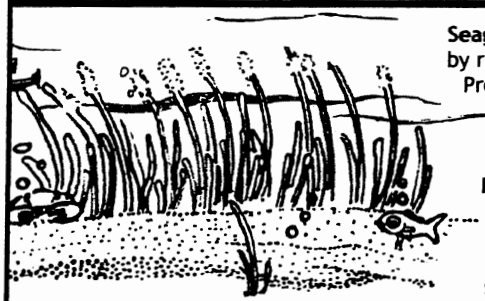
Plants: Black mangrove, buttonwood, red mangrove, and white mangrove.

Animals: Raccoons, mangrove snakes, American crocodiles, fish, oysters, birds, bottlenose dolphins, mangrove tree crabs, snails, insects, spiders, worms.

Oyster Bars: Substantial areas below and above the tide line built up by concentrations of oysters and other mollusks. Provides hard bottom in areas that might otherwise contain soft marine muds and acts as a refuge for small, mobile invertebrates like shrimps and crabs. Oysters are filter feeders that can each potentially filter nearly 10 gallons of seawater every hour. Sporadically found throughout the near shore areas of Sarasota Bay, especially around creeks south of Big Pass.

Plants: Seagrasses sparse, if present. Also microalgae and some macroalgae.

Animals: Oysters, mussels, shell worms, octocorals, sponges, stony corals, crabs, shrimp, wading birds, fish, snails, seastars.

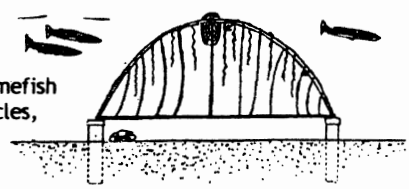


Seagrass Meadows: Expansive areas above or below the tide line, occupied mostly by rooted seagrasses; grasses often have epiphytes and epifauna growing on them. Provide food and shelter for numerous vertebrate and invertebrate species. Mostly located in the nearshore areas of Sarasota Bay, down to a depth of seven feet

Plants: Shoal grass, halophila, widgeon grass, manatee grass and turtle grass. Also microalgae and some macroalgae

Animals: Octocorals, sponges, stony corals, fish, sea turtles, manatees, crabs, snails, worms, seastars, dolphins.

Artificial Reefs: Designed to mimic natural reef systems, these are complex, man-made structures built of pipes, concrete, or other durable materials. They are usually placed in barren or disturbed areas and provide refuge for desirable gamefish species. They also serve as attachment places for settling organisms like barnacles, sponges, corals and algae (epiphytes and epifauna).



What other habitats are found along Florida's coasts? What animals and plants live there?

Activity 2.2: Make It a Habitat

Grade Level: 6-8

Time Required: Two to three 50 minute periods.

Objective: Students will identify the components of a habitat that are essential for many aquatic animals to survive. They will do this by designing an artificial habitat suitable for some aquatic wildlife found along the coasts.

Materials:

- One (1) copy of Activity Sheet 2.2.1
- Art supplies
  - writing materials
  - scissors
  - papier-mache
  - modeling clay
  - gallon jars
  - string
  - cardboard boxes (used to frame the models

Suggested Procedures:

1) Cut out the cards with the animals on Activity Sheet 2.2.1. Feel free to add more animals if necessary.

2) Divide the class into cooperative learning groups of two to four. Have each group draw one card from a hat.

3) Ask each group to design an artificial habitat in which their animal could successfully live. Each group will be expected to consult library reference materials, talk to resource people or conduct Internet research to determine the life requirements of thier creature. In addition, they must investigate and establish the characteristics of the animals's natural habitat.

4) When the research is complete, each group is to design and build a model or small replica of an aquarium habitat which would be suitable for their animal's survival and comfort in captivity. Establish a scale for the exhibits (for example, one inch = five feet for the large animals; actual size for the worms or snails).

5) Once the models are complete, ask each team to report to the rest of the class. Each report should include a description of the basic biological needs of each animal as well as a description of the characteristics of its natural habitat. The students should point out how their models are designed to meet the needs of the animal.

6) Once all the reports are finished, have the students arrange their models in a floorplan for a public aquarium/ museum (optional)

7) Ask the students to summarize the components of habitat that seemed to be necessary for the survival of the aquatic animals they studied. (Food, good water quality, shelter and living space in a suitable arrangement would be the minimum necessary components.)

Discussion:

List the components of suitable habitat that are necessary for most aquatic animals to survive. Pick an aquatic mammal, fish, or other aquatic animal. Describe the biological characteristics of the animal and the kind of habitat requirements it has in order to survive. Compare similarities and differences between this aquatic animal and another aquatic animal. What things, if any, do they both need in order to survive? What things, if any, must be different in their habitats in order for each kind of animal to survive?

Activity 2.2: Make It a Habitat

Background:

Aquariums are artificial habitats. In aquaria, water is a uniquely sensitive part of the habitat and it must serve to do more than quench thirst. The surrounding water must meet specific requirements for different aquatic life forms. Slight changes in salinity, pH, dissolved oxygen and the presence of a wide range of pollutants can spell disaster for certain aquatic organisms.

To successfully house aquatic wildlife in aquariums, careful attention must be paid to the range of conditions that each life form can tolerate. There are also certain physical requirements in terms of the shape and dynamics of the display that must be compatible with each creature. For example, some fish require moving water or currents. Others prefer almost static conditions. Some prefer deep water and others shallow rocky bottoms. The variations are remarkable when one considers designing habitats for microorganisms in pond water versuses the huge habitats for marine mammals.

Concern for the physical requirements of animals must go beyond meeting minimum survival needs. Attention should be given to the animals' comfort, creating conditions as similar to those in their natural habitats as possible.

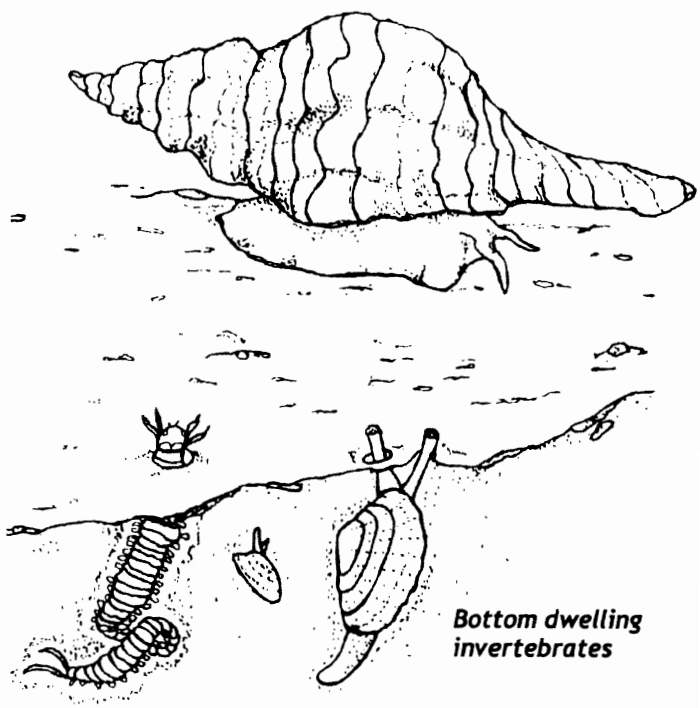
In the growing practices of aquaculture (deliberate cultivation of freshwater organisms) and mariculture (deliberate cultivation of oceanic organisms) much research is conducted regarding habitat requirements. Often natural streams, rivers, lakes and even the ocean are used in these enterprises. Attention to water quality and disease control is just as important in these settings as it is in the confined habitats of an aquarium.

Ethical concerns about the appropriateness or inappropriateness of housing aquatic wildlife in artificial habitats must also be considered. However, this activity is designed simply to address the complex physical needs of aquatic wildlife in order to be able to survive at all under conditions of captivity.

Extensions:

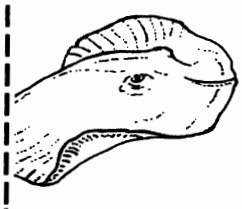
- Visit an aquarium and arrange for a staff person to explain how the aquarium addresses the same basic requirements for animals that the students did.
- Create a balanced aquarium for the classroom.
- Discuss the reasons for and against keeping aquatic wildlife in captivity.

Adapted from: Project WILD. Aquatic Education Activity Guide. 1987.
<www.projectwild.org/materials/sampleaquatic.htm>



Bottom dwelling invertebrates

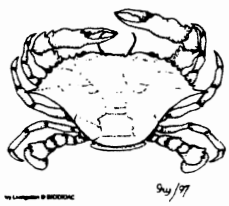
Activity Sheet 2.2.1: Coastal Critter Cards



Name: Atlantic stingray

Diet: Crabs, clams and other bottom dwelling invertebrates.

Notes: Has a venomous barb on its tail that it uses to defend itself



Name: Blue crab

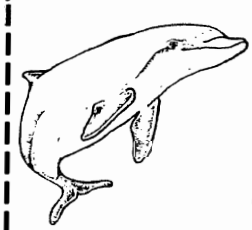
Diet: Dead fish, worms, mollusks, shrimps.

Notes: Strong pinchers for grasping and tearing prey.

Name: Bonnethead shark

Diet: Fish, crustaceans, mollusks.

Notes: Grows to about 3 feet long as an adult.



Name: Bottlenose dolphin

Diet: Fish, squid, shrimp.

Notes: A marine mammal that can use echolocation to find it way and to locate food.

Name: Horseshoe crab

Diet: Small clams, crabs and worms.

Notes: The pointed tail is not venomous. They push themselves upright with it when flipped over.

Name: Mangrove snake

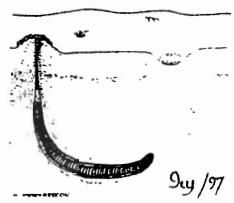
Diet: Small fish, crabs, and shrimp trapped in isolated pools of water by the falling tide.

Notes: Non-venomous.

Name: Oyster

Diet: Filter feeeders that strain plankton and nutrients from the water.

Notes: Attaches together in large groups call beds.



Name: lug worm

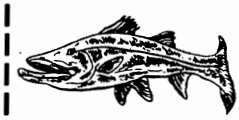
Diet: Sediment feeders, consume detritus.

Notes: Build L-shaped burrows in the sand. A small depression forms above the mouth.

Name: Periwinkle snail

Diet: Algae and detritus

Notes: Usually attached to marsh grasses above the waterline to avoid predators like blue crabs.



Name: snook

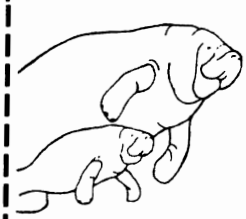
Diet: Smaller fish, shrimp and other crustaceans.

Notes: The black stripe on its side is the lateral line, a sensory organ.

Name: Brittle star

Diet: Scavenges for food from sediment and out of the water column.

Notes: Found in oyster beds and around sponges.



Name: Manatee

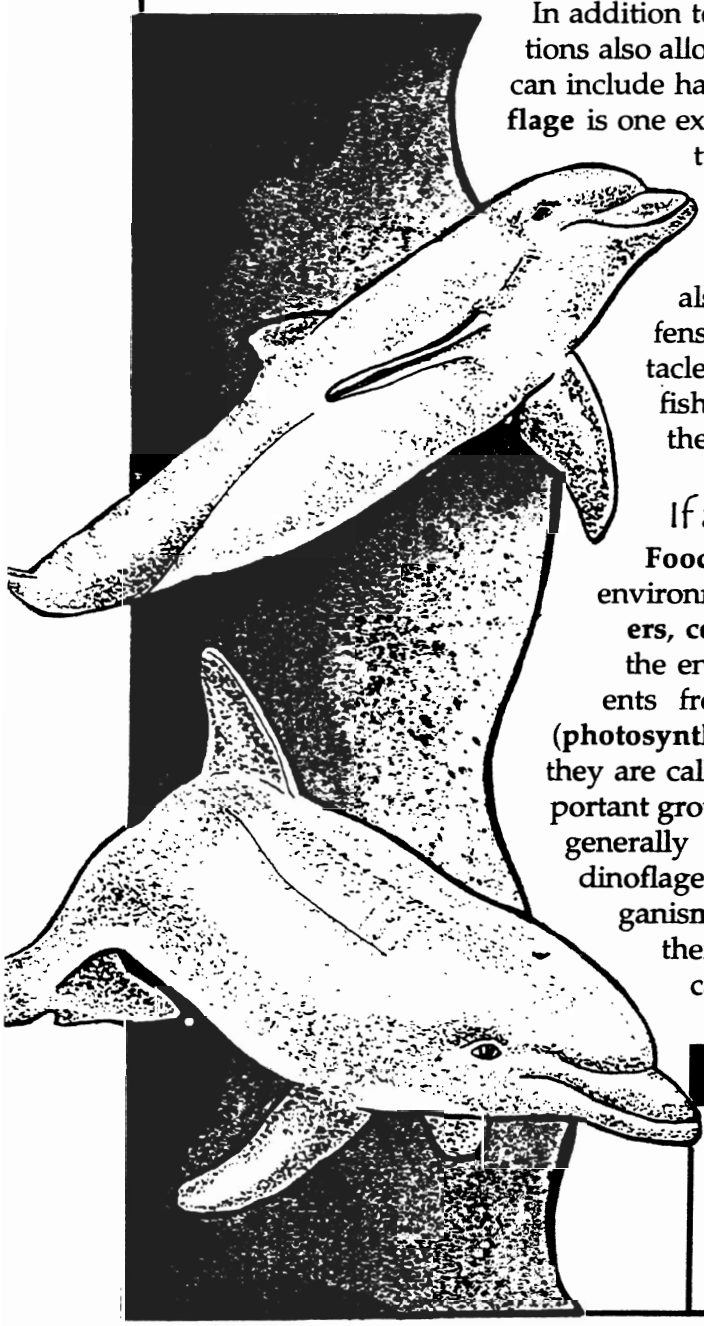
Diet: Aquatic vegetation, including seagrass.

Notes: A marine mammal that is distantly related to elephants.

Developed by Mote Marine Laboratory for P.I.E.R., a program of the Sarasota Bay National Estuary Program

Coping with Change

The coastline is an ever changing environment that offers a number of challenges to any thing that tries to lives there. In places like estuaries, organisms must cope with regular fluctuations in salinity and oxygen levels as freshwater from land mixes with salt water from the ocean. Tides can alternately cover creatures with water, and then expose them to drying air. This can lead to quick changes in temperature too. Marine animals cope with these changes in a number of ways. Mobile animals, like fish and crabs, can move to more favorable conditions. Settled animals like oysters and barnacles can shut up their shells, and animals like worms and clams can dig deeper. Many estuary animals are also able to excrete excess salt.



In addition to coping with changes in the environment, adaptations also allow animals to find food and avoid being eaten. This can include having special body shapes and body parts. **Camouflage** is one example that is common among coastal marine creatures. Camouflage allows animals like seahorses and sea hares to blend in to the background by taking on the colors and patterns of the surrounding seagrass. Specialized appendages can also be helpful, both for grabbing food and for defense. Octopods, sea anemones and seastars have tentacles and arms for capturing prey. Stingrays, scorpionfish and sea urchins have sharp spines to protect themselves.

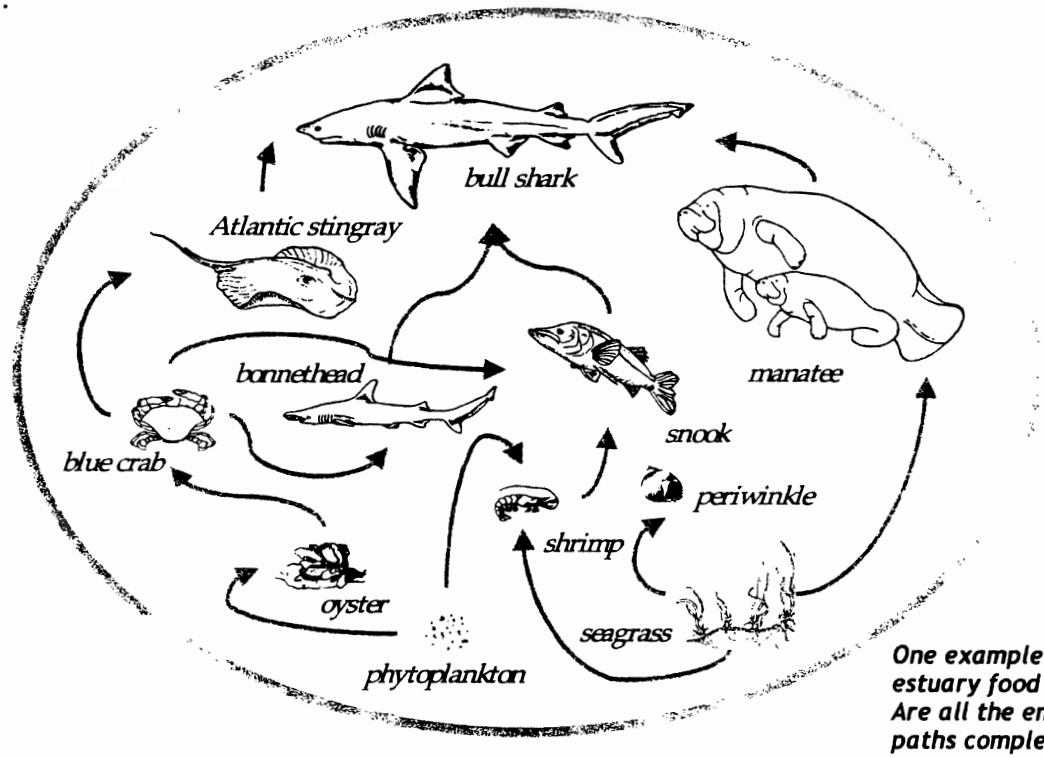
If a Habitat is my Home, What's for Dinner?

Food chains show how energy is cycled through the environment. The simplest food chain consists of **producers, consumers** and **decomposers**. Plants and algae use the energy of the sun, water, carbon dioxide and nutrients from the environment to make their own food (**photosynthesis**). Since these organisms make their own food, they are called producers. In the marine environment, an important group of producers is called phytoplankton. These are generally microscopic photosynthesizing organisms like dinoflagellates that form the base of many food chains. Organisms that do not make their own food, but instead get their energy from eating other plants or animals, are called consumers. Animals that only eat plants are

COASTAL CRITTER FAST FACTS

- There are currently over 130 resident dolphins living in and around Sarasota Bay.
- Over 100 manatees were sighted in Sarasota waters during a single day of surveying.
- Loggerhead sea turtles are the most common species nesting on Sarasota and Manatee beaches.

called **herbivores**. Animals that eat both plants and animals are called **omnivores**. Herbivores and omnivores can be primary consumers, since they are the first organisms in the chain to eat the producers. Animals that eat only other animals are called **carnivores**. They are considered secondary consumers (or tertiary or quaternary, etc., depending on how far removed they are from the primary consumers). Finally, there are organisms that recycle the nutrients by feeding on dead or decaying materials. These are the decomposers. In the marine environment, the decaying material is often available in the form of small bits of plant matter (less than 1cm) called **detritus**. If one expands a food chain by adding more interconnected links, a web of relationships appears. These overlapping links form a **food web**.



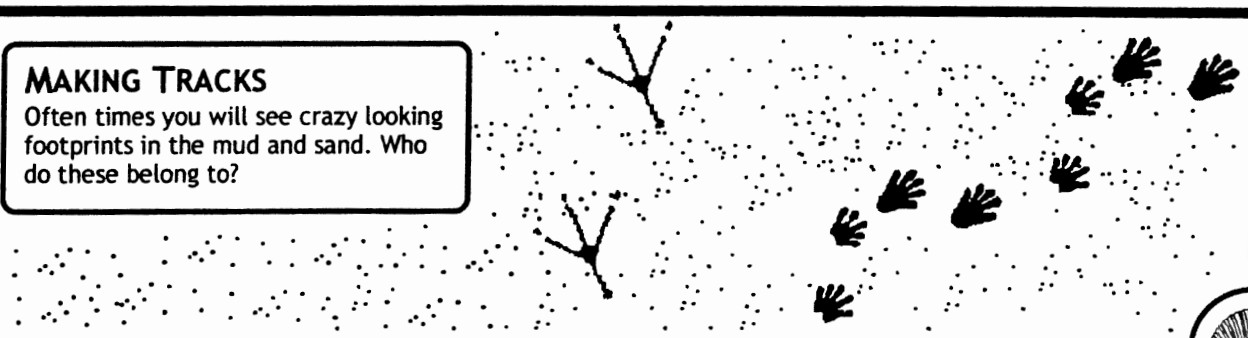
One example of an estuary food web. Are all the energy paths complete?

Waiter, There is Pollution in My Soup

As pollutants move through a watershed, they can come into contact with many different levels of a food chain. When one link of the chain is contaminated, the following links will also be contaminated, but to a greater degree. This is called **bioaccumulation**, which is the increase in the concentration of pollutants as one moves up a food chain. (See Lesson 5 for more information and activities about pollution.)

MAKING TRACKS

Often times you will see crazy looking footprints in the mud and sand. Who do these belong to?



Activity 3.1: A Fish by any Other Name Would Smell

Grade Level: 4-6

Standards: see Appendix A and B.

Time Required: 50 minutes.

Objective: Students will learn about the different varieties of fish that live in coastal waters as well as the adaptations that allow them to survive in these environments.

Materials:
- Writing materials
- Art supplies
- Field guides and other reference material about fish
- Internet access (optional)

Background:

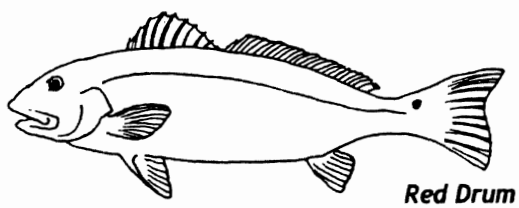
A FISH BY ANY OTHER NAME

The sea can be a strange and scary place to humans, who are more adapt at moving around on the ground than in the water. So when humans first encountered unfamiliar animals from the deep, they would often give them names related to the land animals they already knew about. The following are real fish found along the coasts of the Atlantic Ocean and Gulf of Mexico:

Batfish, Bull Shark, Butterflyfish, Catfish, Cowfish, Dogfish, Frogfish, Goatfish, Hawkfish, Hogfish, Lizardfish, Parrotfish, Porcupine fish, Pigfish, Scorpionfish, Seahorse, Squirrelfish, Toadfish

This is not a complete list. What other marine fish have the names of other animals in their names?

We also name marine fish after familiar objects, like spadefish, guitarfish, needlefish, pipefish and even soapfish. What are some other marine fish named after familiar objects?



Red Drum

Suggested Procedure:

1) Go over the short background exercise above with the entire class. Let the students know that that these are the actual names of fish, even if they have never heard of or seen them before. Allow the students to come up with additional fish names that include other animals or objects in their names. Students may be as imaginative and silly as they want to when proposing new names. Write their suggestions on the board or overhead projection. Note, at the discretion of the teacher, students can name non-fish marine animals like horseshoe crabs, sea hares and sea spiders.

2) Assign each student or group of students one or more of the new, made-up names (depending on how many names were suggested). Using library reference material or the Internet, have the students determine if their made-up fish names actually exist.

   While they are researching their made-up names, encourage students to find and share pictures of the real animals already given in the Background material.

   Some other real possibilities not listed in the background include: alligator fish, coronetfish, crocodile fish, eagle ray, flashlight fish, lionfish, goosefish, pearlfish, rabbitfish, ratfish, seamoth, sea robin, spiderfish, stonefish, tiger shark, trumpetfish, waspfish and wolf eel. Some of these are not Florida fish. Which ones?

   A good resource for finding fish names is Fishbase:
   <www.fishbase.org/search.html>

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3) The students should now have three groups of fish that they have researched:
   a. The real fish names already given during the background exercise.
   b. Fish names they made-up, but which turned out to actually exist. For these fish, have the students write a short natural history about the animals. Include details such as where they live (freshwater or salt?), what they eat and how common they are. Let the students share this information and any picture they have found with rest of the class.
   c. Fish that they made up, but for which students are unable to find any references for (e.g., eraserfish, doorfish, apefish). Let the students create a short natural history of their imaginary fish. What does it look like? Have them draw a picture. Where does it live? What does it eat?

4) Estuaries have been called the nurseries of the sea, and it is estimated that 70 percent of all Florida's commercially and recreationally valuable fish and shellfish species spend some part of their lives there. Have the student try to identify which of the fish they have just researched spend at least some part of their lives in an estuary. Students should be able to separate their fish into at least two groups: deep water, **oceanic** species and near shore, **coastal** species.

5) Review the concept of adaptations. Ask the students to explain what is meant by the term. Ask the students to list some adaptations of their fish that allow them to survive in their environment.

Extensions:

- Visit MARE's Interactive Fish Builder to learn more about fish adaptations:
  <sv.berkeley.edu/showcase>

- Have the students try to determine which of the fish they researched are found in Sarasota Bay. These resources may be useful:

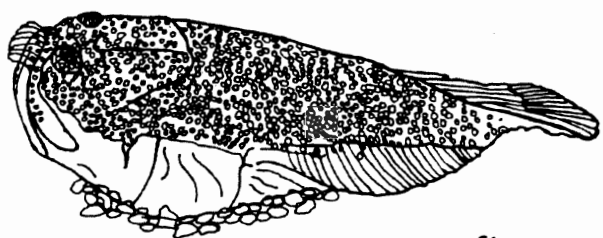
  FWCC Fish Identification Guide
  <www.floridamarine.org/gallery/view_category.asp?catid=1221&subcatid=5131>

  American Littoral Society, SE chapter
  <www.sealitsoc.org/flora_%26_fauna.htm>

- The students will likely find that common names are often applied to very different looking animals. This is because people in different geographical areas often use different local names for the same species of fish. Biologist try to avoid this confusion by giving each species a unique name using a binomial classification system of Latin and Greek words. This would be a good opportunity to introduce a lesson on scientific classification These resources may be useful:

  Science NetLinks:
  Classification of Living Organisms
  <www.sciencenetlinks.com/lessons.cfm?BenchmarkID=5&DocID=87>

  Classifying Critters
  <www.hhmi.org/coolscience/critters/index.html>



Stargazer

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Activity 3.2: Estuary Food Webs

Grade Level: 6-8

Standards: see Appendix A and B.

Time Required: 50 minutes.

Objective: Students will learn about food chains in an estuary.

Materials:
- ❑ Writing materials
- ❑ Art supplies
- ❑ Internet access (optional)

Suggested Procedure:

1) Ask the students what they had for dinner last night. List some of their responses on the black board or overhead projection.

2) Review the concepts of a food chain/ food web in Lesson 4. Ask the students to explain what is meant by each of the bold terms. If these terms are new to your students, write out each word and take time to define and explain each of them, with examples.

3) Go back to the students dinner responses and trace the energy path of some of their responses (e.g., Kyle, human child ← hamburger, cow ← fodder, grass ← sun).

4) Ask the students to think about the kinds of organisms typically found in a Florida estuary. Working individually or in groups, have them write down 9 or more possibilities, making sure they include the following details:
   - At least 3 producers (e.g., phytoplankton, cordgrass, seagrass, mangroves).
     - How the producers get their energy (most likely from the sun).
     - Where they grow in the estuary
     - What feeds on each of them.
     - List 2 adaptations that makes each one well suited to its enviroment.
   - 3 primary consumers (e.g., sea hare, manatee, mullet).
     - How they get their energy (herbivore or omnivore).
     - Where they live in the estuary.
     - What feeds on each of them.
     - List 2 adaptations that makes each one well suited to its enviroment.
   - 2 secondary consumers (e.g., snapper, osprey)
     - How they get their energy (omnivore or carnivore).
     - Where they live in the estuary.
     - What feeds on each of them.
     - List 2 adaptations that makes each one well suited to its enviroment.
   - 1 tertiary consumer (e.g., barracuda, shark).
     - How they get their energy (omnivore or carnivore).
     - Where they live in the estuary.
     - What feeds on each of them, if anything.
     - List 2 adaptations that makes it well suited to its enviroment.

5) Have the students create a food web of a Florida estuary using the organisms from Step 4.
   - Have them name each organism and draw a picture.
   - Include arrows correctly showing the energy flow from each organism.
   - Correctly label each level as either producers, primary consumers, secondary consumers, or tertiary consumers.

Extensions: Review the concepts of bioaccumulation of pollutants in a food chain. Have the students explore the sources of pollution in Sarasota Bay and how it affects the organisms that live there.

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Activity Sheet 3.2.1: Coastal Creature Feature

VERTEBRATES—with a backbone

MAMMALS
Name: Raccoon (*Procyon lotor*)
Description: Raccoons are medium-sized mammals that have black masks and ringed tails. Their fur is grayish brown or sometimes reddish black. Drab coloration allows them to blend into their environment. Raccoons in Florida usually do not get bigger than eight pounds.
Diet: Omnivore; feeds on a varied diet including crustaceans, bird eggs, fruits and nuts.
Adaptations: Sensitive, hand-like paws that are used to feel for food along the edge of creeks. Claws for climbing trees.
Learn more: <www.floridawildlifemagazine.com/species/racoon.htm>

BIRDS
Name: Brown pelican (*Pelecanus occidentalis*)
Description: Large dark seabirds with a whitish head and gray-brown body. It plunges from great heights into the water to capture its prey.
Diet: Carnivore; fish and other small swimming marine animals.
Adaptations: Air sacs just beneath the skin to cushion the blow from diving. Pouch-like beak used to capture fish.
Learn more: <www.floridaconservation.org/viewing/species/brwpelican.htm>

REPTILES
Name: Diamondback terrapin (*Malaclemys terrapin*)
Description: Small turtles that live in the brackish water of saltmarshes along the Atlantic and Gulf of Mexico. Usually have grayish skin with dark spots or markings, however the Florida sub-species is often slate-black in color. In the past, these animals were used to make turtle soup.
Diet: Carnivore; eats crustaceans and other small marine animals.
Adaptations: Hard bony shell protects them from predators. Able to tolerate brackish water.
Learn more: <www.fnai.org/FieldGuide/pdf/Malaclemys_terrapin.PDF>

FISH
Name: Dwarf Seahorse (*Hippocampus zosterae*)
Description: Very small seahorse species, rarely exceeding one inch in length. Very common in the waters of SW Florida, found only in shallow seagrass. Spots all over its body, and a short snout.
Diet: Carnivore; small marine invertebrates, especially crustaceans (copepods)
Adaptations: Prehensile tail can wrap around seagrass blades. Camouflage.

BONUS QUESTION: Why are amphibians like frogs and toads usually rare in marine environments?

INVERTEBRATES—without a backbone

PORIFERANS (POR-IF-ERANS, SPONGES)
Name: Boring sponge (*Cliona* spp.)
Description: A colorful group of sponges, usually bright red, yellow and orange. Living sponges have jelly-like bodies made up of specialized cells, supported by a skeleton of tough fibers (called spongin) and small, hard splinter-like structures (called spicules). Boring sponges make their

PORIFERANS (CONT'D)
homes by boring holes into objects made up of calcium carbonate, like limestone, corals, clam shells (but not pineapples!). If you find a shell on the beach with small holes in it, it may have been caused by a boring sponge.
Diet: Filter feeder; draws in small bits of food floating in the sea water through pores (called ostia)
Adaptations: Bioerosion, the ability to bore holes into hard objects made of calcium carbonate.
Learn more: <www.ucmp.berkeley.edu/porifera/poriferamm.html>

CNIDARIANS (NYE-DARE-IANS, JELLYFISH AND ANEMONES)
Name: Cloak anemone (*Calliactis tricolor*)
Description: Small anemones, usually pale brown, though sometimes dark orange or red. Often found attached to the shells of large hermit crabs. It is thought that the stinging cells of the anemone protect the hermit crab, or offers camouflage. Hermit crabs are messy eaters, and the anemone often gets little bits of food the crab throws away.
Diet: Carnivore; eats plankton and other small animals.
Adaptations: Stinging cells, symbiotic relationship with hermit crabs.

CRUSTACEANS (KRUS-TAY-SHUNS, CRABS AND LOBSTERS)
Name: Brown shrimp (*Penaeus aztecus*)
Description: A brown to olive shrimp with long antennae. Grows up to 7 inches in length. This is one of the edible species.
Diet: Omnivore, eats detritus (small bits of plant matter), plankton and marine worms.
Adaptations: Burrows up to 2 inches under the bottom to escape predators during the day; active at night.
Learn more: <www.sms.si.edu/IRLSpec/Penaeu_duorar.htm>

GASTROPODS (GAS-TRO-PODS, SNAILS AND SLUGS)
Name: Ragged sea hare (*Bursatella* spp.)
Description: Large sea slugs that kind of look like rabbits when viewed head on. These are often found in seagrass meadows, where their greenish color and ragged appearance help them blend in with their surroundings. If you find one of these, be careful, or they might drip purple ink all over you.
Diet: Herbivore, feeds in seagrass meadows.
Adaptations: Camouflage; secretes purple ink that repels predators.
Learn more: <www.seaslugforum.net/bursleac.htm>

ECHINODERMS (E-KINO-DERMS, SEASTARS AND THEIR KIN)
Name: Sand dollar (*Mellita quinquiesperforata*)
Description: Living sand dollars are usually light brown or tan (dead ones are white) with a shell covered with thin short spines. There are five slots in this species. They are found in shallow, sandy areas.
Diet: Detritus and filter feeders.
Adaptations: Hard shell (called a test) and spines make them difficult for predators to eat. Able to burrow in the sand to find food.

HEY, THAT'S WEIRD: Acorn worms are marine animals that are classified somewhere in-between vertebrates and invertebrates. They are in the phylum Hemichordata (him-ee-kor-dah-ta, Greek, "half-chordates"); they have a nerve cord similar to vertebrates, but no hard spine.

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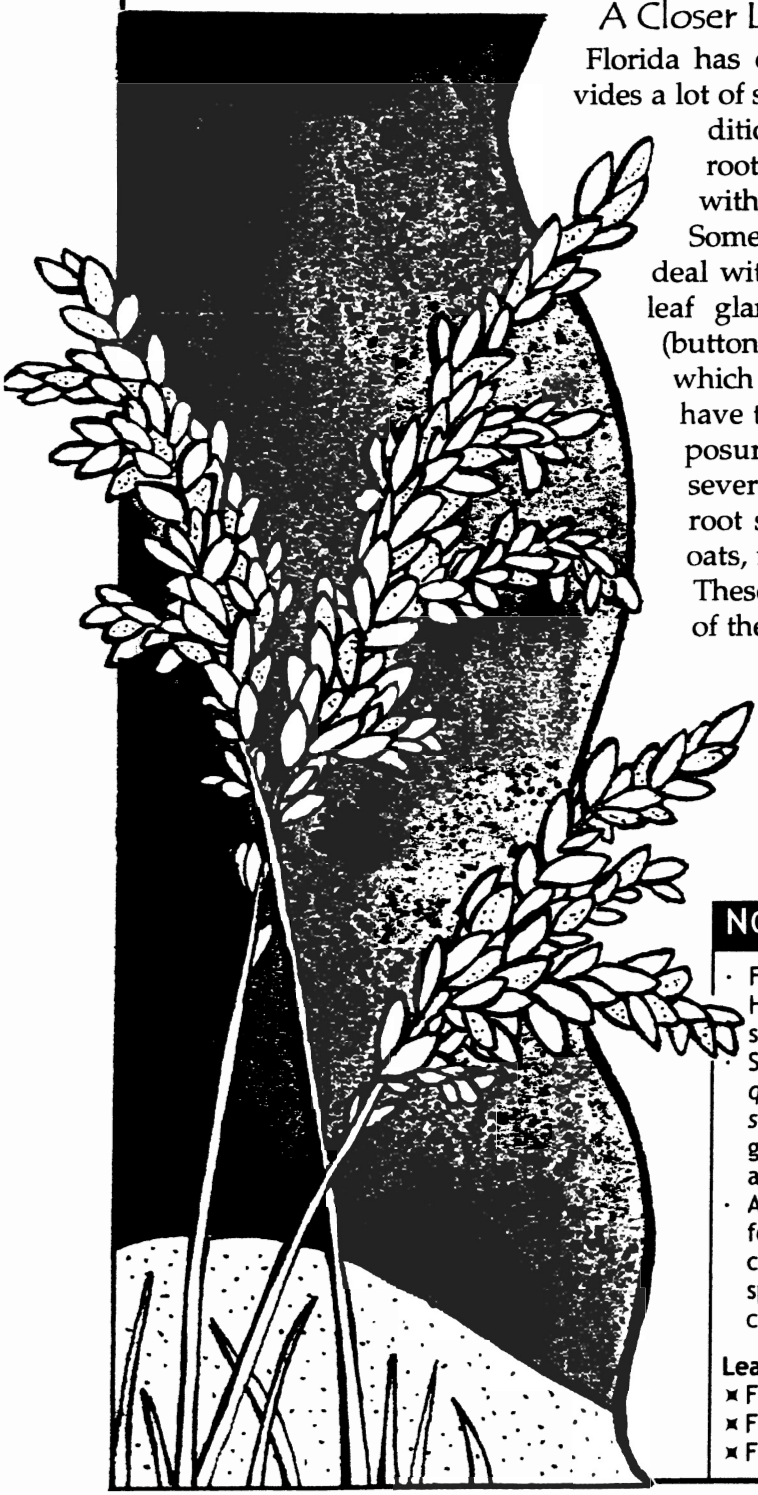
Florida: Land of Flowers

Florida is the third most botanically diverse state in the US, with over 3,800 different kinds of ferns and seed plant species. Part of the variety is due to the state's humid, semitropical climate and its peninsular shape. This allows both temperate and tropical species to grow here. However, about one third of the plant species in Florida are not native.



A Closer Look: Native Coastal Plants

Florida has over 8000 miles of tidal coastline. This provides a lot of space for plants to grow, but the physical conditions can make it difficult for them to get a root-hold. In order to survive, they must cope with both salty water and frequent severe storms. Some species, like the white and black mangroves, deal with excess salt by excreting it through special leaf glands. Others can store salt in their leaves (buttonwoods) or seeds (red mangrove propagules), which are later dropped. Coastal plants also usually have thick, waxy leaves, which helps limit their exposure directly to salt water or spray. To deal with severe storms, coastal plants develop extensive root systems to help hold them in place (e.g., sea oats, red mangrove prop roots, seagrass rhizomes). These plants are often protected by laws because of the value they have in stabilizing the shoreline.

Learn more:

- Dune Plants: <www.floridaplants.com/nature_of_florida.htm>
- Green Thumb at the Coast: <www.dep.state.fl.us/lands/invaspec/2ndlevpgs/pdfs%20for%20pubs/Circular%2021.pdf>

NON-NATIVE PLANT FAST FACTS

- Florida has over 3,800 kinds of ferns and seed plants. However, it is estimated that nearly one-third of those species are non-native.
- Since 1986, partial control of melaleuca (*Melaleuca quinquenervia*) and Australian pine (*Casuarina equisetifolia*) in the East Everglades, adjacent to Everglades National Park, has required 14,000 labor hours and $546,000 in herbicide and helicopter costs.
- At least 45% of the invasive non-native plant species found in Florida were imported for ornamental or agricultural reasons, and 39% of the worst invasive plant species are still commercially available for sale and continue to spread.

Learn more:

- Free mural: <aquat1.ifas.ufl.edu/mural.html>
- Florida Exotic Pest Plants: <www.fleppc.org>
- Florida Native Plants: <www.fnai.org>

Stranglers in Paradise

About 1200 non-native plant species have been introduced into Florida. Sometimes these non-natives are brought in intentionally, either for agricultural (e.g., melaleuca, para grass) or ornamental purposes (e.g., brazilian pepper, carrotwoord). Other times they arrive accidentally, as hitchhikers in freight (e.g., cogon grass) or on wildlife (e.g., West Indian marsh grass by birds).

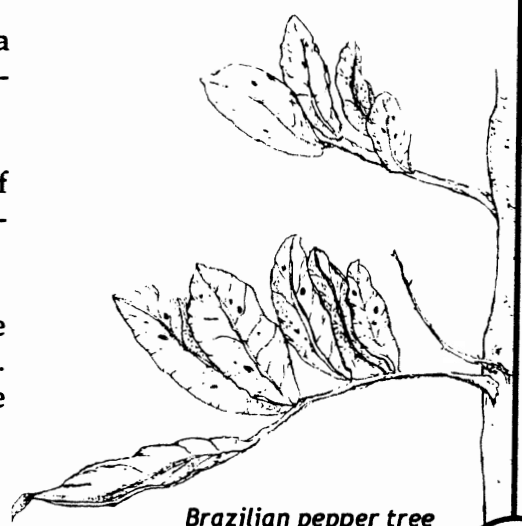
By definition, non-native plants did not develop in their new surroundings. Consequently, they do not face the same competition as they would have in their home range. The animals and diseases that would normally consume them are not around, and the plants that usually compete against them are not present. This often puts non-native plants at an advantage over native plants. Some non-native plants can even invade and displace native plants, which disrupts entire ecosystems. For example, melaluca forms very dense stands of tall trees in areas of the Everglades that were once covered by low growing saw grass. The animals and plants that were adapted to living in the saw grass marshes can not live in the shade of thick groves of melaluca. It can be very difficult and expensive to control the growth of invasive, non-native plants.

What's the Difference?

The following terms are sometimes used interchangeably, but each one has a slightly different meaning or emphasis.

- **Non-native:** Plants that have been introduced to an area outside its native range, either purposefully or accidentally.
- **Exotic:** Often refers to non-native plants that are purposely cultivated for ornamental or landscape reasons. Used as a synonym for non-native.
- **Invasive:** Refers to plants that are capable of *invading* an established ecosystem and disrupting it. Can apply to both native and non-native species. Plants that are both non-native and invasive cause the most trouble.
- **Alien:** Refers to species that are out of place in a given enviroment. Used as a synonym for non-native.
- **Weed:** Defined by the Weed Science Society of America as "a plant growing where it is not desired." Can apply to native and non-native plants.

Here are some other terms used to describe non-native species: **introduced, non-indigenous, transplants.** How are these terms similar or different than those listed above?



Brazilian pepper tree

Choking the Coasts

Two of Florida's worst non-native plants are Australian pine and Brazilian pepper:

Name: Australian pine (*Casuarina glauca*)

Aliases: ironwood, beefwood, she oak and horsetail tree. See also, *Casuarina equisetifolia.*

Origin: Australia

Description: These trees looks like pines (conifers), but are actually flowering plants (angiosperms). The dense, green "needles" of this tree are really branchlets with small, scale-like leaves. It can grow to 70 feet and has woody cone-like fruit clusters containing small, winged nutlets. Their seeds are dispersed by water, wind and birds.

Introduction and Impact: These plants were first introduced to Florida in the early 1900s for use as windbreaks and shade trees. They are somewhat salt tolerant and able to colonized marginal areas (disturbed areas, dunes, beaches) because of associative nitrogen fixing bacteria in their roots. However, unlike native coastal plants, Australian pines do not develop deep, stabilizing root systems. This, along with their large crowns, make them prone to blowing over during storms. When this happens, they take large amounts of soil along with them, exposing the shoreline to increased erosion. They also produce a dense leaf litter which smothers most herbaceous plants below them and, along with their roots, interferes with the nesting of sea turtles.

Control: No biological controls are currently available. Small growths can be removed by hand. Larger infestations can be controlled by cutting down the trees and applying herbicide to the stumps. Raking and removal of litter should be done whenever possible.

Name: Brazilian Pepper (*Schinus terebinthifolius*)

Aliases: Florida holly, Christmas berry, pepper tree

Origin: Brazil, Argentina, Paraguay

Description: Brazilian peppers are evergreen shrubs that can grow to 45 feet from multiple trunks. Their thin branches arch and intertwine, forming dense clumps. Their leaves are aromatic (smell like turpentine), and their sap can be irritating to some allergic individuals. They develop bright red berry clusters in the fall and winter. Seeds are dispersed by wildlife (particularly migrating robins) and by people who use the fruiting branches for decoration.

Impact: This species was imported in the mid-1800s as an ornamental plant. It quickly spread from cultivation, growing into disturbed areas, along roadsides, pastures, hammocks and even mangrove forests. They form dense thickets, called monocultures, where only Brazilian pepper can grow. This prevents the growth of native plants, and great reduces the habitat for wildlife.

Control: Many native insects will feed on the leaves and fruit of Brazilian pepper. However, none of them are known to be specific to this plant alone. Small trees can be removed by hand cutting. Larger infestations can be controlled by cutting down the trees and applying herbicide to the stumps. Native vegetation should be planted in recently disturbed areas to prevent Brazilian pepper from spreading. Florida has listed Brazilian peppers on its prohibited plant list. It is illegal to cultivate, sell or transport them.

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Activity 4.1: Alien Inquisition

Grade Level: 4-6

Time Required: 50 minutes.

Objective: Students will learn about native and non-native plants.

Materials:
- Writing materials
- Field guides and reference material on native and non-native plants:
  Identification and Biology of Non-Native Plants in Florida's Natural Areas, Editors : K.A. Langeland and K. Craddock Burks, <www.fleppc.org/ID_book.htm>
- One (1) copy of Activity Sheet 4.1.1, for each student or group of students.
- Internet access (optional, but highly recommended)
  Center for Aquatic and Invasive Plants, <plants.ifas.ufl.edu/photocat.html>

Suggested Procedures:

1) As a class, ask the students to give the common names of some plants that they have seen and are familiar with. This can include anything from house plants and garden vegetables, to trees in a yard. Encourage them to describe the plants to their classmates and include details about where they specifically saw it growing.

2) Next, go over the definition of native and non-native plants. Give examples of each using reference materials. Ask the students if they know whether any of the plants they just described in Step 1 are native or non-native. If they are uncertain, have them use reference resources to find out.

3) Explain to students the benefits of native plants and the problems caused by the introduction of non-native plants. They should understand how these plants are introduced into the environment and how resource managers attempt to control their growth.

4) Have the student complete Activity Sheet 4.1.1. Review the correct answers with the class after the students complete their sheets.

Extensions:
- If time allows, arrange to take the students on a walking tour of the school campus. Have the students try to find examples of non-native plants growing on the school grounds. These are often found in landscape beddings and along fence lines and edge areas. Remind students not to pick up or remove vegetation, even if it is non-native, without adult permission and supervision. Many plants contain irritating compounds that produce allergic reactions, especially Brazilian Pepper.
- Invite an extension officer or resource manager to your class to speak about native plant communities in your area and how they control non-native species. Some of the control methods can be quite dramatic, including the use of controlled burns, aerial spraying and the use of heavy machinery.

Sarasota & Manatee Cooperative Extension
<www.ifas.ufl.edu/extension/index.htm>

Sarasota County Resource Protection Program
(941) 861-6113
<www.co.sarasota.fl.us/resource_protection/default.asp>

Florida House Learning Center, (941) 316-1203
<sarasota.extension.ufl.edu/FHLC/flahouse.html>

NAME: _____

DATE: _____

Activity Sheet 4.1.1: Alien Inquisition (Student Copy)

1) What is a non-native plant? Give three examples of a non-native plant found in Florida.

2) What conditions allow non-native species to grow?

3) What are two other words used to describe non-native species?

4) What are two ways non-natives get into our yards?

5) What are some methods resource managers use to control non-native plants?

6) Define invasive species.

BONUS: Australian pine and Brazilian pepper trees release allelopathic compounds. Look up the word **allelopathy**, and describe how allelopathic compounds impact native plants.

What You Can Do about Non-native Aquatic Plants:

- Boat trailers are one of the major sources of moving exotic aquatic weeds from one water body to the next. Before leaving a boat ramp, carefully inspect the trailer and boat for aquatic weeds. Many plant species can grow back from even tiny fragments, thereby infesting new bodies of water.
- Never empty the contents of your home aquarium into the wild. Many aquarium plants are imported from around the world and could become a nuisance weed in Florida's waters.
- Report new infestations of pest species such as water-hyacinth and hydrilla to the Florida Department of Environmental Protection.

Learn more: <www.dep.state.fl.us/lands/invaspec/2ndlevpgs/faq.htm>

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Activity Sheet 4.1.2: Alien Inquisition (Teacher Copy)

1) What is a non-native plant? Give three examples of a non-native plant found in Florida.

Non-native plants are ones that have been introduced to an area outside their home range, either purposefully or accidentally. Some example of non-native plants in Florida are melaluca (punk tree), Brazilian pepper (Florida holly), Australian pine and carrotwood.

2) What conditions allow non-native species to grow?

Possible answers include: lack of the natural animals and diseases that would normally consume them; lack of the plants that they normally compete against in their home range; disturbance of natural habitats gives non-native a root-hold.

3) What are two other words used to describe non-native species?

Possible answers include: introduced, non-indigenous, transplant, exotic, alien.

4) What are two ways non-native plants get into our yards?

Possible answers include: intentionally placed in the ground as landscape or ornamental plantings; accidentally mixed in with compost or soil; hitchikers in the pots of other desirable plants; brought in by wildlife (usually bird droppings); blown in by wind; spread from next door lots.

5) What are some methods resource managers use to control non-native plants?

Possible answers include: cutting; herbicide; prescribed fire; biological controls.

6) Define invasive species.

Refers to plants (or animals) that are capable of invading an established ecosystem and disrupting it. Can apply to both native and non-native species. Plants that are both non-native and invasive cause the most trouble.

BONUS: Australian pine and Brazilian pepper trees release allelopathic compounds. Look up the word **allelopathy**, and describe how allelopathic compounds impact native plants.

Allelopathy (al-lee-lop-ah-thee) is a chemical process that some plants use to keep other plants out of its space. Allelopathic plants can put these compounds into the soil through their roots or leaf litter. When non-native plants like Australian pine and Brazilian pepper become established in an area, they can keep other plants from growing there by releasing allelopathic compounds.

Learn more: Back Off! How Plants Guard Their "Personal Space" with Poisons
<www.units.muohio.edu/dragonfly/itc/INDEX.HTMLx>

Activity 4.2: Florida Yards and Neighborhoods

Grade Level: 6-8

Standards: see Appendix A and B.

Time Required: Two to three 50 minute periods.

Objective: Students will learn about the Florida Yards and Neighborhood Program.

Materials:
- ❑ Writing materials
- ❑ Graph paper
- ❑ Activity Sheet 4.2.1
- ❑ Internet access (highly recommended)

Suggested Procedures:

1) Review the concepts in Lesson 5 and on the following Internet sites:
   - Florida Yard and Neighborhoods Program <hort.ufl.edu/fyn/hand.htm>
   - Florida Yardstick Workbook <hort.ufl.edu/fyn/table-of-contents.htm>

2) Student will need to complete Activity Sheet 4.2.
   - Students should take this sheet home and complete it with a supervising adult.
   - Students with a yard at home may complete the survey individually.
   - Students without a yard may be assigned to a cooperative learning group that includes one or more students with a yard. Students without a yard will need to copy the survey information from students with a yard. Alternatively, students without yards at home may ask a relative or neighbor with a yard to help them complete the survey. Students that live in apartments may be able to ask the manager or groundskeeper for help. If none of these options are available, consider allowing them to use the school grounds to complete the information.

3) After all the students complete their surveys, have them draw a diagram of their surveyed yard. Try to have the students accurately scale their diagram using graph paper. Have them include the following:
   - Location and names of trees, plants and plant beds.
   - Location of drainage features (downspouts, ponds, ditches, creeks, gutters) and arrows to show approximate direction of flow.
   - If they have a sprinkler system, have them indicate where the sprinklers are located and the area that they cover.
   - Describe and/or draw pictures of any wildlife that uses their surveyed yard.

4) Ask the students to think about ways their surveyed yard could be improved, based on the recommendations of the Florida Yards and Neighborhoods Handbook. Have them list these ideas with their diagram. Alternatively, have them design a new landscape design using steps listed in the Florida Yards and Neighborhoods Handbook.

5) Have the students answer the following questions:
   - What benefits do native plants offer for landscaping?
   - How do plants help with controlling stormwater runoff and pollution?

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SARASOTA bay COASTAL HABITATS

NAME: _____

DATE: _____

Activity Sheet 4.2.1: Homeowner Survey

Students: Take this survey home and complete the information with the help of a supervising adult. If you are not sure how to answer these questions, ask your teacher for help. More information is also available from the **FLORIDA YARDS AND NEIGHBORHOODS** website: <hort.ufl.edu/fyn/hand.htm>.

The information in this survey will only be used for class. To complete an offical **HOMEOWNER SURVEY**, visit the University of Florida's website: <hort.ufl.edu/fyn/quest.pdf>

GENERAL INFO

1. What is the size of the property or lot that you maintain as lawn or landscape? Check the answer that best fits your situation.

___ About 1/8 acre (7,500 Sq. Ft. or less)
___ About 1/4 acre (7,501-12,500 Sq. Ft.)
___ About 1/2 acre (12,501-30,000 Sq. Ft.)
___ About 1 acre (30,001-50,000 Sq. Ft.)
___ Over 1 acre (specify) _____

2. About what percent of your landscaped area is lawn (turfgrass)?

___ 0% (no lawn)
___ Less than 25% 26 to 50%
___ 51 to 75% 76 to 100%

SITE ANALYSIS, PLANTING AND LANDSCAPE DESIGN

3. Please indicate whether you use any of the following practices:

Plants are chosen based on site conditions (soil pH, soil drainage, sun, shade, salt, etc.).
___ Yes ___ No ___ Don't know

Plants are grouped into beds by water needs.
___ Yes ___ No ___ Don't know

Trees and shrubs are planted with the top of the root ball even with or slightly higher than the soil surface.
___ Yes ___ No ___ Don't know

Western and eastern walls of your home are shaded.
___ Yes ___ No ___ Don't know

Air conditioner and surrounding area are shaded without blocking air flow.
___ Yes ___ No ___ Don't know

Low-maintenance areas are included in the landscape (natural areas, ground covers and mulch areas).
___ Yes ___ No ___ Don't know

STORMWATER RUN-OFF

4. Please indicate whether you use any of the following practices to keep stormwater on site.

Downspouts drain onto the lawn, landscape beds, or containment areas where rain can soak into the soil.
___ Yes ___ No ___ Don't know

Mulch, bricks, gravel or other porous surface are used on walkways, patios and driveways.
___ Yes ___ No ___ Don't know

A rain barrel or cistern collects rainwater for irrigating plants.
___ Yes ___ No ___ Don't know

Low areas in the landscape catch and filter stormwater.
___ Yes ___ No ___ Don't know

IRRIGATION

5. How are your lawn and landscape beds watered? Check all that apply:

Lawn	Beds	
___	___	Rainfall only.
___	___	Permanent sprinkler system.
___	___	Drip, trickle, microsprayers, soaker hoses or other low volume system.
___	___	Garden hose and sprinkler or hand-held nozzle.

6. Please indicate whether you use any of the following irrigation practices.

Plant beds are watered separately from lawn.
___ Yes ___ No ___ Don't know

1/2 to 3/4 inch of water is applied per irrigation.
___ Yes ___ No ___ Don't know

Adjust watering according to rainfall and season.
___ Yes ___ No ___ Don't know

Developed by Mote Marine Laboratory for P.I.E.R., a program of the Sarasota Bay National Estuary Program

Activity Sheet 4.2.1: Homeowner Survey (cont'd)

FERTILIZATION

7. Fertilizer is applied in your lawn or landscape by:
___ No one (fertilizer never applied; go to Question #9).
___ You or a member of the household.
___ A lawn service or commercial maintenance company.

8. Please indicate whether you or your lawn care service use any of the following practices:
Fertilizers with slow release components are used.
___ Yes ___ No ___ Don't know
Fertilizer is applied at rates of 1 pound or less of **actual** nitrogen per 1000 square feet.
___ Yes ___ No ___ Don't know
Iron sulfate is used on lawns instead of fertilizer in summer.
___ Yes ___ No ___ Don't know

PEST MANAGEMENT

9. Pests are controlled in the lawn or landscape by:
___ No one controls pests (go to #11).
___ You or a member of the household.
___ A lawn service or commercial maintenance company.

10. Please indicate whether you or your lawn care service use any of the following practices.
The lawn and/or landscape plants are routinely checked for pest problems.
___ Yes ___ No ___ Don't know
Pesticides are applied only when a pest problem is confirmed.
___ Yes ___ No ___ Don't know
Only infested plant(s) or lawn area(s) are spot-treated.
___ Yes ___ No ___ Don't know
Avoid practices which encourage pests (i.e. mowing too low, excessive watering or fertilizing, improper pruning).
___ Yes ___ No ___ Don't know
If a pesticide is needed, the product (i.e. soaps, oils, etc.) with the least harmful impact on the environment is chosen.
___ Yes ___ No ___ Don't know

MOWING, MULCHING AND RECYCLING

11. Does a lawn care service or maintenance company mow your lawn and/or care for your landscape?
___ All the time ___ Sometimes ___ Never

12. What type(s) of lawn grass do you have?
___ Dwarf St. Augustine ___ Centipede
___ Bahia ___ St. Augustine ___ Bermuda
___ Zoysia ___ Don't know _____ Other

13. At what height do you or your lawn care service mow the lawn?
___ Under 1 ½ inches ___ 1 ½ - < 2 inches
___ 2 - 3 inches ___ Over 3 inches
___ Don't know

14. Please indicate whether you or your lawn care service use any of the following practices.
Mulch is applied 2 to 3 inches deep in beds around trees and shrubs.
___ Yes ___ No ___ Don't know
Yard trimmings, leaves, pruning clippings, grass clippings, etc. are used on site.
___ Yes ___ No ___ Don't know
Alternatives such as eucalyptus, melaleuca, or recycled mulches are used.
___ Yes ___ No ___ Don't know
Grass clippings are left on lawn.
___ Yes ___ No ___ Don't know

WILDLIFE

15. Please indicate whether you use any of the following practices.
Use plants in landscape which provide food for wildlife.
___ Yes ___ No ___ Don't know
Use plants in landscape which provide cover or nesting sites for birds.
___ Yes ___ No ___ Don't know
Provide sources of water for wildlife.
___ Yes ___ No ___ Don't know

ON THE WATERFRONT

16. Do you live on the water?
Yes No (If "No", stop here. Thanks!)

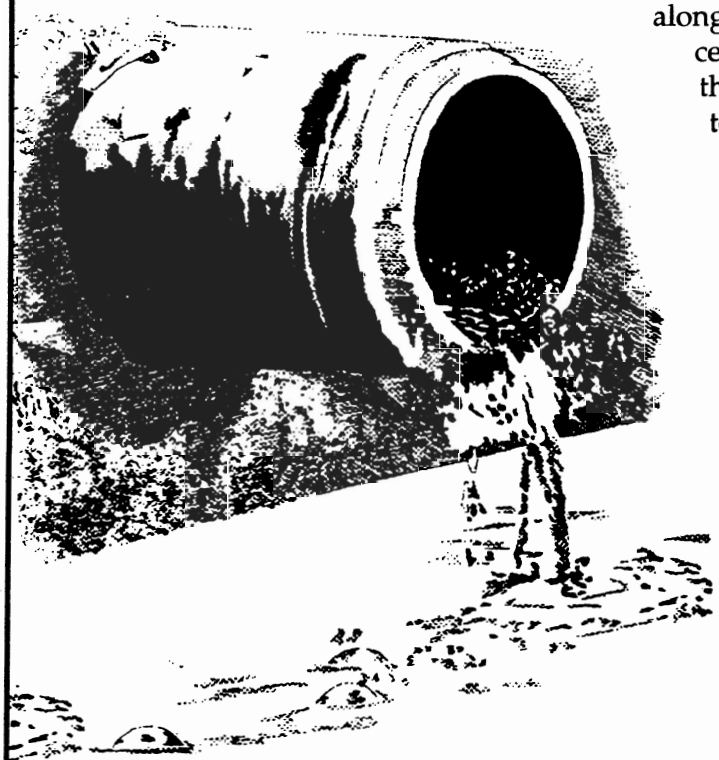
17. Please indicate whether you use any of the following practices.
A border of low maintenance plants has been established or retained between my lawn and the shoreline/seawall.
___ Yes ___ No ___ Don't know
A no-fertilizer, no-pesticide zone 10 to 30 feet wide exists all along the shoreline/ seawall.
___ Yes ___ No ___ Don't know
Native vegetation (i.e. mangroves, pickerel weed, etc.) has been planted or retained in front of the shoreline/seawall.
___ Yes ___ No ___ Don't know
Clean rock or rip-rap has been placed in front of my shoreline/ seawall.
___ Yes ___ No ___ Don't know

When it Rains it Flows

Normally, rain flows through a watershed along a natural course in the form of run-off, or it collects and soaks into the ground. This is usually good for plants and animals out in the wild, but can cause problems for people in developed areas. In particular, rainwater can not penetrate through roads and concrete. This can lead to flooding during storms, which causes damage to property and leads to health problems from standing water. Stormwater managers try to direct and control the flow of run-off and also attempt to limit the amount of pollution it picks up along the way. Pollution is the build up of unwanted or harmful substances in the environment. When it comes from a central source, such as factories or sewers, is referred to as **point source pollution**. It is usually easy to see and control point source pollution. In contrast, **nonpoint source pollution** comes from many different places (industrial, agricultural and residential). It is difficult to find and control this kind of contamination, especially after it is picked up by run-off and carried through out a watershed.

Save the Bay

Non-point pollution is an on-going problem in Sarasota Bay. Stormwater run-off is estimated to contribute much of the suspended solids, and from 30-50 percent of the nutrients, to the bay. This is more than the treated wastewater of both the City of Sarasota and Manatee County combined. Increased development has the potential to produce even more stormwater run-off. Action is being taken by local governments, with the assistance of SBNEP, to address the quality of water entering into Sarasota Bay. This includes an extensive effort to hook up existing septic systems along Phillippi Creek in Sarasota County to central sewer service, and to improve the treatement of stormwater before it enters the bay.



POLLUTION FAST FACTS

- In 2002, 25,284 volunteer collected 1,028,977 pounds of debris from 1,459 miles of Florida's coastline.
- Stormwater is estiamted to contribute 56% of the total nitrogen loading to Sarasota Bay. 60% of this total comes from residential areas.

Learn more:

- Florida Coastal Cleanup <www.floridacoastalcleanup.org>

Developed by Mote Marine Laboratory for P.I.E.R., a program of the Sarasota Bay National Estuary Program

Activity 5.1: Create a Model Watershed

Grade Level: 4-6

Standards: see Appendix A and B.

Time Required: 50 minutes.

Objective: The students will learn the function of wetlands in controlling stormwater runoff and the role wetlands play in the world.

Materials:
- ❑ glass baking pan (or clear box)
- ❑ modeling clay
- ❑ turkey baster or spray bottle
- ❑ strip of indoor-outdoor carpet, 3 inches long x the width of the pan
- ❑ clear water
- ❑ muddy water

Suggested Procedures:

1) Spread a layer of the clay in half of the pan to represent land. Leave the other half of the pan empty to represent the bay. Shape the clay so that it slopes gradually into the bay, as in the illustration. Smooth the edges of the clay along the side of the pan to seal it.

2) Use the turkey baster or spray bottle to spray clear water slowly over the clay. This can represent rainfall. Ask the students to observe what happens. (The water runs over the clay and into the depression.)

3) Use the baster to remove the water from the model back into its original container. Show the students the strip of carpeting and ask them to imagine that it represents a salt marsh or mangroves.

4) Take the cut piece of carpeting and completely fill the width of the pan along the edge of the clay where it meets the bay. This represents a marsh. Ask the students to predict what will happen when water is poured onto the clay again.

5) Explain that marshes and mangroves slow the rate of water flow which helps reduce sudden and drastic flooding.

6) Pour the same amount of water onto the model again. Have the students describe what happens. (The water will drain more slowly because it is hindered by a marsh.)

6) Remove the clear water again. Leave the carpet in place, and pour muddy water onto the clay. Ask the students to compare the water that flows through the marsh into the bay with the remaining muddy. (The water that passed through the marsh should be clearer.) This demonstration shows the ability of marshes and mangroves to reduce soil erosion and filter pollutants.

7) Carefully remove the carpet and pour water over the clay again. This shows what would happen if marsh were not there to act as a filter. (All of the pollutants would flow directly into the bay.)

Discussion:

- Q: Florida has lost nearly half of its wetlands since pioneer times due to development or other alteration. What will happen if Florida continues to develop and alter its wetlands in order to accommodate more people?

  A: Greater risk of flooding, more water pollution and erosion, etc.

Developed by Mote Marine Laboratory for P.I.E.R., a program of the Sarasota Bay National Estuary Program

Activity 5.1: Create a Model Watershed (cont'd)

- Q: Researchers at the University of Florida have found that when wetlands comprise as little as 10 percent of the landscape, flooding is reduced by 60 percent. When wetlands cover 20 percent of an area, flooding is reduced by 90 percent. Are wetlands valuable in areas where recurring flooding costs homeowners, business owners, and insurance companies millions of dollars?

- Q: Sediment and other pollutants that reach rivers and streams adversely affect populations of fish and other aquatic animals. This in turn affects animals in the ecosystem such as Bald Eagles who depend upon fish for food. What role do wetlands play in the health of the ecosystem?

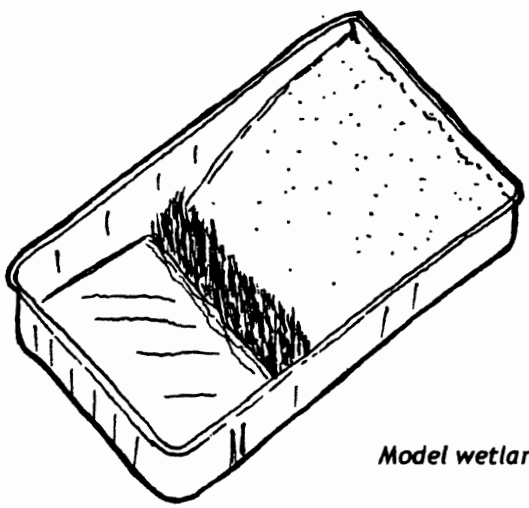
  A: Wetlands help keep water clean.

- Q: Healthy topsoil is important to plant growth. What happens to the ecosystem if the loss of topsoil due to soil erosion suppresses plant growth. Would humans be affected?

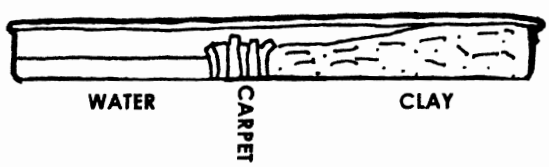
  A: Fewer natural plants would likely result in more water and air pollution - and cause a threat to public health.

Adapted from: SWFWMD and Georgia Water Wise Council. Water Sourcebook. <www.swfwmd.state.fl.us/infoed/educators/splash/buildwet.htm>

See also, <www.marine.usf.edu/pjocean/packets/sp00/s00u3le1.pdf>



Model wetland diagram



Activity 5.2: After the Flush

Grade Level: 6-8

Standards: see Appendix A and B.

Time Required: 50 minutes.

Objective: Students will learn the role that septic systems play in contributing to pollution.

Materials:

- ❑ large, clear, water-proof container
- ❑ play sand (enough to cover the bottom of the container to a depth of one to two inches)
- ❑ small, clear container with lid (model septic tank)
- ❑ modeling clay (kind that never dries out and is not affected by water)
- ❑ flexible drinking straws (4)
- ❑ small funnel
- ❑ water
- ❑ pony beads, smaller beads, and glitter (simulated waste)
- ❑ food coloring
- ❑ awl or icepick

Suggested Procedures:

1) Before you begin to build the model you need to prepare some of the materials. (This will be an important safety issue if you are using the model in a classroom situation.)
   - Take three of the straws and using an awl (or an ice pick) poke holes along the length of the straws.
   - Drill or punch a hole into the model septic tank in the center of one side near the top. This hole should be just big enough for a soda straw to fit into.
   - Punch a hole into the lid of the model septic tank that the small end of the funnel will fit into. This hole should be positioned so that the funnel can be held in place along the side of the large container, and still fit in the hole.

2) Now that you have finished using the sharp tools to prepare the materials, you are ready to begin the actual construction itself.

3) Fill the large container with one to two inches of play sand. This is the "earth" that will hold the tank and the leaching field for the septic system.

4) Use a small section of straw to make an outlet pipe and connect it from the septic tank to where the leach field will be. Seal the joint with modeling clay.

5) Place the model septic tank into the large container, so that the outlet pipe (straw) is lying just on the surface of the sand.

6) Connect the three perforated straws using modeling clay as shown in the diagram, trying to keep the field as level as possible. (It should slope at about a 1% gradient. Water needs a slope to flow, but you don't want to design the system with such a steep gradient so that all the water rushes to the ends of the pipes. You can have your students calculate what a 1% gradient would be over a given distance for a regular system.

7) Seal the ends of the straws with a little modeling clay.

8) Put a little clay into the bottom of the tank to simulate the sludge that is normally found coating the bottom of the tank. Place some beads into the tank. (The clay will also allow you to keep some of the beads from floating.)

9) Place the funnel in the hole in the tank lid and seal the connection with modeling clay. Now the model is built, you are ready to do the simulations.

Developed by Mote Marine Laboratory for P.I.E.R., a program of the Sarasota Bay National Estuary Program

Activity 5.2: After the Flush

10) First, slowly add water to the system through the funnel.
   - What happens if you add too much water?

11) Add some glitter.
   - Describe what happens. What do you think the glitter might simulate?

12) Add some food coloring and wash it into the system with a little water.
   - Describe what happens. What do you notice with the food coloring? What might it simulate?

Discussion:
How would the following substances would act in a home septic system
- solvents
- oils
- hazardous materials
- bleach
- anti-bacterial soaps and detergents

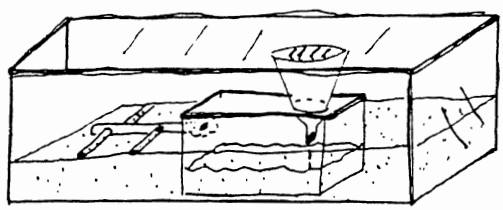
Extensions:
- Try different slopes on the leaching bed, like 0%, 1%, and 2%. What will happen if the slope is too great?
- Research your county regulations on septic systems.
- List some common contaminants in ground water and describe how they could have gotten there.
- List common hazardous materials that may be found around the home.
- Brainstorm about where these would be stored or used in the home.
- Ask how one should properly dispose of any hazardous material "leftovers"
- What effect do different types of soils have on the effectiveness of the leaching system?

- Sarasota County is replacing septic systems with central sewer connections in many neighborhoods. Visit their website to learn more about this process:

  <www.mycentralsewer.com>

  List some pros and cons of septic systems and of central sewer connections.

Adapted from: Purdue University Cooperative Extension Service. Down the Drain and into the Yard.
<www.ecn.purdue.edu/SafeWater/kids/ActivityFour.pdf>



Model septic system diagram

Standards

NATIONAL SCIENCE EDUCATION STANDARDS	1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2
Science Content Standards										
Life Sciences [5-8]										
Structure and function in living systems			x	x	x	x	x	x		
Regulation and behavior			x	x	x	x	x	x		
Populations and ecosystems			x	x	x	x	x	x		
Diversity and adaptations of organisms			x	x	x	x	x	x		
Earth Sciences [5-8]										
Structure of the Earth system	x	x								
Science in Personal and Social Perspectives [5-8]										
Population, Resources and Environments									x	x

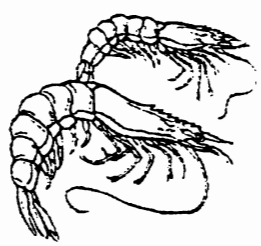
National Countcil of Teachers of English	1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2
Standard 3: Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies, and their understanding of textual features		x	x	x	x	x	x	x		
Standard 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.		x	x	x	x	x	x	x	x	
Standard 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.		x	x	x	x			x		
Standard 7: Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.			x	x	x	x	x	x		
Standard 8: Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.		x	x	x	x	x	x	x		x
Standard 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).		x	x	x	x	x	x	x	x	

National Education Technology Standards	1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2
Technology communications tools										
Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.			x	x	x	x	x	x		
Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.		x	x	x	x	x	x	x		
Technology research tools										
Students use technology to locate, evaluate, and collect information from a variety of sources.			x	x	x	x	x	x		
Students evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.	x	x	x	x	x	x	x	x	x	x

Science Standard	1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2
Processes that Shape the Earth										
SC.D.2.2 The student understands the need for protection of the natural systems on Earth.	x	x	x	x	x	x	x	x	x	x
Processes of Life										
SC.F.1.2 The student describes patterns of structure and function in living things.			x	x	x	x	x	x		
SC.F.1.2.3- knows that living things are different but share similar structures			x	x	x	x	x	x		
How Living Things Interact with Their Environment										
SC.G.1.2 The student understands the competitive, interdependent, cyclic nature of living things in the environment.			x	x						
SC.G.1.2.1- knows ways that plants, animals, and protists interact			x	x	x	x	x	x		
SC.G.1.2.2- knows that living things compete in a climatic region with other living things and that the structural adaptations make them fit for an environment			x	x	x	x	x	x		
SC.G.2.2 The student understands the consequences of using limited natural resources.	x	x	x	x	x	x	x	x	x	x
SC.G.2.2.1- knows that all living things must compete for Earth's limited resources; organisms best adapted to compete for the available resources will be successful and pass their adaptations to their offspring			x	x	x	x	x	x		
The Nature of Science										
SC.H.1.2 The student uses the scientific processes and habits of mind to solve problems.	x	x	x	x	x	x	x	x	x	x
SC.H.1.2.2- knows that a successful method to explore the natural world is to observe and record, and then analyze and communicate the results	x	x	x	x	x	x	x	x	x	x
SC.H.3.2 The student understands that science, technology, and society are interwoven and interdependent.	x	x	x	x	x	x	x	x	x	x
SC.H.3.2.2- knows that data are collected and interpreted in order to explain an event or concept	x	x	x	x	x	x	x	x	x	x
SC.H.3.2.4- knows that through the use of science processes and knowledge, people can solve problems, make decisions, and form new ideas	x	x	x	x	x	x	x	x	x	x

Appendix B: Sunshine State Standards

LANGUAGE ARTS STANDARD	1.1	1.2	2.1	2.2	3.1	3.2	4.1	4.2	5.1	5.2
Reading										
LA.A.2.2 The student constructs meaning from a wide range of texts.		x	x	x		x		x		
LA.A.2.2.1- reads text and determines the main idea or essential message, identifies relevant supporting details and facts, and arranges events in chronological order			x				x	x		
LA.A.2.2.2- identifies the author's purpose in a simple text			x				x	x		
LA.A.2.2.5- reads and organizes information for a variety of purposes, including making a report, conducting interviews, taking at test, and performing an authentic task			x	x	x	x	x	x		
LA.A.2.2.8- selects and uses a variety of appropriate reference materials, including multiple representations of information, such as maps, charts and photos, to gather information for research projects			x	x	x	x	x	x		x
Listening, Viewing, and Speaking										
LA.C.1.2 The student uses listening strategies effectively.	x	x	x	x	x	x	x	x	x	x
LA.C.1.2.1- listen and responds to a variety of oral presentations, such as stories, poems, skits, songs, personal accounts, and informational speeches	x	x	x	x	x	x	x	x	x	x
LA.C.1.2.4- listens attentively to the speaker, including making eye contact and facing the speaker	x	x	x	x	x	x	x	x	x	x
LA.C.3.2 The student uses speaking strategies effectively.	x	x	x	x	x	x	x	x	x	x
LA.C.3.2.1- speaks clearly at an understandable rate and uses appropriate volume	x	x	x	x	x	x	x	x	x	x
LA.C.3.2.3- speaks for specific occasions, audiences, and purposes, including conversations, discussions, projects, and informational or imaginative presentations	x	x	x	x	x	x	x	x	x	x
LA.C.3.2.4- uses eye contact and gestures that engage the audience	x	x	x	x	x	x	x	x	x	x
Language										
LA.D.2.2 The student understands the power of language.	x	x	x	x	x	x	x	x	x	x
LA.D.2.2.1- understands that word choice can shape reaction, perception, and beliefs	x	x	x	x	x	x	x	x	x	x



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Field Trip Activities

Field Trip Activities for Grades K—8

Lesson 1: Coastal Watersheds

Activity Grades K-2 none
Activity Grades 3-5 Field, Forest, Lagoon
Activity Grades 3-5 Pass the Jug
Activity Grades 6-8 Sarasota Bay Inhabitants

Lesson 2: Coastal Habitats

Activity Grades K-2 Consider the Crab
Activity Grades K-2 Mangrove Forest Walk
Activity Grades 3-5 Field, Forest, Lagoon
Activity Grades 3-5 Mangrove Forest Walk
Activity Grades 3-5 Osprey Game
Activity Grades 6-8 Sarasota Bay Inhabitants
Activity Grades 6-8 Scavenger Hunt
Activity Grades 6-8 Sarasota Bay Nature Search

Lesson 3: Coastal Wildlife

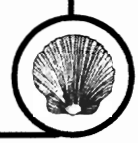
Activity Grades K-2 Consider the Crab
Activity Grades K-2 Mangrove Forest Walk
Activity Grades 3-5 Field, Forest, Lagoon
Activity Grades 3-5 Mangrove Forest Walk
Activity Grades 3-5 Osprey Game
Activity Grades 6-8 Sarasota Bay Inhabitants
Activity Grades 6-8 Scavenger Hunt
Activity Grades 6-8 Sarasota Bay Nature Search

Lesson 4: Native and non-Native Plants

Activity Grades K-2 Mangrove Forest Walk
Activity Grades 3-5 Field, Forest, Lagoon
Activity Grades 3-5 Pass the Jug
Activity Grades 3-5 Mangrove Forest Walk
Activity Grades 6-8 Scavenger Hunt
Activity Grades 6-8 Sarasota Bay Nature Search

Lesson 5: Stormwater Run-off/ Pollution

Activity Grades 3-5 Mangrove Forest Walk
Activity Grades 6-8 Sarasota Bay Inhabitants
Activity Grades 6-8 Sarasota Bay Nature Search



Field Study: Consider the Crab

Lesson 2: Coastal Habitats

Lesson 3: Coastal Wildlife

Grade Level: Kindergarten, 1st and 2nd Grades

Subject: Science, Language Arts

Duration: 35 Minutes

Materials: Pre-caught fiddler crabs in cage, small containers with lids

Skills: Observation, classification, analysis, description, and listening

FL State Standards: SC.A.1.1, SC.D.1.2, SC.D.2.1, SC.F.1.1, SC.F.1.2, SC.F.1.3, SC.F.1.4, SC.F.2.1, SC.F.2.2, SC.G.1.2, SC.G.1.4, SC.G.2.1, SC.G.2.2, LA.C.1.1, LA.C.3.2, LA.C.3.3

Objectives:

- Students will understand that crabs are wildlife and wildlife comes in a variety of forms - small to large.
- Students will understand that this place is home to wildlife, including crabs.
- Students will learn about crab anatomy and animal adaptations.
- Students will learn that they are responsible for their actions affecting this wildlife.

Overview: In this inquiry-based activity, students are told a story about "Why the Crab has No Head". Observations are made with live crabs and potentially the group may collect their own crabs for observation and release.

Background: Fiddler crabs are invertebrates. Male fiddler crabs have one claw that is much larger than the other claw. The female's claws are equal in size. If a male fiddler crab loses his large claw, his remaining claw gets bigger. A new, smaller claw then grows to replace the lost one. The big claw is used for attracting a female fiddler. Small claws are used to pick up food (the female has an advantage here, she has two small claws and the male only has one). Crabs breathe through gills, have eyes on long stalks and move sideways. Fiddlers live in burrows that may go down more than three feet. Hundreds travel together in groups called herds. Fiddler crabs are active by day and eat mainly bacteria, minute algae and rotting marsh plants filtered from the sand. The sand that remains after feeding is left on the ground in the form of small sandballs.

Suggested Procedure:

1) Have the children sit in a circle on the deck of the pavilion.

2) Explain to the children that you will read a fable to them called, "Why the Crab has no Head."

3) Tell them that there will be a show-and-tell session after the story.

4) Sit between two children in the circle. This way you are facing all of them and you don't have your back to any child.

5) Read the story. Try to animate your voice and even do hand gestures where possible.

6) Show them the horseshoe crab shell. Ask them if they know who its relatives are? Explain to them that the horseshoe crab is related to lobster, shrimp, other crabs and even spiders.

7) Explain to the children that the horseshoe crab shell is from a crab that has shed his shell (molted) rather than the shell from a dead crab. This will help ease the site of all of the shells that they will see while on the mangrove walk. I don't want the children to think that all of the shells belong to dead crabs.

8) Pass the horseshoe crab shell around the circle. Ask that they be gentle and hold it with two hands.

9) Show the children the plastic model of the MALE fiddler crab. Explain to them that the male fiddler crab has 1 large claw and 1 small claw, where as the female has 2 small claws. Explain to them that the male crab uses his large claw to attract a mate and to defend himself. He uses his small claw to gather food. The female has an advantage over the male because she has 2 small claws and can therefore gather twice as much food.

10) Put the plastic fiddler crab in the magnifying critter container and pass the container around the circle. Tell the children to leave the crab in the container and to look through the top lens and side lens.

11) Scoop the FEMALE blue crab out of the bucket. (It won't pinch.) Hold it up for the children to see. Point out all of its legs, the pincher claws, and the swimerettes (back paddles) that are used for swimming. Explain/show that the female has an apron on her belly that is shaped like a triangle. This is where she stores her eggs when she is pregnant. Put the female blue crab into a clear plastic berry container and pass the container around the circle.

12) Do the same as above with the MALE fiddler crab. Explain that the male fiddler crab doesn't have a triangle-shaped apron but has a long narrow apron on its belly. It looks a little bit like a spaceship or rocket.

13) When you are done with the activity, switch groups and repeat steps 1 – 12.

Questions for the students to consider:

Legs: How many?
Alike or different?
Notice where they attach to the body.

Claws: How many?
Is one large? (male Fiddler)
Notice where they attach to the body.

Eyes: How many?
How do they attach to the body? (stalks)
Where do they attach to the body? (the crab has no head!)

Mouth: Can you find it?
Does it have lips?
Describe the mouth parts.

Motion: Describe it (scuttle)
What direction? (sideways)
Place it on ground or bench and watch it. (observe)
Does it seem to get tired? Why do you think so?

Noise: Does the crab make noise?
How? (mouth or other body parts?)

Color: Is your crab the same color all over?
Are the colors, shapes, and sizes the same on both sides (symmetrical)?
What is attractive about your crab?
Is it clean?

Habitat: Where does the crab live?
Do they live here year-round?

Conclusions:
Did you think there were so many interesting things about crabs?
Do you think other marine creatures might be as interesting?
What other things might you like to learn about?

*** By studying the fiddler crab, you have done what some scientists do.
Observation. Scientists study something very carefully to learn more about it. ***

Why the Crab Has No Head

- ∞ It was Nzambi Mpungu who made the earth and the sky.
- ∞ And after that, my children, she made the Brown Duck and the Alligator, the Turtle and the Deer, the Panther and the Anole Lizard.
- ∞ And still she was not finished.
- ∞ She took one whole day to make the Manatee, and that was big work!
- ∞ "I will call this little one Crab" she decided, shaping a tough shell for the body and each many-jointed leg. She made two pincer claws and not two, not four, but eight legs!
- ∞ Ai, but she was tired by the time she finished the last leg!
- ∞ "Little Crab" she said to the new creature, "I will finish you tomorrow. Come back in the morning and I will give you a fine head." And Nzambi Mpungu went to lie down on her sleeping mat.
- ∞ Crab was so excited! "Tomorrow! A fine head!" he whispered to himself. "It took Nzambi only one day to make Manatee, but it takes her two days to make me."
- ∞ Which was not exactly true, my children. You can see that, and I can see that, but little Crab was too proud to see truth that day.
- ∞ He told each animal he met to come and see him get his head the next morning.
- ∞ "Wild Boar! Black Bear! Come tomorrow morning to the house of Nzambi and see the fine head she will give me. She is taking all night to prepare it."
- ∞ Which is not exactly true, my children. You can see that, and I can see that, but Crab was too proud to see truth that day.
- ∞ "Gopher Tortoise! Wood Stork! Come tomorrow morning to the house of Nzambi and see the fine head she will give me. No doubt I will have a mane like Lion's, antlers like Deer, and surely a long, graceful neck like Great Blue Heron. How grand I'm going to look!"
- ∞ He scurried away importantly, walking almost sideways with pride.
- ∞ The next morning at sunrise, there was a great crowd at the house of Nzambi Mpungu.

- The whole Scrub Jay family was there, because they are always very curious.
- The Laughing Gulls came ready to laugh at Crab, no matter how grand he was going to look.
- Lion came because he had heard that Crab dared to compare his new head to Lion's own magnificent head.
- Vulture showed up in case there might be food.
- All these animals made so much noise, scuffling and stamping and snorting that Nzambi soon woke up and came outside.
- "Ai! Why are you all here?" She asked when she saw the crowd.
- "Crab invited us!" squeaked the youngest Armadillo, who was quite thrilled by the whole occasion. "Where is the marvelous head you have made for him?"
- "And where is Crab?" rumbled Nzambi in return.
- "Make way, make way!" cried Crab as he scuttled through the legs of the other animals, still feeling so important he could scarcely walk straight. "I have come for my fine head, Nzambi."
- But Nzambi Mpungu looked down sternly at Crab. This little creature was not even completed yet, and already he thought he was more important that all the others in the whole brand-new world.
- She frowned and folded her strong arms. Then she slowly shook her head.
- "No Crab," said Nzambi at last. "I think you are fine just the way you are."
- Now that was perfectly true, my children. And Nzambi went back to her hut to think about what color she would make the Spoonbill that day.
- So Crab never did get a head. To this day, whenever he wants to see, he has to poke his eyes out from his body.
- And he still walks sideways, only now it is from embarrassment instead of pride.

Field Study: Mangrove Forest Walk

Lesson 2: Coastal Habitats
Lesson 3: Coastal Wildlife
Lesson 4: Native and Non-Native Plants

Grade Level: Kindergarten, 1st, 2nd Grades

Subject: Science, Language Arts

Duration: 35 Minutes

Materials: None

Skills: observation, classification, analysis, description, and listening.

FL Sunshine State Standards: SC.B.1.3, SC.D.1.1, SC.D.1.2, SC.D.2.1, SC.F.1.5, SC.G.1.1, SC.G.1.2, SC.G.2.2, SC.H.1.1, (OPTIONAL: LA.B.2.1, LA.B.2.2, LA.C.1.1, LA.C.2.1)

Objectives:

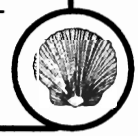
- Students will understand what makes a plant a mangrove
- Students will learn the three types of mangroves in this forest
- Students will understand that this park is part of an estuary and home to wildlife, which makes it a habitat.

Overview: A guided walk through the mangrove forest.

Background: An estuary is a rich ecosystem where fresh water and salt water mix. All of Sarasota Bay is an estuary. Along its low-energy shorelines, where waves are not present, the mangrove forests provide a unique environment. Mangroves have special adaptations that allow them to grow in salt water. This ability to grow in salt water is what makes a plant a mangrove. Mangroves are able to grow in fresh water, but in a freshwater system other plants compete with the mangrove.

A habitat is the home of a plant or animal. A successful habitat provides food, water, shelter and space for its inhabitants. Mangrove forests are rich in life, providing food and a safe haven for coastal and marine animals. Mangrove roots, particularly the red and black, provide hiding places for young fish and marine animals. The upper branches of the mangroves are important nesting sites for many types of birds. For these reasons, the mangrove forest habitat can be considered the nursery of the estuary.

On Sarasota Bay we have 3 mangroves: Red, Black and White. The Buttonwood is not considered a mangrove because it grows behind the high tide line, but they are commonly found beside the mangroves. Florida law protects mangroves, and trimming of branches must follow strict rules and requires a permit.



Mangrove Forest Walk; Grades K–2

Diagram here of hands symbolizing 3 mangroves:

Red (hand down – fingers crooked & spread – re: prop roots); Black (index finger pointed up – re: pneumatophores: breathing tubes or reverse roots); White (touch thumb & index making rounded leaf w/2 salt glands rep by tips)

Suggested Procedure:

As you walk through the mangroves with students engage them in "inquiry-based" learning. (Leading questions are asked so that they come up with a desired correct answer)

What makes a plant a mangrove? (It lives in salt water) – to arrive at this answer ask these questions (or others to arrive at answer desired):

- Where does it live? (in the water)
- What kind of water? (salt)

Point out the Red Mangrove *Rhizophora mangle*. This tree has prop roots that form a dense tangle. Under water, these roots are great hiding places for small fish and marine animals. The upper branches are important nesting sites for many types of birds.

Point out the Black Mangrove *Avicennia germinans*. The specialized roots that come out of the soil in large numbers around the tree are called "pneumatophores"; they are breathing tubes to allow the roots to get oxygen when the tide covers the ground with saltwater.

⇒ Have students choose a black mangrove leaf that they can reach from the boardwalk (do not pick the leaves!). Let each student lick a leaf and taste the salt that is excreted through the leaves. This is the way the black mangrove gets rid of salt so it can use the water for growth.

Point out a White Mangrove *Laguncularia racemosa*. Notice the pair of nodes on the center of the leaf stalk and the rounded leaf tips. When you hold a white mangrove leaf up to the light, you will see black dots (glands) along the leaf margin.

Point out a Buttonwood *Conocarpus erectus*. The leaves of this tree are not as fleshy as the mangroves and they are pointed. They have a pair of nodes located at the base of the leaf stalk. The bark of the buttonwood is furrowed (deeply grooved) and an important host for epiphytes (air plants).

Point out any invasive exotics (non-native plants) that may be growing in the forest. In particular look for Brazilian Pepper, Australian Pine, Maleluca (Punk Tree) and Carrotwood. Explain that these plants were introduced without thought for the consequences of their invasion. These plants reproduce without human assistance and often create a monoculture where nothing else can grow. When this happens, habitat for wildlife is often lost. Food, water, shelter and

space are no longer available to sustain life.

Why Mangroves are important to the bay:

1. Mangrove roots provide a place for little fish to hide from bigger fish.
2. The upper branches of mangrove trees are important nesting sites for many types of birds.
3. The dead leaves of mangroves fall off and break down to become *detritus.* This detritus is food for the tiniest creatures in the bay. These animals become food for bigger creatures, etc. The detritus formed from decaying mangrove leaves is the basis of the food chain in Sarasota Bay.
4. The mangrove root systems protect the shoreline from storms & erosion.
5. Mangrove root systems filter pollutants that run-off from roadways and yards around the bay.

Animals you may encounter on your walk:
Fiddler Crab
Marsh Rabbit
Raccoon
Great Blue Heron
Little Blue Heron
Green Heron
Snowy Egret
Great Egret (American Egret)
Reddish Egret
Yellow Crown Night Heron
Black Crown Night Heron
Osprey
Turkey Vulture
Black Vulture
White Ibis
White Pelican (winter)
Brown Pelican
Double-Crested Cormorant
Roseate Spoonbill
Woodstork
Tri-colored Heron
Green Heron (Louisiana Heron)

Plants you may encounter on your walk:
Sea Oxeye Daisy
Christmas Berry
Florida Privet or wild olive
Sea Purslane
Dune Sunflower
Cordgrass
Sea Grape
Southern Red Cedar
Wax Myrtle
Moon Vine
Arrow Leaf Morning Glory
Cabbage Palm (Sabal Palm)
Marsh Elder

Field, Forest, Lagoon; Field Sampling Activity

Lesson 1: Coastal Watershed
Lesson 2: Coastal Habitats
Lesson 3: Coastal Wildlife
Lesson 4: Native/NonNative Plants

Grade Level: All Levels

Subject: Science, Language Arts

Duration: 15 minutes

Materials: Clipboard, pencil and data sheet, 3 sample stations, 3 thermometers

Skills: observation, information organization, analysis, interpretation, and identification of relationships and patterns.

FL Sunshine State Standards: SC.A.1.1, SC.B.1.6, SC.F.1.2, SC.G.1.2, SC.G.1.7, SC.H.1.1, SC.H.1.2, SC.H.3.2

Objectives:

- Students will investigate and measure components in three different ecosystems.
- Students will describe similarities and differences they observe among three different ecosystems
- Students will identify ways that the non-living (abiotic) components of an ecosystem affect the biotic components.

Overview: In a local environment, physical factors such as sunlight, moisture, temperature, and wind influence the suitability of an area for particular organisms. Students will assess field conditions at three (3) sampling stations throughout the park. Soil moisture, temperature, light, wind, and evidence of plant and animal life will be recorded. By comparing different environments, students will begin to consider how non-living elements (abiotic) influence living conditions in an ecosystem. Teachers will keep the data sheet for further classroom study.

At each sample station, about 10 minutes will be spent making the observations, and another 25 minutes will be available for an activity:

Field: Pass the Jug

Forest: Mangrove Walk

Lagoon: Osprey Game

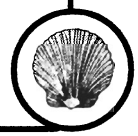
Background: An ecosystem is a community of different species interacting with each other and with the chemical and physical factors making up its non-living environment. It is a system of inter-relationships among organisms, and between organisms and the physical environment.

Field, Forest and Lagoon Sampling

Plants and animals in the Sarasota Bay environment interact with each other in various ways. For example, plants may depend on insects or birds to pollinate flowers and on earthworms to aerate the soil; animals may depend on plants for food or shelter. However, plants and animals also interact with the nonliving elements of their environment. In a local environment such as Sarasota Bay, physical factors such as sunlight, moisture, temperature, and wind influence the suitability of an area for particular organisms. These factors determine the kinds of plants and animals that live here. Physical factors may be determined by the environment's geography, such as its proximity to water, its elevation, or its terrain. In addition, the resident organisms (particularly plants) may affect the sunlight, moisture, temperature, and wind of the area. For example, the trees in a mangrove forest tend to block sunlight and thus create a dark, moist environment, or microclimate on the forest floor that is suitable for shade-loving plants, but is too shady for others. Microclimate refers to special conditions of light, moisture, and temperature that occur in a narrowly restricted area within an ecosystem, for example, under a bush or in a small woodland opening.

Suggested Procedure:

1. Divide group into 3 teams. Each team will rotate through three sampling stations.
2. Complete the data sheet at each station by making observations and recording soil moisture, sunlight, wind direction and strength, temperature at ground level, soil temperature, air temperature, plant life, and animal life.
3. After sample data is collected, complete the appropriate field activity with your guide:
    - Field -> Pass the Jug
    - Forest -> Mangrove Walk
    - Lagoon -> Osprey Game



Developed by Around the Bend Nature Tours for P.I.E.R., a program of the Sarasota Bay Estuary Program

Field, Forest and Lagoon Data Sheet

Date: _____ Teacher: _____ Group: _____

TIME:	Field	Forest	Lagoon
Soil moisture (moist soil will stick together)			
Sunlight sunny, shady bright, overcast			
Wind direction light, strong			
Temp.			
@ ground			
1-inch deep			
3-feet above			
Plant Life trees (size), shrubs, herbs			
Animals look for evidence scat, tracks, burrows, chewed leaves			

Field Activity: Pass the Jug

Adapted for Southwest Florida

Lesson 1: Coastal Watershed

Lesson 4: Native/NonNative Plants

Lesson 5: Stormwater Run-off

Pass the Jug is used with permission from Project WET/Montana State University from the *Project WET Curriculum and Activity Guide.* For further information about Project WET (Water Education for Teachers), contact the Southwest Florida Water Management District, 2379 Broad Street, Brooksville, FL 34604 Phone: (800) 423-1476, ext. 4774, Fax: (352) 754-6883

Grade Level: 3rd, 4th, and 5th Grades

Subject: Science, History, Language Arts

Duration: 35 Minutes

Materials: 3 – 1 gallon jugs containing approx. 110 ounces of water, 11 Pass the Jug scenario cards, 30 - 5oz. paper cups

Skills: observation, analysis (problem solving), description, and listening.

FL Sunshine State Standards: LA.B.2.2, LA.C.1.2, LA.C.3.2, SS.A.1.1, SS.B.2.2, SS.B.2.3, SC.G.1.2, SC.H.1.2

Objectives:

- Students investigate various ways to make a jug of water last among all members of the community.
- Students will understand that water is a resource needed by everyone: plants, animals, and humans.
- Students will learn historical water uses in southwest Florida

Overview: In this role-playing game students run out of water and must determine how to allocate this finite resource.

Background: Water rights provide an organized and systematic manner for allocating water. A water right allows a person, business, community or other group to use a specified amount of water. People receive only the right to use the water; they do not own the water.

The history of water rights is related closely to settlement and land ownership. Settlers in the East of the Mississippi River adapted a water rights policy similar to what is used in England. The Riparian Rights or Common-Law Doctrine gives people who own land bordering a water source the right to use that water however they choose. A more recent version of the doctrine requires people to justify their uses as reasonable. They must also ensure that landowners downstream have their fair share of water.

East of the Mississippi River, average annual rainfall is more plentiful than

west of the Mississippi River. This is apparent from a geographical view. From about the 98th meridian of longitude west to the Pacific coast, average annual rainfall dips significantly below the 20 inches that normally sustain non-irrigated crops in the East.

Scarcity generates westerners' preoccupation and concern with water and water rights. Western water rights were developed for the needs of 19th century settlers. They evolved from the customs and practices of miners, who developed systems for protecting their claims to land and minerals. In many parts of the West, the Prior Appropriation Doctrine regulates water rights. This doctrine maintains "first come, first served" or "first in time is first in right." In other words, whoever uses the water first has the "prior" or first right to the supply of available water. If all the water in a stream is allocated, no new users are allowed.

In the last 20 years, many changes have added new dimensions to water rights and water allocation programs. Irrigated agriculture is a large consumer of water. Individuals and corporations invest millions of dollars in irrigation systems to grow crops for people and for livestock. Cities also need water to meet the needs of residents, businesses, and industries. Water for recreation and for fish and wildlife is receiving growing attention. The challenge of meeting today's growing demand for water will involve nontraditional allocation strategies. Several methods, such as water rights transfers, water rights changes, water marketing, and water leasing, have evolved as considerations to satisfy 21st century needs.

Suggested Procedure:

1. Have students sit in a circle and pass out the eleven Pass the Jug Scenario Cards (pair students if necessary).
2. Pass one cup to each student (additional cups will be passed out later as needed in each scenario).
3. **Discussion:** "Who needs water?" (desired answer: plants, animals, people... everything). Water is a resource needed by everyone. People have invested time, energy, and money to ensure that they have a plentiful supply of water. Sometimes demands on the resource require that water be allocated **(allocate: to distribute according to a plan)**.
4. "Where does our water come from?" (Get them to say Lake Manatee, Peace River, and Floridan Aquifer, sometimes someone knows this, usually they do not)
5. While this discussion is going on introduce the water cycle very simply - water starts as rain, then becomes a puddle which might evaporate, or it goes into the ground - etc.

Developed by Around the Bend Nature Tours for P.I.E.R., a program of the Sarasota Bay Estuary Program

6. Introduce the Floridan Aquifer, a huge lake 400 – 500 feet under Florida.
7. All the water here on earth today is the same water that was here when the earth formed.
8. Did you know we may be drinking the same water the dinosaurs drank?
9. Now show them the jug of water – this is all we have.
10. "Imagine you have just bought a bag of candy and have 6 friends who want some. How are you going to divide it up? Do you give everyone an equal amount? Do you give some to the 1st person who asks? Or do you give your best friend more?"
11. Have the students read the cards in order.
    - #1 reads and you expand on the idea as you pour the allotted amount of water. Be sure they understand each concept.
    - #2 reads and so on...
12. At the end you should run out of water – then discuss who might be able to share.
    - Remember Grandpa may not want to change his ways.
    - Ask the students how they use water in their homes and yards - get a good list.
    - Then ask everyone to suggest ways they might use less water at home (not drinking as much and not taking baths are not an option!)
    - **Hint/Tip:** Usually the town with 5 cups gives one or two to the cattle rancher.

Following are the scenarios for each participant. If you have more participants than scenarios, double up the participants or form teams for each scenario. The 2nd page is the comparisons of water use for each scenario. Print the scenarios and the water use comparisons and then cut the scenarios into strips. Match each scenario with its coordinating water use comparison. Place the coordinating strips back to back and laminate them.

Water Use Scenarios

#1 My grandparents moved to Manatee County a long time ago and built a cattle ranch. My parents still own the ranch where we raise cattle and grow strawberries.

#2 My Uncle George was picking wildflowers in Manatee County in the year 1900 when he found a mineral and began a mine. My family runs this small mine on the banks of the Manatee River.

#3 My great-great grandmother was Electa Lee, the first school teacher in Manatee County. My parents and I still live in her house and we farm the land around the house.

#4 I live in a neighborhood where everyone drives to the city to work. Everyone in the neighborhood uses water in their homes and to water their yards. We will need more water as people move into our neighborhood.

#5 Fifty years ago my grandparents left their farm in Iowa to start a farm in Florida. My Grandpa is still alive and will not use modern farming methods. My parents and I live on the farm and we grow and sell vegetables.

#6 Five years ago my father moved our family to Florida so that he could run his bicycle factory. The factory provides jobs for people in our town; this is a good thing.

#7 My mother works at Mote Marine Laboratory in a fish hatchery where they raise baby fish in big fish tanks. The tanks use lots of water that comes from Sarasota Bay. The water passes through the fish tanks, is filtered, and reused for aquarium displays.

#8 I live in a small town in the countryside. The town grew bigger as people moved to my town. Now my town is a city. All the people living in my town use water for their homes and to water their yards.

#9 I live on a farm. My parents run the farm and use modern water-saving methods of farming. We supply vegetables and fruit to the nearby towns and cities.

#10 Two years ago, my parents decided to start a company. They make beach toys.

#11 My parents own a cattle ranch. The land also has pine trees and an orange grove. My parents earn income from selling cattle, timber and oranges.

#1 Need **2 cups of water**, which is equal to 20,000 gallons of water.

#2 Need **2 cups of water**, which is equal to 20,000 gallons of water everyday.

#3 Need **1 cup of water**, which is equal to 10,000 gallons of water everyday.

#4 Need **3 cups of water**, which is equal to 30,000 of water everyday.

#5 Need **5 cups of water**, which is equal to 50,000 gallons of water everyday.

#6 Need **2 cups of water**, which is equal to 20,000 gallons of water everyday.

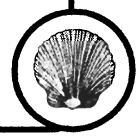
#7 Need **4 cups of water**, which is equal to 40,000 gallons of water everyday, but pour **3 cups of water** back into the jug.

#8 Need **5 cups of water**, which is equal to 50,000 gallons of water everyday.

#9 Need **3 cups of water**, which is equal to 30,000 gallons of water everyday.

#10 Need **2 cups of water**, which is equal to 20,000 gallons of water everyday.

#11 Need **2 cups of water**, which is equal to 20,000 gallons of water everyday.



Field Study: Mangrove Forest Walk

Lesson 2: Coastal Habitats
Lesson 3: Coastal Wildlife
Lesson 4: Native and Non-Native Plants

Grade Level: 3rd, 4th and 5th Grades

Subject: Science, Language Arts

Duration: 35 Minutes

Materials: None

Skills: observation, classification, analysis, description, and listening.

FL Sunshine State Standards: SC.B.1.3, SC.D.1.1, SC.D.1.2, SC.D.2.1, SC.F.1.5, SC.G.1.1, SC.G.1.2, SC.G.2.2, SC.H.1.1, LA.B.2.1, LA.B.2.2, LA.C.1.1, LA.C.2.1

Objectives:

- Students will understand what makes a plant a mangrove
- Students will learn the three types of mangroves in this forest
- Students will understand that this park is part of an estuary and home to wildlife, which makes it a habitat.
- Students will understand that mangroves filter pollution from run-off into the bay.
- Students will understand that non-native, invasive plants can harm an ecosystem.

Overview: This walk through a created lagoon system and forested mangrove wetlands will emphasize the use of native plants as a means to conserve our precious water resources as well as attract native wildlife to this coastal habitat.

Background: An estuary is a rich ecosystem where fresh water and salt water mix. All of Sarasota Bay is an estuary. Along its low-energy shorelines, where waves are not present, the mangrove forests provide a unique environment. Mangroves have special adaptations that allow them to grow in salt water. This ability to grow in salt water is what makes a plant a mangrove. Mangroves are able to grow in fresh water, but in a freshwater system other plants compete with the mangrove.

A habitat is the home of a plant or animal. A successful habitat provides food, water, shelter and space for its inhabitants. Mangrove forests are rich in life, providing food and a safe haven for coastal and marine animals. Mangrove roots, particularly the red and black, provide hiding places for young fish and marine animals. The upper branches of the mangroves are important nesting sites for many types of birds. For these reasons, the mangrove forest habitat can be considered the nursery of the estuary.

Developed by Around the Bend Nature Tours for P.I.E.R., a program of the Sarasota Bay Estuary Program

Mangrove Forest Walk; Grades 3–5

On Sarasota Bay we have 3 mangroves: Red, Black and White. The Buttonwood is not considered a mangrove because it grows behind the high tide line, but they are commonly found beside the mangroves. Florida law protects mangroves, and trimming of branches must follow strict rules and requires a permit.

Diagram here of hands symbolizing 3 mangroves:

Red (hand down – fingers crooked & spread – re: prop roots); Black (index finger pointed up – re: pneumatophores: breathing tubes or reverse roots); White (touch thumb & index making rounded leaf w/2 salt glands rep by tips)

Suggested Procedure:

As you walk through the mangroves with students engage them in "inquiry-based" learning. (Leading questions are asked so that they come up with a desired correct answer)

What makes a plant a mangrove? (It lives in salt water) – to arrive at this answer ask these questions (or others to arrive at answer desired):

- Where does it live? (in the water)
- What kind of water? (salt)

Point out the Red Mangrove *Rhizophora mangle*. This tree has prop roots that form a dense tangle. Under water, these roots are great hiding places for small fish and marine animals. The upper branches are important nesting sites for many types of birds.

Point out the Black Mangrove *Avicennia germinans*. The specialized roots that come out of the soil in large numbers around the tree are called "pneumatophores"; they are breathing tubes to allow the roots to get oxygen when the tide covers the ground with saltwater.

⇒ Have students choose a black mangrove leaf that they can reach from the boardwalk (do not pick the leaves!). Let each student lick a leaf and taste the salt that is excreted through the leaves. This is the way the black mangrove gets rid of salt so it can use the water for growth.

Point out a White Mangrove *Laguncularia racemosa*. Notice the pair of nodes on the center of the leaf stalk and the rounded leaf tips. When you hold a white mangrove leaf up to the light, you will see black dots (glands) along the leaf margin.

Point out a Buttonwood *Conocarpus erectus*. The leaves of this tree are not as fleshy as the mangroves and they are pointed. They have a pair of nodes located at the base of the leaf stalk. The bark of the buttonwood is furrowed (deeply grooved) and an important host for epiphytes (air plants).

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Point out any invasive exotics (non-native plants) that may be growing in the forest. In particular look for Brazilian Pepper, Australian Pine, Maleluca (Punk Tree) and Carrotwood. Explain that these plants were introduced without thought for the consequences of their invasion. These plants reproduce without human assistance and often create a monoculture where nothing else can grow. When this happens, habitat for wildlife is often lost. Food, water, shelter and space are no longer available to sustain life.

Why Mangroves are important to the bay:

1. Mangrove roots provide a place for little fish to hide from bigger fish.
2. The upper branches of mangrove trees are important nesting sites for many types of birds.
3. The dead leaves of mangroves fall off and break down to become *detritus.* This detritus is food for the tiniest creatures in the bay. These animals become food for bigger creatures, etc. The detritus formed from decaying mangrove leaves is the basis of the food chain in Sarasota Bay.
4. The mangrove root systems protect the shoreline from storms & erosion.
5. Mangrove root systems filter pollutants that run-off from roadways and yards around the bay.

Animals you may encounter on your walk:
Fiddler Crab
Marsh Rabbit
Raccoon
Great Blue Heron
Little Blue Heron
Green Heron
Snowy Egret
Great Egret (American Egret)
Reddish Egret
Yellow Crown Night Heron
Black Crown Night Heron
Osprey
Turkey Vulture
Black Vulture
White Ibis
White Pelican (winter)
Brown Pelican
Double-Crested Cormorant
Roseate Spoonbill
Woodstork
Tri-colored Heron
Green Heron (Louisiana Heron)

Plants you may encounter on your walk:
Sea Oxeye Daisy
Christmas Berry
Florida Privet or wild olive
Sea Purslane
Dune Sunflower
Cordgrass
Sea Grape
Southern Red Cedar
Wax Myrtle
Moon Vine
Arrow Leaf Morning Glory
Cabbage Palm (Sabal Palm)
Marsh Elder

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Lagoon Activity: Osprey Game

Role-playing Activity

Lesson 2: Coastal Habitats

Lesson 3: Coastal Wildlife

An Adaptation of Project WILD's "How Many Bears Can Live in this Forest?"
Created by the Staff at the Pelotes Island Nature Preserve, Jacksonville, Florida; http://pelotes.jea.com

Grade Level: All Levels

Subject: Science, Language Arts

Duration: 35 Minutes

Materials: One set of Fish Cards*, Bandana, Bandana with feather, 35 Sea Grape leaves (nests/home base) (Do not let students pick leaves).

Skills: observation, classification, analysis, description, and listening.

FL State Sunshine Standards: SC.F.1.3, SC.G.1.2, SC.G.1.5, SC.G.2.1, SC.G.2.2, SC.G.2.3

Objectives:

- Students will discover how difficult it is to survive as an osprey
- Students will learn that the osprey diet consists only of fish
- Students will understand that some ospreys have a difficult time surviving due to man-made obstacles

Overview: The osprey, a fish hawk, was at one time a common sight along rivers and shores, but pesticides, hunting, and loss of habitat have reduced its number to the point where it is now protected throughout Florida. The purpose of this game is to give the players a better understanding and appreciation for the life and struggles of this unique and rare bird. It will also show them the role man plays in this struggle. The players, in effect, become ospreys and compete with man for their living space, see the effects of eating contaminated food, and deal with other man-made obstacles. By offering these students a better appreciation and understanding of the osprey, we also give them a chance to brighten the osprey's future. The first step in preserving something is realizing that you can lose it.

Background:

FLIGHT AND HUNTING: Ospreys are fish hawks that have brown and white markings on their feathers. They can soar on wind currents, but most of their flight is active (with wings flapping). Ospreys hunt alone, flying over the water looking for fish, then plunging in feet-first, and grabbing the fish with powerful talons (claws.) Ospreys need to catch about 1-3 fish a day. A father osprey, which must fish for 2-3 babies and a mate, has to catch 6-8 fish a day. Ospreys are specially built to be fish-hunters. The bottoms of their feet have many short spines, which help them to hang onto a slimy fish. Many birds have three

toes and a thumb, but the osprey can turn his third toe around, so he can have an extra-strong grip with two fingers and two thumbs. Ospreys have extremely sharp talons and a strong hooked beak for tearing fish into bite-sized pieces. They also have oily feathers that help keep them dry when they splash into the water.

NESTING and RAISING BABIES: Ospreys like to make their nests in dead trees because there are no leaves to get in the way of their wings. It is also harder for predators (dangerous carnivorous animals) to climb a dead tree without the osprey seeing it. Many ospreys build nests on power poles when there aren't enough dead trees around. Ospreys are able to mate (have babies) at 3 years of age. When a male is ready to court (date) a female, he performs the "Sky Dance" by flying around with a fresh caught fish or nesting material. Ospreys mate for life, and mated pairs come back to the same nest year after year. If the pair has no nest, they both collect sticks and grasses. Sometimes they also pick up plastic bags and fishing line (which can kill the babies). Year after year, ospreys make their nests bigger and stronger. An osprey nest can weigh up to 1000 pounds, but it is not very deep inside and probably could not hold a person. Florida ospreys stay in Florida year round and lay their eggs between December and February. (North of Florida, ospreys migrate south each year.) The eggs are about the same size as a chicken's egg, and are cream-colored with spots. Both parents sit on the eggs. The female does most of the sitting, while the male feeds her. Ospreys usually lay 3 eggs. When there isn't much food, the smallest baby often does not survive. Ten to fifteen days before fledging (flying) the young ospreys practice flapping their wings. They jump up and down in the nest until a wind gust carries them over the edge on their first flight. Osprey parents will fly past the nest with a fish and drop it into the water to help the babies catch their first fish. Young ospreys begin to hunt 2-3 days after fledging, but the parents still bring them fish for a few weeks.

HISTORY AND FUTURE: Man has caused some problems for the ospreys. Fertilizers and other pollution can run off the land and into the water and kill the fish (this means the ospreys won't have enough fish to eat.) Timber harvesting (cutting down trees) makes it harder for them to find a place for their nests. Cutting down trees in the rain forest destroys the ospreys' wintering grounds (where they stay in the winter if they migrated south). Some ospreys get shot even though it is against the law to hunt them. People also put some dangerous chemicals into the environment, like the pesticide, DDT. Fish soak up DDT from the water. Since ospreys only eat fish, they get a lot of this DDT. This hurts them in two ways. First, it makes their eggshells thin, so the eggs crack when the mother sits on them. Second, since DDT impregnated eggshells don't let much air through, the baby may not be able to breathe inside the shell. In

the 1970's, after people stopped using DDT, many more osprey babies survived. Today, these fish hawks are a "threatened species" (protected by law) in Florida. Now, people are trying NOT to pollute the water, NOT to shoot ospreys, and NOT to leave fishing line out for them to get tangled in.

Interesting Fact: Girl ospreys are bigger than boy ospreys.

Resources:

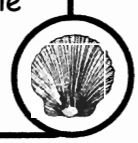
Poole, Allen. Ospreys: A Natural and Unnatural History. Cambridge: Cambridge University Press., 1989.

Terres, John K. The Audubon Society Encyclopedia of N. American Birds. New York: Alfred A. Knopf, Inc., 1987.

Suggested Procedure:

SETTING UP THE GAME:

1. Select one student to play an osprey that has been accidentally shot by careless hunters. This works well if you try to find students who like to hunt. Discuss how most hunters are very careful to hunt only what is in season and what is legal. However, a careless hunter shot this osprey. It is illegal to shoot any type of raptor (bird of prey). An osprey that is shot and recovers may not be able to fly well, so the students must hop around on one leg when hunting.
2. Select another student to play an osprey that has become tangled in fishing line. Discuss how most fisherman are very careful and remove any tangled lines from the water, trees, and shrubs. However, this osprey was injured when a careless fisherman did not remove his tangled line. The line became wrapped around the bird's head, blinding it. This student must hunt with his or her eyes closed. Be sure to have an adult helper lead the child around so that the student is not injured!
3. Match two ospreys as a mated pair. They must get enough food for three ospreys in order to keep their babies alive OR they must have at least one fish for each of their two babies. The mated pair share a nest and must tag-team to find food. One must be at the nest at all times or the babies may be attacked by a predator or die of exposure. The mated pair are the only ospreys in this game that may run.
4. Choose one student to be an eagle. Eagles are much larger than ospreys and often steal fish from them by beginning an aerial attack, which frightens the osprey into dropping its fish. In the game, this thievery will be represented by the eagle being allowed to take one fish from each nest during the game. After stealing from a nest, the eagle may never return to that nest again. The eagle may hunt or he can steal fish. The eagle may not run, only the mated pair of osprey can do this.



Osprey Game; Grades 3—5

TO BEGIN: Place the sea grape leaves in a large circle on the ground. Students should choose one leaf to be their perch tree. Scatter the fish cards inside the circle. Students will walk out into the middle and collect one fish at a time. Each time they pick up one fish they must return it to their perch before collecting the next one. Discuss how ospreys are only able to catch one fish at a time in their rough talons. The eagle may only hunt or steal only one fish at a time as well. The mated pair may only collect one fish per turn, but they may run.

GOAL: Each bird player must collect enough fish to survive.

RULES:

1. Ospreys and the eagle must walk - with the exception of the mated pair of osprey; they may run.
2. Ospreys and eagles may only collect one fish at a time.
3. No one may steal, except for the eagle.

FINISHING THE GAME: After all of the fish cards have been collected (45 seconds-2 minutes), each player will take inventory of the fish cards he or she has collected.

1. Ask students to find any fish cards that say "ESCAPE". These are fish that got away.. Collect the "ESCAPE" cards.
2. Have students check their fish cards for "DDT". Explain how some pesticides run off into the water and poison fish. When the osprey eats poisoned fish they may become sick or their eggs will become very thin. When the mother osprey sits on her eggs they will crack and the babies will die. If the mated pair has "DDT" fish cards, they lose one baby per card. If they have two or more "DDT" fish cards, all the young die. If any other osprey have a "DDT" fish card, ignore it, as the other osprey are all younger than three years old, and are not reproductively mature.
3. Have students check for "H" fish cards. "H" stands for loss of "habitat". Discuss how ospreys make their nests at the top of tall dead trees. What do most people do to dead trees? (Cut them down.) If we cut down all the dead trees, the osprey has no place to make his home. If a player has two or more "H" fish cards, he must turn them in. The osprey had to spend time looking for a new living-hunting ground, so he spent less time fishing.
4. One student will have a fish card with a "G" on it. This stands for "Gunshot". A careless hunter injured this osprey. This osprey loses all but the "G" card (the student is left with only one card).
5. Two students have a fish card with "LINE" on it. "LINE" stands for fishing line. These ospreys were injured when careless fisherman did not remove their tangled fishing lines from the water. These students lose all but the "LINE" fish card (leaving them with only one card each).

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6. Now have students count all of their remaining fish cards, no matter what the letter/blank status. The number of fish cards required to complete the game varies based on the number of players. Do a quick survey by raise of hands

- The top ¼ will be in the **"Fat and Happy"** group. They have more than enough fish to survive. They'll all be 4-years-old next year, and old enough and healthy enough to find a mate.
- The middle 50% will be in the **"Healthy"** group. They're not as "fat and happy" as the other guys, but are certainly doing well.
- The lower ¼ is in the **"Hungry"** group. (Remember, best not to kill the players.) Discuss who is in what group.

➤ Where did the eagles fall? (usually in the healthy group).
➤ Where did the injured ospreys fall and the parents? (usually in the hungry group).
➤ If the injured ospreys do better, did other ospreys help by giving them food? Congratulate the group on teamwork. How many of the ospreys in the hungry group are there because of something people did to them?

WHAT WE LEARN: Some of the ospreys will always be hungry, and it is especially difficult for injured ospreys and mated pairs to get enough food. Students will see that the strongest are best able to compete successfully for enough fish to survive. Also, they will see that man-made obstacles are very dangerous to these beautiful birds.

Have each group ("Fat and Happy", "Healthy", and "Hungry") come up with one way we can help ospreys. Help them come to these suggestions:

We can pick up litter around waterways.
We can make sure we don't leave fishing lines tangled in the water or shrubs.
We can not shoot animals that are illegal to hunt (like raptors).
We can not cut down dead trees, which provide the primary nesting spots.
We can put up poles for ospreys to nest on.

WHAT WE LEARN: Some ospreys have a difficult time surviving because of man-made obstacles. It is especially difficult for injured ospreys and mated pairs to get enough food. What can we do to protect these birds and help maintain their habitat?

1) Don't illegally hunt them.
2) Don't put trash and pollution in the water.
3) Use less pesticides.
4) Don't cut down the dead trees they need for nesting and perching.

* Total number of cards: 108 for about 25 players. Set of Fish Cards includes:

72 Good and tasty fish (fish with name),
24 fish escape cards (Escape),
8 DDT pesticide cards (DDT),
2 habitat loss cards (H),
1 fishing line card (LINE),
1 gun shot card (G).

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Field Study: Sarasota Bay Inhabitants

Lesson 1: Coastal Watershed
Lesson 2: Coastal Habitats
Lesson 3: Coastal Wildlife
Lesson 5: Stormwater Run-off

Grade Level: 6th, 7th and 8th Grades

Subject: Science, Language Arts

Duration: 60 Minutes

Materials: Clipboards, pencil and data sheet, sample station, thermometer, hydrometer, pH kit, 2 5-gallon buckets, seine net, ID guides or reference books

Skills: observation, classification, analysis, recording, description, and listening.

FL Sunshine State Standards: SC. A.1.1, SC.B.1.6, SC.F.1.2, SC.G.1.2, SC.G.1.7, SC.H.1.1, SC.H.1.2, SC.H.3.2.

Objectives:

- Students will investigate and measure water quality and living components in the Sarasota Bay ecosystem.
- Students will describe similarities and differences they observe between two different habitats.
- Students will identify ways that the non-living (abiotic) components of an ecosystem affect the biotic components.

Overview: Students will assess field conditions and water quality at two sampling stations within the park. Using dip nets, students collect specimens from the lagoon and bay for observation. Soil moisture, soil and water temperature, light, wind, salinity, pH, and evidence of plant and animal life will be recorded. By comparing different environments, students will begin to consider how non-living elements (abiotic) influence living conditions in an ecosystem. Teachers will keep the data sheets for further classroom study.

Background: An ecosystem is a community of different species interacting with each other and with the chemical and physical factors making up its non-living environment. It is a system of inter-relationships among organisms, and between organisms and the physical environment.

Plants and animals in the Sarasota Bay environment interact with each other in various ways. For example, plants may depend on insects or birds to pollinate flowers and on earthworms to aerate the soil; animals may depend on plants for food or shelter. However, plants and animals also interact with the non-living elements of their environment. In a local environment such as Sarasota Bay, physical factors such as sunlight, moisture, temperature,

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and wind influence the suitability of an area for particular organisms. These factors determine the kinds of plants and animals that live here. Physical factors may be determined by the environment's geography, such as its proximity to water, its elevation, or its terrain. In addition, the resident organisms (particularly plants) may affect the sunlight, moisture, temperature and wind of the area. For example, the trees in a mangrove forest tend to block sunlight and thus create a dark, moist environment, or microclimate on the forest floor that is suitable for shade-loving plants and animals, but is too shady for others. Microclimate refers to special conditions of light, moisture, and temperature that occur in a narrowly restricted area within an ecosystem, for example, under a bush or in a small woodland opening.

In water bodies the presence or absence of certain organisms, called indicator species, reveals much about water quality. These creatures comprise a biotic index, or number or living organisms found in an ecosystem. The absence or presence of these organisms is an indicator of water quality.

Environments with numerous marine species are usually healthy, whereas environments with just a few different species or many of one species and few of others usually indicates conditions that are less than healthy. The word *healthy* is used to indicate an environment supportive of life. Pollution generally reduces the quality of the environment, and in turn the diversity of life forms.

The quality of water changes as it flows over the land. These changes in water quality may be due to natural factors or human activities. When water is degraded to a point that affects its use for a particular purpose, it has become polluted. Water pollution originates from two very different sources: point sources and non-point sources. Point source pollution come from a discrete source such as a pipe, ditch or wastewater treatment plant. Non-point source means that the pollution come from a broad area, such as a large field that has been covered with fertilizers and pesticides. Excessive application of fertilizer or pesticides on lawns and gardens (such as various "chem.-lawn" companies promote) can create non-point sources. People who use fertilizers and pesticides must read labels to ensure that they are applying the materials properly.

Suggested Procedure:

1. Advise students to dress appropriately for the setting. Closed shoes such as old sneakers are a must. **No flip-flops or sandals without heel straps are allowed in the water under any circumstances.** Sharp rocks and shells will cut feet and in this environment cuts may become infected.
2. Emphasize that all wildlife will be returned to its habitat unharmed. We are visiting the plants and animals in their home and will respect that.

3. Sample data will be taken at two sites 1) Lagoon and 2) bay front.
4. Begin the activity by observing the water. Using the sampling equipment (nets, 5-gallon buckets, seine net, etc.) have the students collect as many different forms of animal life as possible. Ask them to be alert to differing micro-habitats near rocks, pilings and mangrove roots. Place the animals to be observed in 5-gallon buckets for viewing and drawing.
5. Keep an adequate amount of water in the 5-gallon buckets and place in a cool, shady spot if possible. Change or add more water often to provide more oxygen and keep the animals cool.
6. On Sarasota Bay Inhabitants worksheet, have students the animals they observe. Have each student record at least three animal observations. Ask them to fill in the number of each kind found, and describe the actual location/habitat where the animal was found. Once observations are complete, carefully return the animals to their natural habitat.
7. Encourage the students to discuss their observations. How diverse were the marine organisms? Introduce the concept of diversity, or that a variety of different kinds of plants and animals is usually an indication of a healthy ecosystem.
8. Complete the Sarasota Bay Water Quality data sheet a each station by making observations and recording all parameters.
9. Upon returning to your classroom, identify the animals that were found and discuss the results and differences among habitats.

Developed by Around the Bend Nature Tours for P.I.E.R., a program of the Sarasota Bay Estuary Program

Water Quality Data Sheet

Date: _____ Teacher: _____ Group: _____

TIME:	Bayfront	Lagoon
Soil moisture (moist soil will stick together)		
Sunlight sunny, shady bright, overcast		
Wind direction light, strong		
Temp.		
Plant Life trees (size), shrubs, herbs		
Animals look for evidence scat, tracks, burrows, chewed leaves		
Water Temp.		
Salinity		
pH		

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Sarasota Bay Inhabitants Worksheet

Date: _____ Teacher: _____ Group: _____

Location	Sketch of Organism	Number Found

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Field Study: Sarasota Bay Scavenger Hunt

Lesson 2: Coastal Habitats

Lesson 3: Coastal Wildlife

Lesson 4: Native and Non-Native Plants

Grade Level: 6th, 7th and 8th Grades

Subject: Science

Duration: 35 Minutes

Materials: Clipboards, pencil, and ID guides or reference books

Skills: observation, classification, recording, and description

Objectives:

- Students will investigate the habitats within the restoration site on Sarasota Bay.
- Students will identify wildlife.
- Students will identify native and non-native plants.
- Students will identify man-made structures or other evidence of human presence.

Overview: A walk through a restoration site on Sarasota Bay is facilitated by a scavenger hunt photo guide. The major purpose of this activity is for students to recognize that all environments have characteristic life forms and can co-exist in the same habitat. Teachers will keep the scavenger hunt photo guide for reference and further classroom study.

Suggested Procedure:

1. Advise students to dress appropriately for the setting. Closed shoes such as old sneakers are a must. **No flip-flops or sandals without heel straps are allowed in the water under any circumstances.** Sharp rocks and shells will cut feet and in this environment cuts may become infected.
2. Emphasize that all wildlife will be observed and NOT touched, chased or harassed in any way. We are visiting the plants and animals in their home and will respect that.
3. Review the list of items on the scavenger hunt photo guide with the students prior to the start of the scavenger hunt,
4. Once the scavenger hunt has begun, as you find items on the photo guide check the appropriate box above each item on the scavenger hunt photo guide.
5. If you find and identify unique items NOT on the scavenger hunt photo guide, please write and/or draw the item in the provided space.

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SARASOTA Bay Coastal Habitats

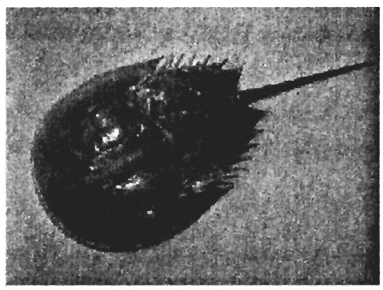
Sarasota Bay Scavenger Hunt

Bird—

☐ Great Egret

Crustacean—

☐ Horseshoe crab molt



Crustacean—

☐ Black mangrove crab

☐ Palm tree

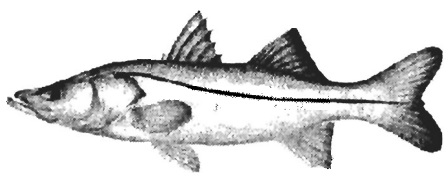
☐ Mangrove Trees (salt tolerant)

☐ Red Mangrove prop roots

☐ Seagrape tree

Fish—

☐ Common Snook



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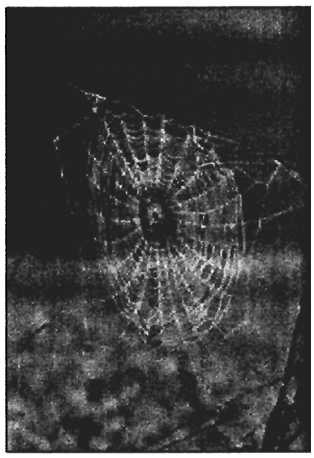
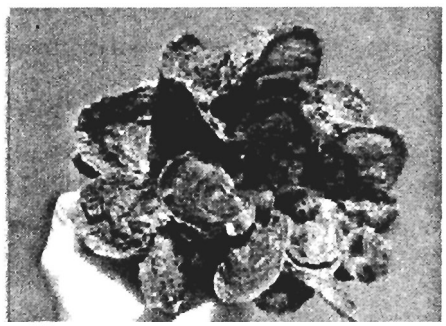
Home—

☐ Crab spider web



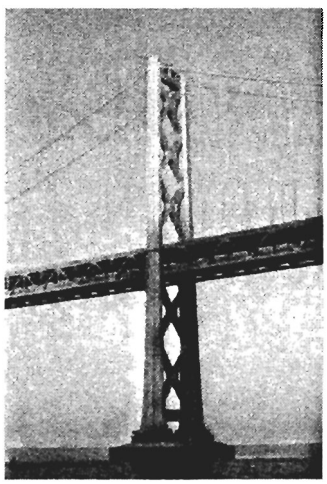
Mollusk—

☐ Oysters



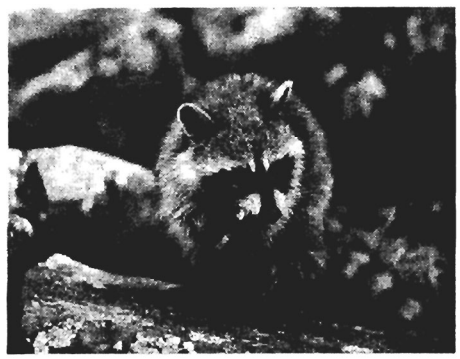
Human presence—

☐ Bridge



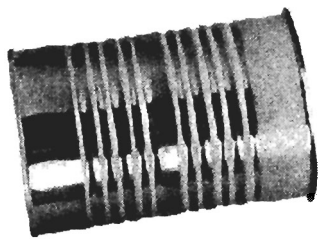
Mammal -

☐ Raccoon



Human presence—

☐ Trash



Please provide any additional observations in this box:

Developed by Around the Bend Nature Tours for P.I.E.R., a program of the Sarasota Bay Estuary Program

Field Study: Sarasota Bay Nature Search

Lesson 2: Coastal Habitats

Lesson 3: Coastal Wildlife

Lesson 4: Native/Non-Native Plants

Grade Level: 6th, 7th and 8th Grades

Subject: Science, Art, Language Arts

Duration: 15 Minutes

Materials: Clipboards, pencil and nature sheet

Skills: observation, classification, analysis, recording, description, and listening.

FL Sunshine State Standards: SC. A.1.1, SC.B.1.6, SC.F.1.2, SC.G.1.2, SC.G.1.7, SC.H.1.1, SC.H.1.2, SC.H.3.2.

Objectives:

- Students will investigate the habitats within the restoration site on Sarasota Bay.
- Students will generalize that each habitat has characteristic life forms.
- Students will suggest ways that the environment affects the life forms that occupy it.
- Students will identify native and non-native plants.

Overview: A walk through a restoration site on Sarasota Bay is facilitated by students completing a nature search worksheet. The major purpose of this activity is for students to recognize that all environments have characteristic life forms and to acquaint students with the distinction between native and non-native plants. Teachers will keep the worksheet for further classroom study.

Background: For most people, wild birds and other animals are valued and appreciated residents of the Sarasota Bay watershed,. Unlike the soil, waterways, or other ecological components of the environment, wild animals do not create, but rather reflect environmental quality. They are an indicator of a diverse and healthy ecological community, and the positive values they impart to Sarasota Bay must be emphasized through public awareness and education of both old and young concerning the potential richness and quality of their environment.

Every environment has its characteristic organisms, both plant and animal. Many organisms have adjusted as their habitat has changed from undeveloped to urban. Not only have people altered the environment; the human environment has been shaped by the ecologies within which people live.

Fossil remains indicate that even in prehistoric times plant and animal populations had migrated to different geographic regions in response to climatic and other conditions (for instance wind blows seed to Florida from the Caribbean.). These migrations took place over long periods of time. In some cases, original inhabitants of an area would die out, having moved away or become extinct.

Natural land and water barriers have prevented some species from spreading to certain areas. But people, with their sophisticated transport systems, have changed the plant and wildlife populations of islands and continents. Many plants and animals that we take for granted as native residents of Sarasota Bay actually were not on this continent when the first European settlers came, while other original species have been removed or destroyed.

Botanists determine whether a plant is native if it was here "pre-Columbian" (before the entrance of Christopher Columbus into the "New World" and the resulting European explorations). A non-native or exotic plant came here from someplace else. Some plants migrated here naturally as explained above, but others were brought here by humans. There are two reasons why people bring plants into an area: 1) for food or agricultural use, and 2) for landscape or ornamental use. Both agricultural and ornamental horticulture are important industries in Florida.

Background:

1. Discuss the diversity of wildlife. Make sure students understand that wildlife includes insects, spiders and other invertebrates as well as birds, fish, reptiles, mammals and amphibians.

2. Explain native and non-native plants and tell students you will be pointing out various plants on the walk and they should make note of these on their worksheets.

3. Ask students to point out wildlife that they may see along the way. Explain that in order to view wildlife, the class must be as quiet as possible on the trail.

4. Complete the nature search worksheet by making observations and recording what you see including plant life and animal life.

Developed by Around the Bend Nature Tours for P.I.E.R., a program of the Sarasota Bay Estuary Program

Sarasota Bay Nature Search

Date: _____ Teacher: _____ Group: _____

	Plants	**Draw at least one:**
Native		
Exotic		

	Animals	**Draw at least one:**
Bird		
Fish		
Mammal		
Reptile & Amphibian		
Insect & Arachnid		

	Habitat	**Draw at least one:**
Food		
Water		
Shelter		
Space		

Developed by Around the Bend Nature Tours for P.I.E.R., a program of the Sarasota Bay Estuary Program

P.I.E.R. PROGRAM FIELD TRIP
STUDENT POST-TEST

SCHOOL NAME: _____

GRADE LEVEL: _____

1. What is an estuary?

2. Provide one importance of an estuary.

3. What do you get when you mix saltwater and freshwater?

4. What is a mangrove?

5. Where do mangroves grow?

6. Name a type of mangrove.

STUDENT POST-TEST (continued)

7. Where are Australian Pine trees originally from? And can you name one of the problems caused by Australian Pine.

8. What is an osprey and what does it eat?

9. What harmful affect does DDT have on ospreys?

10. What is a tributary?

11. Name a tributary of Sarasota Bay.

12. Provide a list of ways you can save water at home.

SARASOTA Bay Coastal Habitats

Appendix E: Curriculum Feedback Form

Your feedback is very important to us. Please take a moment to complete the following questionnaire about the Sarasota Bay Coastal Habitats Curriculum developed by the Sarasota Bay Estuary Program, Mote Marine Laboratory and Around the Bend Nature Tours. Please mail or fax your questions to us. Thank you.

Sarasota Bay Estuary Program
111 S. Orange Avenue, Suite 200W
Sarasota, FL 34236
Fax: 941.955.8081

Mote Marine Laboratory
SeaTrek Distance Learning Program
1600 Ken Thompson Parkway
Sarasota, FL 34236
Fax: 941.388.4312

Around the Bend Nature Tours
1815 Palma Sola Boulevard
Bradenton, FL 34209
Fax: 941.794.8773

About you (Circle one or more for each question)

What grade level(s) do you teach?:
K 1 2 3 4 5 6 7 8

What subjects do you teach?: Science Language Arts Social Studies Math

Approximately how much time did you spend using the Coastal Habitats curriculum with your students?:

2 hours 4 hours 6 hours 8 hours more than 8 hours

About your students (Circle one for each question)
1 = strongly agree 2 = agree 3 = disagree 4 = strongly disagree

How would you rate the overall quality of this curriculum?: 1 2 3 4

Did the content (graphics, text, and layout) appeal to them?: 1 2 3 4

Was the reading level appropriate for your students?: 1 2 3 4

Do you have any suggestions or comments about the curriculum?

_____
_____
_____
_____
_____
_____
_____

SARASOTA Bay Coastal Habitats

Appendix F: Field Trip Feedback Form

Your feedback is very important to us. Please take a moment to complete the following questionnaire about the Sarasota Bay Coastal Habitats Curriculum developed by Around the Bend Nature Tours and the Sarasota Bay Estuary Program. Please mail or fax your questions to us. Thank you.

Around the Bend Nature Tours
1815 Palma Sola Boulevard
Bradenton, FL 34209
Fax: 941.794.8773

Sarasota Bay Estuary Program
111 S. Orange Avenue, Suite 200W
Sarasota, FL 34236
Fax: 941.955.8081

About you (Circle one or more for each question)

What grade level(s) do you teach?:
K 1 2 3 4 5 6 7 8

What subjects do you teach?: Science Language Arts Social Studies Math

About your students (Circle one for each question)
1 = strongly agree 2 = agree 3 = disagree 4 = strongly disagree

How would you rate the overall quality of the field trip?: 1 2 3 4

Did the activities appeal to them?: 1 2 3 4

Was the level appropriate for your students?: 1 2 3 4

What part of the field trip went especially well? Why?

_____
_____
_____
_____

What logistical changes would you make?

1st Activity _____ How could this be improved?

2nd Activity _____ How could this be improved?

3rd Activity _____ How could this be improved?

Do you have any suggestions or comments about the curriculum?

_____
_____
_____
_____
_____
_____

SEATREK
DISTANCE LEARNING
1600 Ken Thompson Parkway, Sarasota FL 34236
www.mote.org | www.seatrek.org

VIDEOCONFERENCE REGISTRATION

Please fill out and fax (including signature) to 941-388-4312. For questions, call 1-800-691-6683 x 250, or email seatrek@seatrek.org.

CONTACT INFO Thank you for your interest in our high-energy multimedia science programs! Please complete the following as thoroughly as possible.

Organization: _____ Contact: _____

Address: _____ Phone: _____ Fax: _____

City: _____ State: _____ Postal Code: _____ Email: _____

Have you ever videoconferenced with us before? ○ Yes ○ No Which program(s): _____

How did you first learn about our programs?: _____

PROGRAMMING Please mark the program you are interested in purchasing.

○ **V01 Sharks: Devouring the Myths ($145.00 US - 50 min)**
Don't be afraid! See sharks up close and learn the truth about them! Find out why it's more dangerous to be at home than in the water with these fascinating creatures.

○ **V02 Sea Turtles: Amazing Reptiles ($145.00 US – 45 min)**
A lively gameshow format reveals why sea turtles are truly amazing! Also discover what a hatchling needs to survive in the open ocean and then take a tour of Mote's turtle exhibits.

○ **V03 Mammals, Mammoths, MANATEES! ($145.00 US - 50 min)**
Do you know how to train a 3000-lbs relative of the elephant? Mote does! Learn how we care for Hugh and Buffett, our resident West Indian manatees and find out how big and smart they are.

○ **V04 Mission: See Deep, ROV ($145.00 US - approx. 60 min)**
Explore how Remotely Operated Vehicles are used to enter the mysterious realms of the deep. Requires the use of a 12-key tone dialer. Visit our website for more details <www.seatrek.org/prog_rov.html>.

○ **V05 SeaTrek Demonstration ($25.00 US - approx. 30 min)**
This is an overview of all the SeaTrek programs and a great way to demonstrate videoconferencing technology.

○ **V07 Coastal Habitats**
Why are estuary's important? Discover the value of coastal habitats to wildlife and how import they are to people too. **Available starting 05/2003.**

SCHEDULING For timeslot availability, please check our website <www.seatrek.org/vidcon.html>. We prefer scheduling using standardized timeslots, although other times may be arranged. You may otherwise indicate additional conferences, alternate dates or a date range below. **ALL TIMES SHOULD BE IN EASTERN TIME (ET).** Schedules will be confirmed by email after receipt of your signed registration.

1st date ____/____/____ ○ 09:00 AM ET ○ 10:00 AM ET ○ 11:00 AM ET ○ 01:00 PM ET ○ Other: _____

Alternate date ____/____/____ ○ 09:00 AM ET ○ 10:00 AM ET ○ 11:00 AM ET ○ 01:00 PM ET ○ Other: _____

Additional dates or a date range: _____

To facilitate voice calls, please indicate your time zone: ○ Eastern ○ Central ○ Mountain ○ Pacific Other: _____ Daylights Savings?: ○ Yes ○ No

SITE INFO We recommend 30 students/participants per conference. **Science programs are designed and recommenced for grades 4-8 (ages 9 – 13 yrs).**

Approx. # of students/participants per conference: _____ Grade levels/Ages: _____

How does your program request relate to the participants' studies or training? _____

Name of Receiving Site (school name, etc.): _____ City/Location of Receiving Site: _____

Lead Participant's Name: _____ Phone: _____

Tech/Room Coordinator's Name: _____ Phone in Videoconference Room: _____

MULTIPOINT CONFERENCES: You may bridge up to three locations for a SeaTrek conference with no additional program charge. However, please duplicate the SITE INFO for each additional location on a separate sheet.

CONNECTING: Please indicate how you will be connecting with us: ○ up to 384 Kbps IP (H.323) ○ up to 768 Kbps IP (Internet 2) ○ 384 Kbps ISDN (H.320)

Program recipients are responsible for connecting with our studios. Dial-up numbers and testing protocols will be sent with your email confirmation. You may connect up to 10 minutes prior to your schedule start time to ensure quality of service. You must connect with us no later than 15 minutes after your start time to avoid cancellation.

BILLING INFO Recipients will be invoiced after successful delivery of the each videoconference. **Cancellations must be made 24 hours prior to your confirmed videoconference to avoid billing.** Program fees will not be waived due to technical problems, unless specific problems can be reliably traced to a SeaTrek hardware malfunction.

Billing Contact (if different than CONTACT above):: _____ Phone: _____

Billing Address: _____ Fax: _____

➡ By signing below, I authorize payment and agree to the cancellation policy.

Thank you! A confirmation will be emailed to you.

Authorized Signature: _____ Date: _____

22:regis03/0213