

Teacher Information: This material is background information for teachers. This should be read and discussed with students before video presentation.
Student Information Sheets: This is background material for students. They should be copied and given to students before video presentation. Activities should be done as follow up after program. Questions should be discussed after the show.

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Unit III. Weedon Island

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Unit III. Weedon Island Packet Contents

Weedon Island Content Standards:

- Populations and Ecosystems
- Diversity and Adaptations
- Population, Resources, and Environments

A. Overview

1. Weedon Island

In the next three lessons students will learn the importance of preserving our wetlands. The objectives are broken up into three focal points. These include land, sea, and air. Topics within each will be discussed during each broadcast, as well as within the teachers' educational materials.

2. Contents of Package

Your packet contains the following lessons:

- Weedon Island – Land
- Weedon Island – Air
- Weedon Island – Sea

Your packet contains the following activities:

- Building a Wetland
- Shells for Tools and Cooking
- Native or Exotic Plants?
- A Wonderful Bird Story
- Pelican Research Program
- Adaptations and Structure
- Waterfront Property
- Water Quality Station
- The Nitrogen Cycle

B. Program Preparation

Teacher Information: This material is background information for teachers. This should be read and discussed with students before video program.

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C. Show Time

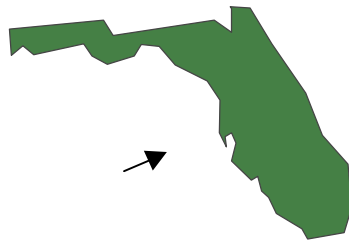
1. Broadcast Topics

This broadcast will link into discussions on mathematics, geography, weather, chemistry, spelling and marine biology.

Unit III. Weedon Island

What is Weedon Island

Weedon Island is one of a group of islands located in Tampa Bay near St. Petersburg, in Pinellas County, Florida. The other islands include Mud Hole Island, Benjamin Island, Christmas Island, Googe Island and Ross Island of the Preserve. Comprising approximately fifteen hundred acres, the Preserve is quite flat; the shellfish mounds left by the Timucuan Indians have the highest elevation. Eleven distinct habitat communities



are found in the Weedon Island Preserve.

Weedon Island is unlike any other park in this Florida County. All picnic areas are well hidden. Otherwise, this place is mostly for the birds, snakes, raccoons, dolphins, deer, otters, bugs, and other inhabitants of this island reserve.

The impact that a natural preserve has on the marine environment can be summarized in one word: preservation.

See map attachment: Where is Weedon Island.

History of Weedon Island

adapted from The Weedon Island Story written by Mr. Keith Thompson

Weedon Island's first residents were American Indians. They came to Weedon Island in 1500 BC in pursuit of migrating mammals. Between 800 AD and 1300 AD, the Weedon Island area was inhabited by a tribe of native Americans. The people were Timucuan Indians, and they called the area Ucita (u see tâ). Chief Harrihiqua controlled the area. The Timucuan Indians were brave and determined warriors, as well as successful farmers.

The islands are still littered with Indian artifacts. Much has been

learned about the culture of the Timucuan Indians through the remains of their kitchen **middens**. The word **midden** refers to a pile, or accumulation of refuse in and around living areas. There are actually two different kinds of middens. A "kitchen midden" is a refuse pile usually of shells but also containing animal and fish bones, broken artifacts, and other things that people have intentionally discarded. A "village midden" consists of food remains, broken tools and implements, and other debris that accumulate gradually in the living

area. At one time, shell middens and mounds were often scraped up and used as road-fill.

The Timucuan culture flourished until the arrival of the Europeans in 1513.

Juan Ponce de Leon, a Spaniard, was credited with the discovery of Florida in 1513. The years following were filled with many battles. Panfilo de Narvaez, Juan Ortiz and Hernando de Soto all unsuccessfully tried to overcome the Indians. Wars for possession of Weedon Island continued until Florida became one of the United States in 1845. The continuous warring left the Timucuan culture weak and the population in a steady decline. The few survivors joined with the Seminole culture.

The name Weedon Island was adopted in the early 1900's. The island was a wedding gift to Blanche and Leslie Weedon in 1898. Originally, it was known as Weedon's Island, but the 's' was dropped when Leslie sold it in 1923.

Over the passing years, the usage of Weedon Island has been colorful. It has been involved in scandalous real estate affairs (1927-1931), served as an archaeological site for the Smithsonian Institution (1930), national headquarters for the airline Eastern Air Transport (1931), was host to the Sun Haven Movie Studio (1933), and served as a training site for Naval and Army pilots during WWII (1945).

Through the 1940's, Weedon Island has had a tumultuous and flavorful history. At one time, the city of St.

Petersburg wanted to turn the island into a National Park. In 1955, The Florida Power Corporation bought the northern portion of the island for the construction of a power plant. An extensive dredge and fill project preceded construction of the plant. As a result of this extensive excavation, several of the small surrounding islands were displaced.

Weedon Island was put on the national Register of Historic Sites in 1972. Since that time, the Florida Park Service and Florida Power Corporation have reached an agreement to jointly manage and protect the preserve. At last, Leslie Weedon's dream of turning his island into a park was coming true.



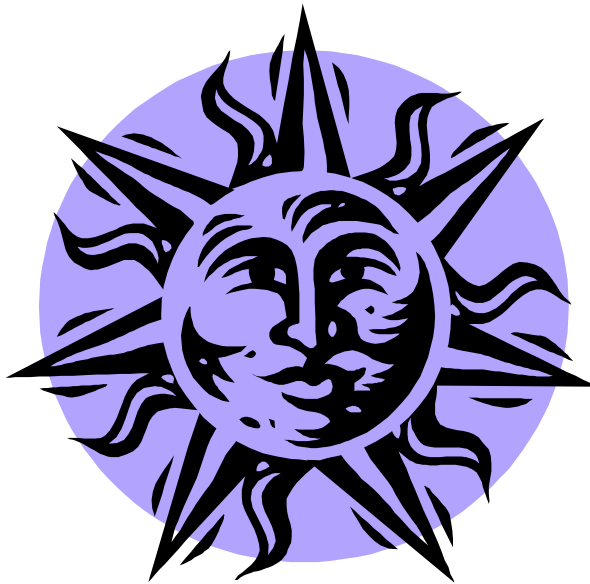
Today, the Weedon Island Preserve is a living classroom. It is a well-known birding and fishing site. Although shellfishing is prohibited for health reasons, Weedon Island's fishing pier and the outlying oyster bars are ideal sites for catching sea trout, snook, and sheepshead. A four-mile, self-guided canoe trail permits exploration of the Preserve's islands.

Future of Weedon Island

People have recognized that the future of Weedon Island lies in its ancient past. The Indian mounds are patrolled daily to prevent the disturbance of these historical sites, and the exotic plants and animals are being removed to maintain the balance for the native plants. The community is being educated about the history and ecology of the area

so that the Weedon Island Preserve may be enjoyed for years to come.

By the year 2000, a new educational center will highlight Weedon Island's rich natural and American Indian history. Additionally, negotiations are underway to acquire more land from Florida Power. Hopefully, the birds will continue to nest, the fish to jump and the raccoons to scurry.



Special Activity for Teachers and Students

Ecoventures: Learning in Florida's Environment

EcoVentures is a multimedia environmental education program designed to help middle grade students, and other users learn about Florida's aquatic environment and the many issues associated with protecting and managing our aquatic resources.

It originated at Florida State University, and who was then contracted by the

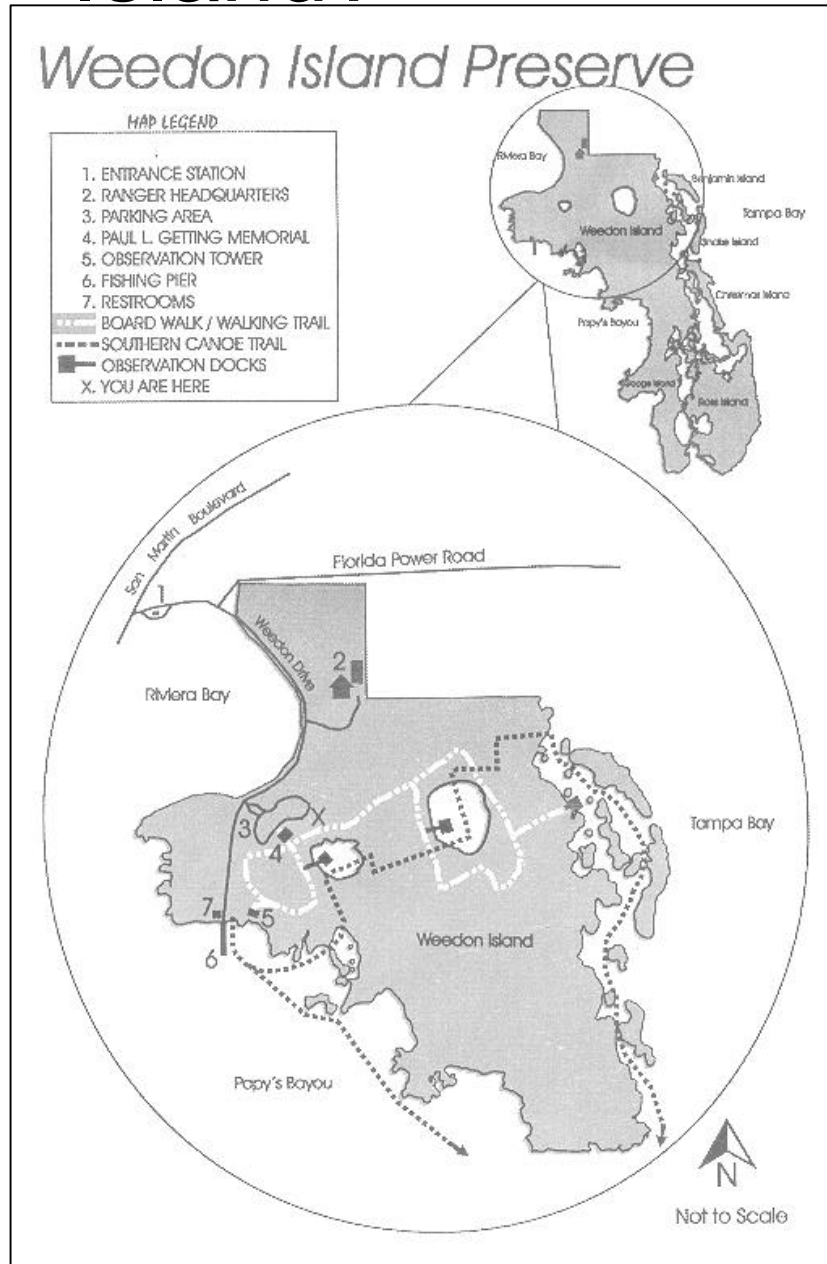
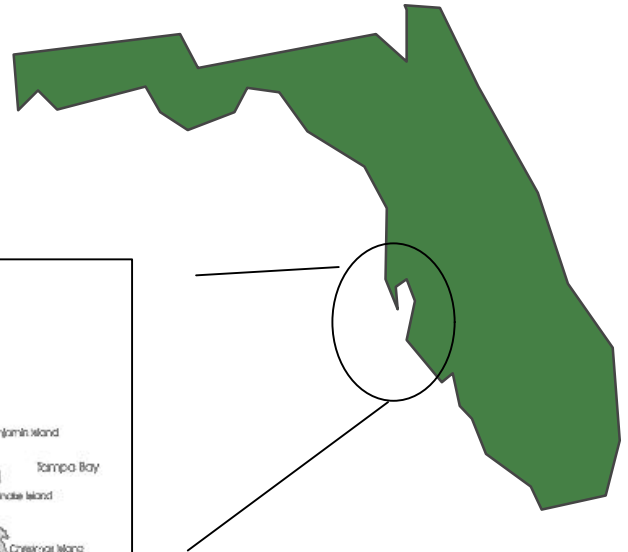


Department of Environmental Protection to develop educational programs. The program has independent, but interrelated components. Many lessons on Florida environments are illustrated through the fictional R.U. Green State Park. Environmental issues are studied, and the students become 'involved' in resolving them. This is accomplished using short video clips, then student-directed investigations. To give students the experience of working as scientists, management tools, including rulers, overlay maps, water-testing equipment, microscopes, and other materials are available on screen. Students can use these tools to assist in data collection. Consultants are available to help students with their research.

Florida's anglers and boaters make this program possible. Anglers and boaters pay federal taxes on fishing gear and boats. In addition, portions of the state's fishing license revenues are also allocated for the EcoVentures program. For more information about this fun and exciting program, contact:

Florida Department of Environmental Protection
EcoVentures
3900 Commonwealth Blvd. MS 240
Tallahassee, FL 32399-3000

Where is Weedon Island?



Lesson I: Weedon Island -- Land

keywords: midden, rookeries, erosion, brackish, mangroves

Weedon Island is a nature preserve where humans are the intruders. So when you visit, you should bring along your bug repellent as you might find that the beetles, cicadas, and mosquitoes might be interested



in you. You might also find a harmless praying mantis, a cockroach or two, and many kinds of spiders if

you look closely. One of the most beautiful spiders found there is the golden orb. It can spin an intricate web larger than six feet in diameter! And when you look at the web at the right angle, you can see that the silk is a golden color. Thus, how the golden orb got its name. Finally, as you continue your walk through the preserve, keep your eyes open for squirrels, armadillos, and foxes. You might even encounter a shy bobcat, or raccoon feasting on berries

Weedon Island, located in Pinellas County, Florida, is a unique wetland **habitat**. The existence of all types of **wetlands** is determined by water

the amount that flows into and out of wetlands and the amount of water stored there.

Wetlands support diverse habitats of fish, birds, mammals, microorganisms and vegetation. Diverse habitats benefit fish for spawning, feeding or seeking shelter from predators. The protective plants that emerge from the mud provide a variety of foods and cover for the waterfowl and smaller organisms.

Wetlands support some of the most diverse ecosystems on earth. Inland wetlands may help control floods by storing water and slowly releasing it to downstream areas. Coastal wetlands reduce wave action. In addition to being a wonderful resource, they provide many opportunities for recreational and educational activities.

Our wetlands are in peril. Since the late 1700's over half of the wetlands of the United States have been lost. Wetland losses have resulted in greater flooding and erosion, reduced water quality, and reduced populations of many plants and animals.

What are Mangroves?

Mangroves are trees or shrubs that are native plants of Florida. All kinds of mangroves have a common trait in that they grow in shallow and muddy

salt water or **brackish** waters. They are classified as any tropical tree or shrubs belonging to the genus *Rhizophora*, the species of which are

mostly low trees growing in marshes or tidal shores, noted for interlacing aboveground roots. Mangrove trees thrive in tropical environments where wetlands are abundant. They have green elliptical shaped leaves, long propagating root stems, and grow where water is abundant. They are sensitive to extreme temperature fluctuations. **Salinity**, water temperature, tidal fluctuations, and soil affect their growth and distribution. They are unique in that they can thrive in salty environments because they are able to obtain freshwater from saltwater. The mangroves may either secrete excess salt through their leaves, or completely block absorption of salt through their roots.

Mangroves are important for many reasons. They trap organic materials, important nutrients, and help prevent **erosion**. Mangroves

protect uplands from storms, winds, waves and flooding. Not only do the mangrove trees trap materials and help to prevent erosion, they provide a home for various marine organisms. Some of these organisms include oysters, crabs, and shrimp. Mangroves also supply a safe nursery for fish. Healthy mangrove forests are important to provide food for recreational and commercial fishes.

Without mangroves, the population of many fish and shellfish would be drastically reduced. In addition to providing a home for marine related organisms, beautiful coastal birds rely on the branches to nest. The nesting areas in the branches of the mangrove trees are called **rookeries**.

Mangrove Forests of Weedon Island

Worldwide, there are more than 50 species of mangroves. In the Weedon Island Preserve, there are three species of mangrove trees.



They are most commonly known as the red mangrove, the black mangrove, and the white mangrove. Of the three, the red mangrove, *Rhizophora mangle*, is the most well-known. The red mangrove can be easily identified along the water's edge by its tangled, reddish roots called "prop roots." These roots have earned mangroves the title, "walking trees." The trees appear to be standing or walking along the surface of the water. The seeds of the red mangrove are very distinctive. They are approximately 8 inches in length, and $\frac{1}{4}$ to $\frac{1}{2}$ inches wide. They are green-yellow, cigar shaped, and heavier at

the root end than the leafy end. Upon falling, they plant themselves in the mud below the tree.

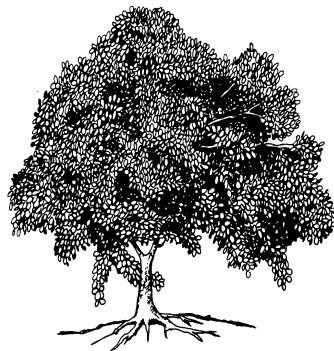
The black mangrove, (right) *Avicennia germinans*, is usually found on a higher elevation than the red mangrove. It can be found further inland than the red mangrove. The black mangrove does not have the “walking” roots, but it has **pneumatophores**. These are narrow, finger like projections that protrude from the soil near the tree’s trunk. **Pneumatophores** act as aerating organs. That means, the pneumatophores help the mangrove

to exchange oxygen and carbon



dioxide with the atmosphere.

Laguncularia racemosa, (left) the white mangrove, is found at higher elevations than the red or black mangrove. It does not have any visible aerial root systems. The easiest way to identify it, is by the leaves. They are elliptical, light yellow-green and have two glands at the base of the leaf blade where the stem starts.



Other Vegetation at Weedon Island

Other Vegetation at Weedon Island.

Mangroves are the most notable vegetation at Weedon Island. But many more beautiful plants are also found there.

Over the lifetime of Weedon Island, there have been many



introduced species of plants and animals. These are called exotics. When a plant or animal is moved beyond its normal range, not native to the local area, it is called an **exotic**. When a plant or animal lives in its natural range and



habitat, it can grow and reproduce without outside aid. It is in balance with its surroundings. This is called a **native** plant or animal.

Most animals that live in native plant habitats are less common in exotic plant habitats. Exotic plants can compete and replace native plants, and therefore reduce fish and wildlife populations.

Many of the plants in Florida today originated on other continents like Africa, South America and Asia. The volunteers and rangers at Weedon Island have been working for many years to control the plants and animals that are exotic to the island. Plants and animals such as the Brazilian pepper, Schefflera and Australian pine are all being removed from the area in the effort to reformat the area to its original state.

Viewing the Inhabitants of Weedon Island

In a place that is more for the birds, fish, snakes, raccoons, dolphins, bobcats, deer and otters than humans, touring Weedon Island might be difficult. Florida's Park Service and the Rangers have solved that dilemma. With the newly built boardwalks and self-guided canoe trail, viewing the inhabitants of Weedon Island is simple for all. In the shallow waters along the way, a sightseer might find pink spoonbills strutting through the waters, blue herons and ospreys startled by the

noise, and even smaller herons and ibises watching from the trees. Further into the mangrove trees, millions of oysters and clams cling to the mangrove roots, and small crabs scurry up and down the trees. In the open waters, snook, mullet, and horseshoe crabs can be found swimming.

In the beautiful flowers that add beauty to the refuge, many different butterflies can be found sipping nectar.



WHAT CAN YOU DO?

To help stop the spread of exotic plants, there are several things you can do:

After boating, make sure all plants are removed from the boat, motor, and trailer. Small pieces of plant stuck on a motor can live for weeks and may be moved to another lake or river. Often, this is how exotic plants spread in Florida waters.

Leave nature in its place. Don't pick things and take them home.

Never empty your home or school aquarium into a lake, river or wetland.

Many aquarium plants sold in pet stores are exotic.

Decrease the amount of pesticide that enters the wetlands! Use a general all-purpose spray: 2½ tablespoons liquid soap with 2½ tablespoons cooking oil in a gallon of water.

Plant the native way! Landscape with native and drought tolerant plants.

They conserve water, require fewer chemicals, and cost less to maintain.

One-fourth of the plants, one-half of the fish, two-thirds of the birds, and three-fourths of the amphibians listed as threatened or **endangered** in the United States are associated with wetlands.

Fun Facts

Wetlands act as a nursery for many organisms. They also provide a nesting habitat, wintering habitat and feeding grounds for many fish, birds and other wildlife.

Wetlands contribute to drinking water supplies.

Wetlands are important in providing protection from flood and storm damage. They store and slow flood waters, lower wave heights and reduce soil erosion.

Construction and city growth has destroyed many millions of acres of wetlands. There are ONLY 99 million acres of wetlands remaining in the lower 48 states. California has lost more than 90 percent of its wetlands! Can you imagine how many wetlands existed when the settlers arrived?

Activity III-1A. Building a Wetland

Modified and adapted from the Water Sourcebook produced by the Georgia Water Wise Council in conjunction with the Environmental Protection Agency. For more information, call (770) 426-8936

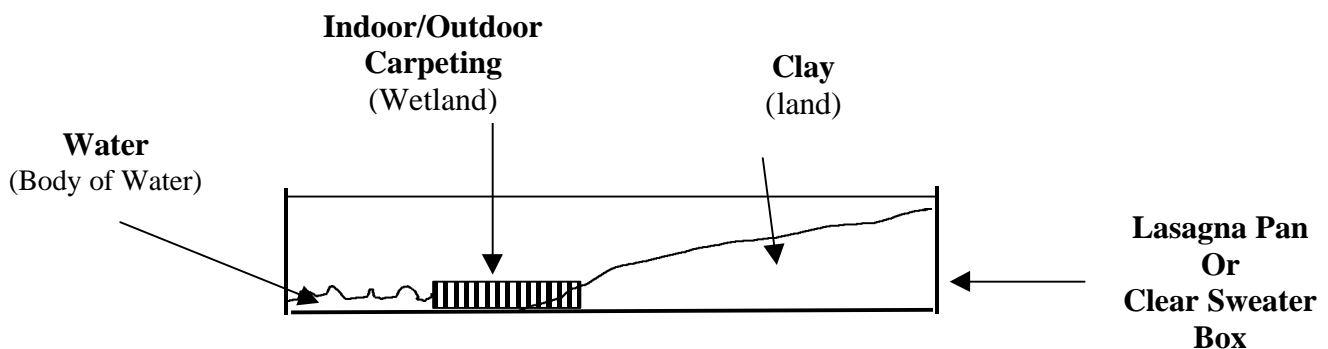
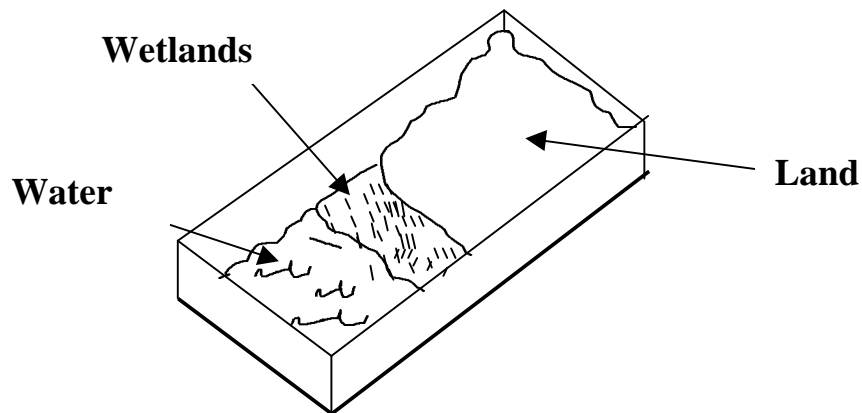
Background: Wetlands are valued as an environment for a variety of plant and animals to live in, but also they provide water resources and other benefits to cities. Some of these include:

1. Wetlands reduce flooding by slowing floodwaters.
2. Wetlands help to filter **sediment** and pollution from runoff before it reaches rivers and streams.
3. Wetlands slow the rate of soil erosion.

Objective: The function of wetlands will be explored through stimulating thought about the role wetlands play in the world.

Materials:

- Glass lasagna pan (or clear plastic sweater box)
- Modeling clay
- Turkey baster
- Strip of indoor-outdoor carpet, 3 inches wide by the width of the pan
- Clear water
- Muddy water



Activity:

1. Spread a layer of clay in half of the lasagna pan or sweater box to represent land. Leave the other half of the pan empty to represent a lake or other body of water. Shape the clay so that it gradually slopes down, as in the activity diagram. Smooth the clay along the sides to seal the edges. Cut a piece of indoor-outdoor carpeting that will completely fill the width of the pan along the edge of the clay. This represents the wetland. Do NOT place the carpet into the model yet.
2. Demonstrate to the class: use the turkey baster to pour clear water slowly over the clay. This represents rainfall. Ask the students to observe what happens. *The water runs over the clay and into the pan or box.*
3. Use the baster to drain 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 wetland. Place the strip in model, and ask the students to predict what will happen when you pour water onto the clay again.
4. Explain that wetlands are important because they are shallow basins. Using the model, explain how this helps reduce flooding. These basins collect water, and slow its rate of flow over the ground. Pour the same amount of water onto the model again. Let the students describe what happens. *(The water will drain more slowly because it is hindered by a wetland.)*
5. Drain out the clear water. Leaving the carpeting in place, pour some of the muddy water onto the clay. Ask the students to compare the water that flows through the wetland into a body of water with the water left in the jar. *(The water that passed through the wetland is clearer.)* This demonstration shows the ability of wetlands to reduce soil erosion and filter stormwater pollutants.
6. Remove the carpeting and again pour the muddy water over the model. Show what would happen if wetlands were not there to act as a water filter. *(All of the pollutants would flow directly into the water body.)*

Discussion Questions

- What will happen if Florida, or any other areas rich in wetlands, continue to destroy their wetlands in order to accommodate more people?
- Are wetlands valuable in areas where recurring flooding costs homeowners, business owners and insurance companies millions of dollars?
- What role do wetlands play in the health of the **ecosystem**?

Background material for Teachers to use with the Discussion Questions

- If wetlands continue to be developed, there will be greater risk of flooding, more water pollution and erosion, etc.
- Researchers at the University of Florida have found that when wetlands make up 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.
- Sediment and other pollution that reaches rivers and streams adversely affect populations of fish and other **aquatic** animals. This in turn affects animals in the ecosystem such as bald eagles that depend upon fish for food. Wetlands help to keep water clean.

Activity III-1B. Shells for Tools and cooking Utensils

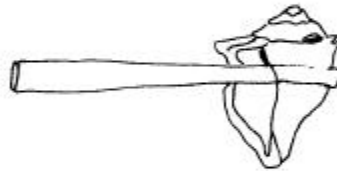
Ladle, dipper or spoon



Cutting tool with handle through two holes



Hammer



Lightning whelk

Cutting tool with handle through one hole and a notch in the rim



Awl or gouge



In the illustration above, there are many tools made from shells. The shells that the Timucuan Indians used were whelk shells. In the following activity, we are promoting preservation as well as illustrating how the Timucuan Indians survived on the land and used its resources wisely.

Objective: Students will learn how valuable natural resources are and how they can be used for many different purposes. Adults are necessary to complete this activity safely!

Materials:

Small shells
Drill and bits
Small dowels

Hemp twine
Plenty of adult supervision
Exacto Knife

Methods:

1. Take the students on a short walking field trip to a local beach or shell quarry. Identify many kinds of shells.
2. Collect a representative shell, that is not broken.
3. Back in the classroom, wash and dry the shells. Sort the shells according to size.
4. Decide which tool will be made and then fashion the shell to look like the diagram. To insert a handle, the shell will need to be drilled and the hemp twine used to secure the handle to the shell.
5. For the other tools, the exacto knife should be adequate to carefully cut and grind away the pieces.

Activity III-1C. Native or Exotic?

Plants that have been living in Florida's lakes, rivers, and wetlands for hundreds of years are called NATIVE. Plants that are not native to Florida are called EXOTIC. Exotic plants were brought to Florida from other continents like Africa, South America and Asia.



Exotic plants and animals are a problem in almost every part of the country. Below are some common native and exotic plants found in Florida's lakes, rivers and wetlands. Ask the students to determine which are native or exotic.

1	2	3
4	5	6
7	8	10
9		

1. Eelgrass 2. Brazilian Pepper 3. Fanwort
 4. Water lettuce 5. Melaleuca 6. Hydrilla
 8. Australian Pine 9. Water Hyacinth 10. Bulrush
 7. Pickerelweed

Teacher's Answer Key to Native or Exotic:

Native Plants: 1, 3, 4, 8

Exotic Plants: 2, 5, 6, 7, 9, 10

Additional project:

Have each student expand his or her knowledge of exotic plants and animals. Have the students search the internet, newspapers, libraries and any other sources to learn about other exotics found across the nation.

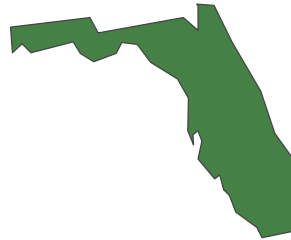
STUDENT INFORMATION SHEET III-1 Weedon Island – Land

Weedon Island is a nature preserve near St. Petersburg, in Pinellas County, Florida. Comprising approximately fifteen hundred acres, the preserve is quite flat; the shellfish mounds left by the Timucuan Indians have the highest elevation. Eleven distinct habitat communities are found in Weedon Island Preserve.

Weedon Island is mostly for the birds, snakes, raccoons, dolphins, deer, otters, bugs, and

other inhabitants. The impact that a natural reserve has on the marine environment can be summarized in

one
word:



preservation.

What kind of environment are you in?

Visualize Location I

A cypress swamp where day becomes night under the trees' thick canopy of branches and leaves. Cypress knees poke out from under murky, standing water, and the humming of insects completes the swamp's eerie atmosphere.

Visualize Location II

A coastal marsh where there are many species of seagrasses waving softly in the breeze, shorebirds are flying overhead, blue herons are stalking small fish and where tides affect whether the land is wet or dry over the course of the day.

Cypress swamps and coastal marshes are both **WETLANDS**. All wetlands have common characteristics, but they vary drastically in appearance, plant and animal habitat and other characteristics. There are five primary wetland types:

1. Coastal marshes
2. Mangrove swamps
3. Freshwater marshes and wet prairies
4. Cypress swamps
5. **Hardwood** swamps

To learn more about the wetlands in general and the state of Florida, contact the Southwest Florida Water Management District at 1-800-423-1476 x4757, or 352-796-7211.

Over the lifetime of Weedon Island, there have been many introduced species of plants and animals. These are called **exotics**. When a plant lives in its natural range and habitat, it can grow and reproduce without outside aid. It is in balance with its surroundings, this is called a **native** plant or animal. Many of the plants in Florida today originated on

other continents like Africa, South America and Asia. Plants from other countries also influence the animals that live in a habitat. Most animals that live in native plant habitats are less common in exotic plant habitats. So exotic plants can reduce fish and wildlife populations and replace native vegetation.



ASK YOURSELF?

In addition to harming fish and other **vertebrates**, what are some other ways that exotic plants affect swimmers and boaters?

Answer: They can smother lakes and rivers making boat navigation difficult and swimming unpleasant!

Fun Facts

Wetlands act as a nursery for many organisms, a nesting habitat, wintering habitat and feeding ground for many fish, birds and other wildlife.

Wetlands contribute to drinking water supplies.

Wetlands are important in providing protection from flood and storm damage. They store and slow flood waters, lower wave heights and reduce soil erosion. Construction and city growth have destroyed many millions of acres of wetlands. There are ONLY 99 million acres of wetlands remaining in the lower 48 states. California has lost more than 90 percent of its wetlands! Can you imagine how many wetlands existed when the settlers arrived?! Decrease the amount of pesticide that enters the wetlands! Use a general all-purpose spray: 2½ tablespoons of liquid soap with 2½ tablespoons cooking oil in a gallon of water.

Plant the native way! Landscape with native and drought-tolerant plants. They conserve water, require fewer chemicals, and cost less to maintain. One-fourth of the plants, one-half of the fish, two-thirds of the birds, and three-fourths of the amphibians listed as threatened or endangered in the United States are associated with wetlands!

If you find any interesting facts, or have any questions that you would like to share with the staff at Project Oceanography, please feel free to call us at: 1-800-51-OCEAN or e-mail us at: pjocean@marine.usf.edu We will answer you either via e-mail or on the air during a broadcast. Visit our website at <http://www.marine.usf.edu/pjocean/index.html>

Lesson II: Weedon Island: Air

keywords: plumage, ratite, bills, talons, molt

Background Bird Information:

In the air, or masqueraded in the canopy of mangrove trees, someone walking quietly might encounter a red-tail hawk, a pileated woodpecker, a red cardinal, and even a wren or warbler. If fortunate, they a bald eagle soaring overhead. Beautiful butterflies color the sky with their wings, and down near the

water's edge, a roseate spoonbill or blue heron might be found hunting. Decorating the water's edge and the surrounding trees might be many white ibis, wood storks and sandpipers. The birds might be hunting small fish, bugs and worms.

Plumage

Birds' feathers, or **plumage** play many important roles; they are influential in attracting a mate, intimidating competitors, vital for warmth and camouflage. In many species, adult males are very brightly colored, whereas the females blend into the background. Plumage protects birds against the cold and rain. Feathers trap air near the body of the bird, and this acts like insulation around the bird's body. Swimming birds have water-repellent body feathers. Under these there lies a dense coat of short, fluffy feathers called down. Down is an excellent insulator.

Birds lose and replace their feathers at least once a year. This is called **molt**. In most migratory species, the new plumage is grown after breeding and before fall migration. The reason that birds **molt** is because feathers become faded and brittle with long exposure to sunlight. Some are lost during flight or pruning, or they just grow old with time and use.



Senses



Birds rely heavily on their senses. Sight, hearing, smell, and

touch are the most commonly used in all birds. Their sense of sight is very good and they can perceive objects in very dim light. Some birds have better developed senses according to their needs, lifestyles and habitat. In addition to these

senses, birds have a superb sense of balance and are sensitive to small vibrations.

Most birds have relatively large eyes and can perceive colors. Some birds' eyes are on the sides of their heads. This allows them to see a larger portion of the surroundings without turning their heads. Others, like owls', have eyes located on the front of their head. Their eyes cannot move from side to side in their sockets; therefore, owls must turn their faces toward an object to see it.

Birds use their voices to sing, communicate and attract a mate.

Often, sound rather than sight recognize birds' mates or young. Only a few kinds of birds have a well-developed sense of smell. These birds include the American vultures, condors and woodpeckers. Vultures locate dead animals on which they feed by using both sight and sound. The honeyguides, small woodpecker-like birds of Asia and Africa, locate beehives by smell. The Kiwis of New Zealand, the smallest of the **ratite** birds, are nearly blind. They are the only birds having nostrils at the very tip of their **bill**. Not much is known about the sense of taste in birds, but they have only a few taste buds on their tongues.

Life History

The life history and lifestyle of birds are intimately correlated with the seasons. The seasons and climate affect birds in many ways. In the temperate climate where four seasons are regularly found, birds mate and nest according to the season. In the tropical and

subtropical climates, some birds will nest on sandy beaches that are revealed when the water recedes; others use the new vegetation that springs up after the rainy season to build their nests. Others use the seasons to follow migratory patterns.

Adaptations



Birds have similar body plans, but are very different in body size and proportion. The largest living

birds are found in the **ratite** family. The largest of all is the ostrich, nearly 2.5m (almost 8 feet tall!) and weighing as much as 167kg (345lb). The smallest birds are the hummingbirds of the Western

Hemisphere. The tiniest of these is the bee hummingbird of Cuba, only 6.3 cm (2.5 in long)!!

Many birds rely on the water for nesting, raising their young and finding food. Several kinds of birds pursue their food by swimming underwater. Almost all swimming birds, divers and surface swimmers, have webs of skin connecting their toes. This creates a paddle for them to navigate through the water.

Another group of birds is adapted such that their noses look like tubes. These tube like bills are useful for capturing food. These birds are strictly marine. These birds are the ibis' and the sandpipers

The group known as the raptors, or birds of prey, has both a day-hunting group and those that feed at night. Hawks, eagles, falcons and vultures are the first type while owls are night creatures. They are all meat eaters. All have powerful, sharp bills, and all but the vultures have grasping toes

tipped with curved, sharp claws or **talons**.

Other birds that feed primarily on flying insects have developed long wings and wide-opening mouths. These birds include the swifts and the swallows. Others, the nightjars or goatsuckers, not only have huge mouths, but also a row of long hairlike feathers called **rectal bristles** surrounding the mouth. These bristles act as a sort of flytrap.

See Diagram I and II for basic bird anatomy.

Diagram I. Basic Bird Anatomy as seen from the exterior.

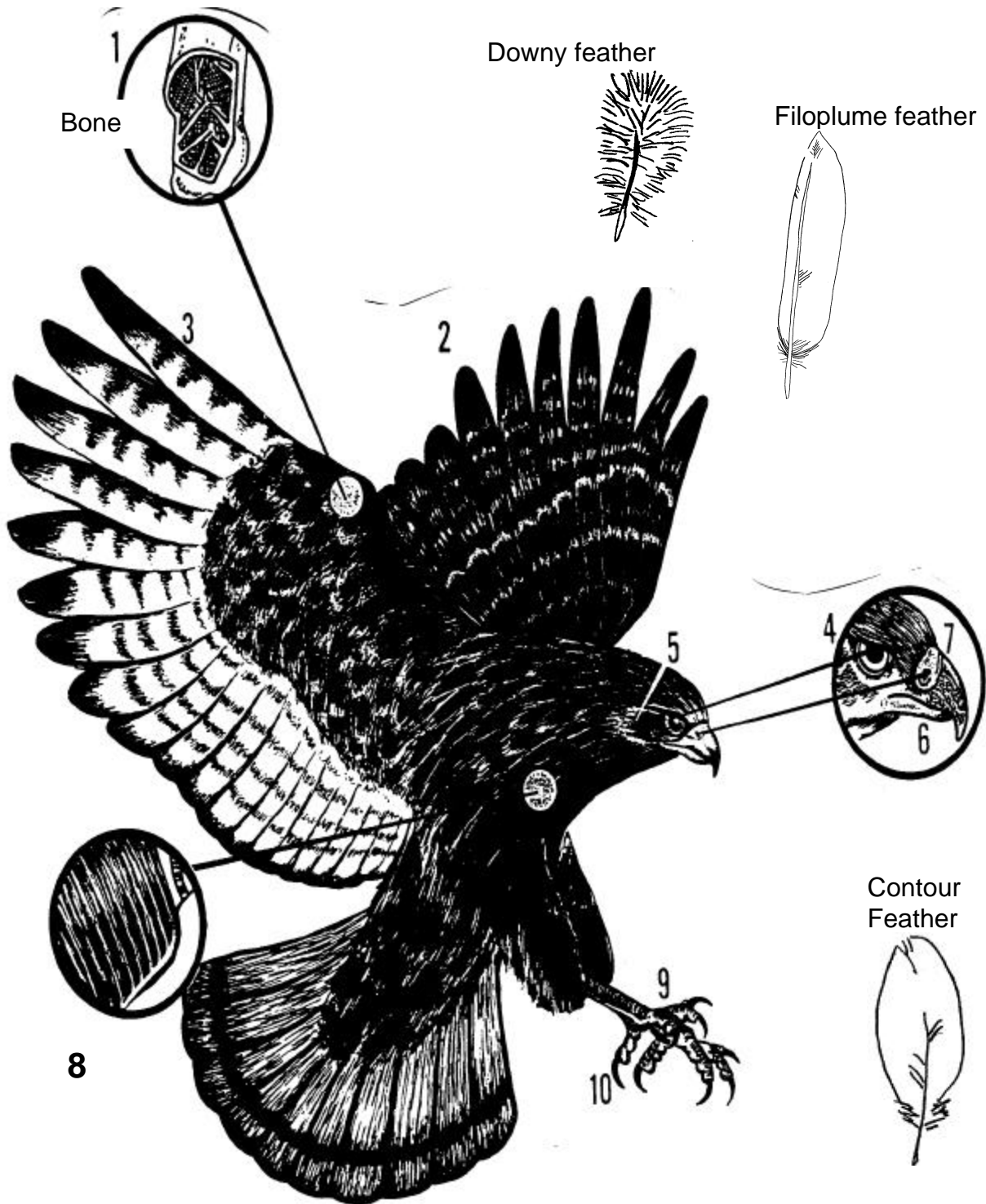


Diagram I. General Anatomy of a Bird.

1. **SKELETON** - Hollow bones with braces inside for support. Makes the skeleton lightweight and strong.
2. **WINGS** – Wings are big and broad for soaring, or short and stubby for flying through trees, or slender and pointed for speed.
3. **FEATHERS** – Birds have several kinds of feathers. Contour feathers cover their bodies, wings and tails. Downy feathers next to the skin provide. Filoplumes form crests and tail displays.
4. **EYES** – Sharp eyesight lets birds of prey see about 10 times better than humans
5. **EARS** – Birds have small ear openings on each side of the head, just below and in back of the eyes.
6. **BEAK** – A raptor’s beak is sharp, curved, and powerful for grasping and eating prey. The size and shape of the beak depend on the size of the bird’s prey.
7. **NOSTRILS** – Two nostrils for breathing are located on top of the upper beak. Most birds, including vultures, have a poorly developed sense of smell.
8. **MUSCLES** – Powerful flight muscles are attached to the large breastbone. These muscles help the birds take off (even with prey), maneuver, hover, and land.
9. **FEET** – Most raptors have three toes pointed forward and one toe directed backward. Owls and ospreys have a reversible outer toe, which means they can turn it to the front or to the rear.
10. **TALONS** – All raptors, except vulture, have long, curved sharp talons (claws) for seizing live prey. The larger the prey, the longer the talons.



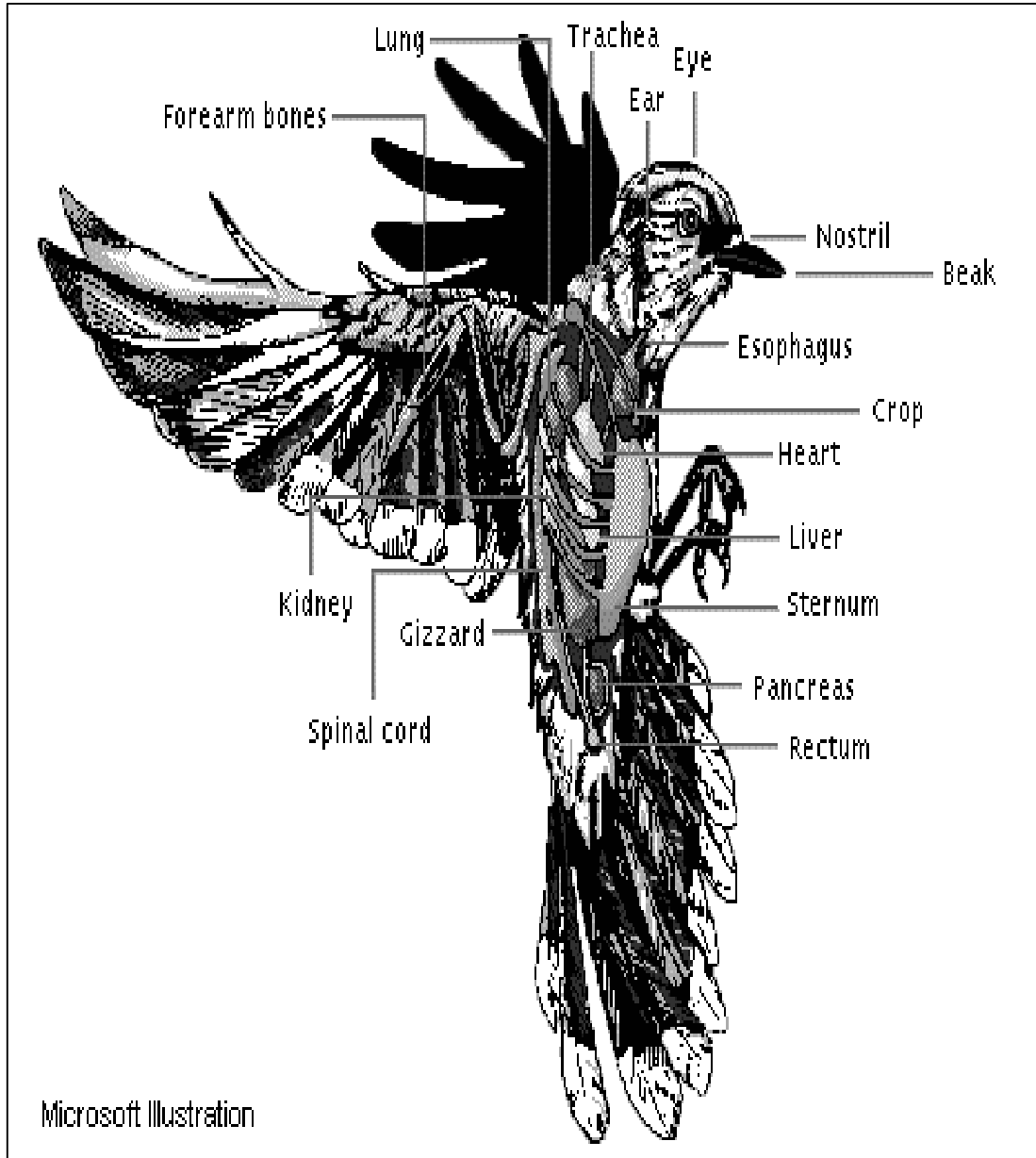


Diagram II. General Anatomy of the Inside of a Bird.

Other Important Birds on Weedon Island



In addition to the birds of prey found at and around Weedon Island, there are many other birds that make the island their home. Some it is the Brown Pelican that makes Weedon Island, and other parts of the Florida Coast, its home.

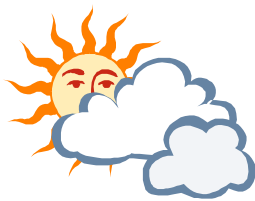
Brown pelicans are very handsome birds and with their huge wingspan of 6 feet, they can be seen soaring high above the water or gliding over the waves. Brown pelicans have a large, stocky body, brown in color, and a massive bill and throat pouch

of these birds are spoonbills, warblers, blackbirds, cardinals, ibis', egrets, herons, pelicans, and many, many more. There are many different kinds of each bird that nest on the island. One of the most common to all coastlines is the brown pelican. This can be misleading as it is endangered in many other states. The pelican is an interesting and sociable bird. In Florida,

Pelicans nest in **colonies** on coastal mangrove islands. Nests are built in low trees or mangroves to protect the nest and hatchlings. Pelican babies are born without feathers and are fed partially digested fish from the parent's gullet. Usually two or three chicks are hatched. The chicks will be ready to leave the nest in 12 weeks.

WATCH FOR PELICANS IN THE AIR!

Pelicans often fly together in long lines of several or more birds. They will flap their wings and then glide. The wing flaps are not at the same moment, but in sequence, starting with the leader. Each bird will flap when he reaches the same spot where the lead bird began to flap. Often the birds will fly very close to the water's surface, skimming along just above it!



Pelicans take off from the water with help from their large feet. They kick both feet together to boost their large body into the air. Landings in the water are accomplished with both feet out in front of the bird, skidding against the water acting as brakes.

THREATS TO PELICANS IN FLORIDA

Due to overbuilding, many pelican nesting areas have been lost. As populations grow, pelicans are in increasing danger of losing more nesting and breeding areas.

Feeding birds near fishing areas is not a good idea. It increases the chances of the pelican getting tangled in fishing gear as well as encouraging them to become nuisances by stealing fish from buckets and getting tangled in line.



Pelicans often get tangled in fishing line, lures and hooks. If

the line is cut by the fisherman and is left to dangle from the bird, it could get caught on a mangrove branch, trapping the bird and leading to **starvation**, or the line can become tightly wound around the pelican's legs or wings.

How You Can Help!



If you, or someone you know, hooks a pelican, the bird should be reeled in carefully or walked to the shore if possible. **DON'T** attempt to do this on your own! Get help as pelicans are very strong! One person should hold the bird while the other works on freeing the line or hook. It is a

good idea to cover the bird's head with a towel as the darkness calms the bird and the towel will protect your hand!

If there is a hook lodged in the bird, first clip the barb off and then slide the hook out. If the bird seems weak, ill or seriously injured, take it to the nearest Seabird Sanctuary or Veterinary Surgeon's Office. Make sure to place the hook and line you remove in the trash and not in the water.

Fun Facts:

Pelicans do NOT carry fish in their pouch.

Pelicans flap their pouch to lower their body temperature

Pelicans are unique birds. They can live to be 30+ years old, weigh from 5-8 pounds, and might eat 3 to 4 pounds of fish per day!

Pelicans are victims of oil spills, **pesticides**, fishing hooks, fishing lines, guns, arrows, cars, boats and power lines.

Nearly 20% of all land and seabirds (between 700,000 and 1.2 million birds!) that live on the Atlantic Coast depend on Florida's wetlands for their winter home

Hummingbirds are aerial acrobats. They are the only birds that regularly fly backward! Their legs and feet are too weak for walking or hopping, so they must fly from one perch to the next.

Activity III-2A. Bird Words

Modified from Suncoast Seabird Sanctuary, Pinellas County, Florida

Sanctuary
Incubate
Rookery
Species
Plumage
Molt
Preen
Migrate
Nocturnal

Match words with their definitions:

- _____ a single kind of animal, plant, or bird.
- _____ to clean, smooth, and oil feathers with the beak.
- _____ a breeding place or colony of birds.
- _____ to warm and hatch eggs.
- _____ active during the night.
- _____ feathers that cover a bird.
- _____ to shed feathers.
- _____ a protected area for birds and animals where hunting is prohibited.
- _____ to move from one place to another with the change of the seasons.

Activity II-2B. A Wonderful Bird Story

Modified from Suncoast Seabird Sanctuary, Pinellas County, Florida

Use the following words to fill in the story below. Each word will be used only one time.

Sanctuary
Incubate
Rookery
Species
Plumage
Molt
Preen
Migrate
Nocturnal

There are many _____ of birds. Some are easily seen because they are active during the day. Others, like owls, are hard to see because they are _____. One of the easiest ways to identify birds is by their colorful _____. A bird's plumage, of course, is affected by their _____ing and _____ing. Birds nest in a _____. They lay their eggs, then _____ them until they hatch. For birds that _____, rookeries are only temporary habitats. Throughout history, wild birds have been hunted for their beautiful feathers, and as a sport, but today many areas of the country have been declared _____ies to protect the many different species. In Pinellas County, Florida, there is another kind of Sanctuary – The Suncoast Seabird Sanctuary where injured birds are repaired, and if possible, released to fly free once again.

ACTIVITY III-2C Pelican Research Projects

Pelican Research Project

Conduct a research project on pelicans.

Some ideas for possible projects:

*Comparing White and Brown Pelicans

*Pelicans in Danger!

The finished product could be in the form of a poster, oral presentation or written paper.

ACTIVITY III-2D Adaptation, Structure and Function - Class Discussion

Adaptation, Structure and Function - Class Discussion

Pelican Feeding - How do pelicans use their bills, pouches and wings to catch their prey?

Teacher Background:

Pelicans glide over the water in order to spot their potential prey. They bank out of the sky in a steep climbing turn, stall in flight and drop like a rock plummeting towards the water. They use their wings to give final course directions. At impact, the wings are folded back out of the way and the bird is flipped over. Pelicans have special air sacs under their flesh on the front of their body to cushion them from the enormous impact with the water surface. This huge impact stuns the fish and the pelican uses his pouch like a fishnet to grab his prey. The lower beak is long and narrow and can stretch out under water to almost the shape of a basketball hoop. As the pelican surfaces, the pouch is tilted forward and the water drained out leaving the pelican with his catch which he then swallows before taking off again.

Activity III-2E. Birds of the Estuary Activity

modified from "Project Estuary" by Gail Jones

OBJECTIVE: To explore the birds that live in the estuarine environment.

CROSS-CURRICULAR CONNECTIONS: Science, Art, Communication,

MATERIALS: Overhead projector, Birds of the **Estuary** Silhouettes, black paper, yellow coloring pencil, Birds of the Estuary Information sheet, Reference books, field guides, (Internet access).

TEACHER PREPARATION:

1. Make 3 copies of the silhouette sheet.
2. Cut out each bird silhouette and distribute to students as bird cards.
3. Make a transparency of the silhouette sheet.
4. Cut out each bird for individual students to use on the overhead projector.
5. Make a class set of the Birds of the Estuary Information sheet.

BACKGROUND INFORMATION: There are a variety of bird species that live in estuaries. Most estuary birds are fish-loving species, while other prefer insects and small amphibians. Millions of waterfowl use estuaries year-round as nesting or wintering grounds or just as a place to stop off while on their yearly migrations

VOCABULARY: Silhouette, Swamp, Marsh, Estuary, Habitat, Wooded Streams.

PROCEDURE:

1. Give each student a different Birds of the Estuary silhouette card and an information sheet.
2. Make an overhead projector copy of the Birds of the Estuary Silhouettes sheet.
3. Instruct them to look up information on their particular bird in reference books, field guides or on the Internet.
4. Record any data about the birds of the estuary on the information sheet provided.
5. Tape the black paper to the board and shine the projector through the overhead projector copy of the Birds of the Estuary Silhouettes image on the paper.
6. Instruct students to trace their bird silhouette on the black paper with a pencil and then cut it out.
7. The silhouette should be glued to the information sheet and displayed in the classroom for all students to see.

EXTENSION:

- Students could give an oral report on their particular bird species.
- Create a mural showing an estuary and where particular bird species would live.

BIRDS OF THE ESTUARY
SILHOUETTES

(Transparency & Bird Cards)



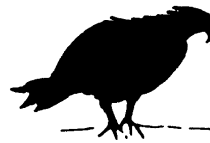
SNOWY EGRET



GREAT BLUE HERON



COMMON EGRET



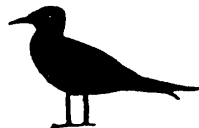
OSPREY



CATTLE EGRET



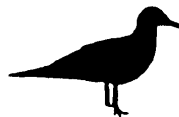
BROWN PELICAN



LAUGHING GULL



COMMON TERN



HERRING GULL



ROYAL TERN

Bird Silhouettes adapted from "Project Estuary" by Gail Jones

Student Name: _____ -

BIRDS OF THE ESTUARY
INFORMATION SHEET

Name of Bird: _____

Habitat: _____

Description of Bird:

Additional information:

Student Information III-2- Birds of Prey

In today's show we will be focusing on 3 birds of prey that are commonly found on Weedon Island. They are also common to many areas of North America.

RED-TAILED HAWK (*Buteo jamaicensis*)

The Red-tailed Hawk is Florida's largest hawk with a height of 25" and a wing span of almost 4 feet. It has a broad chest with light or white feathers intermixed with sepia streaks. Its broad red or rufus colored tail with a black band along the edge gives this hawk its name.

The Red-tailed hawk is widely distributed throughout the U.S. and Canada. It prefers the edges of pine or hardwood forests with open areas for hunting. It hunts from both a perched position, patiently waiting for prey to move about, or from the wing while gliding or soaring on thermal updrafts.

This hawk is well adapted to hunt a large variety of prey that including rodents of all types: snakes, turtles, frogs, toads, birds insects and small mammals.

Male and female Red-tailed hawks overlap in size and are similar in coloration. Therefore, it is difficult to distinguish the sexes. Red-tailed hawks usually mate for life or at least for very long periods. They usually nest in a tall pine tree where they may build a nest of sticks lined with bark or use an old nest from another species. Usually two eggs are laid in March with a 28-day incubation period. The young spend another five weeks in the nest before **fledging**. The female does most of the incubation duties while the male hunts for food to feed her.

Florida Red-tailed hawks are non-migratory. We have other northern birds migrating through or spending the winter in our area each year.

SCREECH OWL (*Otus asio*)

Screech owls are the smallest "eared" owls in North America. You can tell this small owl from all others by the long "ear" tufts. Adults are only 8" - 9" tall. There are two (or three) color phases: red or grey (some include a brown as well). The red phase displays a white breast

with mottled russet and tawny streaks while the grey phase owls are a drab brown-gray with a white breast streaked with gray.

Screech owls are found throughout the eastern U.S. They are one of the most common owls and can be

found nesting in the treed backyards of heavily populated areas. The nest is usually found in an abandoned woodpecker hole, a natural hollow in a snag or a nest box. They nest in early spring in Florida (March/April), laying two to five eggs. The female, which is indistinguishable from the male in size and color, incubates the eggs for about 28 days while the male hunts. The eggs are laid a day or two apart so when the young hatch there is a range of ages in the

nest. They usually fledge in another 30 days.

This small owl is one of the most strictly nocturnal owls. It hunts only after sunset and at night, while spending the day perched in a cool shady spot on a limb, in a hollow or snuggled up to a tree trunk. It feeds largely on insects and small rodents but will also catch small birds, **anoles**, scorpions and earthworms.

GREAT HORNED OWL (*Bubo virginianus*)

Great horned owls are the third largest owls found in North America. Their territory ranges from Canada to the southern tip of South America and most of Northern Europe. They are the largest “eared” owls with a length of two feet and a wing span of about five feet. Their **plumage** is finely mottled with brown, russet and ocher on the upper parts, with a white underside shaded with ocher and narrow crossbars on the abdomen.

Great horned owls are extremely powerful birds capable of hunting prey as large as opossums. The force on their **talons** has been measured in the laboratory and found to be as great as 10,000 lbs. per square inch. Like Red-tailed hawks, however, they are generalist feeders with a diet of almost anything they can catch. This includes rabbits, squirrels, rats, mice, water fowl and even skunks.

These owls usually nest in tall pines and particularly like to use the nest of other large raptors such as bald eagles, often displacing the original tenant. A pair usually bonds for life. Two eggs are laid in midwinter (December/January) which the female and male incubate for 30 - 35 days. After hatching, the female usually broods the young for the first three weeks while the male brings all the food. The young mature slowly and do not **fledge** until they are nine to 10 weeks old. The parents are extremely protective and will continue to feed and guard a juvenile even if it falls from the nest.

Great horned owls are the classic hoot owl. Their call is a series of six or seven low hoots that can be heard over long distances. Pairs will serenade each other for hours, especially when courting.

Lesson III. Weedon Island – Sea

keywords: pollution, nitrogen, nitrate, nitrite, ammonia

Inhabitants of Weedon Island

Some of the fish that can be collected in a net at Weedon Island include anchovy, sheepshead, catfish, snook, blenny, stingray, and snapper. At the water's edge, an observer might see a fish jumping, a bird stalking a small fish, or a Cormorant duck lazily drifting in the current. As one might look further out into the deeper waters that surround the island, a dolphin playing or a manatee might be spotted.

The waters and the muddy flats are found on Weedon Island are great place to observe the local reptile families. Alligators, and turtles might be found floating at the surface of the water basking in the warm Florida sun, while others may be found in trees. Skinks, squirrel treefrogs, mangrove snakes, diamondback terrapin snakes, and rattlesnakes can all be found throughout the preserve.

The Nitrogen Cycle

adapted from an article written by Dr. Kent Fanning for the St. Petersburg Times, St. Petersburg, FL

The element nitrogen, which forms up to 90% of the air that we breathe, is also important in seawater. It is the most abundant gas in the atmosphere, and necessary for all functions of life. The movement of nerve impulses, muscle contraction, photosynthesis, growth, digestion of food, vision and growth of hair, feathers, or scales are only a few of the processes that require nitrogen.

But nitrogen has a negative side. Processes inside healthy tissues produce a molecule in which nitrogen is joined to hydrogen atoms. This molecule is called ammonia, or ammonium. Ammonia is poisonous and if not removed, or contained in some way inside tissue, it causes death. All animals, including fish and people, must some how get rid of

this poison that is a by-product of normal living. Fish **excrete ammonia (NH₄⁺)** through their gills. Mammals excrete urea, birds excrete uric acid.

Ocean fish benefit from another process that recycles the excess nitrogen -- **phytoplankton!** These are microscopic algae and they are the basis of the food web for the entire ocean. They are nearly everywhere in the surface ocean. They are usually starved for nitrogen, and take ammonia out of seawater whenever they encounter it. Ammonia is their "favorite" fertilizer during photosynthesis.

Phytoplankton growing on ammonia "convert" a fish's waste ammonia

into plant tissue fish can then feed on.

At the same time, bacteria called nitrifying bacteria cause a reaction between ammonia and dissolved oxygen that makes forms of nitrogen called **nitrate (NO₃)** and **nitrite**

(NO₂). Because of nitrifying bacteria, ocean water nearly always contains nitrate, nitrite or both. Harmful concentrations of ammonia almost never build up in the ocean because of the actions of phytoplankton and nitrifying bacteria.

Biological Filters

adapted from an article written by Dr. Kent Fanning for the St. Petersburg Times, St. Petersburg, Fl

How does an aquarium compare to a wetland or an ocean? An aquarium is a closed system, where as a wetland or an ocean is an open system. All stated ecosystems must have some way to remove ammonia, purify the waters around them, and convert ammonia to nitrate and nitrite. Let's illustrate these systems through example.

In any system aquarium, there are three processes that can protect the fish from their own waste ammonia and provide food. These are water flow, phytoplankton and bacteria, and removal of ammonia across the fishes gills. The fish have gills in their anatomy, but they can not do anything about the phytoplankton and the water flow. In an open system, the amount of seawater to receive their wastes is huge. Surrounding seawater dilutes the ammonia and harmful levels are rarely reached. In an aquarium, that is not the case. If there could be as great a flushing of old, ammonia-contaminated water, there would be little need to worry about an ammonia build up. However, a large source of clean seawater rarely exists near an aquarium, and pumping a lot of seawater from a

natural environment would be horribly expensive. The most practical way to run the aquarium is the keep the same seawater in the tank.

If enough phytoplankton were present in the tank, they might be able to remove the ammonia that cannot be flushed away. But no one wants that much phytoplankton (or any kind of algae for that matter) in an aquarium. That would make the waters murky, and the fish difficult to observe. Therefore the consumption of ammonia by phytoplankton, so important to the cycling of nitrogen in the oceanic realm is absent from the tank by any design.

The aquaria replace phytoplankton with nutrients. Although there are not any phytoplankton in the tank, there are nitrifying bacteria found in the sand filter that the water cycles through. The filter is the second stage of the purification of the water found in the aquarium. The bacteria do the same job inside the filter that they do in the ocean: convert ammonia to nitrate and nitrite. The last step of the purification system is to replace the oxygen and remove the carbon dioxide in the water. An

aquarium uses a pump to supply a constant stream of air. In the closed system of the aquarium, nitrite and nitrate are not converted to plant tissue by phytoplankton. They are simply allowed to build up in the tank, and are eventually diluted when some of the old seawater is removed and replaced by new seawater. The aquarium is a closed system where life is manually sustained. In an

open system, like Weedon Island, or any environment found naturally, life is sustained on its own. The organisms of Weedon Island all work together to ensure that Weedon Island will be able to sustain life. The waters flow, the organisms eat, plants live and die, the water dilutes ammonia, and brings the necessary materials to the waters edge, and the sun provides energy for photosynthesis.

Pollution Sources

Land-based marine pollution can either be from a “**point source**” or a “**nonpoint source**.” Point source pollution originates from a specific place such as an oil refinery or a paper mill. Nonpoint source pollution, on the other hand, is contaminated runoff originating from an indefinite or undefined place, often a variety of places (e.g., farms, acid rain and airborne contaminants, and poor land development). The soot, dust, oil, animal wastes, litter (debris), sand, salt, and chemicals that constitute nonpoint source pollution often come from everyday activities such as fertilizing lawns, walking pets, changing motor oil, and driving. With each rainfall, pollutants from these activities are washed from lawns and streets into storm water drains that often lead directly to nearby bodies of water such as streams, rivers, and oceans.

While rarely visible, nonpoint source pollution is a chronic and ubiquitous form of coastal water contamination. The U.S. Environmental Protection Agency estimates that the primary

cause of the pollutants in the oceans is not from point sources, but from various forms of runoff. Mitigating nonpoint source pollution is difficult, even if the multiple sources can be identified and located. Often solutions entail major changes in land-use practices at the local level and expensive methods to minimize runoff. However, nonpoint source pollution does offer individual citizens an ideal opportunity to combat marine pollution. By changing everyday actions, individuals can help reduce the cumulative impact of nonpoint source pollution.

One way to help with pollution in the oceans and the waterways, is to participate in the International Coastal Cleanup held every year in the late summer. In 1997, there were 2,176,826 pieces of trash picked up in Florida alone. Worldwide, an estimated 100,000 people that joined forces to help clean up our waterways. Litter in the marine and aquatic environment can lead to loss of habitat, death of

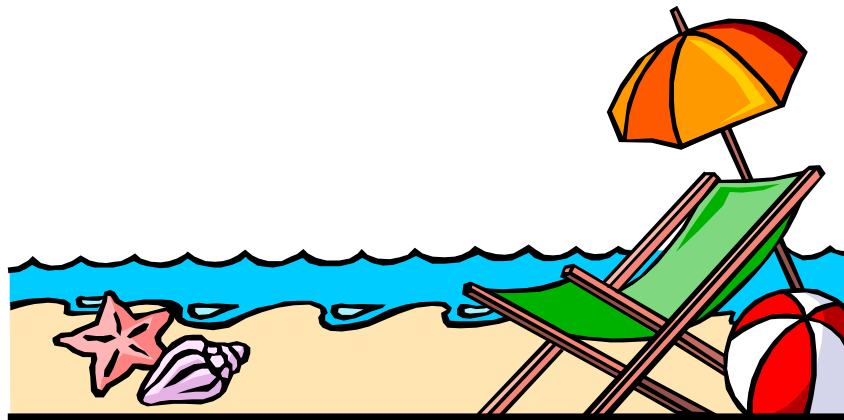
animals, and starvation. Let's all be better stewards of our waterways

and keep litter in its place!

Salinity

Salinity is a measure of the dissolved salts in water. Salinity in water, varies worldwide. Freshwater has salinity near zero, and seawater has an average salinity of 35. In waters influenced by both rivers and oceans, the salinity varies between these two values because they are mixtures of freshwater and seawater. Weedon Island is a wetland that has brackish water. On an average, brackish water usually has a salinity

of approximately 8 parts per thousand to 21 parts per thousand at the high end. Brackish water has less salt than the ocean, but more salt than freshwater. Brackish water environments are unique in that they may serve as nursery grounds for organisms that spend part of their lives in freshwater and part in saltwater.





Did you know?

The International Coastal Cleanup sponsored by the Center for Marine Conservation represents the largest, single diving event in the world!

Polluted runoff is the number one source of water pollution today.

The U.S. "Exclusive Economic Zone" (EEZ), which reaches 200 miles from the coast into the oceans, is estimated to contain about one-fifth of the world's harvestable seafood.

Approximately 8 out of 10 molecules that enter our lungs are nitrogen, and only 2 out of 10 molecules are oxygen!

Weedon Island is a brackish water system, and helps to sustain life in both fresh and saltwater environments.

Activity III-3A. Waterfront Property

Objective: Students will learn to distinguish the difference between point and non-point source pollution. The students will recognize that everyone contributes to the water quality in an aquatic environment. This activity will help the students to understand management of bay strategies.

Materials:

Large piece of poster board, or newsprint works well

Blue marker or paint to draw a river or stream on it. Divide the stream down the middle and across all sections of the board. Each section must have a piece of stream, and blank space to allow room for students to draw on their plot of 'land'. The number of sections should correspond with the number of students or groups of students working together. Number the sections on one side of the river in order, and repeat for the other side. Cut the sections of stream.

Drawing pens and pencils

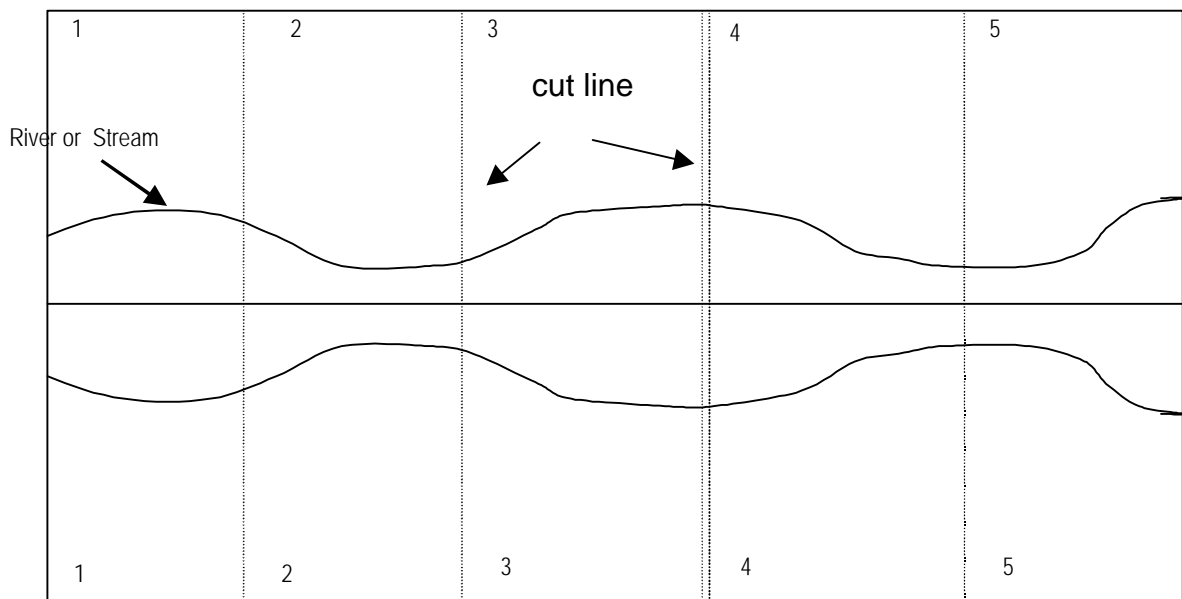
Items from students desk (pens, paper clips, etc)

Background:

The quality of watering a river (or lake) is a reflection of land uses and natural factors that surround it. If the land is stable, and has enough vegetation cover, erosion is kept in check. When humans settle an area, and begin to break up the ground cover, water quality is impacted.

Watershed investigations are conducted for many reasons. Some of reasons include water quality, changes in water flow, changes in water path, detection of contaminants, protection of nurseries, and to determination of the best methods to protect lakes or rivers from pollutants. Also, watershed investigations provide important information for policymakers and water managers when determining how best to spend money for improvements.

When watershed managers investigate land use practices that might affect the quality of water, they are concerned with two general sources of pollutants: Point and Non-point.



Procedure:

1. Determine the student knowledge about watersheds by asking them to name several major American Rivers. Where do these rivers originate and end? How many states does each cross or touch?
2. Discuss some of the types of land usage found along one river as it flows through one state. Do the students think that these practices could effect the river?
3. Tell each student, or group of students that they have just inherited a piece of waterfront property, and one million dollars to develop that piece of land.
4. Pass out the pieces of 'land'. Explain that the water is blue, and the blank space is the parcel of land they own. They can develop their land as they wish. (Ranch, farm, build a house, factories, parks, log, mine – whatever they would like to do.)
5. After the students have completed their drawing, explain to them that their property is actually a piece of a puzzle.
6. Have the students re-assemble the location of land beginning with piece number one. They will construct the stream pathway and adjacent land area in order.
7. Have the students describe their land and how they used it. Have students represent each of their contributions to the watershed with an item from their desks.
8. Tell students to take their items and line up in the same order as their pieces of riverfront property. They are going to pass their pollution pieces downstream. Have them announce what kind of pollutant they are holding before they pass it on. The ones will pass their items to the twos, the twos will pass everything to the threes, and so on, until the last students are holding all items.

Discussion:

1. Could a student downstream be effected by the actions of a student upstream?
2. How did the students at the middle or end of the river feel?
3. Tell the students to reclaim their items. Explain that the items easily identifiable as their own simulate point source pollution. Other items may be more difficult to claim, because these kinds of pollutants originated from multiple sources. Tell students these represent non-point source pollution.

Follow up: Have each student write one paragraph detailing ways to reduce the amount of pollution he or she contributed.

Activity III-3B. Water Quality Station

Part 1. Key terms and definitions. Have the students draw a line to match each term with the appropriate description.

Nitrification

Phytoplankton bloom

Nutrients

Ranges from 1 – 14

Salinity

Breakdown of fish waste

pH

Abundant plant life

Oligotrophic

Dissolved Salts

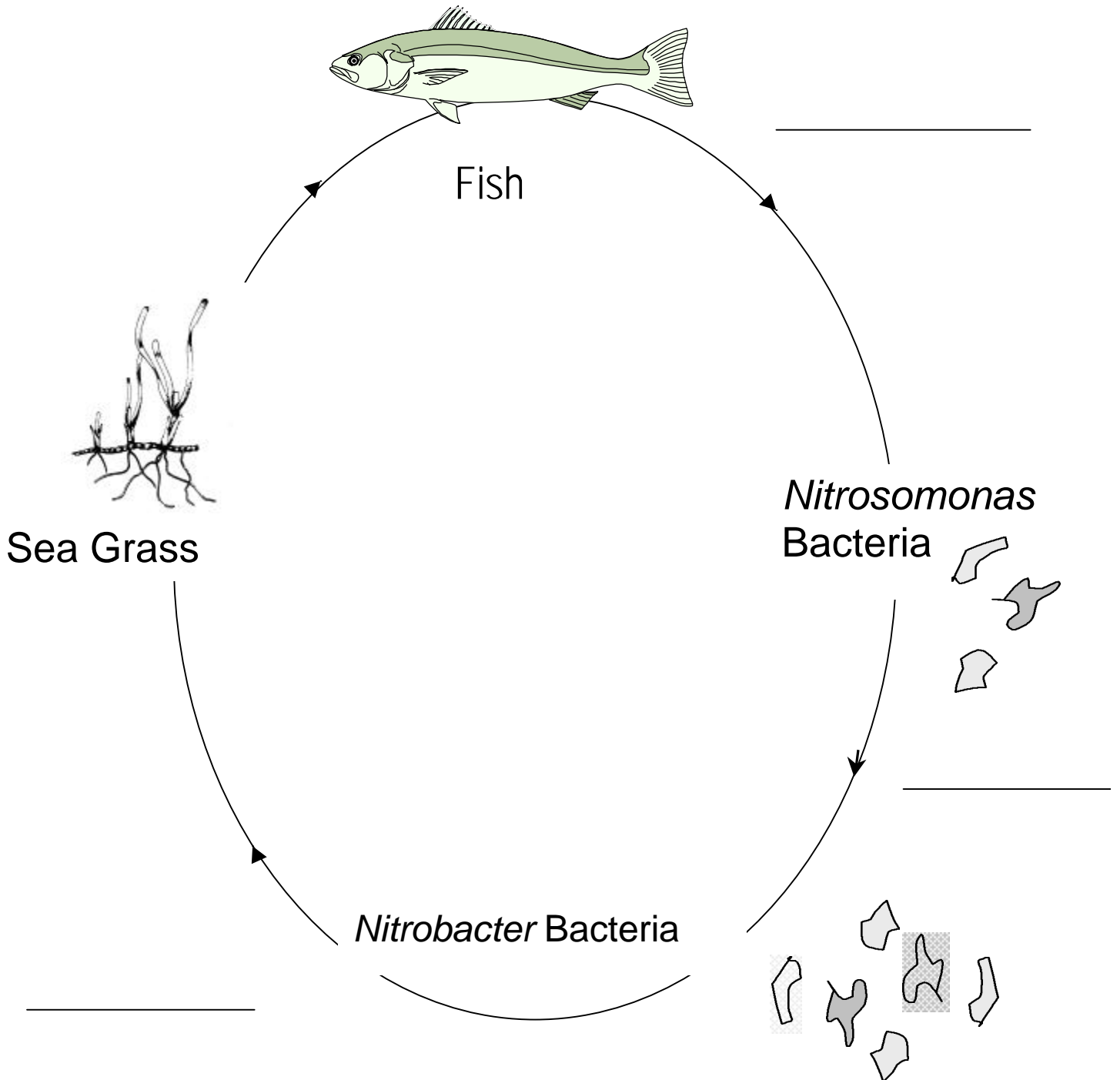
Eutrophic

Clear Blue Water

Part 2. Fill in the blanks with the appropriate nitrogen compound.

- NO_3^- _____ → nitrate
 NH_4^+ _____ → ammonia
 NO_2^- _____ → nitrite

NITROGEN CYCLE



Student Information Sheet III. Weedon Island – Sea

Did you know?

The International Coastal Cleanup sponsored by the Center for Marine Conservation represents the largest, single diving event in the world!

Polluted runoff is the number one source of water pollution today.

The U.S. “Exclusive Economic Zone” (EEZ), which reaches 200 miles from the coast into the oceans, is estimated to contain about one-fifth of the world’s harvestable seafood.

Approximately 8 out of 10 molecules that enter our lungs are nitrogen, and only 2 out of 10 molecules are oxygen

Weedon Island is a brackish water system and helps to sustain life in both fresh and saltwater environments.

Land-based marine pollution can either be from a “**point source**” or a “**non-point source**.” Point source pollution originates from a specific place such as an oil refinery or a paper mill. Nonpoint source pollution, on the other hand, is contaminated runoff originating from an indefinite or undefined place, often a variety of places (e.g., farms, acid rain and airborne contaminants, and poor land development). The soot, dust, oil, animal wastes, litter (debris), sand, salt, and chemicals that constitute nonpoint source pollution often come from everyday activities such as fertilizing lawns, walking pets, changing motor oil, and driving. With each rainfall, pollutants from these activities are washed from lawns and streets into storm water drains that often lead directly to nearby bodies of water such as streams, rivers, and oceans.

Salinity is a measure of the dissolved salts in water. Salinity in water, varies worldwide. Freshwater has salinity near zero, and seawater has an average salinity of 35. In waters influenced by both rivers and oceans, the salinity varies between these two values because they are mixtures of freshwater and seawater. Weedon Island is a wetland that has brackish water. On an average, brackish water usually has a salinity of approximately 8 parts per thousand to 21 parts per thousand at the high end. Brackish water has less salt than the ocean, but more salt than freshwater. Brackish water environments are unique in that they may serve as nursery grounds for organisms that spend part of their lives in freshwater and part in saltwater.

If you find any interesting facts, or have any questions that you would like to share with the staff at Project Oceanography, please feel free to call us at: 1-800-51-OCEAN or e-mail us at: pjocean@marine.usf.edu We will answer you either via e-mail or on the air during a broadcast. Visit our website at <http://www.marine.usf.edu/pjocean/index.html>

Here is a list of some of the words that you will need to know in order to make learning about wetlands easier for you.

Vocabulary

aquatic: living or growing in water
arboreal: of or pertaining to the trees; treelike
bill: the parts of a bird's jaws that are covered with a horny or leathery sheath; beak
brackish water: a mixture of salt water and freshwater found in estuaries
circulation: the transmission or passage of anything from place to place, or person to person
clone: a population of individuals genetically identical to the unit or individual form; a person or thing, that duplicates, imitates, or closely resembles another in appearance, function, etc.
colonies: groups of organisms of the same kind living or growing in close association
coralline: composed of coral or having the structure of coral
deciduous: the kind of trees that lose their leaves once a year
detritus: rock in small particles or other material worn or broken away from a mass, as by the action of water, or glacial ice; debris
detritivores: organisms that eat debris, or detritus
ecosystem: a community of living organisms
embayment: a bay, or a baylike formation
endangered: threatened with extinction; exposed to danger
epiphyte: a plant that grows above the ground, supported by the structure of another plant or object, and deriving its nutrients and water from rain, the air, dust, etc.
erosion: rain or wind causing the loss of topsoil
estuary: the area where a river (freshwater) empties into the sea (saltwater)
exoskeleton: an external covering or integuments especially when hard like a shell
eutrophic: water that is rich in nutrients producing abundant plant life causing the water to appear murky and with low transparency
evergreen: kind of trees that keep their leaves year round
excrete: to eliminate wastes or harmful materials from blood or tissue
exotic: not native; introduced from abroad; foreign
fledgling: a young bird that has recently learned to fly
habitat: the natural environment of an organism; place that is natural for the life and growth of an organism
hardwood: slow growing flowering trees with broad leaves
halophyte: a plant that thrives in saline soil
instinctive: prompted by or resulting from or as if from instinct; natural; unlearned
invertebrate: without a backbone or spinal column
lenticel: a corky slash or spot appearing on plant bark, about the epidermal stoma, that allows for the exchange of gases between the atmosphere and inner tissue.
mangrove: any tropical tree or shrub belonging to the genus *Rhizophora*, of the family Rhizophoraceae, the species of which are mostly low trees growing in marshes or tidal shores, noted for interlacing above-ground roots
metabolism: the process in an organism by which its body is produced, maintained, and destroyed; how energy is made
midden: a refuse heap

molt: to cast or shed the feathers, skin, or the like, in the process of renewal or growth

native: being the place or environment in which a person was born or a thing came into being; remaining or growing in a natural and original state.

nitrification: oxidize ammonia to nitrates, nitrites, their respective acids by bacterial action

non-point source pollution: source of a contaminant is unidentifiable; that is, the pollutant can come from one of many places

oligotrophic: water that is low in nutrients and is characterized by low plant production and high transparency (clear water)

pesticide: a chemical preparation for destroying plant, fungal, or animal pests

pH: a measure that indicates the relative acidity or alkalinity of a substance. pH ranges from 1 (most acidic) to 14 (most basic), where a pH of 7 is neutral

phytoplankton: single-cell marine plants responsible for photosynthesis

plumage: the entire feathery covering of a bird

pneumatophore: specialized structure developed from the root in certain plants growing in swamps and marshes, serving as a respiratory organ

point source pollution: pollutants that are discharged from and can be traced back to an identifiable point or source, such as a factory's discharge pipe or a sewage ditch

propagule: a structure, as a plant cutting that is used for propagation

raptor: a bird of prey

ratite: a bird having a flat, unkeeled sternum, as an Ostrich, Emu, or Mao

rhizome: a rootlike underground stem, commonly in the horizontal position that produces roots below, and sends up shoots progressively from the upper surface

rookery: a colony or breeding place of rooks or other gregarious creatures, as penguins, large birds or seals

salinity: a word describing the amount of salt in a liquid

saturated: the condition in soil in which it has absorbed as much water as it can physically hold

sediment: soil that finds its way into rivers, streams and lakes

starvation: the act of starving, or the state of being starved

talon: a claw, especially on a bird of prey

tides: changes in water level due to the gravity of the sun and the moon

ultrafiltration: a filter having pores sufficiently small to prevent the passage of suspended particles

vertebrate: having a segmented backbone

wetland: an area where water saturates the soil for several months each year, usually during the growing season

wingspread: the distance between the outermost tips of the wings of a bird, insect, etc., when the wings are extended as far as possible