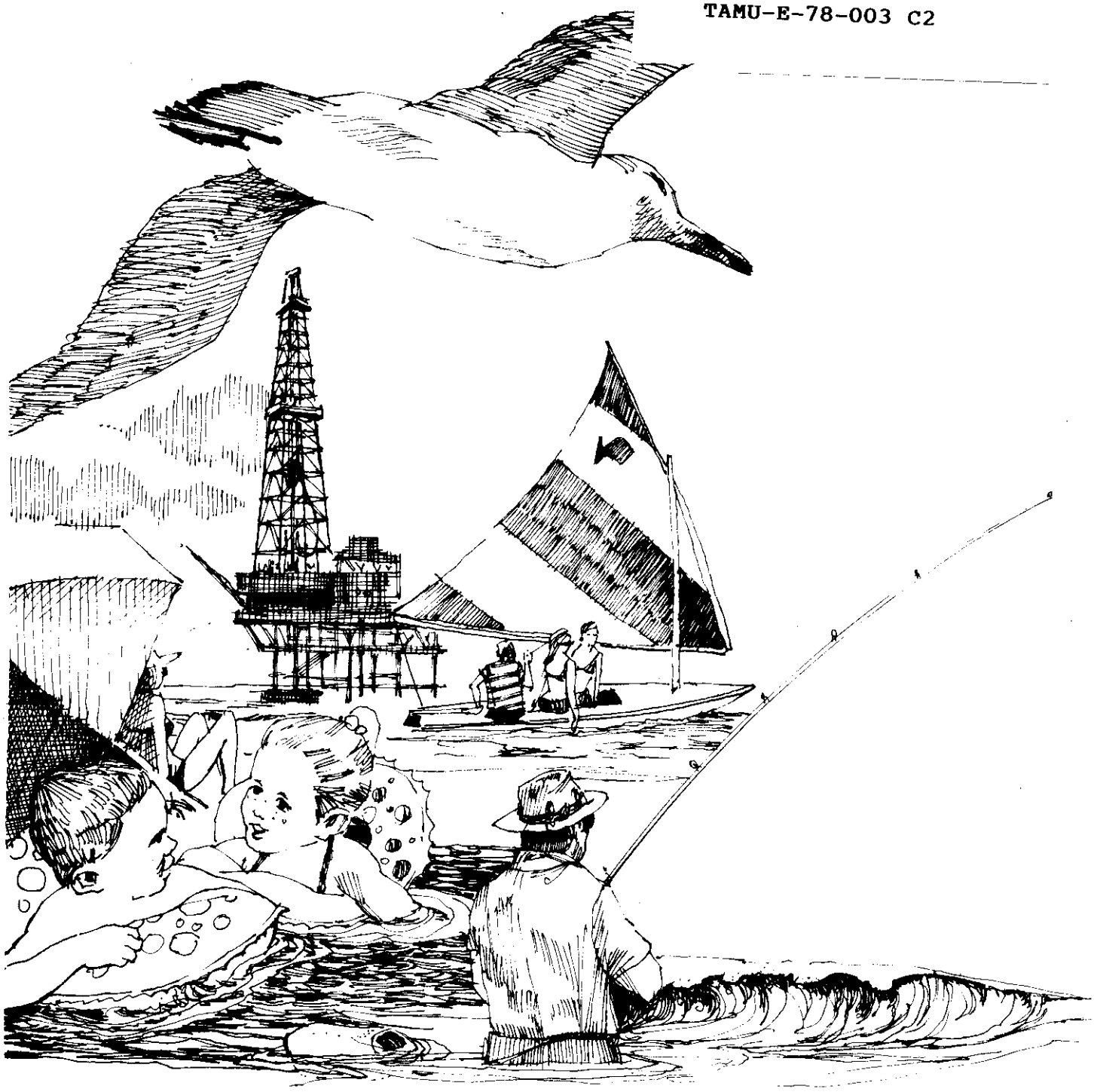


Investigating the Marine Environment and Its Resources

PART II
TAMU-SG-79-401

LESSON THIRTEEN
TRANSPORTATION

ACTIVITIES 1-4

Suggested Time for Classroom Use of Materials: Approximately 5-7 class periods

Materials for Classroom Use:

Your Answer/activity
Transportation as a Resource/reading
Bible--Old Testament
Sailing Ship/drawing
Audio tape of Sea Chanteys
Sea Chanteys and Sailing Ships
Supertanker/drawing
The Supership/reading
Tugs, Barges and the Gulf's Waterway/reading
My Opinion/activity
Prospect for a Superport/reading
Superports/drawings
The Future/reading
Texas' Future Water Highways/activity
Texas Highway Map (which shows rivers)

Major Objectives for the Lesson: After completing the lesson, the student will be able to:

1.1 cite examples of transportation as a resource in the past, present and projected future;

2.3 evaluate a transportation problem man has solved and the changes that resulted and the new problems that arose;

2.6 analyze the use of transportation in the past, present and projected future in view of the needs of the time and the values involved;

2.6 describe how the changing use of marine transportation has changes lifestyles;

2.6 analyze value positions to determine similiarities, differences and possible conflicts;

2.7 formulate possible future uses of marine transportation;

2.7 discuss marine transportation's influence on the cultures of many societies;

3.1 discuss the interplay of the many factors(economic, governmental, moral and etc.) in man's utilization of marine transportation;

3.2 describe and identify situations where technology has caused a change in the use of marine transportation;

3.3 analyze which factors are most importatant in decision making concerning marine transportation;

3.3 identify a situation in which short term economic gains may produce long term environmental losses;

4.1 appraises the influence of peoples' values on the use of marine transportation.

Teaching suggestions: The purpose of this lesson is to introduce the student to marine transportation as a major marine resource in the past, present and in the projected future. He should also begin to form ideas relative to how man is utilizing this resource and its impact on the marine environment.

1. The students will complete the readings and respond to the questions and/or activities. (The materials may be distributed on previous days.)

2. In small groups and/or as a whole class discuss the readings, activities and questions.

3. Additional references:

   National Geographic Magazine
   The Gulf's Working Waterway, Vol 153, No.2 (Feb. 1978) pp. 200-224

   Giants That Move The World's Oil-Superships, Vol. 154, No. 1 (July 1978) pp. 102-123

4. The Sea Shanties are from the album Foc'sle Songs and Shanties (Fa 2429) by Paul Clayton and the Foc'sle Singers. Another album of sea shanties is

Colonial & Revolutionary War Sea Songs & Chanteys (FH 5275) sung at Seaport '76 by Cliff Hadam and John Millar. Both are available from Folkways Records & Service Corp., 43 W. 61st St., N.Y., N.Y. 10023.
American Sea Songs and Chanteys by Frank Shay, W.W. Norton & Co. Inc. N.Y. 1948.

TRANSPORTATION-EARLY RESOURCE

LESSON THIRTEEN

ACTIVITY ONE

Complete -

Your Answer activity.

Share -

Your answers with your classmates.

Read -

Transportation as a Resource.

Read -

The description of the nature and value of transportation as a resource in the past. The description is in the Old Testament of the Bible in Ezakiel 27:1-25.

List -

The items which were carried for trade by ships and list the countries involved.

YOUR ANSWER

Has anyone, all of a sudden, asked you a question you weren't expecting?

Below are some situations like that. Fill in your response.

HOW DID ALL THE SETTLERS AND SUPPLIES GET TO TEXAS?

YOU

HOW DOES MIDDLE EAST OIL GET TO US?

YOU

THE OCEANS AND THE GULF OF MEXICO ARE A MEDIUM OF TRANSPORTATION. IS THIS A RESOURCE?

YOU

WHY?

YOU

TRANSPORTATION AS A RESOURCE

One of the major marine resources is that of transportation of men and goods. Ocean transportation allows large quantities of materials to be moved from one place to another. The materials are moved from a place where they are plentiful to places where they are lacking. Movement across the water requires little energy in comparison to other means. This characteristic so valuable in the past is still valuable today. An example is the supertankers which carry oil from the oil rich Middle East to the oil starved United States.

Past

We do not know when man first used the oceans to get from one place to another. The first people recorded as having used the ocean for transportation were the Phoenicians. Beginning in 1022 B.C., they had boats rigged with sails that they used to travel from the eastern Mediterranean to England and the north coast of Africa.

An excellent description of this nature and value of transportation is given in the Old Testament account of Ezekiel (Ezekiel 27: 1-25.) Around 1000 A.D. Lief Erickson traveled from Norway to the eastern coast of the United States. By the 15th century, Spanish, Portugese and Dutch ships were exploring the Atlantic.

In the early 16th century, the Spanish ships began exploring the Gulf of Mexico and the coast of Texas. From the 17th to the 19th century, ships from Spain brought soldiers and supplies to Mexico and Texas. The ships would then take back precious raw materials from Mexico. By the mid 19th century ships began to bring settlers and supplies to Texas. This was the beginning of the development of the Gulf as a resource for transportation.

TRANSPORTATION IN THE PAST

Read the description of the nature and value of transportation as a resource in the past. The description in the Old Testament of the Bible in Ezekiel 27: 1-25. List the items which were carried for trade by early ships and which countries were involved.

SEA CHANTEYS AND THE SAILING SHIPS

LESSON THIRTEEN

ACTIVITY TWO

Look at -

Drawing of Sailing Ship.

Imagine -

You are on a 19th century sailing ship.

Sing -

Along with the audio tape of sea chanteys and act out each activity.

Imagine -

What is would be like to work on the deck with the sails during a storm.

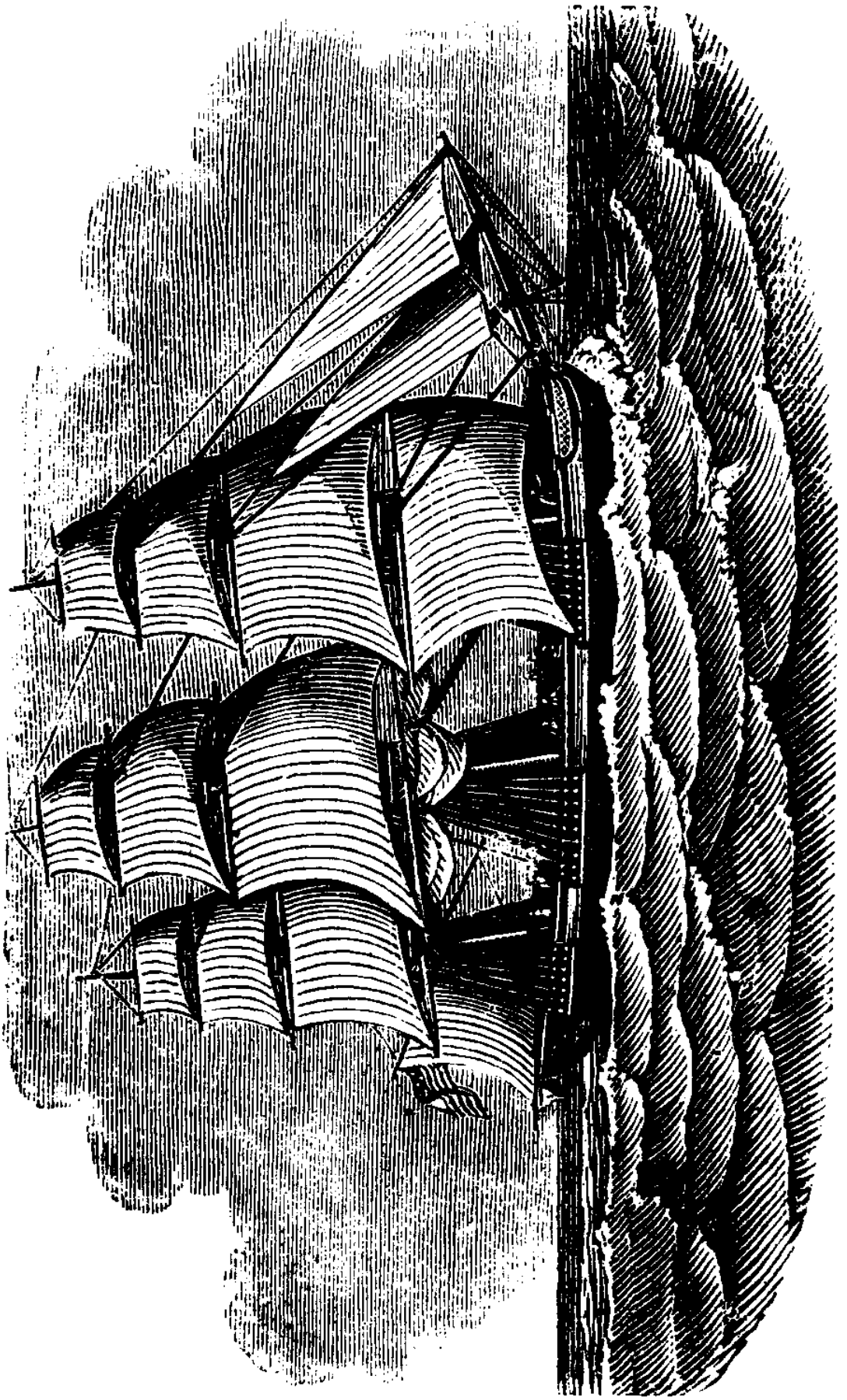
Write -

A short story or song describing the scene.

Answer - The questions.

Write -

A song that would be sung on or about a vessel today. Some vessels that you might want to write a song about are: tugboat, supertanker, cargo ship, ferryboat, tankers and cruise ship.



SEA CHANTEYS AND THE SAILING SHIPS

Imagine you are on a sailing ship in the 19th century. Today is sailing day! Sailing day for a famous ship is always a gala affair. All great ships had their fans who followed their careers, cheered their speedy passages,and often welcomed them home. Sailing day attracted the largest crowds. The sailors want to make the most of the moment.

As the tide prepares to ebb, the order is passed forward and the chief officer goes into action and snaps out his order to raise the anchor.

Pretend you are pulling up an anchor by performing the actual motions. The final word in the chorus is the signal to pull back on the rope.

Chief Officer: "Now, men and sogers both, heave away at the windlass. You, chanteyman, give us 'Rye-O!' and raise the decks, aye, raise the very dead. Heave and a-way!"

Chanteyman: Oh, say were you ever in the Rio Grande,

Crew: Oh you Rio,

Chanteyman: It's there that the river runs down the golden sand,

Crew: And we're bound for the Rio Grande.

Chorus: So away love away,
Oh you Rio,
Sing fare well, my pretty young girl,
And we're bound for the Rio Grande.

Chanteyman: Now New York town is no place for me,

Crew: Oh you Rio,

Chanteyman: I'll pack up my trunk and I'll go off to sea,

Crew: And we're bound for the Rio Grande.

Chanteyman: Now all you beachcombers we'll have you to know,

Crew: Oh you Rio,

Chanteyman: We're bound for the Southard and glad for to go,

Crew: And we're bound for the Rio Grande.

Chanteyman: So it's put down your bag and get it unpacked,

Crew: Oh you Rio,

Chanteyman: The sooner we leave, the quicker we're back,

Crew: And we're bound for the Rio Grande.

Chanteyman: The anchor is weighed and the gear all made fast,

Crew: Oh you Rio,

Chanteyman: And the boys give a cheer when the harbor is passed,

Crew: And we're bound for the Rio Grande.

This favorite capstan chantey was used mainly in raising the anchor on outbound trips. It does not refer to the Rio Grande River but to the Brazilian port of the same name. Whether bound for that port or not, a chanteyman would strike up this rollicking song on leaving port, as much to entertain the girls and men on the crowed docks as to facilitate heaving up the anchor.

Once the anchor is raised, the chief mate turns to the quarter-deck and receiving his orders from the captain cries out.

Chief mate: "Lay aloft there, ye walkin' corpses, and loose all sails!"

The second and third mates, the bosun and bosum's mate rush to their stations, repeating orders and checking the progress of of the work. The foremost sail is the first to break out white, followed quickly and in order by the main and mizzen masts. Other chanteys break out. From the shore comes another great cheer that puts even more heart and brawn into the crew. The ship moves and a new voyage has begun.

Roll the Cotton Down

(This chantey probably originated from one of the southern cotton ports. Used in hoisting the main sails.)

Pretend you are pulling up the mail sail by performing the actual motions.

Chanteyman: Away down south where I was born,

Crew: And roll the cotton down,

Chanteyman: I used to work from night till morn,

Crew: And roll the cotton down.

Chanteyman: I thought I'd go and climb the lines,

Crew: And roll the cotton down,

Chanteyman: And for the sailors sun shall shine,

Crew: And roll the cotton down.

Chanteyman: A dime a day is the black man's pay,

Crew: And roll the cotton down,

Chanteyman: A white man's pay is a dollar a day,

Crew: And roll the cotton down.

Chanteyman: I served my time in the Black Ball line,

Crew: And roll the cotton down,

Chanteyman: It was the there I wasted all my prime,

Crew: And roll the cotton down.

Chanteyman: On the Black Ball line is for me the line,

Crew: And roll the cotton down,

Chanteyman: That's when you'll fly the number nine,

Crew: And roll the cotton down.

Chanteyman: And to Henry Clay I went one day,

Crew: And roll the cotton down,

Chanteyman: And for Liverpool town we sailed away,

Crew: And roll the cotton down.

Imagine you have a few free moments to reflect on your life as a sailor. You would probably sing a non-work song or foc'sle song. It is named for the area of the ship where it was usually sung.

The three elements found most frequently in sea songs: complaints about the hard life at sea as compared to an easier life on shore; a description of actual work on board ship; and some mention of the girl left behind,are found in this song.

Haul Boys Haul

Chorus:
Haul, Boys, Haul, haul, boys haul,
Heave away the capstan, lads, and let's get up the trawl,
When the wind is gently blowing and the ship is gently rolling,
My Hannah, my Hannah, won't you be true to me.

Oh, once I was a schoolboy and I lived at home in ease,
But now I am a traveling lad to plow the raging seas;
I thought I'd like seafaring life, 'twas all right till I found
"Twas a damn sight worse than slavery when you got on the ground.

For every night in winter, as regular as the clock,
You put on your sou'wester and likewise your oilskin frock,
And go up to the capstan, lads, and ever heave away,
For that's the cry in the middle of the night as well as in the day.

All your sailing days are not pleasant. Imagine what it would be like to work on the deck with the sails during a severe storm. Write a short story describing the scene or write a song about it.

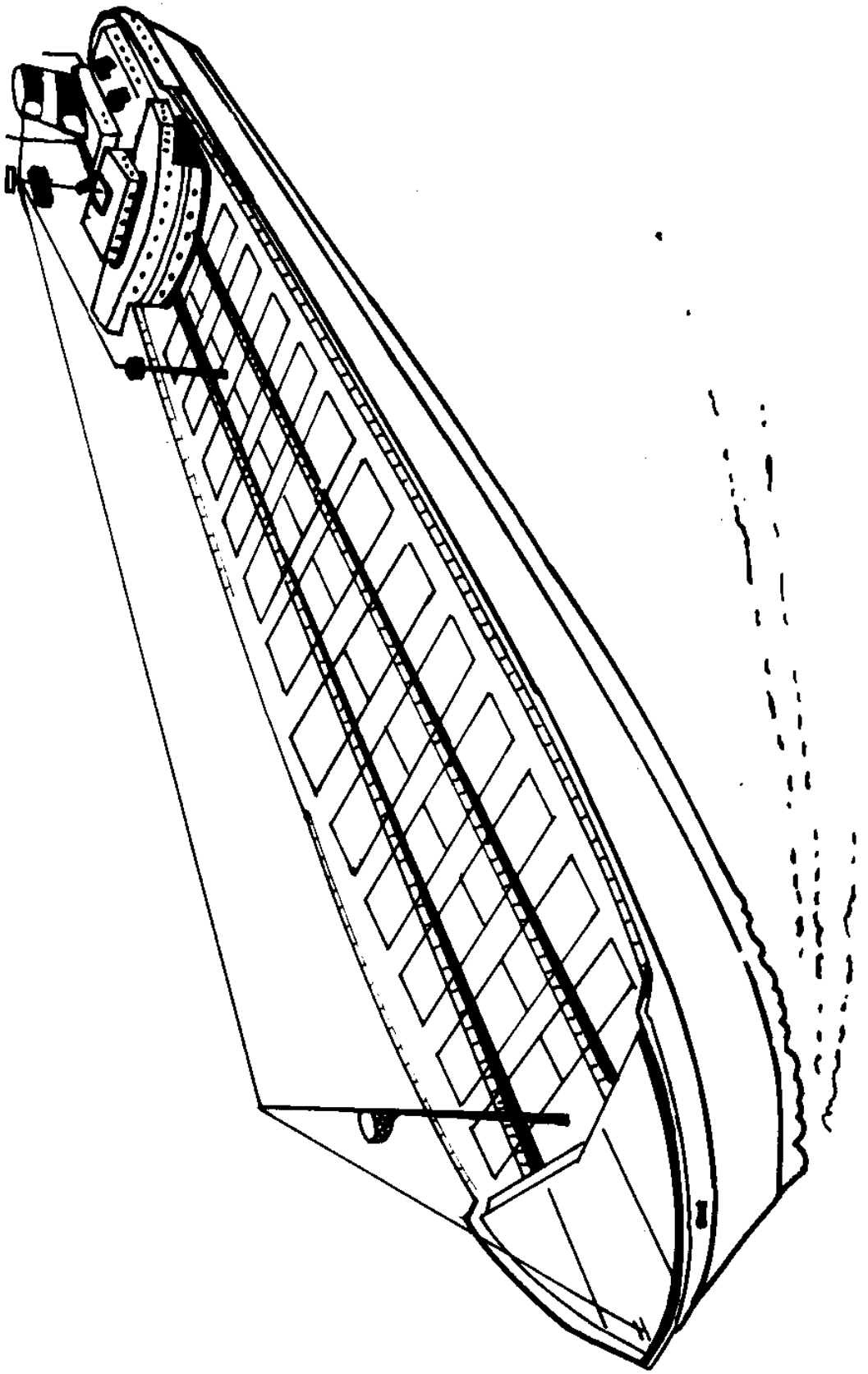
1. Why were chanteys an important part of sailing the square rigged sailing ships?

2. What feeling do they give?

3. Why aren't chanteys a part of ship life today?

4. How have the ships and the life of the sailor changed? What caused this change?

5. What would a chantey written today on a supership say?



THE SUPERSHIPS

Meet Capt. Petro, he is the captain of a supertanker, He will tell you about his supership.

Today supertankers like mine which have a deadweight of 500,000 tons are common. This was not always true. The first ocean-going oil tanker, the Gluckauf, was built a 100 years ago. The first full cargo of oil was transported from Philadelphia to London. That ship could hardly be called a "tanker." However, it started the transportation of oil which today dominates modern commerce due to both the size and importance of tankers.

During World War II, the largest tanker had a deadweight of 18,000 DWT (deadweight tons). Superships are almost a quarter of a mile long with bridges 100 feet above the surface of the water. Today there are hundreds; by the turn of the century there will be thousands.

My supertanker requires more than three miles to stop therefore new navigation equipment and skills are needed. Our tankers account for half of all tonnage afloat. 1,000,000 DWT tankers are being planned.

Sailors don't look at these depersonalized vessels as ships. They are called VLCC's or Very Large Crude Carriers. Our supertankers are too expensive to remain still so we spend less than 10 percent of their time in port.

Ports are another problem. Few ports can handle our supership. Today the United States is only planning a superport. So we have to unload our cargo onto smaller vessels to carry it into port. Foreign countries, however, have ports that can handle our superships. Where natural harbor and channel depths are not available at these foreign ports, they have constructed transfer channels in deep water miles offshore. These foreign countries believe that the port which can handle these ships will get the bulk cargo business of the future. So numerous foreign nations dealing in the iron ore, coal and crude oil have readied or are developing ports to receive our ships. The United States ports severely limit tanker size to under 100,000 DWT.

Transport savings of large tankers and bulk carriers have been long since proven. Many people are opposed to the supertankers because of their large size or because they also represent a tremendous threat to the environment.

In a detailed study of the recent ship accidents that involved pollution almost all were due to poor seamanship and

human error. A very large number of these mistakes are made by ships flying one of the flags of convenience. These are ships owned by United States interests, flying a foreign flag and manned by a foreign crew.

According to the law, American flag ships must be built in the United States and three-fourths of the crew must be Americans. American shipbuilding costs and seamen's wages are still higher than others. So American users of the flags of convenience argue that they use them because it is cheaper.

These new supertankers under the flags of convenience have the newest equipment. However, too often its crew does not know how to use the equipment or repair it. Super-ships are not built to last. As they get older, they begin to break down and become too expensive to repair. So to protect us and the environment,we need to make some international standards at sea.

1. Under the present construction prices, it would take over $20 million to build a tanker of 50,000 DWT and over $71 million to build a tanker of 400,000 DWT. The larger the tanker the more expensive it is to build. Why build a supertanker?

2. How many 50,000 DWT (dead weight tons) class ships do you need to transport a cargo of 400,000 tons?

3. What will have to be done to Texas ports before supertankers can use them.

TUGS,BARGES AND THE GULF'S WATERWAY

Meet Capt. Tug, he is the Captain of a tugboat on the Gulf Intracoastal Waterway. He will tell you about transportation on his waterway.

My waterway is a work route. It stretches almost 1,200 miles from the Florida panhandle to the Mexican border. Actually the waterway is a string of bays, natural channels and man-made canals. The waterway provides our barges, tugs and other small craft a protected passageway. The channel is at least 12 feet deep and 125 feet wide.

When the project really got started in the early 1900's, they hoped the traffic would grow to 5 million tons a year. They were wrong. Today it is more like 100 million tons and still growing. In fact,each year Gulf Intracoastal Waterway more than pays for the total of building and maintaining it. This is in the form of transportation savings. If the shipper had to use a more expensive form of transportation, he would have to charge his customers more. Railroads say that barges are unfair competition. They are leading a fight to have us pay a "user fee." The use of waterways has always been free.

Petroleum and petroleum products account for most of the traffic. A fourth of the cargo is crude oil pumped from the fields on the Texas and Louisiana coasts and from offshore wells. This makes the passage from New Orleans to Houston the busiest section. Pleasure boaters and fishermen also used the waterway for shelter and easy access to the Gulf.

A tugboat is small but powerful. It can push or pull any big ship into a dock. Tugboats not only work in the harbors but many like mine push long strings of barges along the waterway. This method is very economical since individual barges can be disconnected and dropped off at various ports. Tugs and barges have a very shallow draft, making them suitable for the waterway and many areas that larger ships can't enter.

The new LASH (standing for "lighter aboard ship") and Seabee will improve cargo handling tremendously. They are special barges that are carried on board ship. They will be able to load 12 times as much per hour with less than half the people. Also with the sealed barges, cargo damage and theft will be reduced.

Here is how it works. You have 25,000 tons of Texas soybeans that must be moved to Cologne, West Germany. The

soybeans are loaded on to LASH barges at Corpus Christi. A tugboat moves the barges along the waterway to Houston or New orleans. They are lifted on the mother ship, which goes to Rotterdam. There the LASH barges are unloaded. A tug then moves them up the Rhine River to Cologne where the soybeans are scooped out.

Life on our 50 foot tug is self-contained. We work in two shifts. While one is working, the other sleeps in the small cabins below the deck. Our lives seldom touch the land which is only several feet away.

We see lots of waterfowl, deer, muskrats, nutrias, otters, alligators, and snakes. You have to watch where you walk since sometimes a water moccasin comes on board. The waterway cuts through the marshes of the Aransas National Wildlife Refuge. The magnificent whooping cranes are not bothered by the traffic. However, a bad spill from an oil or chemical large could kill their food as well as that of other birds. In the past, the waterway ran outside of the refuge.

Since the waterway is an economic success, industry wants to make it more successful. In 1962 Congress approved enlarging the waterway between New Orleans and Houston. So far nothing has happened. There are many groups to be satisfied- industry, counties, landowners, hunting and fishing clubs, environmentalists and others. Industry wants it enlarged. Landowners don't want to give up their land. Counties don't want to use tax money to move the pipelines under it since they don't get any benefits from barges moving by. Environmentalists are against enlarging it since dredging destroys the wetlands. Deepening the channel causes increased salt water, and it may also stir up harmful pollutants in the sediments. Who will win...the honking of geese or the growl of the tugs?

1. Why are barges an efficient way of transporting goods?

2. Is the use of the waterway really free?

3. Can more barges move along the waterway and leave it unspoiled?

4. How do the values of the different groups affect the waterway's future?

5. What do you think should be done about the Intracoastal waterway?

6. How has technology caused a change in the use of the marine resource transportation?

7. Why is there a decrease in the use of passenger ships for transportation?

MY OPINION

A number of governmental agencies are discussing the supertankers, superports and the enlarging of the Gulf Intracoastal Waterway. Pretent you're writing to one of them with your own ideas of what should be done.

Dear People,
I've been thinking about _____,
and I think

Thank you for considering my opinion.

Sincerely,

SUPERPORTS AND THE FUTURE

LESSON THIRTEEN

ACTIVITY FOUR

Read -

Prospect for a Superport.

Look at -

Sketches of possible future ports.

List -

The advantages and disadvantages of a superport facility offshore in the Gulf of Mexico.

Read -

The Future.

Obtain -

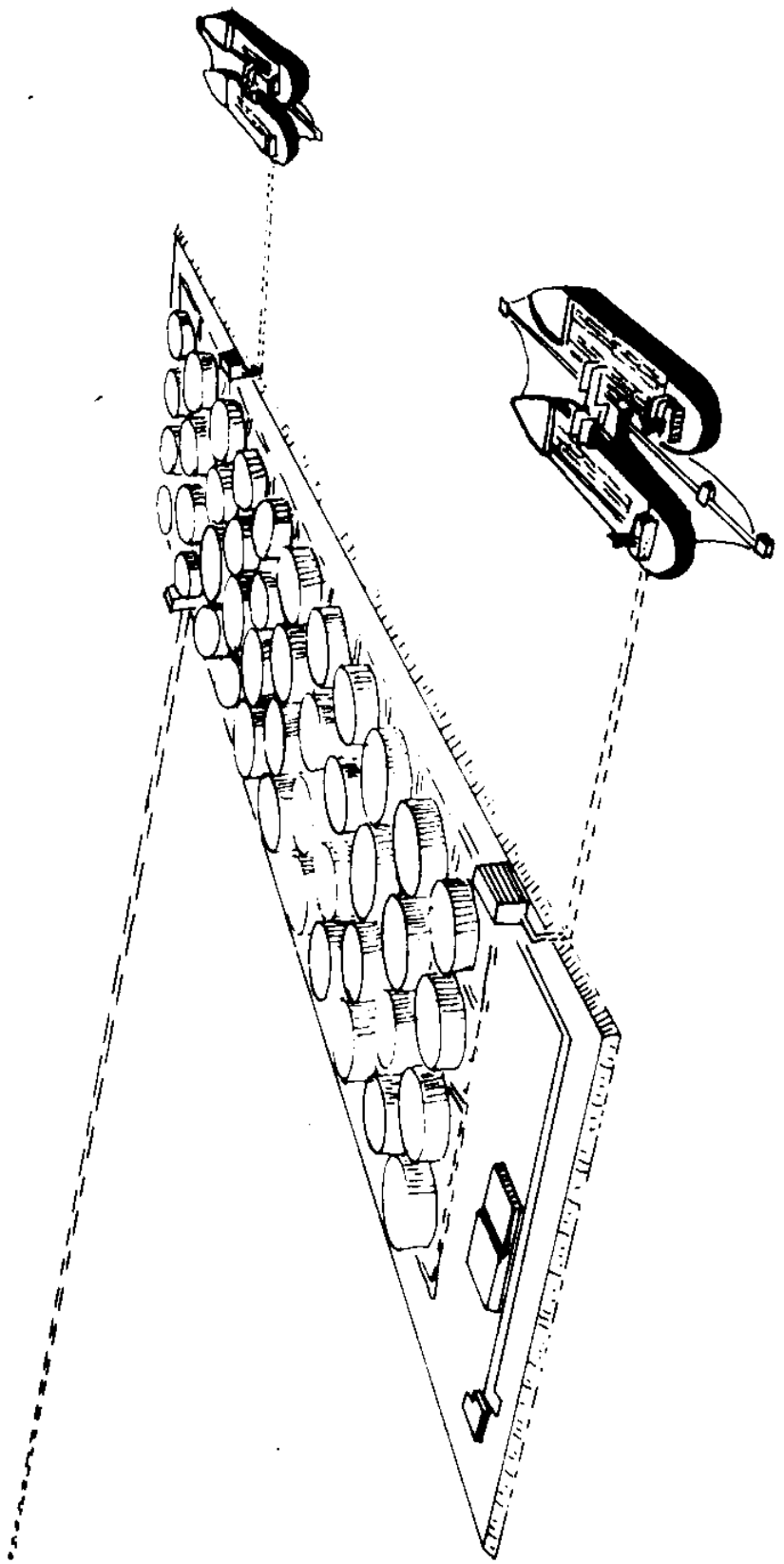
A Texas Highway Map.

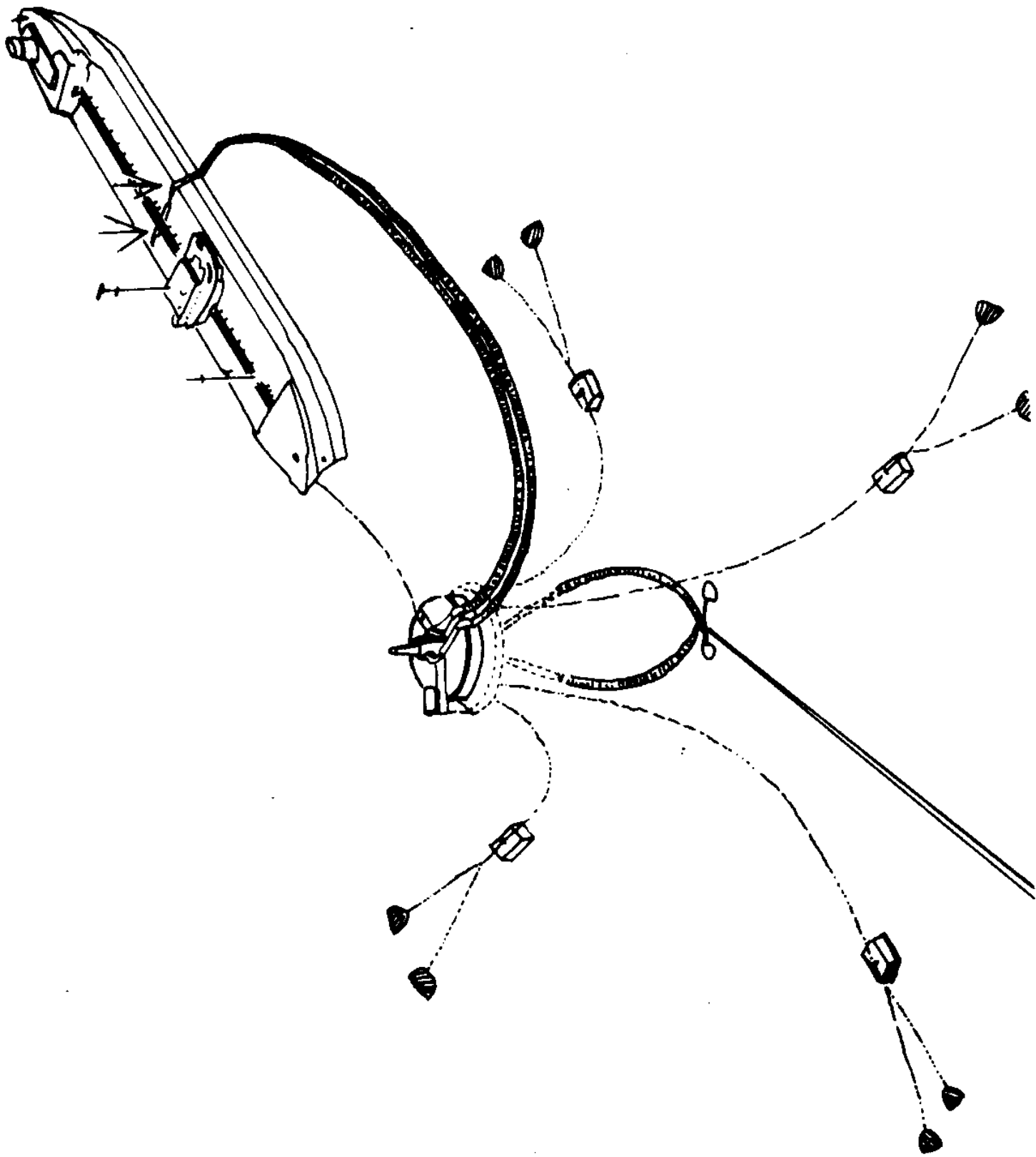
Use -

Map to complete Texas' Future Water Highways.

Answer -

The questions.



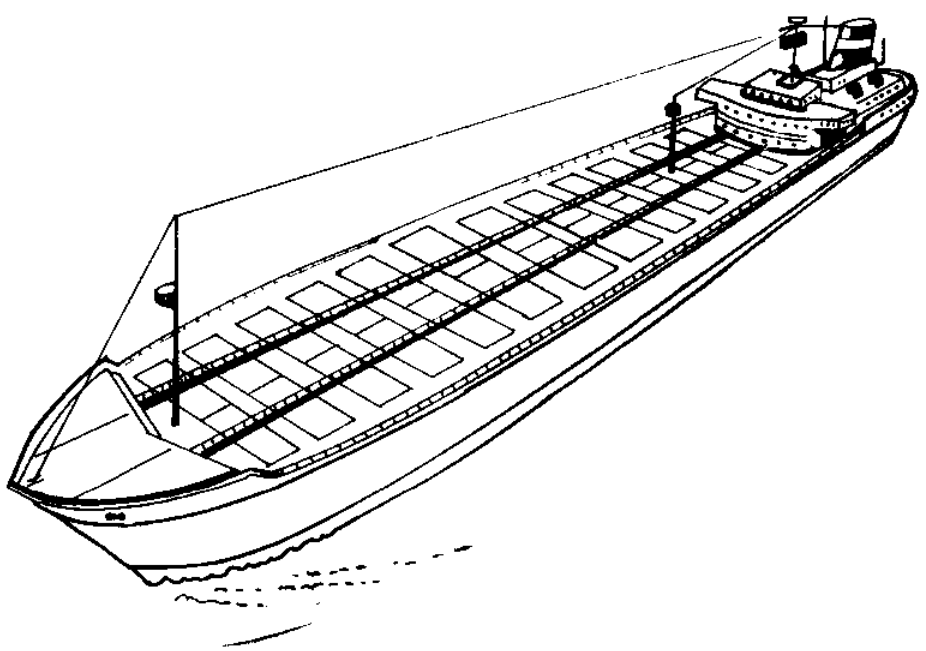


PROSPECT FOR A SUPERPORT

There is considerable discussion and agitation over the prospect of a superport off the Texas coast. With the need for increasing supplies of petroleum and petroleum products, we will have to import vast amounts of foreign oil. To supply these needs for oil, we will need the supertankers which need ports of depths up to 100 feet.

There are many questions to be answered. Can channels for supertankers be safely dredged? How will the channel affect the marine life? How will it effect the lives of the people in the area? What will be the economic, social, environmental and international implications of a superport?

There are alternatives to developing a port. Offshore ports can be constructed so there will be no need for dredging channels. A buoy-mooring facility is one possibility. See the drawing. The supertanker attaches to hoses of a mooring buoy. Then underwater pipelines from the buoy would carry the oil to storage tanks on shore. This buoys would be located several miles out into the Gulf where the depth is great enough for the superships. Another possibility is to build an artificial island out in the Gulf where the depth is great enough for supertankers. This island will hold storage tanks for oil. This oil is then piped to the refineries on shore as it is needed.



THE FUTURE

Vessels

Traveling the bays, lagoons, the major rivers and streams, and the Gulf, are hydrofoil crafts. They skim on the surface of the water, requiring only a depth of 3 feet. They can travel up to speeds of 50-75 miles an hour. These vessels carrying passengers and cargo up and down the major streams. With the decrease in petroleum and the high cost of gas and oil, trucks, buses and cars have become too expensive. Waterways again have become a resource for transportation.

Also in the bays, lagoons and in the Gulf, there are SES (Surface effect ships) ships. These several hundred ton vessels reach speeds of up to a 100 miles per hour as they skim on a bubble of air trapped between their hulls and the flexible "skirts" at each end. They ride smoothly over 2-4 foot waves. Long-range SES ships are being developed for carrying high grade cargo on trans-ocean routes.

There are large submerged or semisubmerged vessels, particularly tankers. A ship operating below the surface of the sea does not produce surface waves. Therefore, it can be propelled at high speeds with less power than a surface ship. Since it is operated submerged, it is not affected by the weather conditions.

Advanced Technology

Most cargos are shipped in a container system which reduces cargo handling by 60 to 80 percent. The developments in remote control and in monitoring equipment have led to machinery plants on ships which need only a crew for maintenance and minor adjustments. This development of unmanned power plants and sophisticated navigation equipment has led to ships which travel between ports almost without a crew. They have only a small emergency crew. Others board the ship on a rrival outside of a port to take it into port.

We all realize that wind power was the major energy for ocean transportation until the invention of the steam engine. If energy costs continue to rise, nuclear energy may be used for the superships. A hybrid form of sail and fossil fuel may once again be the most economic form of ocean transportation.

TEXAS' FUTURE WATER HIGHWAYS

Obtain a Texas Highway map.

Trace all the rivers with a blue magic marker. Underline each city of a population of over 20,000 that is on a river or bay, lagoon or intracoastal waterway with a red magic marker. Or use the Texas Almanac listing of the populations of over 20,000 on the map and underline with a red pen those which are located on a bay, lagoon. river or waterway or within a couple of miles of one.

1. What proportion of the state would hydrofoil craft or SES be able to reach? Could this be a feasible means of future transportation?

2. What problems would have to be overcome for this type of transportation to develop?

3. Would people be willing to give up travel by automobile for travel by hydrofoil vessels?

4. What is the social impact of technological change in transportation? How can we solve the problem of how to cope with the social impact of technology?

5. In the 19th and 20th centuries, the ocean was and is used as a domain for military power, and two World Wars have been fought on it. Some do not regard military use as a resource. What do you think?

LESSON FOURTEEN
MARINE ENERGY SOURCES

ACTIVITY ONE-Oil!

ACTIVITY TWO-Pollution Free Energy

Suggested Time for Classroom Use of Materials: Approximately 3 to 5 class periods

Materials for Classroom Use:
My Energy Position/activity
Here and Now With Energy/activity
Oil Production/reading
Letter on Offshore Oil Platform/reading
World Wide Oil Exploration/reading
Pre-Oil Social and Environmental Impact/report/reading
Point/Counterpoint/activity
Pollution Free Energy/reading
Future Energy headlines/activity

Major Objectives for the Lesson: After completing the lesson, the student will be able to:

1.1 cite examples of marine energy resources;

2.3 evaluate a marine energy resource problem man has solved and the changes that resulted and the new problems that arose;

2.5 generate a list of marine energy resources which will be important in the future;

2.6 analyze the use of marine energy resources in the past, present and projected future in view of the needs thru time and in relation to the values involved;

2.6 describe how the changing use of the energy resources has changed and will change lifestyles;

2.6 analyze value positions in relation to marine energy resources to determine similiarities, differences and possible conflicts;

2.7 discuss the idea that marine energy resources represent "a common heritage" and belong to the entire

international community;

3.1 discuss the interplay of the many facets (sociological, economic, governmental, psychological and moral) in the management and utilization of the energy sources;

3.2 describe and identify situations where technology has caused a change in the use of marine energy sources from the past to the present and projected future;

3.3 analyze which considerations are important in the utilization of marine energy sources;

3.3 identify a situation in which short term economic gains may produce long term environmental losses;

3.4 make projections about the consequences of man's use of marine energy resources;

4.1 appraise attitudes about marine energy sources;

4.2 advocate the use of less energy.

Teaching Suggestions: The purpose of this lesson is to present the student information on the marine energy resources of the past, present and future. He should also begin to form ideas in terms of how man's actions will affect the environment and how in turn the change will affect man.

1. Have the students complete the readings and respond to the questions and/or activities.

2. (The materials may be handed out the previous day.)

3. In the My Energy Position activity, define a "ridiculous middle" to help steer participants off that position. To share the responses in the total group, label opposite walls in a room with the extremes and ask participants to physically stand where their beliefs are. Or, draw the continuum on a chalkboard and ask participants to initial the spots that represent their beliefs. There are no correct answers for that person at that time!

3. In the point/counterpoint activity have the students

draw for their position and opponent. Usually a class has more students than positions so you will have more than one presentation on the same issue. The drawing for positions may be set up as follows for example: Superport A/No superport A
Superport B/No superport B
Offshore drilling A/No more offshore drilling A
Offshore drilling B/No more offshore drilling B
and etc.

Also give the students time to prepare for their presentation (either in class or out). You will act as the timer. This is patterned after the C.B.S. 60 Minutes Point/Counterpoint.

4. Have the students discuss the readings, questions and activities in small groups and/or as a whole class. Encourage students to generate related questions and then strive to answer them cooperatively.

5. Additional references from:
<u>National Geographic Magazine</u>

Pollution, Threat to Man's Only Home. Vol. 138 No. 6 (Dec. 1970) pp. 738-781
Barehanded Battle to Clean the Bay, Vol. 139, No. 6 (June 1971) pp. 866-881
The Search For Tomorrow's Power, Vol. 142, No. 5 (Nov. 1972) pp. 650-681
Oil:The Dwindling Treasure, Vol. 145, No. 6 (June 1974) pp. 792-825
Man's New Frontier-The Continental Shelf, Vol. 153, No. 4 (April 1978) pp. 495-531
Sailing with the Supertankers (pp. 102-123) and World's Worst Spill (pp. 124-135), Vol. 154, No. 1 (July 1978)

OIL!

LESSON FOURTEEN

ACTIVITY ONE

Complete -

My Energy Position activity.

Share -

Your position with your class mates.

Complete -

Here and Now with Energy Activity.

Discuss -

The results with your classmates.

Read -

Oil Production
Offshore Oil Platform Letter
Letter from T. Bender of World Wide
Oil Exploration
Pre-Oil Social and Environmental Impact Report

Answer -

The questions.

Prepare -

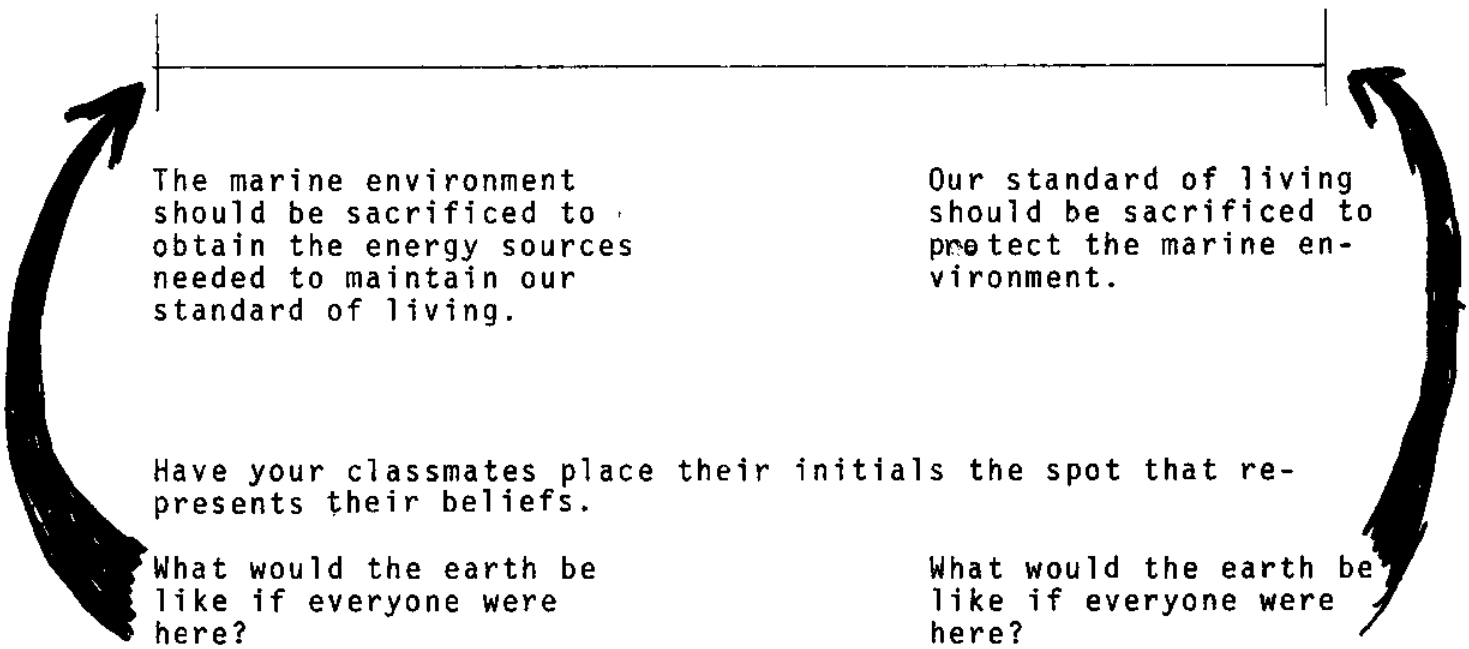
A one minute point/counterpoint presentation.
You will draw one of the following positions:
Offshore drilling/No more offshore drilling
Superport/No superports
Supertanker/No supertankers
Money for more oil exploration/Money for other sources of energy

Present -

Your one minute presentation in front of the class with classmate who has opposing view position.

MY ENERGY POSITION

Put your initials on the line that represents your position.



The marine environment should be sacrificed to obtain the energy sources needed to maintain our standard of living.

Our standard of living should be sacrificed to protect the marine environment.

Have your classmates place their initials the spot that represents their beliefs.

What would the earth be like if everyone were here?

What would the earth be like if everyone were here?

Were more initials on the left or the right side of center?

HERE AND NOW WITH ENERGY

Right at this moment, what sources of energy are you using?

What sources of energy did you use today?

What would happen if one of these sources was cut off right now?

What would you do about its being cut off?

What sources are marine in origin?

OIL PRODUCTION

For thousands of years, people have thought of the harvest of the sea in terms of food resources. Recently, attention has been turned to the harvest of the mineral resources that lie beneath the sea. An estimated 26 percent of the world's known oil reserves are submerged beneath the seas. Some experts think exploration will greatly raise that percentage. An increasing amount of the world's oil of the future will be drawn from beneath the ocean. The end of the oil age will occur when the oil in the deeper parts of the ocean is exhausted.

Oil in the Texas coastal zone was found seeping from the soil long before the first Europeans arrived. They told explorers that the fluid had medicinal values. This first record of Europeans using crude oil was in the calking of boats, in 1543, by survivors of the De Soto expedition near Sabine Pass. In 1866, the first well was drilled to produce oil. The basic principle of rotary drilling was used and it has been used ever since, although with much improvement.

The development of offshore oil exploration had its beginning in the Gulf of Mexico during the summer and fall of 1947. The first subsea well was completed from a mobile platform in the Gulf of Mexico. No longer was offshore oil production limited to the rigid platforms that had to be built in place.

Exploration for petroleum is taking place on all continental shelves except the Antarctic. The continental shelf in the Gulf of Mexico has had the greatest concentration of exploration and drilling. It also has the largest number of producing wells of any offshore area in the world. Over a million dollars is spent each day to develop offshore oil wells in the Gulf. A recent count showed that around 7,000 platforms are located in the Gulf of Mexico. More than 40 percent of the nation's natural gas reserves are located on the Texas Gulf Coast.

Even in the Gulf of Mexico, with all its wells, a large area remains to be explored. There are more than 330 million submerged acres beneath the Gulf in water less than 60 feet deep. Of these only about 35 million acres have been explored. There are also billions of acres at deeper depths that are unexplored.

With the increasing demand for oil, it is important to know the success in finding new fields, the time involved in the discovery, and the development of the field for production.

These are important in predicting the role of offshore oil on future energy supplies. In the Gulf, the time from discovery to development is 3 to 4 years. In the North Sea it is at least 10 years, due to the sea's conditions. Of course, the major problem still is that we do not know where oil is located. Therefore, many wells that are drilled which find no oil, and it costs millions of dollars just to learn there was no oil there.

To tap more underwater oil deposits, there will have to be drilling in deeper water. It now costs seven times more to drill for oil offshore than on land. As drilling begins in deeper water, the costs rise even more. Even if there are large submerged oil deposits, they will be expensive to develop.

LETTER ON OFFSHORE OIL PLATFORM

Capt. Al G. Seaborne
Coastal Port
Texas

Dear Captain Seaborne,

I am working as a roughneck at sea on an offshore oil drilling platform in the Gulf of Mexico.

A helicopter takes us to work 95 miles out in the Gulf. We land on the helicopter pad of our drilling rig. There are fifty of us, men and women, working and living here. We work twelve hour shifts for seven days. Then we helicopter back to shore for our seven days off.

The platform and its operations look like those on T.V. commercials. It is spotless. We are not allowed to throw even a cup over the side. Even rain water falling on the platform is filtered before it reaches the surface of the Gulf.

Our platform is 200 feet wide and 290 feet long. It is 160 feet above the Gulf. The platform has the helicopter landing pad, derrick, pumps and machinery, monitoring equipment, repair shops, offices and living quarters. We are in water that is 300 feet deep and may drill to a depth of 10,000 feet. Our platform can move under its own power. The living conditions are good and so is the food. Only when you look at the water do you know that you are not on land.

If you look through the five stories of grill work, you can see scores of fish darting about the platform's steel legs. The fish are neither attracted nor repelled by oil for the simple reason, there is none. The fish are attracted by the platform itself, which acts like a reef. It attracts a food chain that starts with phytoplankton and barnacles and works to larger marine creatures like the shark. Our platform actually attracts more marine organisms into the area than were here before.

The job is outdoors and offers adventure and excitement. This drilling platform works on the same principle as the earlier ones. The operation is different today. It is larger and there are more technological innovations. Today we even use T.V. cameras and computers in our work. It is more difficult now, so more education is needed. Once only grade school was needed, now one needs a high school education or more.

It is time for my shift to go to work.

Sincerely yours,

C. Diver

C. Diver

LETTER OF ENVIRONMENTAL IMPACT OF OFFSHORE DRILLING

Capt. Al G. Seaborne
Coastal Port
Texas

Dear Captain Seaborne,

This is in answer to your letter asking me to assess the environmental impact of offshore drilling.

After the oil shortage of 1973,one of the provisions to decrease our dependence on oil imports was to lease some 10 million acres of the Outer Continental Shelf for offshore oil development. The plan aroused a storm of opposition from environmentalists, legislators, business men as well as nature lovers.

There is an uproar in spite of economic pressures and the talk of energy shortages. People who care little about protecting the environment at a distance really get concerned about protecting it close to home. The uproar is understandable, but not for their reason--the fear of oil spills.

Oil companies have greatly improved their offshore oil production. The reasons for this improvement were: drastic fines for damage from oil spills; the financial loss due to wasting oil; and public opinion. Now there are automatic storm chokes which react instantly to changes in heat, pressure and rates of flow. There are also thicker pipes,electric monitoring,and blowout preventers designed to cut off and contain oil in emergency cases.

Even if the new safety systems fail, there are improved booms and skimmers to contain the spill before it reaches a shore. Pipes are used to carry the oil to shore in the Gulf. The environmental danger is much greater if ships are used. The chance of a large oil spill from the offshore platforms is fairly remote.

Among the sources of oceanic pollution, spills from offshore drilling rank far down the list. Tankers and even normal shipping are far great offenders--19 times greater. River deposits and sewer drain-offs,including crankcase oil from the thousands of gas stations,cause more pollution. Even the natural seepage emitted from time to time from the oil seabeds is greater.

There is visual pollution by the wells and rigs in the Gulf. They do give the seascape an industrial look. However, they don't have to be unattractive. Off Long Beach, California, they are made to look like apartments on an offshore artificial island. Off the Atlantic coast is 25 to 75 miles offshore and on a clear day the uppermost

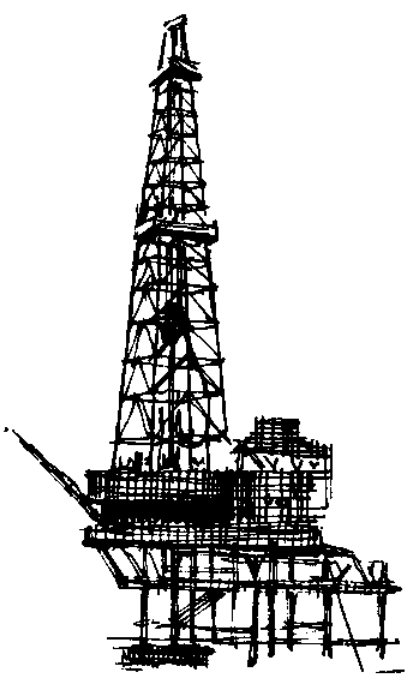
tip of the rig would be seen from shore.

It is the shore itself--what drilling can do to it...that is the real issue. It is not the oil itself since pipes carrying the offshore fuel are heavily protected against corrosion and rupturing. They can be brought in underground to the refineries and storage tanks which can be inland away from the fragile coastal area. The real problem, social as well as environmental comes before any oil is produced. I have attached a report on that problem.

Sincerely yours,

Tom Bender

Tom Bender, Executive
World Wide Oil
Exploration Inc.



PRE-OIL SOCIAL AND ENVIRONMENTAL IMPACT

The real problem of offshore oil development is social as well as environmental and occurs before any oil is produced. The building and the setting up of the offshore platforms requires a large onshore task force. The offshore work force is small compared to the people employed onshore. People are needed to assemble the platforms, operate the needed fleet of boats and barges and to supply the daily needs of the crew. This working force of thousands, along with their families moving into a small coastal community, creates large problems--both social and environmental, both immediate and long range.

The platform construction workers bring other builders needed to put up housing for the workers and their families. Next come more schools, stores, restaurants, professional office and entertainment establishments, with roads and sewers needed for all of them. (In other words it becomes a boom-town with labor shortages, inflated land prices, and higher wages. There are also the social strains between natives and out-siders.

Another problem exists. The small shore community is probably scenic with recreation activities that are easily ffected by sudden growth in industry and construction. The fragile nature or the coastal environment allows it to be easily dammaged from the heavy equipment that the building and hauling of oil rigs and heavy supplies re-quire.

The boom may abruptly end. The field's potential may not be what was expected. Only actual drilling answers that question, and the odds are only one in seven that a well will yield any oil or gas. Or the time comes when the oil is gone. No more platforms are built; no more pipe laid; workers move away; stores close; schools disappear; houses are empty. A boomtown becomes a ghost town. Worse is that it will never recover its pre-boom resort quality. All energy taken from the earth requires a price in environmental damage.

Another problem is that no one knows how much, or if any, oil or gas is available under the outer Continental Shelf. If there is oil there, it will be 8-10 years at least before any large scale production will occur. In the meantime, we continue to increase our use of petroleum. By the end of 1975 we were importing close to 40 percent, a long way from independence.

1. Do you think we should continue and increase offshore oil exploration? Why or why not?

2. What are the alternatives if we choose not to explore for offshore oil?

3. At present, most U.S. offshore oil production is in the Gulf of Mexico and off the coast of California while the Atlantic coastal states are saying no to offshore oil development. How do you feel about this?

   What should be done?

4. How would you solve the problem of small coastal communities becoming boom towns?

5. Oil gushes up from the sea bed--black gold, the greatest source of wealth from the sea, with the highest potential to destroy. State your feelings and explanation about the above statement.

POINT/COUNTERPOINT

You have drawn to determine which position you will represent. Your presentation will be one minute in length. You'll probably want to make an outline so you don't leave anything out.

_____

by_____

I. _____

A.

B.

C.

II. A.

B.

C.

III. _____

A.

B.

C.

POLLUTION FREE ENERGY

LESSON FOURTEEN

ACTIVITY TWO

Read -

Pollution Free Energy.

Divide -

A sheet of paper into three columns. Label the columns:
Past
Present
Future

List the marine energy resources in the column in which they belong. Some may be more than one column.

Answer -

The questions.

Complete -

Future Energy Headlines activity.

POLLUTION FREE ENERGY

The sea produces many miracles--one is the potential for pollution free energy. All the energy the world needs is concentrated in the ocean's physical systems. Ever since the need for new sources of energy arose, scientists and engineers have looked toward the endlessly moving waters of the oceans: the fury of the storm, the pounding of the surf, the rise and fall of the tides. All suggest that the seas hold an awesome amount of potential power. The question has been how to harness that power for use in a way that is economical and will not interfere with the marine ecosystem.

Tidal Power

By the late middle ages tidal mills were in existence along the coasts of England, Holland,and Wales. The first tidal mill in the United States was built in 1635 in Salem, Massachusetts. The tidal mills used waterwheels and were low in energy production. Today on the Rance River in France there is a 240 megawatt plant which has successfully harnessed the tides. There are only about 90 places where tidal heights and volumes are great enough for the operation of tidal electric power plants. Therefore, the total power produced from this resource will be small in terms of the world total energy needs.

There are some problems in the construction of tidal power plants. These include high cost of construction and blockage of the waterway to commercial and pleasure craft. There is also the scenic pollution of dams and turbined on the river. The life cycles of the marine organisms may be affected by changes in salinity, temperature and nutrients.

Wave Energy

There is a tremendous amount of energy in the form of waves. Scientists have estimated that a four foot wave has 5.45 horsepower per wave; or 28,000 horsepower per mile. (Small riding lawner mowers have a 5 horsepower engine.) If the power in one 10 foot wave were harnessed for 4 miles it would produce an amount of energy equal to the daily production of a typical nuclear power plant.

In 1909 an invention called "The Reynolds Wave Motor" was produced. It transformed the energy of the surf into electricity. It did produce electricity to light a string of light bulbs but not much more. The theory was sound and with today's technology,it could become the basis of an efficient

energy system. However, large-scale production of energy from waves needs more research.

Windmills in the Water

In the past, before electricity, windmills dotted the farms and ranches of Texas. The power of a breeze would turn the blades and pumps would be driven to pull the water from underground wells. Today, windmills are beginning to make a comeback on land. The principle of the windmill may be used to capture the power of the sea in the future also.

The water of the Gulf stream flows rapidly past the Florida Keys. The force of the water is like a breeze. The current's speed changes, but it is more reliable than wind. Scientists have proposed a system of underwater windmills in the Gulf stream. 350 miles from the U.S. the water is strong enough to drive rotor-type motors. A proposed row of twelve turbines over the 350 mile area could produce 100,000 megawatts of pollution free energy. Other streams in the ocean could also be harnessed by windmills.

Sea Thermal Power

The most promising form of oceanic energy is the use of energy from the difference in temperature between the surface water and the water of the ocean depths. It is the ocean's greatest renewable source, since it is replenished each day by solar radiation. A sea thermal plant could operate 24 hours year round. It has been estimated that the temperature differences of the Gulf stream could generate 82 trillion kilowatt hours. The projected need for the United States by 1980 is 2.8 trillion kilowatt hours. One team of researchers has estimated that this ocean-wide power source is capable of providing continuously 200 times the earth's total power needs in the year 2000.

The one side-effect that exists is that it could warm the ocean water. This could effect marine life and weather conditions. Weather changes can be caused by a small change in the heat balance of the ocean. The warming of the cold nutrient waters from below (artificial updwelling) may cause increased growth of marine organisms. We do not know the long range effects. Therefore, the ecological consequences of sea thermal power need to be studied.

Harvest of the Wind

The heating of the earth's atmosphere by the sun, and the rotation of the earth, results in wind patterns. Wind power was the major energy for ocean transportation until the invention of the steam engine. If energy costs continue to rise, a combination of oil and fossil fuel may once again be the most economical form of ocean transportation. Windmills have been the other use of wind power. The building of large windmills on floating platforms offshore is now being investigated. A problem is that winds are extemely variable and the platforms must be able to withstand storm winds.

Energy of theFuture--Nuclear Fusion

In the future, it expected that power from nuclear fusion will be feasible and the cost will be reasonable. The fuel for these power plants will be heavy water (Water whose hydrogen atom contains an extra neutron.). A small but important percentage of sea water is heavy water.so when this form of energy is developed, the ocean will be the source for the fuel.

The Ocean as a Coolant

The ocean can serve as an effective and inexhaustible source of cold water for cooling. For any kind of thermal power plant, whether it is solar, nuclear or fossil fuel that is used as an energy a supply of cooling water is as important as the heat source. Land-based plants require expensive, unsightly cooling towers. Also, nobody wants a power plant in his backyard, especially a nuclear one.

An alternative is to build these power plants offshore. The New Jersey Public Service Electric and Gas Comapny with the combined efforts of Tenneco and Westinghouse, plans to construct the first floating nuclear power plant 2.8 miles off the coast of New Jersey. The developers believe that in the open sea the warm water will disperse better. Therefore there will be less damage than occurs when the heated water is discharged into coastal areas. Mariculturists feel that the warm water could be used to set up areas where fish could be grown more rapidly and with a better chance of survival.

The problem of radioactive materials will have to

be kept at very low levels. Some feel that the ocean dilutes radioactivity more easily than does the land. This theory is not logical since the radioactive substances will be used by marine organisms. So the radioactive chemicals will be returned to us in our food fish.

In the future, whether it is oil, coal, ocean thermal, wind, wave, tide nuclear fission or nuclear fusion, a large part of the world's production of energy may be from the oceans.

1. Why should pollution costs be included when comparing one energy source with another?

2. What are the problems in the use of fossil fuels for energy?

3. How does energy from fossil fuel compare with energy from waves, currents, tides and water temperature differences?

4. Why must we find non-polluting sources of energy?

5. Why do we need more energy than was needed in the past?

6. Why is the ocean considered the source of most of our future energy?

FUTURE ENERGY HEADLINES

Newspaper headlines seem to fluctuate between good news and bad news about the marine environment and energy. As you look into the future, what do you see newspaper headlines saying? Write your worst fears and best hopes for the marine environment and energy in the form of headlines.

Worse Fears	Best Hopes

Which of these headlines do you think is more likely to happen? Put an X by it.

Put a star by those fears that one person could do something about.

Circle those things that would require a lot of people to prevent from becoming true.

LESSON FIFTEEN
RICHES OF DAVY JONE'S LOCKER

ACTIVITY ONE-Marine Mineral Resources

Suggested Time for Classroom Use of Materials: Approximately 3 to 5 class periods

Materials for Classroom Use:
Table of Concentration of 57 elements in Seawater
Riches of Davy Jone's Locker/series of readings
Water-The Most Priceless Resource/reading
A Solar Still/activity
More of the Riches of Davy Jone's Locker/reading
Who is the Owner?/reading
Questions of Ownership?/activity
What I Think Should Be Done About The Ocean's Mineral Resources

Major Objectives for the Lesson: After completing the lesson, the student will be able to:

1.1 list some marine mineral resources;

2.3 evaluate a marine mineral resource problem man has solved and the changes that resulted and the new problems that arose;

2.5 generate a list of marine mineral resources that will be important in the future;

2.5 identify the consumer products produced from marine mineral resources;

2.6 explain and categorize ways in which marine mineral resources were used in the past and are being used;

2.6 analyze the use of a marine mineral resource through time in relation to the values involved;

2.6 describe how the changing use of marine mineral resources has changed lifestyles;

2.6 identify and clarify his own value position in relation to marine mineral resources;

2.6 analyze value position in relation to marine mineral resources to determine similiarities, differences and possible conflicts;

2.7 discuss the idea that marine mineral resources represent "a common heritage" and belongs to the entire international community;

3.2 describe and identify situations where technology has caused a change in the use of a marine mineral resource through time;

3.3 if given examples of marine mineral resource acquisition to evaluate what considerations are important;

3.3 identify a situation in which short term economic gains may produce long term environmental losses;

3.4 make projections about the future consequences of man's exploitation of the marine mineral resources;

4.2 advocate a position in relation to marine mineral resources.

Teaching Suggestions: The purpose of this lesson is to present the student information on the marine mineral resources. He should also begin to form ideas in terms of ownership and how various actions will affect the environment and in turn affect man.

1. Have the students complete the readings and respond to the questions and/or activities. (The readings may be handed out the previous day so they can be read before class.)

2. In the "Question of Ownership" continuum, steer students off the middle position. There is no correct answer on the continuum, every individual's answer is the right answer for that person at that time.

3. After dealing with each reading or at the end of the entire set have a class discussion on the questions and/or activities.

4. In the speech on "What I think should be done about

the ocean's mineral resources" you may have them share their outlines in smallgroups and then the small group compiles an outline to present to the class. If you have each student present a speech to the class, be sure to time the presentation.

Additonal reference.

5. National Geographic Magazine, Man's New Frontier--The Continental Shelf, Vol. 153, No. 4 (April 1978) pp. 495-531

MARINE MINERAL RESOURCES

LESSON FIFTEEN

ACTIVITY ONE

Look at -

Table of Concentration of 57 Elements in Seawater.

Read -

Riches of Davy Jone's Locker
Water-The Most Priceless Resource

Optional
Make -

A solar still and distill saltwater.

Read -

More of the Riches of Davy Jone's Locker.

Optional
Select -

A marine resource and report on all its uses.

Read -

Who is the Owner?

Complete -

Question of Ownership activity.

Share and
discuss -

The Results of the Question of Ownership activity.

Prepare -

Outline for five minute speech for "What I Think should be done about the ocean's mineral resources" activity.

Present -

Speech to the class.

TABLE OF CONCENTRATION OF 57 ELEMENTS IN SEAWATER

ELEMENT	TONS PER CUBIC MILE	ELEMENT	TONS PER CUBIC MILE
Chlorine	89,500,000	Nickel	9
Sodium	49,500,000	Vanadium	9
Magnesium	6,400,000	Manganese	9
Sulfur	4,200,000	Titanium	5
Calcium	1,900,000	Antimony	2
Potassium	1,800,000	Cobalt	2
Bromine	306,000	Cesium	2
Carbon	132,000	Cerium	2
Strontium	38,000	Yttrium	1
Boron	23,000	Silver	1
Silicon	14,000	Lanthanum	1
Fluorine	6,100	Krypton	1
Argon	2,800	Neon	.5
Nitrogen	2,400	Cadmium	.5
Lithium	800	Tungsten	.5
Rubidium	570	Xenon	.5
Phosphorus	330	Germanium	.3
Iodine	280	Chromium	.2
Barium	140	Thorium	.2
Indium	94	Scandium	.2
Zinc	47	Lead	.1
Iron	47	Mercury	.1
Aluminum	47	Gallium	.1
Molybdenum	47	Bismuth	.1
Selenium	19	Niobium	.05
Tin	14	Thallium	.05
Copper	14	Helium	.03
Arsenic	14	Gold	.02
Uranium	14		

Seawater contains an average of 35,000 parts per million of dissolved solids. In one cubic mile of seawater, weighing 4.7 billion tons, there is about 165 million tons of dissolved matter, mostly chlorine and sodium. The volume of the ocean is about 350 million cubic miles, giving a theoretical mineral reserve of about 60 quadrillion tons.

RICHES OF DAVY JONE'S LOCKER

The world's oceans are a storehouse of a great variety of mineral materials. They vary greatly in characteristics and occurrence. The minerals incluse those dissolved in the sea water, those accumulated on the ocean floor, and those locked in rocks beneath the ocean floor. If the minerals of the sea could somehow be extracted from the water and spread evenly over a smooth sphere the size of the earth, the resulting mineral layer would be 150 feet thick. It has been estimated that within the oceans there are some 50 quadrillion (metric) tons of minerals, including:

2 quadrillion tons of magnesium

100 trillion tons of bromine

7 trillion tons of boron

20 billion tons of uranium

10 billion tons of gold

(See the chart of the elements in sea water.)
At the present,only common salt, magnesium, bromine and fresh water are being recovered from sea water. The gross value per cubic mile of sea water of the 17 common industrial elements is around $600,000.00. Most of these elements are in short supply in the United States. The major economic problem in removing the elements of low concentration from sea water is the huge amount of water that needs to be pumped and processed. A plant handling this much water would have to process 2.1 million gallons per minute, every minute for an entire year. Progress has been made in economically recovering a few of the elements of higher concentration. These minerals are bromine, iodine, and magnesium. The removal of these from the sea water is the same in cost as removing them from land sources.

WATER-THE MOST PRICELESS RESOURCE

Among the resources of the ocean the most priceless is the water itself, and in the future it may well be the most important resource recovered from sea water. Interest in desalination (obtaining usable water by removing salt from saltwater) goes back several thousand years to Aristotle. He described a method of evaporating seawater to produce drinking water. Greek sailors of that time-period drank fresh water that had been desalted in small quantities on board their vessels.

Even though water is central to the history of man, 97 percent of the world's supply is salt water unfit for consumption. The fresh water in lakes and rivers, so important to life is really water in transition as it flows toward the sea.

A practical approach to solving the domestic, agricultural and industrial water problems is the application of desalination on a large scale. The processes used in pilot plants include: distillation, semi-permeable membranes, (reverse osmosis and electrodialysis), freezing and crystallization.

Distillation processes are the most widely used today. All of the world's larger desalination installations use this method. This includes the 1,000,000 gallon per day at Freeport, Texas and the 905,000 gallon per day at Chocolate Bayou, Texas.

The cost of pure water from conventional sources is steadily rising. The cost of water from desalination is decreasing, especially in the large plants. Soon the cost of desalting in large size plants may decrease on advanced technology in large scale desalting plants and low-cost heat sources.

Long-range estimates indicate that by the year 2000, world desalting production should be more than 30 billion gallons per day, compared to about 0.10 billion gallons per day in 1970. This 30 billion gallons per day is about 8 percent of U.S. domestic use today.

We must renew our understanding of the importance of water. Our personal and national lives depend of the quality and supply of fresh water and the careful use of the resources from the sea.

A SOLAR STILL

Make a solar still and distill salt water into fresh water by using energy from sunlight.

1. Obtain a plastic tray with cover. (Plastic shoe box)
2. Cover the tray with black paper (construction paper) (side and bottom).
3. Cut a piece of aluminum foil a little shorter than the length of the tray. Attach it to the sides of the tray by making a small fold.
4. Fold the foil to make a V shape.
5. Pour a salt solution (10 grams of salt in 100 ml of water) into the tray to a depth of 1/2 inch.
6. Put the cover on the tray.
7. Set it in direct sunlight.
8. Let it remain undisturbed until drops collect on the underside of the cover.
9. When a large number of drops have collected, tap the cover to make the drops roll into the foil "V" trough.
10. Pour the sample into a cup and taste it.

Answer:

1. Where did the drops that formed on the cover come from?

2. Are these drops "fresh" or "salt" water?

3. Some people have said that the future of a country depends on her water supply. Do you think this is true? Why or why not?

The demonstration you set up is a simple process that distills a liquid with the energy of sunlight (solar energy) It works well on a small scale. However, it costs too much to build the solar stills, to pump sea water into them, and fresh water out. We can't irrigate a field with high cost water and expect to grow low cost crops.

4. What do you think will happen in the future?

MORE OF THE RICHES OF DAVY JONE'S LOCKER

NUMBER THREE-MAGNESIUM METAL

Magnesium is the third most abundant element found in sea water. Ninety percent of magnesium metal produced in the U.S. is obtained from seawater. Some 65 percent of the world's production comes from only two plants that process seawater: Dow Chemical Company at Freeport, Texas and Norsk Hydro-Elektrisk, Norway. Magnesium is used where weight is important, since it is the lightest of structural metals.

The first magnesium metal from seawater was produced in 1940 from the Gulf of Mexico by Dow Chemical of Freeport, Texas. It is estimated that a cubic mile of seawater contains roughly six million tons of magnesium. This is approximately one-sixth of an ounce per gallon and is worth less tham 10 cents. The Dow plant pumps approximately 1 1/2 million gallons per minute or almost 2 billion gallons per day. This includes the water for cooling.

Magnesium hydroxide is also removed from the water at the Freeport plant and sent elsewhere. Bromine was extracted from seawater from 1941 to 1970 at Dow Chemical. This operation is no longer occuring,so the only plants are in France, Italy, England and Japan.

OIL-BLACK GOLD

Oil is the principle mineral of economic value that is obtained from the continental shelf. There are a great many other minerals on the shelves that have been extracted and will be extracted. Oil deposits extend into the continental shelves, so do the deposits of many other minerals.

OCEAN COAL MINES?

Coal is one of the minerals which has deposits extending into the continental shelf. Coal is abundant throughout the world on the continental shelves. If coal develops as the main raw material for energy, we may see oceanic coal become important. However, the land coal reserves are so great that they will be the main source of coal. The oceanic coal will not be mined until its extraction costs equal that of land coal.

THE ECONOMIC INDICATOR

Sulfur is so important to modern industry that it is considered to be an indicator of the nation's economic activity. Most of the United States sulfur is mined from salt dome deposits in the Gulf coastal region. As the sulfur deposits on land are being depleted, more sulfur is being recovered from the offshore salt domes in the Gulf of Mexico. It is not known how many salt domes in the Gulf contain sulfur, since it was discovered during oil exploration.

Sulfur is used to make sulfuric acid. Sulfuric acid is needed by the fertilizer, chemical, paint and pigment, iron and steel, rayon, film, paper, petroleum and many other industries.

"THAR'S GOLD IN THEM WATERS"

There is gold under the waves. Gold may be found underwater in areas where streams that contained large amounts of gold empty into the ocean.

When gold was discovered in California in the nineteenth century, a gold rush took place, causing towns to spring up overnight. The discovery of gold under the water has not caused the same excitement. On land only a pick and shovel was needed. Mining the ocean raises much greater problems.

The removal of gold from beneath the sea is complicated and expensive. Methods must be discovered that will interfer with bottom-dwelling organisms only for a short time period. It must not seriously affect the marine environment.

A WOMAN'S BEST FRIEND-DIAMONDS

Off the coast of Africa, millions of dollars worth of diamonds lie on the seabed. A Texan, Sal Collins, was the first to remove diamonds from the seabed on a commercial scale. He used barges to dredge the offshore area. Although his success was limited, he opened the way for underwater mining.

Today, mining barges with over a hundred men use suction hoses to pump gravel and diamonds on board. The diamonds are removed and sorted by hand. The remaining material is returned to the sea. Support and sampling vessels prospect for diamonds. When an area is rich, large-scale dredging is taken over by the large mining barge.

JEWELS FROM THE SEA

Man has always been attached to shells and fascinated by their beauty. Primitive man actually used shells as money. Even today, shells are of value. For example a great spotted cowrie shell, of which only 18 are known to exist in the world was offered for sale in 1973 for $1750.

Shell collecting led to hundreds of shell shops around the world. Most are located in tourist and resort areas near the sea. Many of the valuable shells in the shops are collected by divers. They collect the marine life for only their shells. In some areas the shell animals no longer exist because of the collecting of living animals.

Red coral has always been valued for its beauty. It was also used as a medium of exchange. Eventually wars were even fought over the right to take coral from the Mediterranean. Today instead of divers depleting the coral reefs, dredges are used. In a few years all coral will be a souvenir of the past. Dredging takes coral which took thousands of years to form, in a short period of time. The dredging also kills the living coral and other inhabitants of the reef.

As coral becomes more scarce, the price increases. The price of coral is almost as expensive as the price of gold. Also a coral diver can earn in a few months more than a business executive does in a year. That is, as long as there is coral.

THE DULLEST RESOURCES-SAND AND GRAVEL

When compared with oil, diamonds, and gold, sand and gravel seem very dull. However, sand and gravel are a valuable resource for making cement for construction. In the U.S., sand and gravel is a billion dollar a year industry. Projections indicate that by the year 2000 the demand will increase four times.

Presently in the United States, there is little mining of offshore sand and gravel. In great Britian, the land sources of gravel are close to being depleted. It is projected that by 1990 England will get all its sand and gravel from the sea. The ocean in its beach erosion processes produce and sort gravel and sand into different sizes. Sand and gravel from land sources often must be crushed which requires energy and increases the cost.

Dredging the continental slope can turn entire marine environments into wastelands. Plant life, attached organisms, shellfish and crustaceans, die from silt churned up by dredging. Eggs and larvae of many species will be destroyed. Sand and gravel are an important resource for the continued growth, but also a destroyer of the marine environment.

THE MYSTERIOUS MANGANESE COBBLESTONES

The most glamorous and maybe the most mysterious marine resource is the billions of tons of metals contained in the manganese nodules scattered on the ocean floor. In some areas the sea floor looks like cobblestone streets due to the large number of the nodules. It is estimated that in some areas the nodules concentration reaches 180,000 tons to the square mile.

The nodules also contain iron, nickel, copper, cobalt and traces of two dozen other elements. The elements found in the nodules will vary from one location to another.

Besides the economic value of the nodules for the metals they contain, they have another valuable quality. The nodules are a renewable resource. The nodules are continually forming; however, they grow very slowly. The process by which the nodules are formed is not clear. Once this is learned then it might be possible to "raise" the nodules on a mineral farm.

Recovering the nodules poses new problems in technology and of international law. The two most reasonable mining ones are the use of deep-sea hydraulic systems or of a cable bucket system. The hydraulic system depends on a dredge to collect and sort the nodules on the ocean floor. The cable-bucket system is a series of collecting containers attached to a cable that moves them down and across the ocean floor.

Mining the nodules will not be easy. There are difficulties in controlling a long length of pipe or cable from a ship in a rough sea. It will also be costly.

Although the nodules are found in areas that are almost biological deserts, it does not mean that mining will have no effect on the marine environment. The potential problems include: disruption of the sea floor ecosystem; distribution of sediments changed; chemical balances altered; and sediments may bury organisms that live on the sea floor. A greater environmental problem may come from the plants on land that will process the nodules. They will have to dispose of millions of tons of residues which will contain toxic metals.

There is also the uncertainty about the legal aspects of deep-sea mining. Who will control the mining? Who owns the nodules? These questions must still be answered. Successful exploitation of the minerals of the sea depends on

three factors: (1) more geological knowledge to determine the location of resources (2) technological advances for pollution-free extraction and mining (3) definition of international law regarding marine mineral rights. Number three is important to the others because national governments and private industry want legal protection for their investment.

SHELLS AND SAND

In addition, many specialized mineral sands are found on the shelves. Glaniconite is mined as a fertilizer. Almost all the oil drilling muds come from offshore deposits, in Alaska.

As much as 20 million tons of oyster shell have been produced from the shelf. Most of this came from Texas and other Gulf Coast states. It is estimated that a minimum of 100 million tons of shells may lie on the continental shelf off the Gulf Coast. The oyster and clam shells are used in concrete and road material, manufacture of cement and lime, poultry grit and fertilizer additives.

Investigations have shown high concentrations of zircon, titanium and iron in the Gulf. Zircon is used in resistant types of materials like chemically resistant ware, electrical insulators, glazes, porcelains, enamels and pigments. Other deposits in the Gulf include potash-rich layers, phosphatic rock, iron ore, bauxite and possibly other metallic veins. Much remains to be learned about the mineral treasures of the continental shelf.

To Sum it Up

What can we say in summary on the mineral wealth of the oceans? We can say that all of the minerals of the land appear in the oceans and in concentrations that may be larger than those on land. Finding the deposits of the minerals in the ocean is more difficult than finding them on land. In the water the minerals are spread out over the oceans while on land they are concentrated into particular areas. We can predict that an increasing percentage of the world's minerals will be obtained from the sea. Also someday the ocean may be the major storehouse of the world's mineral wealth.

WHO IS THE OWNER?

Who owns the resources of the ocean? In the past, it was whoever could stake a claim. Today with technology, our ability to take from the sea has also changed.

This could be the picture in the year 2000. The coastal countries have extended their limits to the centers of the oceans. All vessels must pay a tax as they pass from one country's zone to another. There is constant fighting between the rich and the poor countries for the resources of the sea. There is fighting between the coastal countries and the landlocked countries for ownership of the ocean's mineral resources. The landlocked nations are demanding access to the ocean through neighboring countries and fishing and mineral rights in the sea also. The world situation is tense. Fish are rare. The fish that are found taste odd. Most of the ocean is polluted. In most coastal areas, swimming is forbidden by law. Pollution is killing most of the phytoplankton which produce the world's oxygen.

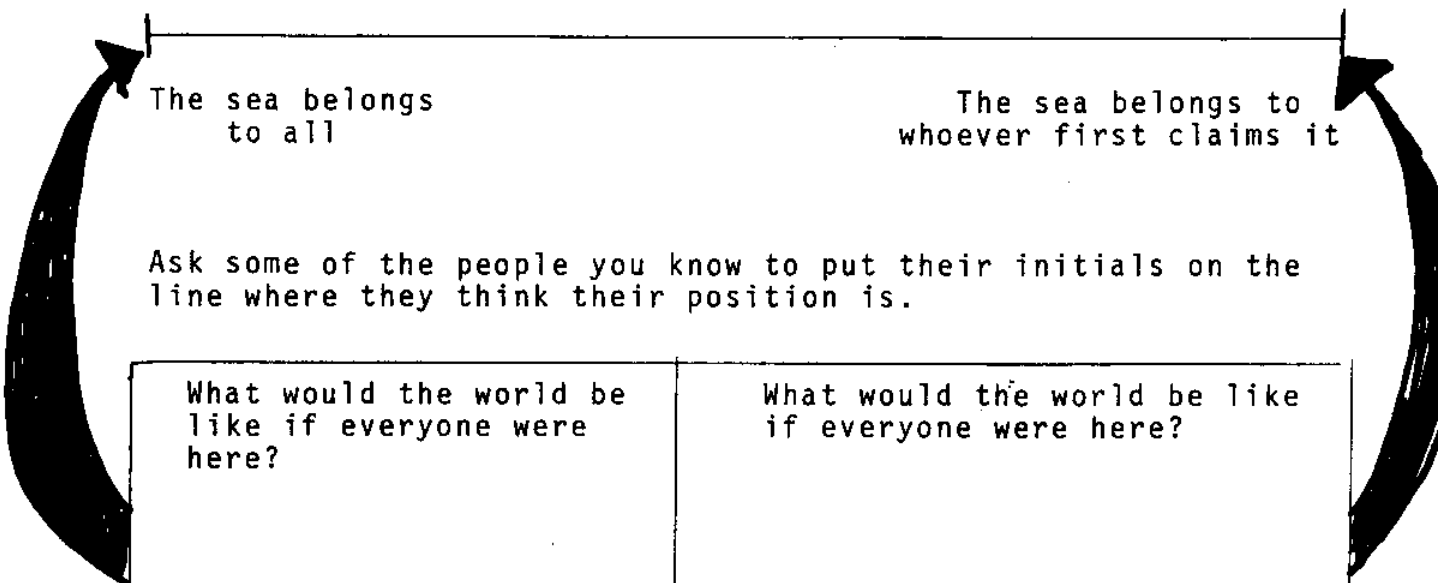
Does it sound scary? It could happen. The 1970s have seen growing tension between governments over fishing rights, rights of passage, mineral resources, control of pollution, and scientific exploration.

In 1967, the United Nations created a forty-two nation study committee to study the problem. On the recommendation of the committee, the U N General Assembly adopted a resolution in 1970, stating that the oceans were "the common heritage of mankind." This became the basis for a series of international conferences to establish a new law of the sea. There have been conferences in 1973, 1974, 1975 and in 1976,with more than 1,200 negotiators from 156 nations.

One of the most important and controversial issues before the Law of the Sea Conference is the forming of an international authority to manage and distribute the resources of the sea. The crucial question is, can we find a way to create this needed organization in time?

QUESTION OF OWNERSHIP?

Put your initials on the line that represents your position.



The sea belongs to all

The sea belongs to whoever first claims it

Ask some of the people you know to put their initials on the line where they think their position is.

What would the world be like if everyone were here?	What would the world be like if everyone were here?

Where do you think we (the world) are today on the question of ownership?

What are the possible alternatives?

Why are a nation's extended boundaries what it says they are and other nations will agree to?

Do animals have a common right to the oceans just as people do? How would this effect our use of the oceans?

Congratulations! You've just been invited to speak to a session of the United Nations on "What I Think Should be Done about the Oceans' Mineral Resources." The speech is to be five minutes long. You'll probably want to make an outline so you don't leave anything out.

"What I Think Should be done about
the Oceans' Mineral Resources"
by _____

I. _____

A. _____

B. _____

C. _____

II. _____

A. _____

B. _____

C. _____

D. _____

III. _____

A. _____

B. _____

C. _____

LESSON SIXTEEN
RECREATION

ACTIVITY ONE-Marine Recreation and You
ACTIVITY TWO-A Needed and Benefical Resource
ACTIVITY THREE-Marine Parks?

Suggested Time for Classroom Use of Materials: Approximately 5 to 7 class periods

Materials for Classroom Use:
You Are the Recreation Director/activity
Recreational Activities/activity
Your Uncareer/activity
Recreation and the Economy/activity
Problems in Recreational Development/activity
Needed: Marine Parks/reading
Design a Marine Park/activity

Major Objectives for the Lesson: After completing the lesson, the student will be able to:

1.1 identify marine recreational activities;

1.1 defend recreation as a marine resource;

2.3 evaluate a marine recreational problem;

2.6 analyze the marine recreational activities through time in relation to values and lifestyles;

2.6 compare and contrast marine recreational activities in different cultures;

2.6 identify and clarify his own value position in relation to marine recreational activities;

2.7 formulate possible future marine recreational activities;

3.1 discuss the interplay of the many facets (sociological, economic, governmental, psychological, and moral) in man's use of the marine environment for recreation;

3.2 describe and identify situations where technology has caused a change in the marine recreational activities;

3.3 analyze which factors are important in utilization of the marine environment for recreation;

3.3 identify a situation in which short term economic gains may produce long term environmental losses;

3.4 identify man's marine recreational needs and wants--past, present and future;

3.4 make projections about the future consequences of man's use of the marine environment for recreation;

3.4 plan a marine park;

4.2 express personal philosphy on marine recreational activities.

Teaching Suggestions: The purpose of this lesson is to have the students analyze the marine environment in relation to recreation and make decisions concerning its use.

1. The students will complete the readings and respond to the questions and/or activities. (Materials may be distributed on the previous day.)

2. In small groups and/or as a whole class discuss the illustrated activities.

3. Encourage students to generate related questions and then strive to research and answer them.

4. References:
Texas Parks and Wildlife Magazine

Young Naturalist: Beachcombing
Vol, 30, No. 7 (July 1972) pp. 6-9
Parks take Planning
Vol. 32, No. 11 (Nov. 1974) pp. 2-5
Beneath the Gulf (diving)
Vol. 33, No. 4 (April 1975) pp. 16-21
Winter Diving
Vol. 34, No. 2 (Feb. 1976) pp. 6-9
Too Many People
Vol. 35, No. 12 (Dec. 1977) pp. 16-18
Master of the Wind & Water (sailing)
Vol. 36, No. 6 (June 1978) pp. 2-5

MARINE RECREATION AND YOU

LESSON SIXTEEN

ACTIVITY ONE

Complete -

You Are the Recreation Director activity.

Share -

Your plans with your classmates.

Answer -

The questions.

Complete -

The Recreational Activities sheet.

Discuss -

The questions with your classmates.

Draw pictures
or make symbols -

For Your Uncareer activity.

YOU ARE THE RECREATION DIRECTOR

You have been hired as the recreation director in the Gulf coastal area. Your first job is to plan a weekend for twenty people. All you know about them is that they are more or less like you and that they want to have a good time.

Divide your paper into 4 columns.
In the first column: What would be the schedule or activities for the weekend? In the second column list the facilities you would use for each activity. In the third column list the equipment you would need for each activity.

In column 4 place a $ sign by all of the activities which cost money. Place an E beside all activities which require the uses of petroleum energy (gas, oil). Place an check by all the activities which can only be done in a coastal area. Place an X by all the activities that pollute the marine environment.

1. Did you list activities that you like to do or activities you thought the group would like?

2. Which activity do you think the group will enjoy the most? What activity would you enjoy the most?

3. How many activities in you schedule can only take place in a coastal zone?

4. Which activity will have the greatest economic value to the area? Which will have the least?

5. How would your list of activities differ if this weekend had been 25 years ago?

6. What affect would the age of the group make in your plans?

RECREATIONAL ACTIVITIES

Beach combing	Photography
Bicycling	Picnicing
Bird watching	Sailing
Canoeing	Scuba diving
Camping	Sea shell collecting
Crabing	Shrimp broil
Cruises	Sight seeing
Driving	Sunbathing
Dune buggy	Surfing
Fishing	Swimming
Fish fry	Tennis
Golf	Visiting historical sights
Horseback riding	Visiting archeological sites
Hunting	Walking
Lounging	Water skiing
Motor boating	Wildlife watching
Motorized bikes	Others _____
Oyster cookout	_____
Painting	_____

1. Place a X by those activities which can only take place in a marine environment.

2. Which recreational activities would your grandparents have participated in when they were your age?

3. Why didn't some of the other activities take place in the past?

4. Check each of the activities in which you have participated.

5. Place an * (asterick) by the activities which you have never done and would like to do.

6. Which activities depend mainly on natural resources?

7. Which recreational activities require technology and development?

YOUR UNCAREER

We spend time thinking about the future and our "career." But you won't be working all the time. What sorts of things do you look forward to doing in your leisure time? Use this page to draw pictures or make symbols of all the things that you can think of that you'd like to do in your future "time off." (Don't forget to include possible recreational activities of the future that may not exist today.)
You live within 100 miles of the coast.

A NEEDED AND BENEFICIAL RESOURCE

LESSON SIXTEEN

ACTIVITY TWO

Read -

Recreation-A Needed Resource.

Answer -

The questions.

Complete -

Recreation and the Economy activity.

Compare -

Your Recreational Activity's Impact with your classmates.

Answer -

The questions.

Read -

Problems in Recreation Development.

Select -

A problem of coastal recreation development.

Prepare -

A T.V. presentation on the problem you selected.

RECREATION-- A NEEDED RESOURCE

One of the greatest potential resources of the Gulf coast has little to do with oil, minerals, or even food. It is the attraction of the water itself for outdoor recreation activities. Throughtout history we have found a way to mix play with work.

Pleasure and peace of mind are not small pursuits. Our ultimate goal is not production or work for the sake of working or producing. Our goal is to fill essential needs and to provide for our happiness. Today we have more free time for enjoying recreational--leisure activities in order to gain relief from the pressures of living in an over-crowded industrial society. Leisure has become an American life-style. It is more than just an occasional hobby enjoyed once a year.

A great deal of money and time is spent not only in enjoying leisure, but also in preparing for it. A conservative estimate is that the U.S. consumer will spend over 100 billion yearly on recreational activities. This will continue to increase.

Nationally, over 75 percent of the population lives in coastal areas and here the rate of growth is greatest. The recreational demand is increasing at a rate generally double that of the population growth. Texas is no exception. Nearly half of the people of Texas already live near the coast. Those choosing the coast for recreation have doubled in numbers in recent years and they spend $200 million annually for recreation uses there.

The population growth brings greater and greater pressure for recreational uses upon the same resources that are important for other uses such as for industry, algriculture, navigation and fishing. Already serious conflicts with other land uses are occuring. Texas can protect her coast from the exploitation which has occurred on other state's coastal shores. From Maine around to Texas and from California to Washingtion, development has,for the most part,monopolized the coastal zone. The development of the Texas coastal zone is beginning. It is the last major source for recreational and tourism left in the 48 contigious states. Due to the demands of individuals for recreation and tourism it appears that the coast is a valuable resource from both the aesthetic and economic points of view.

1. Is recreation a resource? Explain your answer. If recreation is a resource is it a renewable or non-renewable resource?

2. Why do we need time for recreation and leisure?

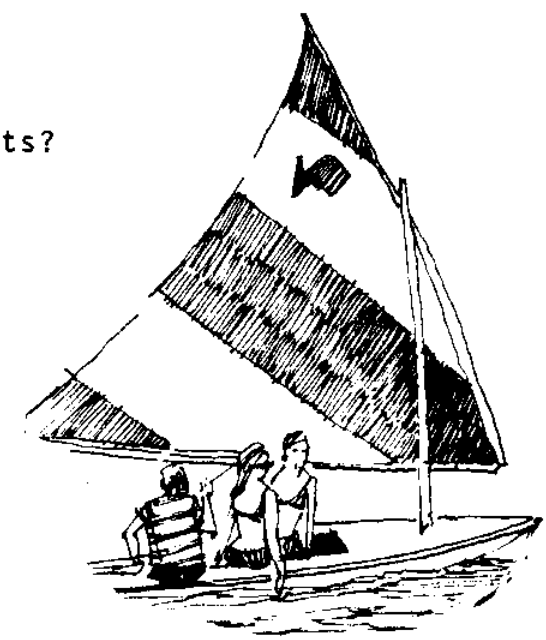
3. Why do we have more time for recreation today than we did in the Past?

   Will our time for recreation in the future increase or decrease?

4. The coastal area is attracting many people for recreational activities and it will probably attract even more in the future. List the assets of the coastal zone that are important for recreation and tourism.

5. Which of the assets are natural resources?

   Which are man-made resource assets?



RECREATION AND THE ECONOMY

Select one activity from the recreation activity list that you have done or would like to do for a weekend. Analyze the economic impact of the activity. Write down all the items you would purchase for your weekend and include the source of the purchase. (Don't forget to include equipment, food, beverages, lodging, transportation, clothes and etc.)

1. Which activity had the least economic impact?

   the most economic impact?

2. Which activity would have the greatest environmental impact? the least environmental impact?

3. What is the relationship between economic impact and environmental impact? Is there one?

PROBLEMS IN RECREATION DEVELOPMENT

Equally important as assets for development are the problems of the coastal region. The following have been identified as problems of the region for recreation-tourism development today:

Overall environmental pollution--air, water, aesthetics

Lack of centralized concern--state government and regional

Lack of planning and growth guidance

Lack of private leadership (business and citizen) in regional planning development

Lack of legal tools to guarantee good land use

Conflicts with non-recreational users

Conflicts among recreational users

Poor maintenance--public and private

Poor policing and management of areas

Excessive haphazard and low-quality development

Poor access to beaches

Conflict between developers and preservationists

Conflicting legal ownership and regulation of beaches

Not enough parks and recreational areas

Conflicts of social goals--parimutual betting, liquor

Lack of potable water supply

Public lack of concern towards the problems appears to be a greater obstacle than the lack of technology. A local T.V. station is providing time between their regular programs for public presentations on these problems. The presentation is to be 3 minutes long. You may use any medium (skit, music, charts, songs, etc.) to provide information on the problem. Select a problem from the list for your presentation. You will probably want to prepare your script so you don't leave anything out. Time your presentation so that the station will not cut you off before you finish.

MARINE PARKS?

LESSON SIXTEEN

ACTIVITY THREE

Read -

Needed: Marine Parks.

Complete -

Design a Marine Park activity.

Share -

Your recommendations for the marine park with your classmates.

MARINE PARKS

We have attempted to preserve the beauty of land areas by the formation of National and State Parks. There are areas of great beauty in the sea as well, but the idea of preserving them is slow to develop. Yellowstone, the first U.S. National Park, was established in 1872, but it was not until 1935 that an area of the sea was included in control of the United States National Park Service. This was Fort Jefferson National Monument at Dry Tortugas, 65 miles west of Key West, Florida. It was not created for its marine gardens, but for the massive fortifications.

In 1971, the National Park Service only had control over the adjacent marine areas of 10 of the 47 national parks in coastal areas. Some are under study for inclusion of the marine zones and some aquatic-related areas are under consideration for addition.

One of the reasons that marine parks have developed slowly is that man has only entered the sea for recreation on a large scale in the last couple of decades. There is a feeling that there is no need for preservation since the resources of the sea are so great. This is not true for certain fishes and other marine organisms which are endangered. Another attitude is that the oceans are a good dumping place for wastes. However, a can in a marine garden is as offensive as one in a land garden. Conservation must replace wanton exploitation.

A marine park does not have to be all ocean. Any park that includes part of the sea can be a marine park. Large marine parks can be divided into different areas. Recreation can be emphasized in some. Other areas could have complete protection so coral gardens can be merely observed or photographed, and fishes watched, not speared.

The advantages of marine parks are numerous. Visitors can be educated to appreciate what they see and become more aware of the need for conservation. It will be a sanctuary to maintain breeding stocks of threatened marine organisms and examples of the various marine habitats. It can serve as a research area that will not be disturbed by fisherman and others.

A major problem facing marine parks once they are established, is enforcement. In marine parks it will be more difficult to enforce the park regulations.

Progress has been made in the development of marine parks. However we must increase the efforts to preserve the natural areas of the sea from exploitation by man.

DESIGN A MARINE PARK

The United States Park Service has asked you to locate an area to establish a marine park. You are also to make recommendations about its use.

For what activities will the park be used?

List things that need to be considered in selecting the site for your park.

What other factors do you feel are important in establishing a marine park?

Why are park regulations more difficult to enforce in marine parks than land parks? How will you enforce the regulations?

LESSON SEVENTEEN
WATERFOWL

ACTIVITY ONE-For the Birds...

Suggested Time for Classroom Use of Materials: Aprroximately 1-2 class periods

Materials for Classroom Use: Waterfowl/reading

Major Objectives for the Lesson: After completing the lesson, the student will be able to:

1.1 explain waterfowl and wildlife as a marine resource;

2.5 reconstruct the relationship of the waterfowl in the marine environment;

2.6 identify and clarify his own value position in relation to waterfowl;

3.2 describe and identify where technology has caused a change in waterfowl in the marine environment;

3.3 analyze which factors are important in man's utilization and management of waterfowl;

3.4 make projections about the future consequences of waterfowl;

4.1 recognize that values influence man's use and management of the waterfowl.

Teaching Suggestions: The purpose of this lesson is to have the students analyze waterfowl use and management in relation to the marine environment.

1. The student will complete the reading and respond to the questions (reading and questions may be distributed the previous day).

2. Discuss in small groups and/or a whole class the reading questions and the possible future alternative which they wrote.

3. Use the waterfowl articles listed in the teacher's section of Lesson Five to help in obtaining information. Have the student present the information to the class as though they were the bird himself speaking.

4. Additional articles:
   Texas Parks and Wildlife Magazine

   A New Look at Texas
   Vol. 33, No. 9 (Sept. 1975) pp. 6-8
   A Better View of Wildlife Management
   Vol. 36, No. 6 (March 1978) pp. 13-15

WATERFOWL

LESSON SEVENTEEN

ACTIVITY ONE

Read -

Waterfowl.

Answer -

The questions.

Write -

A possible alternative to the possible future reading.

Look up -

Information about a specific waterfowl.

Present -

The information about the waterfowl to the class as though you were the bird, himself, speaking.

Optional
Read -

An article in Texas Parks and Wildlife Magazine on waterfowl or wildlife management in the coastal zone.

Optional
Write -

A short summary or report to the class on the article you read.

WATERFOWL

Past

Picture in your mind the thousands of acres of marshes and estuaries on the upper Texas Coast filled with millions of waterfowl. They migrated South each fall to spend the winter where plenty of food, water, and shelter was available for them. This was an area of wide-open spaces, very few people, no roads, or fences. Cattle roamed the prairies and grazed on the lush green growth in the marshes.

This was an area where market hunters came to slaughter ducks and geese by the thousands. They were shipped in barrels to market in the cities of the Northeast United States. This was a thriving business in the early days. Canvasback ducks sold for $5.00 per pair; Greenhead Mallards and Pintails sold for $3.50 per pair.

Present

Now, picture the same area today, with its thousands of people living in and around these marshes. Blacktop roads leading in all directions from one area to another from one city to another. Railroads run across the area. Drainage ditches cut throughout the upper coast. Land is fenced with barb wire and the cattle are confined to certain pastures. There are large rice farms where marshes used to be, before the drainage. Large canals cut through the marshes, with tug boats pulling and pushing several sections of barges up and down the canals.

Telephone and power lines run throughout the area. Airplanes fly overhead. Large cities surround the area. There are large industrial plants operating and more are being built. Oil fields are developing in and around these areas. Pipelines are laid through the marsh. There are automobiles and trucks speeding through. Insecticides and pesticides are used freely on crops and cattle. The waste and pollution from all mentioned above flows into the lowlands, marshes and estuaries and bays. What a wonder, that we still have waterfowl continuing to use such an area. Will they continue?

Good sound management is necessary if we expect to keep the great number of waterfowl that migrate to the coast each fall. The marshes and estuaries on the upper Texas Coast with the surrounding rice farms still are an inviting winter grounds for waterfowl.

A Possible Future

Now, picture the same area in the future with good management. The management can be very complicated or simple. It can be expensive or not so expensive, depending on the location of the area and its existing conditions.

We will picture the management of a 25,000 acre ranch in this area. Due to civilization having moved in, water gates are installed on canals to control the water level. This is done to keep a certain amount of salt water coming into the marshes and with high tides to maintain the water in a brackish form to keep the marsh vegetation.

There is a large reservoir for open water for ducks and geese, which is good in the dry season. Pumps are installed to flood the rice stubble for waterfowl use. Roads have been constructed and shelled to the marsh areas for access by the hunters. Cattle walkways are built through the marsh and can be used by the hunters.

Three hundred acres are set aside as a rest area, where hunting isn't permitted. This provides an area where the game may rest, feed and not be bothered during hunting hours. This helps keep great numbers of waterfowl on the ranch.

Another ranch regulation is that hunting is only allowed from sunrise to 12:00 noon. This gives the game all afternoon and might to return throughout the ranch to feed, rest, and shelter from hunting done on neighboring ranches and marshes.

Hunters are checked in at the gate. After the hunt, the hunter returns to the checkout gate and a record of his kill is recorded. The exact number of hunters and number of waterfowl killed is known. Hunters are given information on hunting sights, laws, and a guidebook for identification of waterfowl. The ranch is open to the public, and a fee is charged for hunting privileges.

Between 16,000--20,000 ducks and 8,00--10,000 geese are bagged each year, which is a very good average per person who hunts this ranch.

In addition to public hunting, about 3,000 acres are used for rice farming. Muskrats are trapped, and 4,000 head of cattle run on the ranch. There is fishing in the reserviors and some grain and hay is raised. There is also shrimp and crab farming.

There are problems of trespassing, hunters that are careless and lack knowledge and nutria rats destroying vegetation. However, by good management, the marshes and estuaries are preserved. They can have multiple uses with economic value.

1. Why are waterfowl important and why should the marsh areas be preserved?

2. Why is good management necessary to keep a large number of waterfowl coming to the Texas coast?

3. Why is multiple use of the area important?

4. What are some problems that must be overcome to make the future come true?

LESSON EIGHTEEN
MARINE MEDICINE CHEST

ACTIVITY ONE-Marine Medicine Chest

Suggested Time for Classroom Use of Materials: 1 class period

Materials for Classroom Use: Marine Medicine Chest-A Lifesaving Gold Mine/reading

Major Objectives for the Lesson: After completing the lesson the student will be able to:

1.1 cite examples of medicine and drugs from the sea;

2.5 identify the marine medicine and drugs that will be important in the future;

2.5 identify the consumer products produced from the marine organisms;

2.6 discuss ways in which marine organisms were used for medical purposes in the past and at present;

2.6 identify situations where economic values are often in conflict with esthetic values;

3.2 describe and identify a situation where technology has caused a change in the use of marine organisms for medicine.

Teaching Suggestions: The purpose of this activity is to introduce the student to marine medicine and drugs and problems associated with the development of their use.

1. Have the students complete the readings and respond to the questions.

2. Discuss the readings and questions as a whole class.

3. Have the students share the feelings or opinions that they expressed in their slogans and/or advertisement.

MARINE MEDICINE AND DRUGS

LESSON EIGHTEEN

ACTIVITY ONE

Read -

Marine Medicine Chest-A Lifesaving Gold Mine.

Answer -

The questions.

Write -

Slogans or advertisements stating your feelings and/or opinions on governments, private industry, defense, transportation, recreation, mining and other interests spending millions of dollars annually. This is spent to exploit the oceans, but marine medicine and pharmacology receive little financial support.

Subject: Marine Medicine Chest a Life-Saving Gold Mine

The Pharmacology Institute
U.S.A.

Dear Capt. Seaborne,

I am unbale to come and speak to your group of students due to my research schedule. However, I would like to tell you why I think that the oceans are a medicine chest. These marine resources could become a life-saving gold mine. There are hundreds of marine organisms that are poisonous. Each one of these toxins and poisons has potential as a medicine.

Past

The earliest record of the effect of algae toxins is in the Biblical writing, Exodus 7:17-18, where it describes the waters of the Nile turing red and the fish dying. We know that dinoflagellates cause red tides and killing of fish.

The acient Japanese ate red seaweed to cure intestinal worms. The modern cure is a substance (kainic acid) commercially prepared from the red seaweed. Cancer is not found among some of the Polynesian Islanders. The custom has been that cancer victoms are given the fluid from a sea worm. Researchers are finding that substances from marine worms will stop 60% of the cancers in laboratory mice.

The natives of Guam squeezed sea cucumbers into pools where fish were. The drugged fish would float to the surface where they could be easily caught. These sea cucumber chemicals slow growth in fruit flies, prevent regeneration and stop the spread of several types of tumors in mice--a possible answer to cancer in man. They also stimulate the heart like digitales, a heart drug.

Present and Future

Presently, only one percent of our drugs come from the sea. Only a very small group of the marine plants and animals have been examined for potential drugs. Of the more than 2,000 organisms surveyed, mostly from the Caribbean and the Pacific, we found 250 species with confirmed anti-cancer properties and half a dozen that could be useful in the circulatory and nervous systems. Here the ancient medical records may be of help. The ancient Biblical dietary law in Leviticus 11:9-12 states: "You may eat any kind of fish that has fins and scales, but anything living in the water that does not have fins and scales must not be eaten..."

Many poisonous fish belong to the group that lacks scales and each poison is a potential drug.

The toxins from jellyfish, hydroids, sea anemones and corals that cause paralysis and death have the greatest possibility for becoming drugs for heart and muscle diseases and even epilepsy. However at present, we need to develop an anti-toxin for these toxins to protect divers.

The potential of algae is high as a source of food protein, an ingredient for dental impression substrates, treatment for ulcers, and a potential killer of bacteria. The alginic acid of kelp collects radioactive strontuim from our body and waterways,so it could be a lifesaver from the fallout of atomic explosions. Another kelp compound holds heavy particles in suspension so one will not have to shake medicines first. There is also a green algae which contains a strong antibiotic.

The toxins of the dinoflagellates which cause the red tides may be used to cure bacterial diseases since they stop the growth of most types of bacteria.

A toxin from a snail causes muscles to relax-a possible drug for muscle convulsion. Another smail toxin causes muscles to contract violently so one could be the antidote for the other. A drug from it could possibly help restore damaged muscles.

Many possible drugs exist in the sea. An abalone (a mollusk) extract will protect laboratory mice from flu and polio virus. A toxin from the puffer fish acts on muscles and nerves that receive pain. It is commercially available as an antispasm treatment for epileptics and to relieve the pain of terminal cancer. The poison from the deadly stone-fish could aid in treatment of high blood pressure. The chemical from a marine worm may become an important cancer or birth control drug. A chemical from the hagfish may be able to take the place of heart pacemakers.

We have found a fungus that feeds on sewage that is the source of an antibiotic with properties similiar to penicillin. An extract from the sea squirt recently cured 50% of two groups of mice with leukemia and destroyed human cancer cells in tissue culture experiments. The venom of the weever fish is undergoing investigation for a chemical that slows the heartbeat as a potential aid in surgery.

A chemical from clam liver stops cancer growth,but only if the clams are in unpolluted water. So as we pollute our waters we could also be destroying our cancer cure

potential drugs. One of the major problems is when the chemicals in the sea change, so do the fluids in the marine organisms. Mariculture could help solve this problem.

We have one group looking at the remarkable properties of chitoson-from chitin in the shells of shrimp, lobsters and crabs. It has amazing wound healing properties. Therefore it is possible that from the millions of tons of waste (skeletons and shells) we may make suture material that helps in healing.

We are just beginning our research into marine medicine and we have a long way to go. It is a long and difficult process to extract and purify chemicals. Then we must still find out what the chemical will do for a sick human.

Yes, the oceans could be a medical gold mine! Yet remember that we could very easily destroy it with pollution.

Sincerely yours,

C. Pill

Dr. C. Pill

Questions:

1. List some marine organisms and how their chemicals might be helpful.

2. Why should we undertake expensive research for marine antibiotics similiar to penicillin?

3. How could mariculture help in supplying marine drugs?

4. Why are poisonous marine organisms possible sources of drugs?

5. We usually see nothing wrong with killing an organism that could be dangerous to man. Why might this not be a good idea?

LESSON NINETEEN
THE UNSUNG HEROS

ACTIVITY ONE-Beauty
ACTIVITY TWO-Knowledge
ACTIVITY THREE-Space

Suggested Time for Classroom Use of Materials: Approximately 4 to 5 periods

Materials for Classroom Use:
Life's Extras/activity
A Refreshing Refill/reading
The Sea-A Source of Knowledge/reading
Evidence is Being Destroyed/reading
My Thoughts/activity
City on the Sea/drawing
Space-A Resource Too!/reading
Working Under the Sea and Homo
Aquati /drawing
Living and Working Under the Sea/reading

Major Objectives for the Lesson: After completing the lesson the student will be able to:

1.1 to explain why beauty, knowledge, and space are considered to be resources;

2.6 predict the future use of the marine environment as a source of beauty, knowledge, and space;

2.7 discuss the influence of the marine environment man and nations as a source of beauty, knowledge and space;

3.1 analyze man's role in the utilization and management of the marine environment in relation to beauty, knowledge and space;

3.1 discuss the interplay of the many factors (sociological, economic, psychological, political and moral) in man's management of the marine environment for beauty, knowledge and space;

3.2 generate possible future changes in marine resources (beauty, knowledge, and space) which will be brought about by technology;

4.1 appraise attitudes towards living below or on the sea;

4.3 identify and clarify value position in relation to beauty, knowledge, and space of the marine environment.

Teaching Suggestions: The purpose of this lesson is to help the student identify beauty, knowledge, and space as marine resources.

1. Have the students complete the readings and respond to the questions and/or activities. (Readings may by distributed on the previous day.)

2. During the days on which these readings, questions and activities are used, have the students discuss them in small groups and/or as a whole class.

BEAUTY

LESSON NINETEEN

ACTIVITY ONE

Complete -

Life's Extras activity.

Read -

A Refreshing Refill.

Find -

A poem, picture, painting, song, story or music that illustrates the sea as a source of inspiration to the writer or artist.

Share -

It with your classmates.

Present -

To the class art, poetry, literature, song or music which illustrate the aesthetic joy or inspiration the sea provides you. It may be your own creation or work done by a writer or artist which expresses your feelings.

Find pictures -

Of marine organisms especially sea shells. Use these for ideas to design future buildings.

Make -

A sketch of a design for a future building based on a sea shell.

LIFE'S EXTRAS

Answer

1. What is beauty?

   What does beauty mean to you?

2. Is beauty necessary or is it just an extra?

Make two lists: one listing marine things that are necessary and the other things that are extras.

Necessary Marine Things	Extra Marine Things

Share your lists with your classmates.

A REFRESHING REFILL

The sea's greatest treasure is not a monetary one. The greatest joys are those of the heart and the sea can flood us with an aesthetic joy. The sea exists to nourish us not only physically but spiritually. It can refill our creative springs.

Frank Lloyd Wright, the great American architect, told his students to examine the designs in nature, especially those in sea shells. The housing of the marine organisms may seem lowly when compared to the great buildings constructed by man. However, the marine organisms have inspired form to match the complex function. Man's structures often lack inspiring form. The sea provides us with needed inspiration.

The sea provides a much needed escape and release from our hectic lifestyle. It draws us, capturing our attention and imagination. The sea is an inspiration and has been throughout the ages. This is seen in art, literature and song. As our urban areas increase, we will need the refreshing spiritual refill of the unpolluted sea even more.

KNOWLEDGE

LESSON NINETEEN

ACTIVITY TWO

Read -

The Sea-A Source of Knowledge.
Evidence is Being Destroyed.

Complete -

The My Thoughts sentences.

Share -

Your sentences with your classmates.

Optional
Read -

"Glass Treasure From Aegean", National Geographic Vol. 153, No. 6 (June 1978) pp. 768-793

THE SEA-A SOURCE OF KNOWLEDGE

Early man could not have conceived, even approximately, of the oceans as we know them today. Even today we still have much to learn from the sea. The greatest resources of the sea are the aesthetic and intellectual joys it can flood us with.

Marine Archaeology

Marine archaelogy can give us a glimpse of the technology of a period and the life of a seaman at that time. The excavation of the Revolutionary War ship DEFENCE will give us a view of the life of a seaman and the technology during the Revolutionary War. The artifacts provide information on the story and daily life of the Colonial period not found in books.

There is an excavation of an 11th Century shipwreck which was carrying a load of Islamic glass when it sunk in 100 feet of water off the southern coast of Turkey. It has provided evidence of important changes that took place in wooden hull construction and design at that time. It may tell of the ship's port of origin, her destination, the route she took, who the people were, what they traded, with whom they traded and what life aboard an 11th Century vessel was like.

Marine Archaelogy will help to determine the location, age, construction techniques and overall design of ancient ports. It will answer many questions of man's past history and his relationship with the sea which we can learn of in no other way. It shows us a lively world that has vanished.

Marine Geology

The sea is level but the surface of the earth beneath the sea is as varied as the more familiar surface of the land. There are rocky mountains, muddy plains, chasms, cliffs and canyons.

The rough jigsaw puzzle fit of the continents first was noticed when the New World was mapped in the 16th century. In the last two decades, scientists have found new evidence to support the theory that the continents have drifted apart. The proof of their theories came from the sea. They discovered the Mid-Oceanic Ridge, sources of earthquakes and the reversal of magnetic fields, found and measured the movement of continents. According to the theory of continental drift, the continents came into their present position by the spreading of the sea floor between the great land masses. The sea is helping to decipher the origin of the

earth and the geological events that followed.

Medicine and Drugs

The animals of the sea that are most curious to us are those that appear to be very different from us. However, all forms of life carry on many of the same functions. Careful study of the lower forms of life can often provide clues to what can go wrong with our own physiology. In fact, almost any human organ or system in need of study will be found in a simpler, more convenient form in the sea. The ocean is providing medicine with some vital research tools.

Obviously, marine drug discoveries involve only a small part of the organisms known to live in the seas. Hundreds of thousands are waiting to be understood, appreciated and used. The knowledge the sea provides us in all areas is definitely one of its greatest resources.

EVIDENCE IS BEING DESTROYED

Many changes that result from cultural and technological changes affect the interactions between man and his natural environment. Indications of these interactions are records of the past. They are resources. They are important for cultural, scientific, aesthetic and psychological reasons. This evidence is continually being lost.

In spite of our modern technological protection from the natural processes, many lessons can be learned from a study of the past. Indianola might have been Texas' great port city, but it was destroyed by hurricanes in 1875 and 1886. There is a lesson there and in the Galveston hurricane of 1900. There are lessons to be learned from man's coping with the drought years of the 1870's, the 1930's and the early 1950's. There are lessons to be learned from the uncontrolled actions during the boom years of oil gushers and spills. The flaring of natural gas in the coastal oil fields during the early 1900's was common. All these show how man has an impact on the environment and how the environment exerts an impact on man.

It has been estimated that one-third to one-half of all recorded archaeological and historical sites in the coastal region have already been destroyed. Less than one percent of this area has been studied to locate evidence of the past. The submerged areas of the coastal region are almost totally unexplored. It is difficult to predict where a great new archaeological resource or a historical resource may be found on land. It is also hard to predict where evidence may exist on submerged lands.

It is in our best interest to learn from the past and to benefit from past experiences. Therefore, any sites with evidence that provide a link with other times and other people and the land, are valuable.

MY THOUGHTS

Knowledge of the sea in the past was important to _____

_____ because _____

_____.

Knowledge of the sea is important to me today _____

_____

_____.

Knowledge from the sea is important to the world _____

_____

_____.

In the future, knowledge from the sea _____

_____

_____.

Therefore, I feel _____

_____

_____.

I wish _____.

I will _____.

Ect. _____

_____

_____.

SPACE

LESSON NINETEEN

ACTIVITY THREE

Look at -

Picture of City on the Sea.
Picture of Man-made Island.

Read -

Space-A Resource Too!

List -

Possible uses of the surface of the sea.

Make -

Sketches of your designs and ideas for the use of the sea's surface.

Look at -

Pictures of working under the sea and Homo Aquaticus.

Read -

Living and Working Under the Sea.

Read -

An article on living and working under the sea.

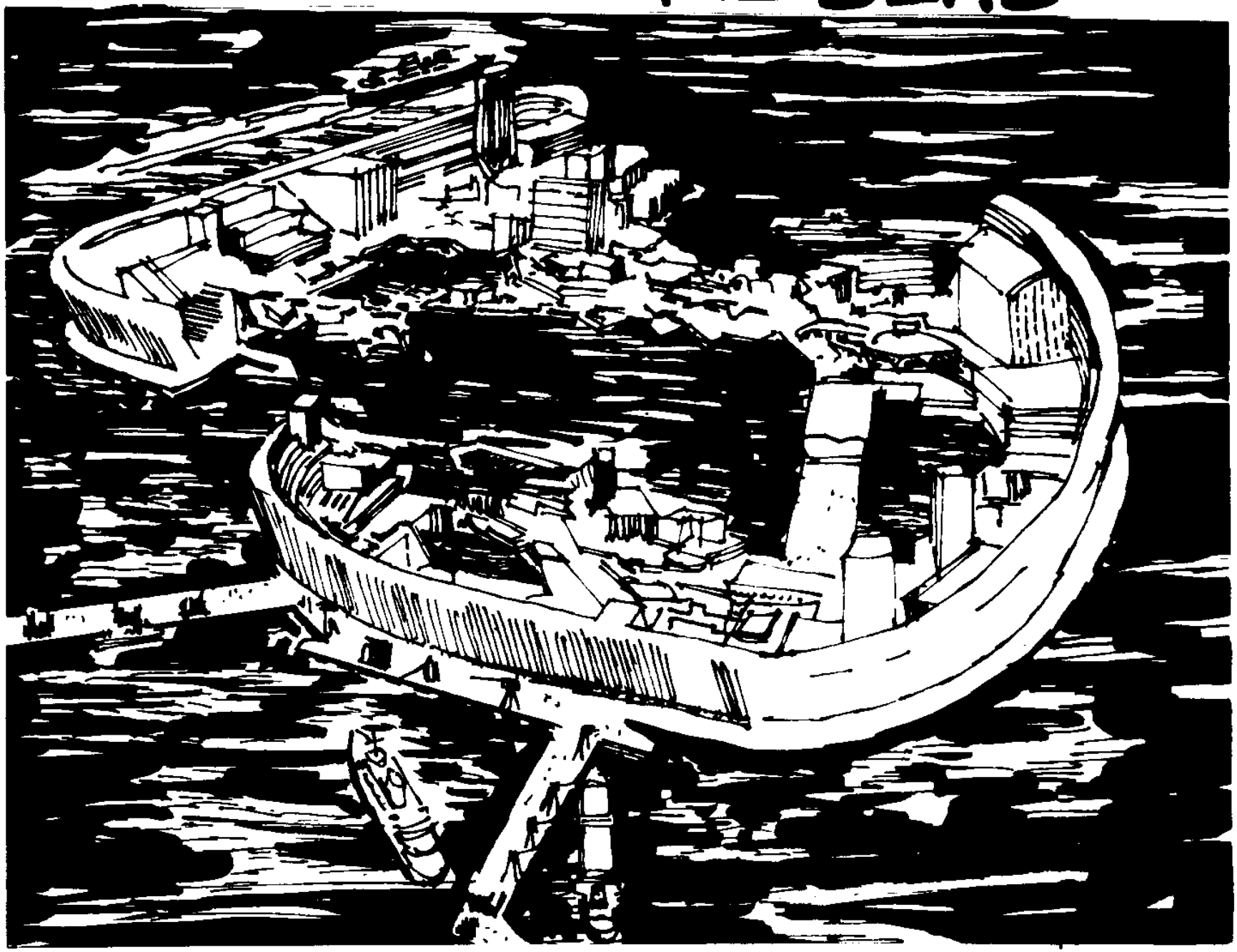
Imagine -

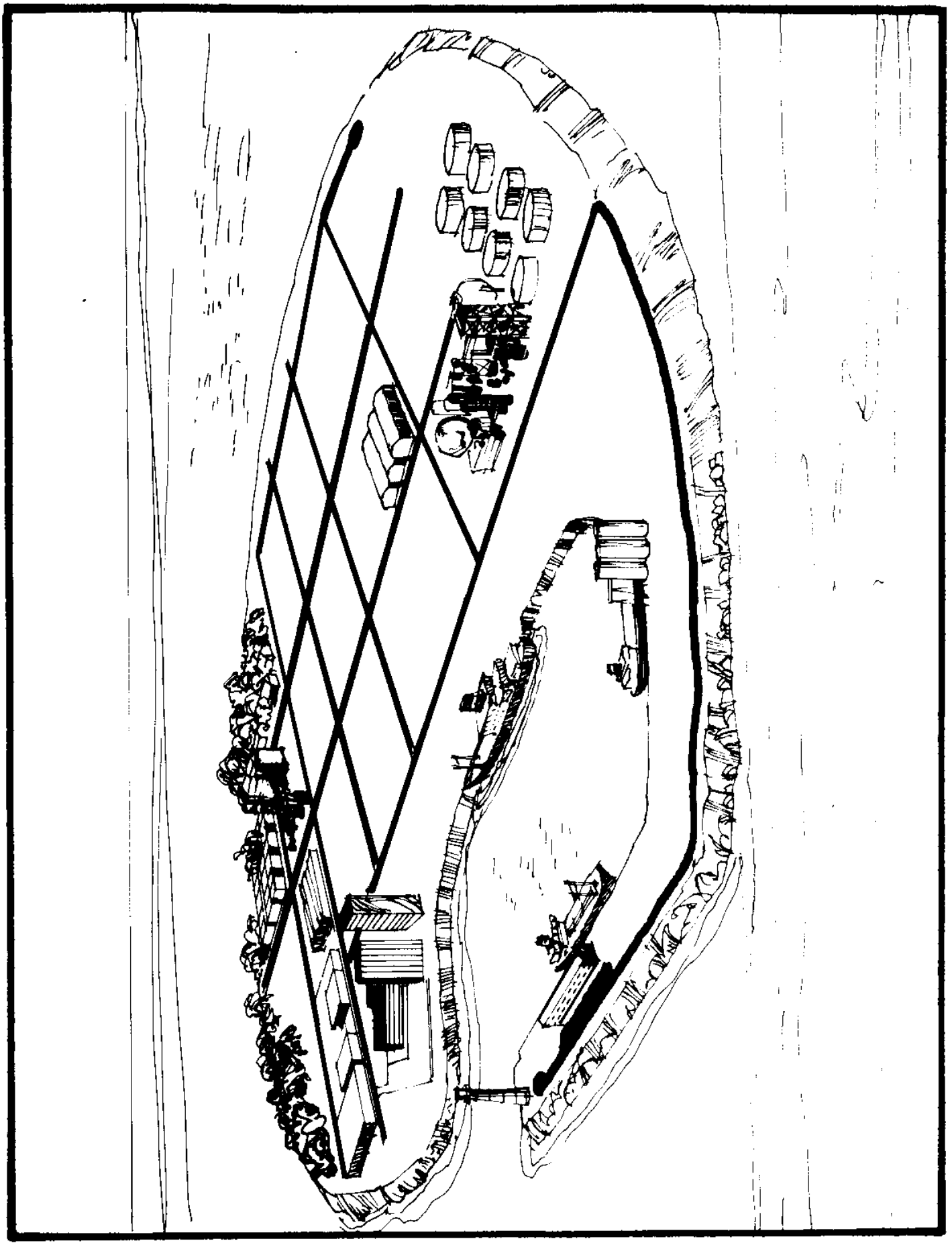
What a day in the future-2000 would be like if you lived on the sea or under the sea.

Now write -

A short story about your day. You may want to include drawings.

CITIES ON THE SEAS





SPACE-A RESOURCE TOO!

The surface of the sea itself is a natural resource for a space-starved land. The ocean is only a space like the land. The use of the ocean surface away from land for power plants, airports, cities, industrial complexes and resorts reduces the threat of destroying coastal estuaries.

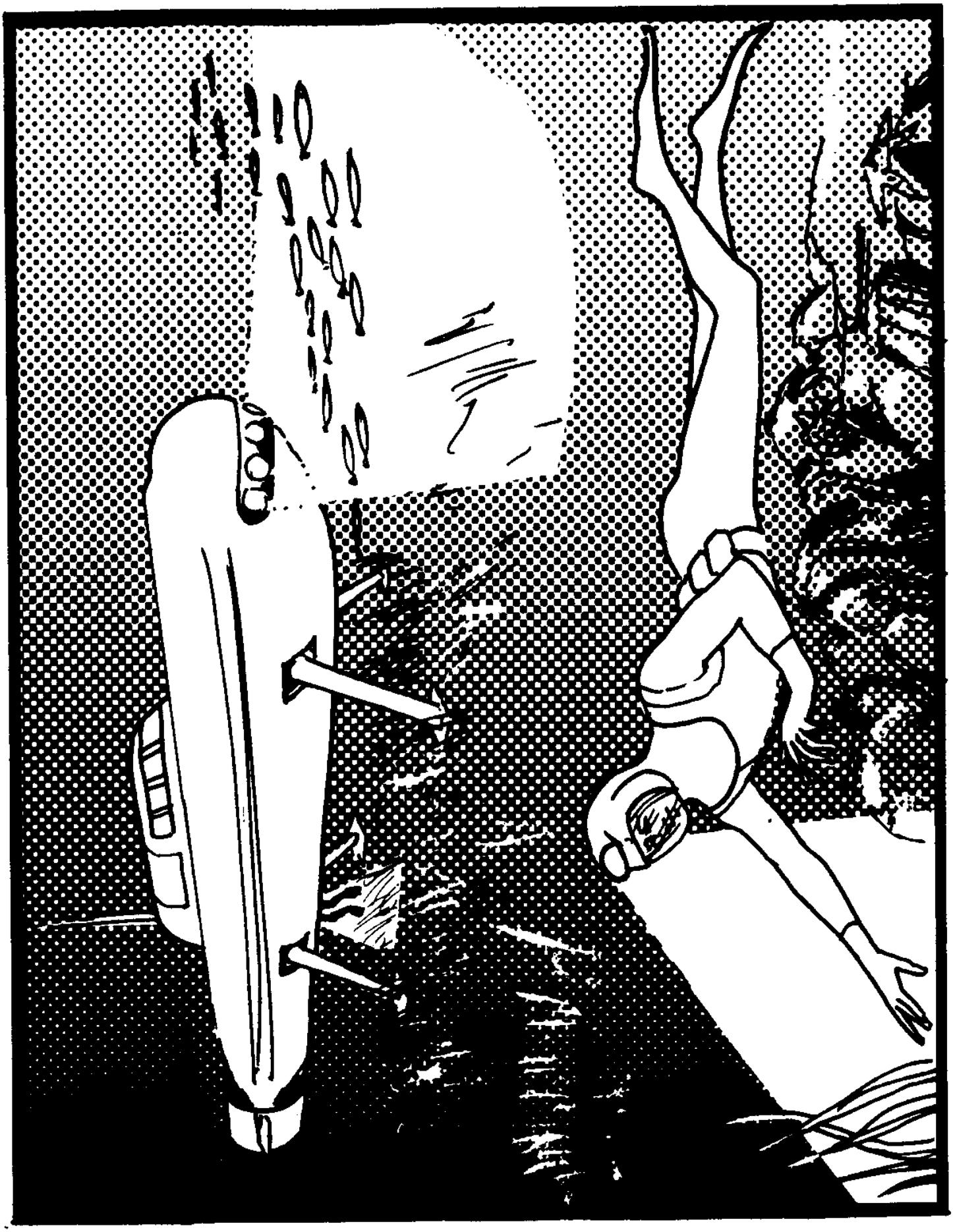
The nutrient-rich waters of the coastal area are the nurseries for a majority of the marine organisms. The filling in of these areas for buildings, beaches, hotels and industrial sites decreases the survival chances of the salt marshes and estuaries. If these structures were built offshore, the delicate coastal ecosystems could be protected. Indications are that the energy costs of living on land are much greater than on the sea. There is no occupation that cannot be done on a water environment.

The United States was once an ocean society. The sea was a daily part of lives. It was a source of cheap transportation for goods and people. The housing was next to the port and the sea. In the future we may again become an ocean society.

The U.S. Federal Aviation Administration is considering the design of floating terminals, and several groups are involved with floating cities. Several countries are already beginning to build artificial islands. These artificial islands will be used for power plants, airports, cities, industrial plants, ports and resorts. Along with the plans for floating cities there are plans for floating high rise structures and cities on stilts. The maripolis (marine city) is a possible future solution to our land space problems.

Think of possible uses of the surface of the sea.

Make sketches of your ideas.



LIVING AND WORKING UNDER THE SEA

We have greatly increased our ability to do things under water in the last few decades. Prior to 1940, a diver could only dive with a lungful of air and work for a few minutes at a shallow depth. The development of the aqualung by Jacques Cousteau and Emile Gagman during World War II freed divers from cumbersome diving suits and air hoses. With this diving became a sport. It opened the shallow waters to whole new fields of science and engineering.

A breakthrough in deep diving was made by Piccard, who in 1948, developed the bathyscaph. This allowed man to go down into the deepest parts of the ocean. Since then many other types of submersibles have been developed which can work almost anywhere.

Some underwater tasks require prolonged diving, invloving physiological changes that require very slow ascent to the surface. Now pressurized, self-contained living and working spaces have been built so the diver does not have to spend so much time going up and down. These devices are called Sealab, Conshelf and Tektite. Scientists have lived in and worked out of them for several months at depths of fifty feet and for weeks at greater depths. There seems to be no reason why larger underwater habitats should not be put to use.

The underwater habitats make a difference in the kind of observations that can be made by an observer who is an underwater inhabitant. To the underwater inhabitant, organisms become individuals whose complex relationships are the key to their survival. The next step in underwater exploration is to move our laboratories and classrooms to the marine environment. Classes in the future will be conducted underwater, where the action is.

Submarine farming, effective monitoring of the ocean, undersea mining and industrial work will increase. Man's use of diving suits, submarines, underwater habitats and innovative methods of deep scuba diving will help man work on and become more familiar with the continental shelf. A suit called Jim is used to retrive and repair oil-rig equipment in the Gulf of Mexico. It enables one to work at depths as deep as 1,500 feet. Dry chambers or "cellars" are used to allow men to make offshore repairs on oil wells in their shirt sleeves. These cellars are less expensive than platforms and can be used in water too deep for platforms.

Perhaps we will experiment until we have medically engineered Homo Aquaticus. He is a human being who has been medically engineered to live underwater without oxygen tanks. He has undergone a surgical operation which replaced his lungs with a unit containg a special fluid which furnishes oxygen to his circulatory system. He can travel a deep in tne sea and as long as he likes. He cannot breath a gas (air) and he does not have to worry about the "bends" or other symptoms of nitrogen narcosis or decompression trama. He would be at complete liberty to live in the sea, to play, to farm, to repair undersea machinery and to supervise research.

LESSON TWENTY
RAP UP!

ACTIVITY ONE-Simulation: Shoreview
ACTIVITY TWO-International Sea Exposition
ACTIVITY THREE-My Feelings About It All!

Suggested Time for Classroom Use of Materials:

Materials for Classroom Use:

Coastal Management Reports/reading
Coastal Problems
Coastal Management Authority
Basis for Concern
Shoreview City Council Action/reading
Aerial View of Shoreview Area/sketch
Instructions for Simulation
Role Cards For Simulation
Information Sheet
International Sea Exposition/instructions
Say It With Music/activity
Self Contract

Major Objectives for the Lesson:

After completing the lesson the student will be able to:

2.3 infer that environmental problems do not have simple answers and that many factors must be considered;

3.1 explain the factors which must be considered when attempting to live in harmony with nature in selected marine environment;

3.3 identify activities of man which would have the least detrimental impacts on given marine environments;

3.4 devise a plan for living in harmony with the environment in a selected situation;

3.1-4 plan a display on the past, present, and projected future importance of marine resources and their exploitation and management;

4.2 select personal goals in the interest of preserving the marine environment and conserving marine resources.

Teaching Suggestions: The purpose of this lesson is to have the student think about the factors that must be considered to determine how one would go about living in harmony with the marine environment and utilizing marine resources, while at the same time considering economic, political, social and other pressures which cannot be ignored. The student's values are being confronted in a very real manner and he is given the opportunity to affect other people's actions by producing a presentation which will be heard and seen by his classmates and which has the possibility of being seen and heard by the public.

1. The students should have been made aware of these two culminating activities at the beginning of the unit. The students may already have been assigned sections for the International Sea Exposition with Lesson Eleven-and have been gathering material for the display.

2. Distribute the readings to the students and discuss the readings.

3. The class periods for activities one and two are greatly variable. You will need to decide this in relation to your objectives and schedule.

4. Discuss the instructions for the simulation roles.

5. Have the students draw for their roles. (Separate the cards into male and female roles for the drawing.) Emphasize the importance of the students playing their role to the hilt. You may even want to award "Academy Award-Oscars" for the best performances. Provide for the students a time schedule for the activity to aid in their conducting the simulation. Remind them to apply all that they have learned in previous lessons. A background reference is "Can We Save Our Salt Marshes?" National Geographic Vol. 141, No. 6 (June 1972) pp. 729-765.

6. The questions and discussion at the end of the simulation is very critical to its success and culmination. This is an open ended simulation game, feel free to add scenarios as interest of class dictates.

7. Being quite serious, make arrangements to have the displays set up in an area where they can be viewed by the community. This may be in a bank, local shopping center mall or other area where the public could view them in your community. Announce the dates of the display to the class before you begin this lesson. Then make sure the local news media is alerted to the display.

8. You may even have the public evaluate or vote on the displays. For example-most informative, best use of music, best art work, most attractive and etc.

9. If you have more than one class of students, you will have to determine in some manner which displays groups in each class will develop. This is in order to avoid duplication and neglect of some areas.

10. These activities are limited only by you. (Remember public awareness of students' learning is beneficial to education.)

SIMULATION: SHOREVIEW

LESSON TWENTY

ACTIVITY ONE

Read -

Coastal Management Reports on:
Coastal Problems
Coastal Management Authority
Basis for Concern
Shoreview City Council Action

Look at -

Sketch of aerial view of Shoreview area.

Optional
Read-

Article "Can We Save Our Salt Marshes?"
National Geographic, Vol. 141, No. 6
(June 1972) pp. 729-765

Read -

Instruction for Simulation: Shoreview.

Draw -

Card to determine the role you will play in the simulation game.

Complete -

The description of the role you will be acting by completing the information sheet.

Play -

Your role in the activities of the Simulation: Shoreview.

Answer -

Questions.

COASTAL PROBLEMS
COASTAL MANAGEMENT PROGRAM REPORT

The Texas bays and estuaries are a great public resource. They provide habitats for fish, birds, and other wildlife. They contain important archaeological and historic sites; and they are scenic assets. The bays and estuaries provide for many human uses also.

Generally, these waters can handle heavy uses without any bad effects, but they are not all equally suited for all uses. Heavy human demands on critical natural areas such as tidal marshes and submerged grass areas cause problems.

Tidal marshes produce twice as much dry organic material per acre per year as the best farmlands. Only tropical rain forests, coral reefs, and some algal beds produce more. This high level or productivity supports extensive food chains in the marsh and adjacent bay areas.

Because of the high productivity of marsh plants, a tidal marsh can use high levels of municipal and industrial wastes to produce its organic material. Tidal marshes serve as a nursery areas for estuarine organisms, a variety of fur bearing animals, game fish, waterfowl and including several "endangered species." Tidal marshes also aid in erosion control by absorbing wave energy and serve as temporary flood buffers.

Human uses supported by the marsh system include:

waterfowl management and hunting
livestock grazing
commercial and sport fishing
waterborne transportation (channel dredging)
recreational and aesthetic enjoyment
mineral production
mariculture and waterfront land development for resorts
recreational and second homes

It is unlikely that a marsh system could handle all of these uses at the same time. However, marsh systems can provide many values at the same time, and even land developments can be designed to minimize their adverse impacts upon the total marsh system.

Because of the role the marsh plays in the production of food for the populations, both inside and outside the marsh, anything that effect the natural flow of water are harmful. These include: filling of sea grass areas, poorly planned road embankments, ditches, and dredged material dumpings.

Another intensive human use is the dredging of waterways and

the placing of dredged materials (spoil). Texas bays are so shallow that dredging is essential, so large ocean-going ships can enter. The direct effects of dredging and spoil placement immediately effect only the local environment and organisms. These activities also have indirect and long-term effects. These effects include: changes in bay circulation patterns, erosion rates, salinity levels, sediment distribution and migration of various marine organisms. Changes in salinity levels and suspended material may reduce the productivity of oyster reefs, marsh areas and open bays far from the site of dredging. Channels must be redredged. Poor placement of dredged material may unnecessarily cover biologically productive areas or increase the turbidity of water so it is harmful to marine organisms. Sometimes the dredged material contains pollutants.

There are problems in finding locations for placement of the dredged material. However, proper placement of dredged materials can actually create new marsh areas. All these must be taken into consideration when planning the placement of dredged material. Solutions that are consistent with local environment, social, economic, or political conditions should be selected.

CURRENT MANAGEMENT AUTHORITY
COASTAL MANAGEMENT PROGRAM REPORT

Most of the management decisions affecting the coastal area are made by private interests operating in a market economy. The private sector, from the individual citizen who shops in the grocery store to giant corporations, makes most of the decisions that effect coastal use. Such decisions as what use will be made of a particular tract of land, what product a plant will manufacture, or what crops will be planted by private decisions-makers in response to market forces.

When public problems arise from private decisions concerning the use of coastal resources, it becomes necessary for government to intervene in the market economy. For example, water pollution that results from a decision made in the private sector is a problem that cannot be solved by the private sector alone. So the government steps in. Although federal and state governments have coastal regulatory authority, most governmental decisions regarding the coast are made by local governments. Some local government decisions are shaped partly by the guidelines and regulations issued by state and federal agencies.

COASTAL MANAGEMENT PROGRAM REPORT
BASIS FOR CONCERN

The abundant natural resources of the coastal region contribute to both economic development and the attractiveness of the coast as a place to live. As a result,the Gulf Coast of Texas is a major contributor to the prosperity and well-being of both the state and the nation. It houses 40 percent of the nation's petrochemical industry and over 25 percent of the nation's refining capacity. In 1972, its combined agricultural and fishery production was over $700 million, and the 2,500 miles of shoreline brought nearly 10 million visitors to the state. The petroleum, petrochemical, and agricultural sectors rely heavily upon Texas ports and waterways for transportation of their products. Three-fourths of all goods shipped from Texas to other states travel by water.

The population and economy of the Texas Gulf Coast have grown rapidly over the past decade. This growth rate is expected to continue. The natural systems of the Texas Coast are interdependent. They are closely tied to the coastal economic and social systems. Coastal issues, too, are bound together--jobs with livability, housing with agriculture, wetlands protection with water transportation.

There are three main areas for public concern in and around coastal waters. They are:

(1) the economic activities produced by the coastal waters
(2) the natural resources within and beneath coastal waters
(3) the livability (qualities that make an area a good place to live) of the coastal region

These areas for concern interact. The economic activities use natural resources. The natural resources provide the "raw materials" for a livable envrionment. The economic activities also produce jobs and dollar flows which increase livability. Economic activities provide tax revenues that may be used for resource conservation projects or public works.

Livability is determined by intangible values of resources, both natural and social. The coastal region can continue to be a livable place as long as economic and natural resources are used to promote human well-being. Noncoastal residents also have a stake in the future of the coastal zone. Not only to visit or because the coastal waters are publicly owned, but because their uses benefit the state and

nation. The coastal waters are owned by the public and their rights and interests should take priorty over the rights of private individuals to profit at public expense.

SHOREVIEW CITY COUNCIL ACTION

In public meetings held by the Coastal Management Program along the Gulf Coast, coastal residents have expressed their concern about a number of problems that result from conflicts over the use of natural resources. Based on this, the three Coastal Management reports, increasing local problems, and increasing pressure from various interest, the Shoreeview City council has decided to take action to develop a plan for the future of the city.

The city council decided that the following procudure would be followed:

A) The city council will appoint a planning commission of five citizens.
B) The planning commission will hold hearings in which they will listen to everyone or each group who wishes to speak on the problems and make recommendations.
C) The planning commission may ask for presentations by consultants or groups to help them.
D) The planning commission is to develop several proposals (2 to 5) as the master plan for the city's future growth and development.
E) The planning commission will present the proposals to the citizens at a meeting where the citizens may ask questions and state concerns.
F) The planning commission will then either amend the proposals or present the original proposals to the citizens for a vote.
G) The voters (citizens) will then select the proposal they favor. They may campaign for the proposal.
H) An election will be held to determine which proposal the citizens favor.
I) If there is no definite favorite proposal, the city council has the option to ask the planning commission to develop a new compromise proposal based on the ideas of the stronger proposals.
J) This may or may not be voted on by the citizens. The city council will decide this and how the proposals will be used.

Here are a few of the suggestions or statements that are being discussed or presented to the city council.

Channels need to be dredged deeper and wider so boats won't run into each other or run aground.

Is a beautiful part of the shore scene--marsh and dunes as essential as hills or forests?

Need to allow mining of oil, natural gas, phosphates, sand, shell and gravel.

Need to allow tidelands real estate development. This includes residential housing, industrial development, boat basins, marinas, highways, airports and recreational area.

Need to build a power generating plant in the estuaries which can provide cooling water.

Need to use it as a city land-fill so we can get it filled in free.

Is a source of salt water hay.

Is a mosquito breeding ground, to be drained or treated.

Do not need to change, if we change will loose our small town resort characteristics.

Need to build a superport so catch up and pass up other Texas port cities.

A superport would provide jobs and allow the chemical and oil companies to expand.

Need to protect the marshes,otherwise our fish, shrimp, oysters and wildlife will disappear.

INSTRUCTIONS FOR SIMULATION

A) Draw a card to determine the role you will play in deciding Shoreview's future. Complete the citizen information sheet.

B) Although you are provided some information about the individual, you will want to add more information to help describe the role/individual you will be.

C) If you are a city council member, you will need to meet with your fellow city council members to select the five planning commission members. The mayor will call your meeting.

D) If you are selected to be a member of the planning commission you need to meet with your fellow members. Select a chairman,decide your procedures, (Rules and regulations for people or groups speaking at the hearing.) set the date for the hearing. Decide on things you will need to know to complete your assignment for the city council.

E) If you are a citizen, prepare your presentation to the planning commission. (Remember to follow their rules and regulations.) You may want to find others that feel like you do (individuals you represent) and form a group. You may want to make single presentations or a group presentation. Research your position, obtain data and etc to help present your view and interests.

F) Make your (or group) presentation to Planning Commission hearing.

G) After hearing, Planning Commission meets to develop proposals.

H) Planning Commission reports on the proposals it has developed.

I) Determine what action you (and your group) will take. Will you favor a proposal? Which one? Plan and conduct your campaign for your position.

J) The city council will set up the vote on the proposals.

K) After the election, the city council will determine the next step.

SURFSIDE GROCERY STORE MANAGER — 40 yrs. old Female

3 children, husband is Sea Breeze Yacht Service Inc. Manager, oldest son recently employed as welder at oil refinery, own 2 boats

PHARMACIST — 50 yrs. old Male

No children at home, Mayor, owns Bayside Drugstore, wife just became a real estate saleswoman, own bay property and sailboat

CHEMICAL COMPANY MANAGER — 45 yrs. old Male

Chemical engineer, only one teenager at home, city council member, building a beach home

RESORT REALTY SALESPERSON — 30 yrs. old Female

3 children, husband manages Sea Wind Apartments and Surfside Motel, Resort Realty specializes in resort retails and sales, plans to buy some beach front real estate

DRIFTWOOD GIFT AND SHELL SHOP OPERATOR — 37 yrs. old Female

2 children, husband is architect beach combs, makes gifts to sell from materials collected on beach

BAYSIDE BUILDER AND DEVELOPER — 49 yrs. old Male

2 children, owns some beach front and marsh land which he hopes to develop, specializes in beach or bay front apartments & homes, owns deep sea fishing boat

CHARTER AND PARTY BOATS, INC. RECEPTIONIST — 31 yrs. old Female

3 children, husband is self-employed plumber, saving to build a beach front home

SAND DUNES INSURANCE CO. SALESPERSON — 43 yrs. old Female

2 children, husband is a boat salesman, own sailboat and small motor boat

BUILDER'S SUPPLY LUMBER COMPANY OWNER — 62 yrs. old Male

Widower, part-owner of two shrimp boats, one son is a builder, another one owns shrimp boat repair service

WE HAVE EVERYTHING DEPARTMENT STORE MANAGER — 52 yrs. old Female

Widowed, 3 children, 23 yr old unemployed son living with her, city council member, member local Audubon Society, bird watcher

B & J BARGE CO. OFFICE MANAGER — 40 yrs. old Female

2 children in college, 1 in high school, 19 yr old unemployed daughter, husband is county tax collector

SEA BREEZE MOTEL OWNER — 56 yrs. old Female

No children at home, husband employed by city, own boat for deep sea fishing

BLACK GOLD OIL COMPANY EXECUTIVE — 39 yrs. old Male

2 children, owns beach home, boat, travel trailer

LAWYER — 27 yrs. old Male

1 child, wife is substitute teacher, president of Jaycee's (Junior Chamber of Commerce)

INDUSTRIAL PLANT MANAGER — 46 yrs. old Male

3 children (2 in college), wife is secretary for Vice President of Oil Refinery, own sailboat, building a bayside cabin

WAITRESS AT SANDPIPER LOUNGE — 21 yrs. old Female

Part-time Jr. College student, lives at home, dating Tugboat Co. Employee, loves to surf

U.S. POSTAL SERVICE EMPLOYEE — 33 yrs. old Female Divorced, 2 children, water sports enthusiast, teaches swimming and diving to all local youth	BEACH BAIT & TACKLE EMPLOYEE — 21 yrs. old Female Single, lives in Bayside Apts., water skier and surfer
RICE FARMER — 55 yrs. old Male No children at home, son with degree in Agribusiness is helping run the farm, another son operates local rice dryer	SARGE'S SERVICE AND GARAGE OWNER — 32 yrs. old Male 2 children, city council member, hunts and fishes, owns small boat
SURF SHACK MANAGER — 30 yrs. old Female 2 children, husband works on offshore drilling platform, spends time off beach combing	SEA GULL RESTUARANT OWNER — 60 yrs. old Female Widow, no children at home, owns some undeveloped property along the beach
BAYSIDE MARINA EMPLOYEE — 20 yrs. old Male Lives with his parents, surfing enthusiast, father works at local industrial plant	HIGH SCHOOL COACH — 40 yrs. old Male 3 children, in summer directs a beach camp for Junior High age students, hunts, fishes, owns pickup camper

JUNIOR HIGH STUDENT — 14 yrs.old Female 3 brothers and sisters, father is telephone company manager, mother is secretary for Resort Realty, family owns boat	DOCTOR — 59 yrs. old Male No children at home, owns Bayside Clinic, beach home and yacht, has invested in local real estate, one son is practicing medicine with him, daughter is an oceanographer
HIGH SCHOOL SENIOR — 18 yrs.old Male Needsjob, 4 brothers and sisters, father works for B & J Barge Company	SUPERINTENDENT OF SCHOOL DISTRICT — 45 yrs. old Male 4 children, 2 in college, wants to build beach home, owns sailboat, wife is local women's club officer
TRUCK DRIVER FOR INDUSTRIAL PLANT — 28 yrs. old Male Divorced, 1 child, owns boat and hunts	BIOLOGY TEACHER — 28 yrs. old Female 1 child, husband is counselor, takes students on field trips and camping, board member local natural history museum, member Sierra Club
STATE REPRESENTATIVE — 41 yrs. old Male 2 children, a lawyer, his family owns ranch, he owns some marsh land near town, loves to hunt ducks and geese	ART TEACHER — 24 yrs. old Female Single, paints and photographs nature, very successful at arts and crafts shows statewide

DREDGE-AWAY DREDGING SERVICE EMPLOYEE — 27 yrs. old Male

4 children, likes to hunt and fish, hopes to buy deep sea fishing boat

FIRST STATE BANK PRESIDENT — 60 yrs. old Male

Married, no children at home, owns beach home and some ranch land in the county

DRIFTWOOD FLOWER SHOP AND NURSERY MANAGER — 48 yrs. old Female

No children at home, teaches flower arranging, collects sea shells, husband employed by chemical plant

TEXAS PARKS & WILDLIFE EMPLOYEE — 35 yrs. old Male

2 children, wife paints seascapes, has degree in Marine Biology, likes to fish

BLUE CRAB CAMPGROUND AND MARINA MANAGER — 42 yrs. old Female

Widow, 3 children (2 in college)

GULF CONSTRUCTION COMPANY EMPLOYEE — 29 yrs. old Male

2 children, likes to race motorcycles, owns dune buggy

TELEPHONE COMPANY EMPLOYEE — 28 yrs. old Female

2 children, recently divorced from automobile salesman, lifelong resident of community

BEACHSIDE DRIVE-IN GROCERY MANAGER — 45 yrs. old Female

2 children, husband maintenance manager for oil refinery

SURFSIDE DAIRY QUEEN MANAGER — 32 yrs. old Female 3 children, husband Maintenance Dept. Manager at nearby marine research station	DRIFTWOOD MOBILE HOME PARK OFFICE MANAGER — 60 yrs. old Female Widow, no children at home, husband was a shrimper
REITRED FISHING BOAT CAPTAIN — 65 yrs. old Male Sometimes acts as fishing guide for Sportsman's Village Marina	BANK TELLER — 22 yrs. old Female Engaged to surveyor for construction company, likes to spend weekends on the beach
SANDPIPER REALTY OWNER — 50 yrs. old Male 4 children (only 1 at home), member of city council, part owner of Rip Tide Apartments and Condominiums, owns yacht	REPRESENTATIVE FROM SUPERPORT, INC. — 31 yrs. old Male A non-resident who is here to convince people to support building of a superport. If port is established will receive a large promotion and a 25% pay increase
CAPTAIN'S JUG MANAGER (LIQUOR STORE) — 30 yrs. old Male 2 children, hoping to find another job but wants to stay in area	LIBRARIAN AT PUBLIC LIBRARY — 52 yrs. old Female 2 children in college, lifelong resident, hobby cooking seafood small dishes, husband manages sea food processing plant in neighboring town

GRADUATE STUDENT 24 yrs. old Female Single, student at state university, studying the local marsh as a part of her research in Marine Biology, lifelong resident of area, member National Wildlife Society	AMATEUR NATURE PHOTOGRAPHER 42 yrs. old Female 3 children, mainly is a housewife, husband is editor of the local paper
NURSE 23 yrs. old Female Single, dating single real estate salesman, member of Sierra Club	AUDUBON SOCIETY PRESIDENT 51 yrs. old Female No children at home, husband owns small income tax service, both enjoy camping and birdwatching
REPORTER 30 yrs. old Female or Male 1 child, married, spend free time writing stories about coastal area-past, present & future	

INFORMATION SHEET

Name _____ Occupation _____

(You may make up a name for the individual you are representing.)

Are you a city council member? _____

Are you a planning commission member? _____

Describe yourself. (family, interests, opinions, etc.) In more detail.

Describe what you think the city should do in planning for its future.

What people in town probably feel the same way you do?

What people will probably differ from you?

What will it take for you to change your position or view

QUESTIONS

1) What are your general feelings after participating in Simulation: Shoreview?

2) What upsets you the most?

3) What did you like the best?

4) Do you think that the simulation was realistic or not? Explain.

5) Do you feel that the local, state or federal government should be responsible for managing the coastal waters and wetlands? Explain.

6) What could or should be done to insure the best coastal management of the coastal area to insure its survival?

INTERNATIONAL SEA EXPOSITION

LESSON TWENTY

ACTIVITY TWO

Brainstorm and list -

Ideas to be presented.

Discuss -

List of ideas with your classmates.

Select -

The ideas that will be presented.

Research -

The idea that you and your group are working on.

Outline -

Your group's presentation.

Design -

Your group's exhibit.

Prepare -

The exhibit.

Set up -

The exhibit.

INTERNATIONAL SEA EXPOSITION

Now that you have studied some of the resources of the Gulf of Mexico along with some of the marine resources, you and your classmated have been invited to prepare part of the exhibit for the International Sea Exposition. Your section will present the importance of the sea with emphasis on the Gulf of Mexico. The display should illustrate past and present importance of the sea. It should place emphasis on the projected future importance of the Gulf of Mexico's resources.

The exhibit will be set up in a convention hall, so design it accordingly. Use the media (slides, tapes, pictures, murals, collages, models, drawings& etc.) that will best present your ideas. Remember, it should be self-explanatory to the people viewing it.

Let's brainstorm for a few minutes to make a list of all the ideas that should be presented as part of your exhibit at the International Sea Exposition. You may brainstorm as a class or divide into groups. Select a chairperson, a recorder, and a time keeper. List all ideas. Limit your brainstorming to 7 minutes.

Discuss the list of ideas and determine which ones you will present as part of the exhibit. Divide into groups and each group select an idea to present as an exhibit. Your first steps should be to research your idea, outline your presentation, and design your exhibit. Then you are ready to begin preparing to set up the exhibit.

Use the space below to outline your presentation and sketch the design of your exhibit.

MY FEELINGS ABOUT IT ALL!

LESSON TWENTY

ACTIVITY THREE

Complete -

Say It With Music activity.

Complete -

Your Self Contract.

This completes your study of the marine environment and marine resources. Would you please help us improve this unit by evaluating or grading it for us. Your teacher will provide you with the forms.

Thank you,

Captain Seaborne

Captain Seaborne

SAY IT WITH MUSIC

It might be fun to speak about some things you know through songs. List below some of the things about the marine resources you might want to say.

Now spend some time thinking of songs for each thing. Listen to the radio or T.V. for ideas. If you can't find a song for something, describe the type of song and what you want it to say.

SELF CONTRACT

_____, hereafter known as Self, agrees to the following terms:

1. In the interest of preserving marine environment, my Self will _____

_____.

2. In the interest of conserving marine resources, my Self will _____

_____.

3. _____

_____.

Signed:

A P P E N D I X

FIELD TEST TEACHING UNIT

Because this project has been concerned with the development of a Resource Unit and because we wish to field test a selection of the activities in that unit in a meaningful manner, we are required to make some choices which will generate a meaningfull 10-15 day teaching unit with a degree of uniformity among the teachers who are doing the field testing. The teaching unit plan which follows is the one which has been designed with the above named factors considered.

There are a few options offered within the teaching unit, but perhaps not as many as you might desire. For purposes of field testing, however, we ask you to closely adhere to the teaching unit plan. There are undoubtedly other teaching/learning activities in the resource unit which you would like to use. We would certainly encourage that--but <u>after you have</u> completed this teaching unit. By using the teaching unit as presented you will help us generate meaningful conclusion as to the specific activities being used as well as to the overall types of activities.

UNIT TITLE: INTRODUCTION TO MARINE RESOURCES

PURPOSE: The purpose of this unit is to provide the students with an overall view of marine resources. It as anticipated that for most students this study will widen the scope of what they previously considered marine resources. It is expected that the students will attend more closely to and take more actions toward using marine resources wisely as a result of their study. Special emphasis is placed upon thinking about marine resources in the future.

INTENDED AUDIENCE: This unit has been designed primarily for secondary school students in science and/or social studies.

GENERAL OBJECTIVES: As a result of the study of this unit, the student will be able to:

1. understand the intricate interrelationships within and among all parts of the total environment with emphasis on the marine environment;

2. analyze the effect of man's past activities upon the marine environment and resources and analyze possible future responses of man's interaction with the marine environment and resources considering how to foresee and avoid undesirable consequences;

3. more skillfully apply the techniques of good management, planning, and problem solving with respect to the marine environment and resources now and in the future;

4. appreciate more fully the marine environment and resources.

TEACHING/LEARNING ACTIVITIES: Below are listed the activities which are to be used in this unit. The activity title and the page(s) upon which they are found in the resource unit are indicated. A time estimate for each activity is also included. You may wish to vary the order of the activities and that is permissable.

Note that you will make a choice on the last two activities listed. If you choose to do the "International Sea Exposition" activity you will want to inform the students about some aspects of the activity early in the study of the unit so they may begin preparing for the activity.