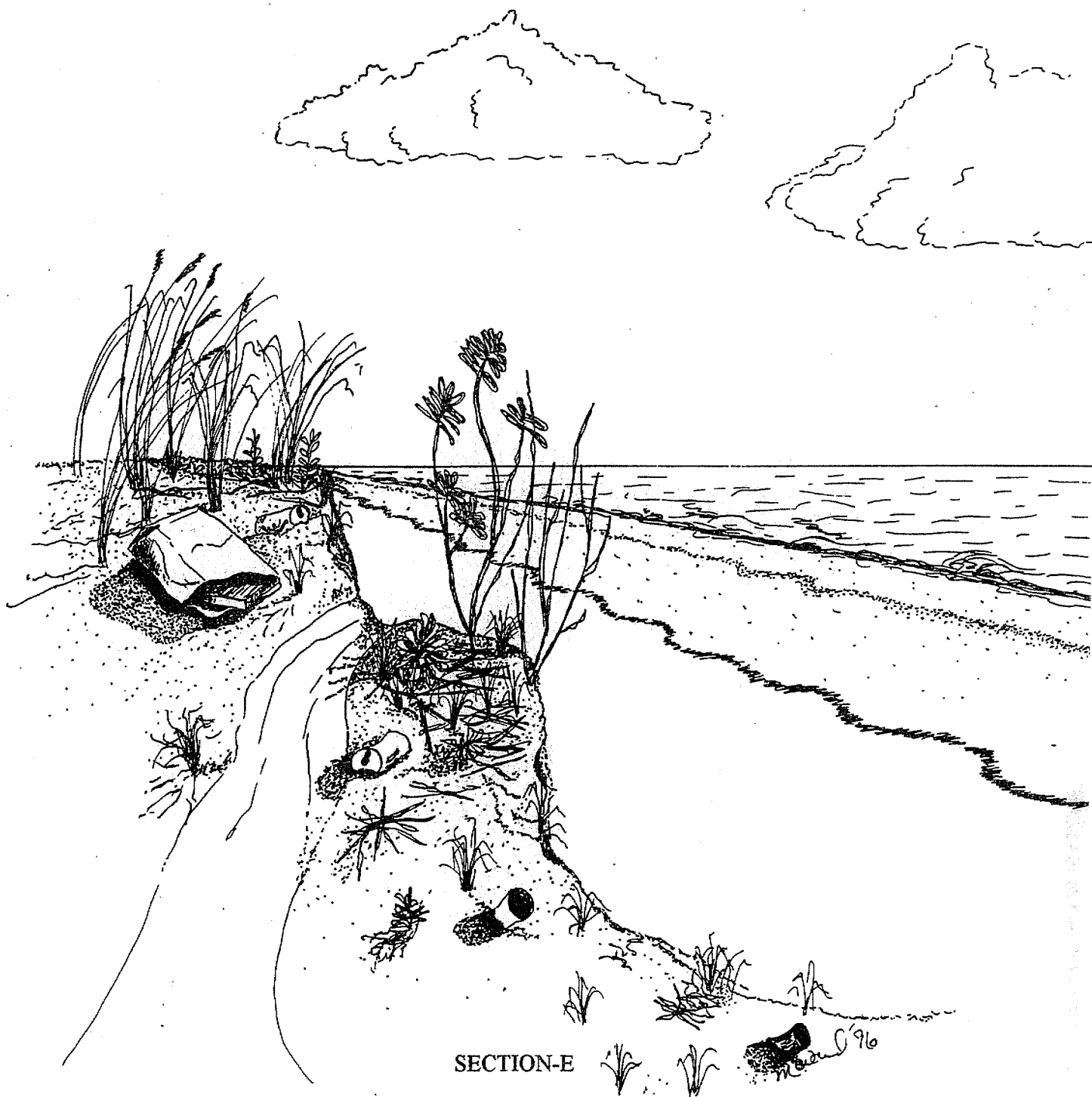


MAN'S INFLUENCE ON OUR BARRIER ISLANDS



MAN'S INFLUENCE ON OUR BARRIER ISLANDS

Man has had an influence on Georgia's coast for centuries. More and more people are coming to the coast to enjoy relaxation and recreation along its shores. Many of man's actions along the coast have resulted in undesirable ecological disturbances that either could have been avoided or minimized by proper planning and education.

GROUNDWATER CONTAMINATION:

The major source of fresh water for coastal Georgia is groundwater. Groundwater is brought to the surface by drilling wells into a water-yielding rock call an aquifer. Because of increased population in coastal areas and heavy industrial use of water, groundwater aquifers are becoming contaminated by salt water.

POLLUTION:

Aquatic pollution is very serious in our marsh-estuarine system. Once pollutants enter the estuary they are often trapped there by tidal currents instead of reaching the open ocean where their effects would be less. These pollutants move back and forth within the estuary. Most pollutants entering the marsh-estuarine system come from industrial wastes, sewage, and pesticides from the runoff of agricultural and forest lands and from cities and towns along the rivers that enter our estuaries. Point source pollution is pollution that comes from industries, water treatment plants, etc. and their source is easy to identify and regulate or control. Nonpoint source pollution or "people pollution" is very difficult to identify and regulate (see the Watersheds and their Importance fact sheet for more examples of nonpoint source pollution. It is important to remember that even a small amount of pollution can travel a long way in the ocean when picked up by currents.

Although industries contribute significantly to the economy of coastal areas, the large volumes of pollutants they create pose severe threats to the productivity and stability of the important estuarine communities. Many of the industrial wastes such as acids, dyes, oil and heavy metals (mercury, lead, zinc, etc.) are not biodegradable and may remain in the estuarine system for a long time. These industrial pollutants are consumed by oysters, crabs and fish making them unfit for human consumption.

Sewage from homes near the rivers and marshes often is not treated before entering the marsh-estuary system. This raw sewage becomes food for many shellfish which are filter or deposit feeders. This untreated sewage doesn't directly affect the shellfish but often is toxic to man.

Pesticides mostly enter the system by way of runoff from agricultural and forest lands. Detritus

feeders and bottom dwelling organisms concentrate these pesticides and their effects are magnified as they pass through the food chain. The decline in bald eagle, brown pelican and osprey populations along our coast are thought to be mostly due to DDT pollution. All of us pour or flush chemicals down the drain or onto our lawns almost daily (washing powders, dish detergent, toilet paper, bleach, paint thinners, cleaning products and oil from our cars). These will eventually reach the water table and someday reach the ocean.

DAMMING RIVERS:

The damming of rivers is important for the production of electricity, but it also traps sand that would otherwise have reached our beaches. This "sand starvation," as it is called, is partly responsible for the recent acceleration in beach erosion along Georgia's coast and elsewhere.

DREDGING:

Dredging is important for the maintenance of harbors, inland waterways, and for material for highway construction. Dredging destroys portions of the marshes, interrupts the natural flow of water and sand between the islands and increases erosion and deposition. It also increases the amount of silt and the turbidity in the water, which affects the amount of photosynthesis carried on by phytoplankton. Sessile and bottom dwelling organisms, such as oysters and clams, may be buried by the silt. Since dredge spoil (material dredged up from the ocean bottom) is usually very acidic, the marshes where it is deposited are often unproductive for many years and often create breeding grounds for mosquitoes. On the positive side, spoil deposits create nesting and feeding areas for many migratory birds.

CAUSEWAYS AND HIGHWAYS:

Improperly planned causeways and highways across marshlands often obstruct tidal flow and may cause the loss of extensive areas of marsh habitat. Unrestricted tidal flow is necessary for the removal of sediments, the transportation of nutrients and detritus to the estuaries, and the maintenance of spartina (marsh grass) communities.

LITTER:

Trash in the ocean and on our beaches has only recently gained recognition as an international problem. Worldwide, over 100,000 freighters, tankers, naval ships, commercial fishing boats and cruise ships dump more than 6 million tons of trash per year into the ocean. Weekend boaters in the United States discard more than 34,000 tons of trash into the ocean per year. Many of us, without thinking, leave styrofoam, aluminum cans, baggies, etc. on the beaches. Millions of marine animals such as dolphins, whales, sea birds, fishes and sea turtles die each year from entanglement in or by ingesting this debris. This trash also poses a problem to shrimpers and boaters by causing damage to boats requiring expensive repairs and loss of profit.

GROINS , JETTIES AND SEAWALLS:

To prevent beach erosion, groins and jetties are often built out into the ocean to trap sand. Rather than preventing erosion as they were intended, they often increase the erosion. These structures interfere with the littoral drift of sand caused by longshore currents. The updrift sides of these groins and jetties do capture sand but the downdrift sides lose sand more rapidly than normal as the longshore current continues to move southward. Seawalls built to protect beachfront property actually accelerate the erosion they were meant to prevent. When waves roll onto a beach, the water spreads out over the sand and the energy of the wave is dissipated over a large area. When a seawall is added, the energy of the wave has nowhere to go and strikes the wall with full force, creating a severe backwash that undermines whatever beach remains and carries it away.

DRAINING OF WETLANDS:

Today about one-half of the population of the United States lives in coastal areas. At one time there were more 200 million acres of wetlands in the United States. Today fewer than 100 million acres remain. Man, not realizing the importance of wetlands as flood reducers, nurseries, natural filters, and natural water storage areas, has drained and filled wetlands for farmland and to build homes and industries.

DESTRUCTION OF SAND DUNES:

Not realizing the importance of sand dunes as buffers against storms and as sand reserves for beaches, man has bulldozed many sand dunes in order to obtain a better view of the ocean from homes, and in order to build hotels and condominiums near the water. We also ride off-road vehicles and walk over the dunes, not realizing the fragile nature of dune plants. Man also, for years, picked the beautiful sea oats to make flower arrangements. Sea oats and dune plants play a vital role in capturing and keeping sand on the dunes and therefore the beaches. Dunes are important in reducing the impact of storm winds and waves and therefore are essential to the reduction of beach erosion. Today it is illegal to pick sea oats and if caught one faces a \$500 fine.

ACID RAIN:

Water in the atmosphere, including fog, rain, sleet, and snow, may become polluted by dirty air. Exhaust from cars and factories that burn fossil fuels contains gases that become dangerous when mixed with water. When acid rain falls on lakes, ponds, sloughs or in the ocean it can change the chemical makeup of the water and affect the health of the organisms living there.

OIL LEAKS AND SPILLS:

As of 1995, Georgia, luckily, has not experienced any major oil spills. The potential for leaks or spills is an ever present threat due to the heavy use of the Savannah River, the Brunswick Harbor and the naval base at St. Mary's.

Oil is lighter than water and will float. It acts like a blanket over the water and can affect wildlife for miles. Birds are especially vulnerable and, if coated with oil, are unable to swim or fly. When oil washes onto the beach it suffocates all the organisms living there. The oil will eventually sink to the bottom of the ocean and when it does, it kills the creatures that live there as well. The marsh-estuarine system is one of our most valuable natural resources. It not only performs important ecological functions but it is important to man in many ways such as: commercial harvest of fish, shellfish and wildlife; research and education; many forms of outdoor recreation like fishing, hunting, nature study, boating, swimming, etc. Only through education and understanding can man's undesirable influences, whether intentional or accidental, be corrected.

WHAT CAN YOU DO?

The responsibility for the care and health of our marine environment belongs to us all. We can have a positive impact on the marine environmental conditions and the legislation that controls its use.

All of us can help by doing simple things such as:

- Consider using alternatives to disposable plastic products, such as reusable dinnerware, containers, paper bags and cups and washable diapers.
- Take a trash bag with you every time you go to the beach or boating and take all your trash home with you.
- If you buy six-pack drinks attached together with plastic rings, cut the rings into small sections that are too small for animals to become entangled in.
- Try to re-use shopping bags.
- Be careful not to walk on fragile dune plants, and remind others to do the same.
- Adopt a beach, stream, lake, pond, or river and organize individual or group clean ups. Take pictures and write an article for your local paper.
- Investigate to see if factories near you have the proper filtering devices to clean the air and water they put into the environment.
- Try walking or riding a bike or carpooling and use your car less.
- Buy only phosphate-free detergents and use less than the label says.

-Buy toilet paper that has not been bleached (chlorine and dyes do not biodegrade and remain in the water).

-Look around your county and neighborhoods. Are there industries or factories that are polluting the environment? If so, contact your local legislators and encourage them to look into the problem.

-Write to cruiselines and local shrimping companies and encourage them to be more environmentally conscious and to deposit their trash on land rather than at sea.

-We can become more aware of current legislation that affects our coasts and write to our legislators and encourage them to vote for the protection of our coastal areas. Do not be afraid to voice your concerns. Write letters to the president, the governor, and your local and state legislators. When writing to legislators or companies, remember to be clear and polite and to (1) voice your concern (2) give factual evidence to support your concern and (3) offer suggestions of ways that your concern might be addressed. Include your return address for an answer. The more letters politicians receive, the more attention they will pay to a particular issue. It is generally accepted that for every letter received, there are at least 100 others with the same concern.

President of the United States
The White House
Washington, D. C. 20501

The Honorable _____
U. S. House of Representatives
Washington, D. C. 20515

Office of the Governor
203 State Capital Building
Atlanta, Ga. 30334

(Call your local court house for local addresses. Call the office of the Secretary of the Senate (404) 656-5042 and ask for your senators address or ask for a "white book;" which has all the addresses of State Legislators.

-Become vocally supportive of the preservation of our wetland areas.

-Most of all, set a good example for others.

PERMEABILITY AND POROSITY OF SOIL

Permeability is the capacity of rock or soil to transmit water. It is a measure of the relative ease with which water will flow through the rock or soil. Porosity is a measure of the rock or soil's ability to hold water and is expressed as a percentage. A rock or soil that holds a lot of water is said to be porous and is permeable if it allows water to flow easily through it. A rock or soil is impermeable when it does not allow water to flow through. When all the open spaces between the soil particles or rock particles become filled with water, the soil is said to be saturated. The water table flows along the zone of saturation. Above the zone of saturation (the water table) is the zone of aeration or unsaturated zone. In this zone of aeration, the spaces between the soil grains is partly filled with water and partly with air. It is from this zone of aeration that plant roots get their water. Most plants will drown if their roots are completely covered with water. Marsh plants are the exception, they have adapted to living in a water environment.

When water from rain or run-off flows over the surface of the earth, it will seep into the ground and travel downward until it reaches the water table. This water then flows downslope or downhill, relatively slowly, through underground permeable rock and eventually to the ocean. How fast the water in the water table flows depends on the slope of the land and the permeability of the rock or soil through which it is flowing. Water flows faster down a steep slope. The amount of space between the soil particles also has an effect on the speed of flow of the

groundwater. Water flows faster through gravel and sand than through silt and clay. In regions like coastal Georgia and on islands such as Sapelo, where the topography is relatively flat, the water table would flow very slowly (even through highly permeable rock or soil). Therefore, any pollutants that reach the flat coastal regions of the state will tend to stay in the water table.

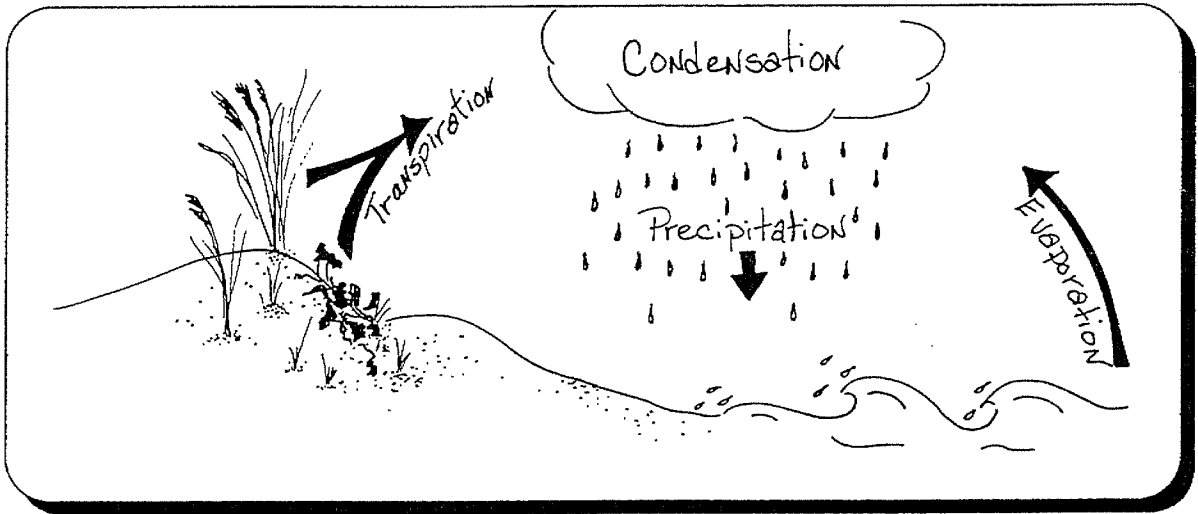
Sediment	Porosity %	Permeability
gravel	25 - 40	excellent
sand	30 - 50	good to excellent
silt	35 - 50	moderate
clay	10 - 20	poor (impermeable)

Soil and rock can filter some pollutants out of groundwater before it reaches the ocean. This filtering ability depends on the permeability and mineral composition of the soil. Sand is not a good filter of pollutants because the water travels through it too fast. Clay and silt, however, are better filters to pollutants because water does not travel through them as fast. Because clay, the major component of marsh mud, is almost impermeable to water, marshes serve as a good filter to pollutants by trapping them in the marsh mud where they can be decomposed by bacteria. There is a limit, however, to the amount of pollutants a marsh or any soil can filter. Therefore it is important first of all to prevent pollutants from reaching our water table and secondly to preserve our marshes so they can naturally filter the pollutants from the water before they reach the ocean.

Each habitat on a barrier island such as Sapelo has a different type of soil, each having its own characteristic porosity and permeability. It is interesting to test the porosity and permeability of the various habitats as you travel through them.

WATERSHEDS AND THEIR IMPORTANCE

A watershed (total drainage basin) is defined by topography or the shape of the land that governs the path runoff follows as it moves from higher to lower elevations. The watershed includes not only the streams and rivers that flow directly into an ocean, but also wetlands and dry land areas over which the runoff flows. In other words, a watershed is like a large bowl. All the water that falls into that bowl eventually ends up at the bottom (the ocean). Everyone lives within a watershed and every watershed eventually drains into the ocean. Through the water cycle (evaporation, transpiration, condensation and precipitation), our homes and businesses are all connected to local watersheds. The water in these small local watersheds eventually reaches the ocean. Therefore, we all have an effect on our region's water quality and thus on the quality of the water that reaches our oceans.



Development of land within a watershed can have severe consequences on water quality. Sources of pollution may be "point source" pollution which is easy to identify, like waste water treatment plants. Once identified, the sources of point source pollution can be regulated and to some extent controlled. "Nonpoint source" pollution or "people pollution" is much more difficult to pinpoint because it consists of pollutants that come from everyday activities such as driving our cars (exhaust), fertilizing the lawn, walking pets, changing oil in a car and littering. Nonpoint source pollution collects over large areas and is washed from streets and lawns into streams that eventually lead to the ocean. This nonpoint source pollution increases due to development because roads, driveways, parking lots that are all made of impervious surfaces do not allow the infiltration of stormwater into the soil. These paved surfaces increase the amount of runoff which can pick up pollution and they are often responsible for increased erosion and flooding. The amount of poisonous runoff from oil on our streets alone amounts to the same as a major oil spill.

In undeveloped or natural areas, runoff is not usually a problem. Grass, trees, and other vegetation slow runoff and reduce erosion by allowing the water to seep into the ground where it replenishes the groundwater supply. They allow the natural filtering of pollutants by the soil. The quality of water in our watersheds is important because all life along a food chain is ultimately dependent on its water environment. Many microscopic plants and animals (plankton) and other small water organisms serve as food sources for small fish. These small fish are food for larger fish. They, in turn, feed birds and other animals including man. Worms, plants, and microscopic organisms living in sediments (infauna) or on sediments (epifauna) at the bottom of a waterway or the ocean are also an important part of the food chain. They are also food for fish and shellfish which in turn are eaten by larger fish, wildlife and man. At each link in the food chain, the concentration of pollutants may increase. A pollutant level in the sediment that does not harm worms, snails or fish may accumulate in the food chain and become harmful to the higher organisms that eat them.

Sapelo is very unique and fortunate in one sense because its immediate watershed, the Duplin River Watershed, has no rivers entering directly into it. The water that enters directly into the Duplin River comes from rainfall or runoff from the marsh. The water in the Duplin River, having no freshwater flow, is washed back and forth with the tides, much of it staying in the river. If pollutants enter the Duplin River, they have a tendency to stay there. The quality of water around Sapelo is also influenced by the water from the Sapelo, Mud and South Newport Rivers to the north and the creeks and rivers that enter Doboy Sound to the south. These creeks and rivers are much more susceptible to the pollutants from runoff from the mainland and in turn have an effect on the quality of the water around Sapelo. Since all the islands along the Georgia coast and even the Atlantic coast are connected by the ocean, any pollutant entering any part of the system could eventually have an effect on the quality of water and therefore the quality of life on Sapelo.

Each of us, whether we know it or not, contribute to nonpoint source pollution that eventually reaches our oceans. We can help stop or at least reduce this pollution by doing such things as:

- Avoid overuse of fertilizers and pesticides. Use natural alternatives where possible.
- Check for and repair leaks in toilets and faucets.
- Compost solid food wastes.
- Determine what household products contain toxins and use non-toxic alternatives.
- Drive less and keep your car tuned up to reduce poisonous emissions.
- Mulch around plants to reduce evaporation.
- Place all litter in appropriate containers.
- Plant bare areas with vegetation.
- Plant disease and pest resistant plants.
- Pick up after your pets and dispose of the wastes in the garbage or toilet.
- Recycle.
- Recycle used automotive fluids.
- Take showers instead of baths.
- Use a mulching lawnmower or set the blade at least two and one-half inches high.
- Use sand instead of salt to de-ice roads.
- Wash dishes in a dishpan rather than under running water or a dishwasher.
- Wash cars on the grass using non-phosphate detergents or at commercial car washes that recycle water.

WATERSHEDS AFFECTING THE WATERS OF SAPELO

OBJECTIVE: To investigate the watersheds affecting the quality of the waters around Sapelo.

MATERIALS: Fact Sheet: Watersheds and Their Importance

Maps: Counties of Georgia	Ink pens: red, black, blue
Rivers of Georgia	Colored pencils: orange, green, yellow
A Georgia Road Map	Pencil
	Tracing paper

PROCEDURE:

1. Read the fact sheet: Watersheds and Their Importance.
2. Using a **black** ink pen and a sheet of tracing paper, trace the outline of the State from the Rivers of Georgia map.
2. Using a **blue** ink pen, trace and label the rivers that enter into the Atlantic Ocean.
3. Using a Georgia Road map and a **pencil**, add the following major cities to your traced drawing: Atlanta, Athens, Augusta, Macon, Savannah, Darien, Brunswick.
4. Using a **red** ink pen, add the location of the city or town nearest to where you live.
5. Answer the following questions.

OBSERVATIONS:

Note: The total watershed of Sapelo consists of all the streams and rivers entering the Atlantic Ocean because longshore currents transport water southward and the Gulf Stream transports water northward.

1. Lay your traced map over the map of the Counties of Georgia (be sure to line up the outline of the State). List the counties in Georgia that could have an effect on Sapelo's total watershed.

2. Using the information from the Watersheds and Their Importance Fact Sheet, shade Sapelo's immediate watershed in **green**.
3. Using a Georgia road map, list any towns or cities that could have an effect on Sapelo's immediate watershed. _____
4. Water that enters the ocean from the north of Sapelo can have an effect on the waters around Sapelo because longshore currents transport these waters southward. Using a **yellow** colored pencil, shade the portion of the State that could affect the waters of Sapelo from the north.
5. Water that enters the Atlantic Ocean from the south of Sapelo could have an effect on the waters around Sapelo because the Gulf Stream could transports these waters northward.

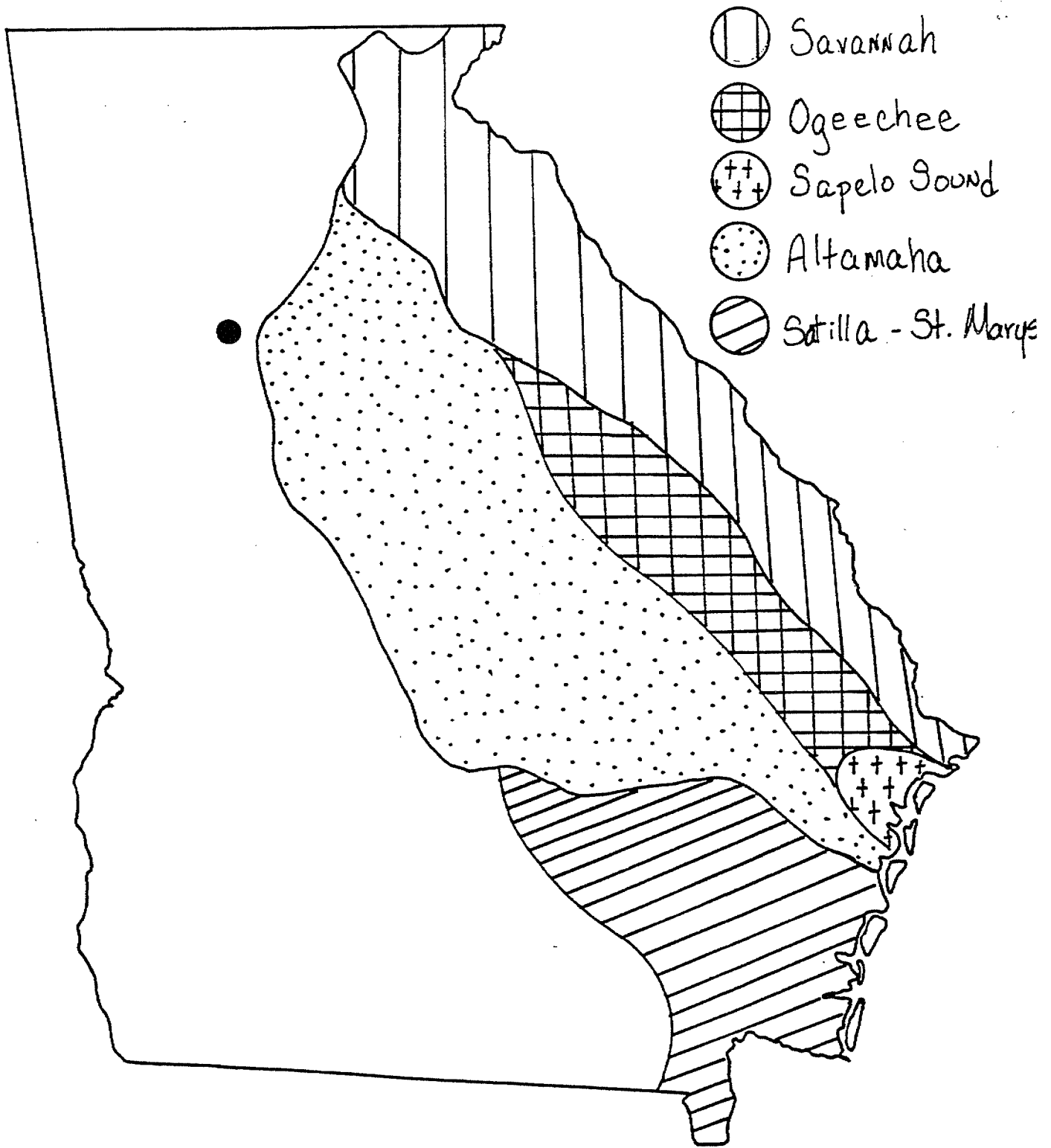
Using an **orange** colored pencil, shade the portion of the State that could affect the waters of Sapelo from the south.

6. According to the total shaded area on your map (include all colors), estimate the approximate percentage of the state of Georgia that could affect the waters entering the Atlantic Ocean and therefore the waters around Sapelo. _____
7. Could activities that take place in the city or town that you live in or near have an effect on the waters around Sapelo? _____ Explain your answer. _____
8. List some of the activities that you yourself take part in that could add non-point source pollution that could affect Sapelo's total watershed. _____
9. List some alternatives or ways that you personally could help to reduce the non-point source pollution of Sapelo's total watershed. _____
10. Joe Citizen lives on a farm in northeast Tattnall County. He raises horses, cows, and pigs. He also raises cotton. Could he have an effect on Sapelo's total watershed? _____
Explain how. _____
Would this be considered point source or non-point source pollution? _____
Describe the route that this pollution would take in order to reach the waters around Sapelo. _____
11. A leak has been detected in a cooling water tank at the Savannah River Nuclear Power Plant near Augusta. What River could this nuclear pollution contaminate? _____
Would this be point source or non-point source pollution? _____
Could this nuclear pollution reach Sapelo? _____ Explain how: _____
12. Sally Citizen lives in Crescent, Ga. (Find Crescent on your Georgia road map). She does not know it, but the pipe leading to her septic tank has broken and raw sewage is seeping into the ground. If this sewage gets into the water table, would it be point source or non-point source pollution? _____ Since there are no rivers or streams entering Sapelo's immediate watershed, could this pollution possibly affect the waters around Sapelo? _____
Explain your answer. _____
13. If pollution of any kind reaches the waters around Sapelo, what effect would or could it have on plant and animal life in and around the island? _____
How could this affect you? _____

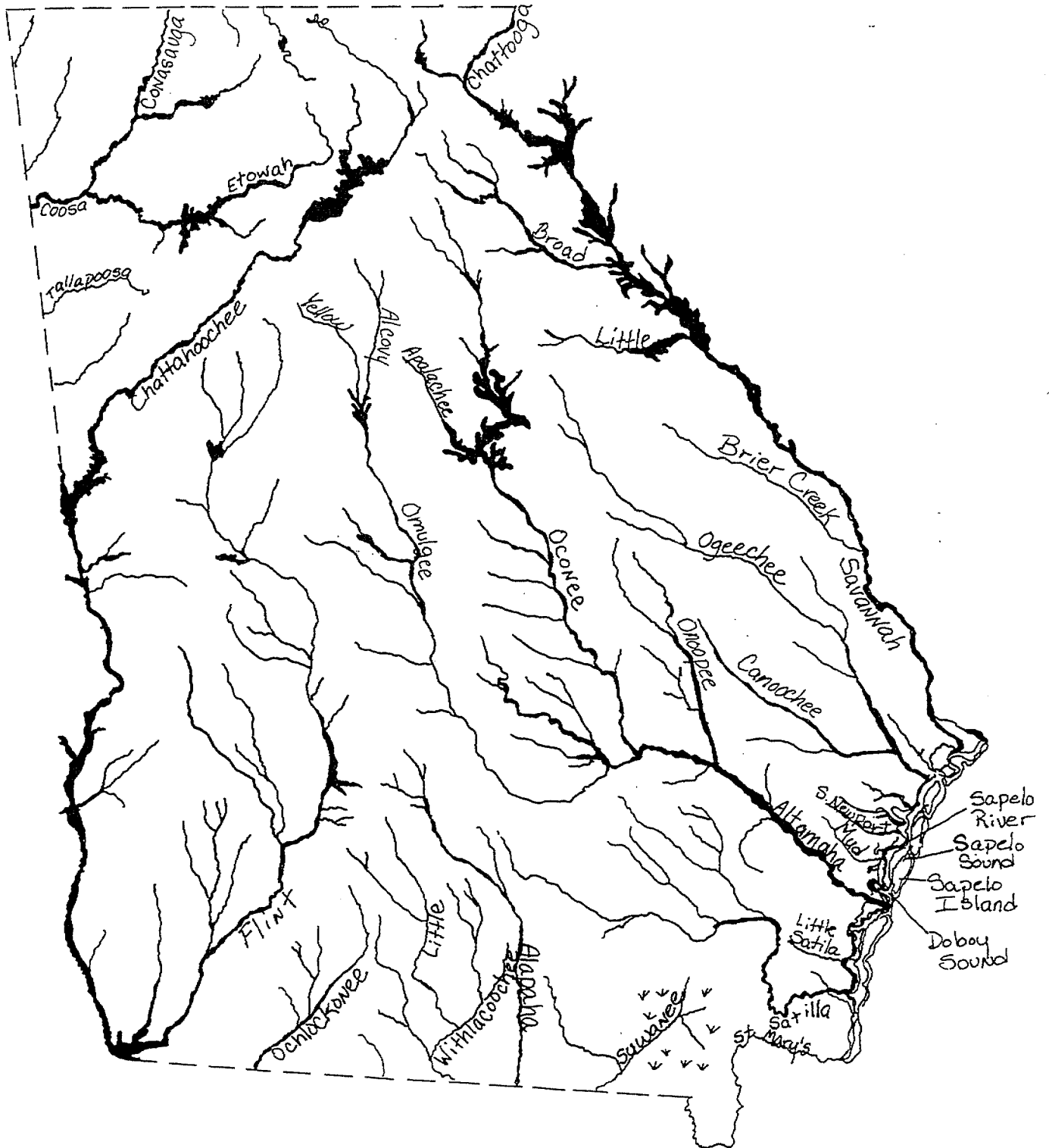
CONCLUSION:

In your own words define a watershed, point source and non-point source pollution. Explain how industry and the everyday activities of the citizens of Georgia could affect the quality of life of the plants and animals on or in the waters around Sapelo and ultimately you.

SAPELO'S WATERSHEDS



RIVERS OF GEORGIA



A hand-drawn map of Georgia showing its 159 counties. The map is labeled with the names of the counties in a handwritten style. The counties are arranged in a grid-like pattern, with some counties having irregular shapes. The map includes the state's outline and the names of the counties, such as DeKalb, Fulton, Cobb, and others. The map is titled "COUNTIES OF GEORGIA" at the top.

SHIPWRECK

PURPOSE: To determine a strategy or strategies for containment and clean-up of oil, wreckage, and other pollutants from a shipwreck.

SCENARIO:

One night in a heavy fog, an oil tanker bound from Savannah to Brunswick collided with a shrimp boat in the intercoastal waterway in Sapelo Sound north of Sapelo Island. Both ships sank. Luckily the men on board both ships were rescued by the Coast Guard. As a result of the collision, an oil spill and other wreckage are headed toward Sapelo. You have been assigned to a clean-up team to try and prevent the oil and wreckage from reaching the estuaries of Sapelo. If the wreckage reaches the estuaries, you must plan what you will do to help clean-up the estuary and to help the organisms that are affected. Before beginning your task, you must meet with the other members of your team and plan your containment and clean-up strategies. Keep in mind that the waters within Sapelo Sound are affected by waves, tides and currents.

MATERIALS

FOR SAPELO SOUND MODEL:

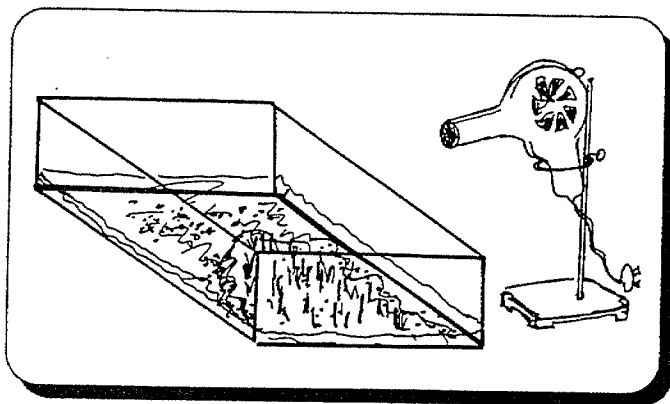
Large plastic container (large storage boxes can be obtained from local department stores)
Sand (from building supply store)
Motor oil
Transmission fluid
Antifreeze
Small pieces of paper, sticks, toothpicks, cloth, plastic, metal
Mixture of red jell-O and water
Hair dryer and stand (stand optional)
Small shells, bird and or animal models, blades of grass, sticks, etc. (these represent the organisms living in the estuary)
Map of Sapelo Sound
Small pebbles or rocks

FOR CONTAINMENT AND CLEAN-UP:

Pieces of sponge
Wire screen
Paper towels
Eyedropper
Plastic spoon
Netting (bags that onions or oranges come in will work)
Pieces of cloth (cheese cloth)
Dish detergent
Large beaker or mayonnaise jar to place pollutants in after they are recovered

PROCEDURE:

1. Divide the class into groups. Give each group the materials listed above.
2. Using the map of Sapelo Sound as a guide, each group should create their Sapelo Sound model. At one end of the container shape the sand to represent the northern end on Sapelo Island. Slope the sand so that some will be underwater. Add sticks and blades of grass to represent the marsh grasses in the estuary. Also place some small pebbles or rocks in the bottom to represent organisms that live in the bottom of the sound. Cover these with a layer of sand. Carefully pour water into the container. You may need to reshape your model after the water is added. At the end of the container where the wind would be coming from the ocean, set the hair dryer in a stand so that it will blow onto the water when turned on. If you do not have a stand for the dryer, assign a student in each group to hold the dryer. Do not turn the dryer on until the oil spill and wreckage has been added to the water.



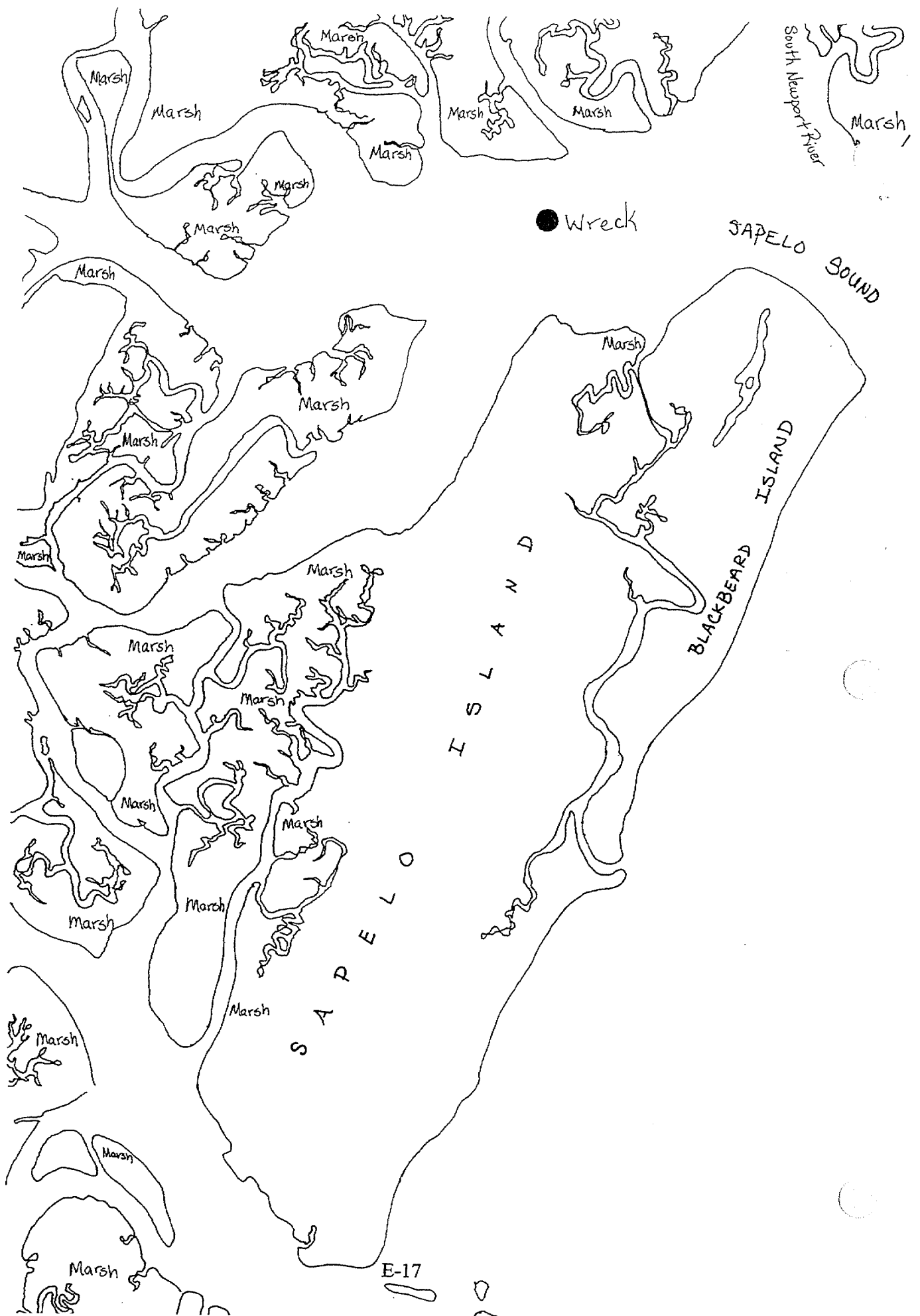
3. Arrange shells, animals and bird models, blades of grass and sticks , etc. (the grass and sticks represent the plant life) along the edge of the water.
4. Each group should read the shipwreck scenario and discuss what must be done to prevent the oil spill and wreckage from reaching the shore. They should also discuss what they will do if some of the oil does reach shore. Since the shipwreck occurred in the sound, they should also discuss what, if anything can be done for the organisms living in the water or in the mud on the floor of the sound. They should discuss how the changing tides will affect their clean-up efforts.
5. After each group has planned their strategies, mix all the materials for the oil spill and wreckage from the sunken ships and add this to center of the sound away from the island.
6. Turn on the dryer and allow it to blow onto the water containing the wreckage for a few minutes.
7. Begin your containment and clean-up procedures. Do the best you can in the time you have allotted.

OBSERVATIONS:

1. Were you able to prevent all of the oil and wreckage from reaching Sapelo?
Explain your answer.

2. Which items were the easiest to contain or clean-up?
How did you accomplish this?
3. Which items were more difficult to contain or clean-up?
What did you use to accomplish this?
4. Which items were you unable to contain before they reached the shore of your Sapelo model?
5. Why do you think you were unable to contain the items listed in question #4?
6. Describe what happened to the animals and plants that were on the shore when the spill and wreckage reached them?
7. Were you able to clean the oil and other pollutants from these animals? Explain your procedures.
8. Describe what happened to the organisms that live on the bottom of the sound. Were you able to clean the pollutants from these organisms? Explain why or why not and state what affect you think this will have on them.
9. Leave your model set up overnight and if possible allow the hair dryer to continue to blow (As the wind would do. You might even want to change the direction of the wind).
Describe the effect of the oil spill and wreckage on your model overnight.
10. If you can see through your container, observe it from the side. Has any of the oil, antifreeze, transmission fluid, jell-o mixture, etc. soaked into the sand?
How deep into the sand did the pollution seep?
11. Many organisms live beneath the sand and mud of the estuary. How would they be affected by the oil spill and wreckage?
12. Would the spill be confined to the estuarine area of Sapelo or would it also affect the beaches on the ocean side of the island and/or the marshes on the mainland?
Explain your answer.

CONCLUSION: Describe how an oil spill or major ship wreck would affect the estuaries and coastline of Sapelo. Explain how much of the spill was able to be contained before it reached Sapelo compared to the amount that reached the island. Also describe the effect of the spill on the living organisms in the estuary and marsh and along the beach.



DEVELOP AN ISLAND

SCENARIO:

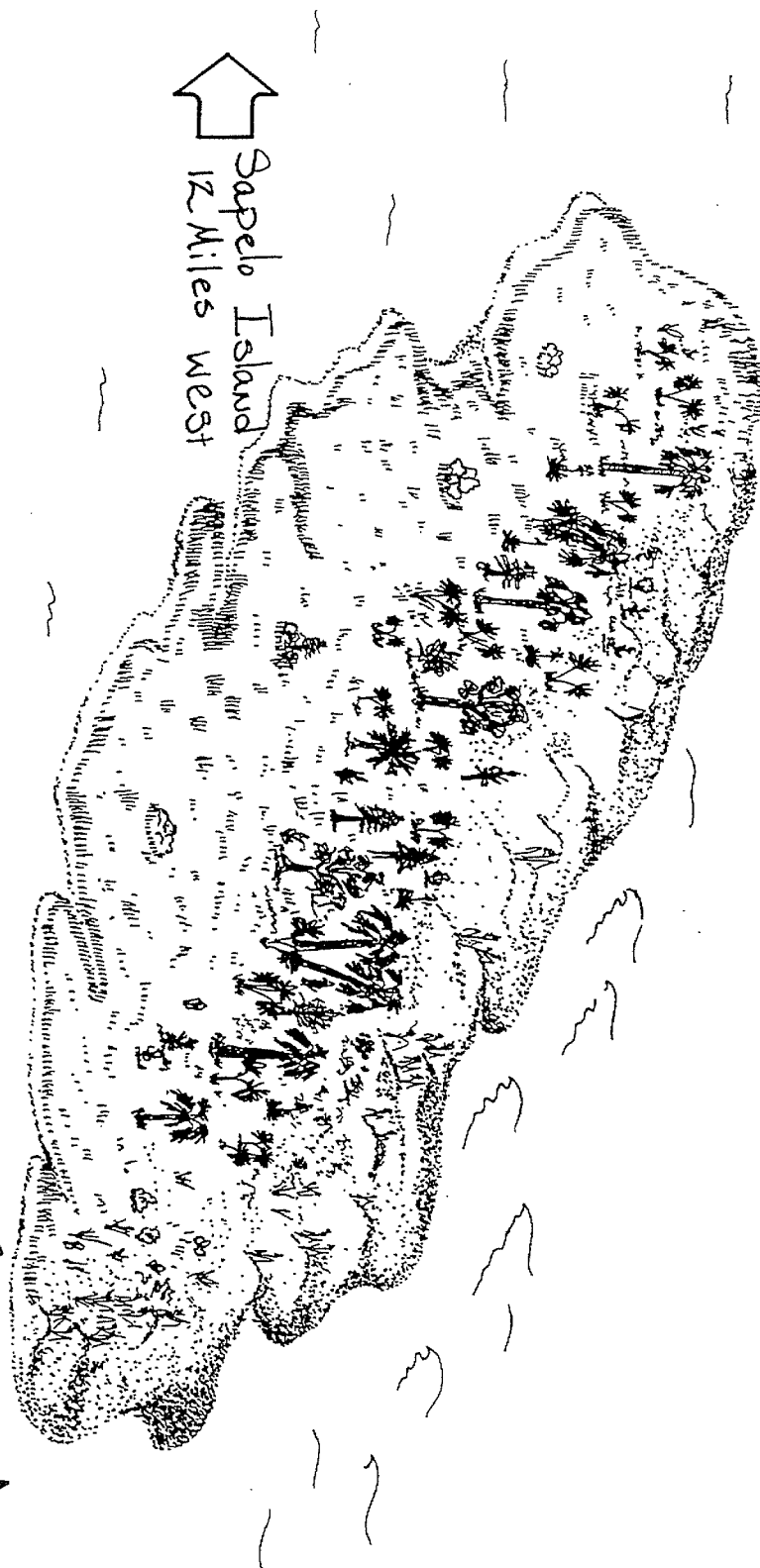
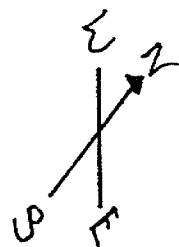
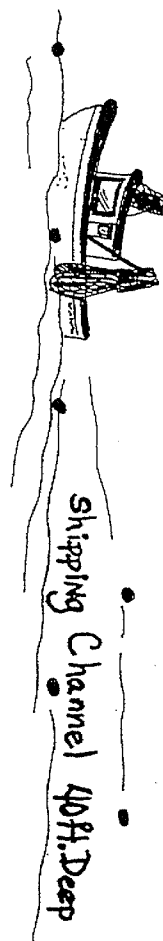
It is the year 2050 and after several years of major storms and severe erosion to Georgia's coastline, a new island named "Paradise Island" has formed. The island is two and one-half miles long and one and one-half miles wide. On its east shore are sandy beaches and large primary dunes. On its west shore is an immature salt marsh. The center of the island is covered with pines, Wax myrtle, Bayberry, Spanish Bayonet, Cabbage and Saw Palmettos and numerous vines. There are only a few very young live oaks. The water depth between Sapelo and this new island is only about 10 to 15 feet deep. However, just to the north of Little Sapelo is a shipping channel that is 40 feet deep. The island is located twelve miles east of Sapelo and five miles northwest of Grays Reef. With the destruction of Florida's Coral Reefs, Grays Reef is now very commercially important for sports fishing and scuba diving. It is also the site of an underwater research facility for the University of Georgia.

The island has been purchased by a large company and you have been hired to develop immediate and long-range plans for the development of the island. The owners are very environmentally conscious. You have been told that the island must be developed in such a way as to earn the owners a profit on their investment but at the same time preserve the integrity of the island ecosystems. The owners want to attract tourist and scuba divers from all over the world. They also hope to attract the family of the UGA personnel working in the underwater research facility at Grays Reef and other research professors. They want teachers from all over the southeast to be able to bring small groups of students for 3 to 5 day study experiences. Everything that you plan must be ecologically correct. No pollutants or chemicals can ever be added to the island or the ocean that might harm the coral reef, since it is one of the major attractions for tourists.

You are to present your plan for the island's development to the company's board of directors. Your plan is to include immediate plans, plans for five years from now, 10 years from now with final completion in 20 years. You must submit a written plan for the island for each time period that includes everything that people will need: entertainment, shopping, education, food, water, electricity, transportation (to and from the island as well as on the island), and waste management. You must also submit 4 sketches or drawings of the island. One representing what immediate use of the island will be, one showing the five-year plan, one for the 10-year plan and one for the 20-year plan. There must be a marina with a dive shop and a dock for supply ships, dive boats, deep-sea fishing and sightseeing boats. Remember that in no way can you harm the environment or the ecology of the nearby limestone reef or the island ecosystems.

Paradise Island

2 1/2 X 1 1/2 miles



Sapelo Island
12 Miles West

Grays Reef
5 miles SE