



Keywords: phyla, brackish, mangroves, seagrasses, International Year of the Ocean

Lesson I: Why the Oceans are Important!

In this lesson, we will introduce you to the first of our three fall units: Year of the Ocean 98. In this unit shows, we will discuss why the ocean is important, the ocean biosphere, marine pollution, the methods used to study the ocean, and the instruments used for research. The first lesson will focus on the importance of the ocean. Why is the ocean important to every individual on planet Earth, and why is there a worldwide program the misuse of oceans?

People enjoy the beauty of the ocean and the bounty of its waters,

but may not understand that their everyday actions – boating, construction, improper waste disposal, and ignoring protected areas can impact the ocean and its resources. Long-term planning for growth, development and use of coastal areas is the key to the continued life of the ocean.

As part of this effort, Project Oceanography has dedicated a portion of its 1998 Fall Schedule to Year of the Ocean (YOTO).



The declaration of **1998** as the **International Year of the Ocean (YOTO)** provides an opportunity for governments, organizations and individuals to raise public awareness of the role the ocean plays in our lives, and to initiate changes needed to sustain the marine resources on which we all depend. The points that YOTO is hoping to

get across to everyone include:

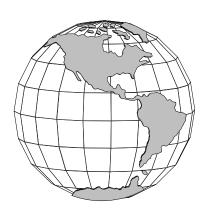
- The importance of the oceans to the health of planet Earth.
- Different instruments that we use to study the ocean, and What can we learn?
- The importance of marine environments and the organisms in them that are threatened. Participating in YOTO is easy for everyone, and it can be an ongoing participation. There is an abundance of free materials and resources available through government agencies, much of it via the internet, which you can use in your classrooms for many years. Now is a good time to order and download lots of free, high-quality marine educational materials.

Both President Clinton and Vice President Al Gore are big supporters of ocean protection. They are advocating what may prove to be a new era in ocean exploration. Among many of the new programs announced in June 1998, the U.S. will review ocean resources and policy to insure a "cleaner, healthier, marine environment.



One of the educational activities planned for YOTO is the Drifter project. Over 100 drifters will be deployed between now and early next year to provide researchers, educators, and students with near real-time and easily accessible oceanographic data for new ways to investigate the ocean. You can use this opportunity to bring "real-time" ocean data to your classrooms. Check out the official YOTO drifter web site at http://www.drifters.doe.gov for hands on, interactive oceanography, mapping, and math problems. The site also provides links to information on pollution, particle transport, climate, weather, and many other topics of interest. The Project Oceanography Fall 1998 series will also be highlighting many of the same topics, so follow along!

Why are the Oceans Important?



We can make a long list of how the oceans and marine life are important to us. Did you know the Oceans cover

greater than 70% of the earth's surface? They contain 99% of the living space on earth! Without this space for organisms to survive, there would be five fewer **phyla** of animals on the earth. Perhaps this is the most important reason to protect the oceans – to preserve the **biodiversity** of the Earth.

1. Biodiversity

Coral reefs, salt marshes, estuaries and mangrove and seagrass beds are just a few of the ocean environments which support a large number of different species of organisms – that is, have a high **biodiversity**. Estuaries are **brackish** water systems that empty their waters into the

world's oceans, and support many, many fish and other organisms. Along with coral reefs, estuaries sustain 75 percent of all commercial fish and shellfish during some point of their life cycles! Spawning organisms make reefs and estuaries their home because animals can find an abundance of food and excellent protection from predators. The fish, anemones, sea cucumbers and sea fans that populate the coral reefs all work together in symbiosis. In the estuary, the seagrasses provide protection to juveniles and food for herbivore. **Mangroves** not only act as nurseries for commercially important marine species, they also act as a filtering system for coastal water. Seagrass beds, mangroves and coral reefs are crucial to providing protection against shoreline erosion and flooding.

The sandy shores are home to fiddler craps and burrowing worms, as well as a feeding ground for birds. Without coral reefs and estuaries, our oceans would lose many, many

organisms that are important to both humans and other marine life.

How do we maintain biodiversity?

In 1972, the United States
Congress authorized discrete areas to
protect and manage natural resources.
These are called National Marine
Sanctuaries. They may be bays, coral
reefs, estuaries, or coastlines.
Sanctuaries promote education,
conservation of species, scientific
research, as well as public awareness
and appreciation of the environment.
There are 12 designated National
Marine Sanctuaries throughout the
east and west coasts, along with one
in the Gulf of Mexico.

National Marine Sanctuaries can be very small, or thousands of square miles in size. Sanctuaries are founded to protect one exclusive marine animal, but since there are many animals that live in one habitat, all are helped by it. A sanctuary in the Hawaiian Islands and its coral reefs are home to many species of whales, turtles, and corals, while a sanctuary off the coast of Washington is home to otters, sea birds, tidal pool vegetation, shellfish, and many fish.

2. Natural resources

The ocean floor habitat is not as well known as coral reefs or coastal areas, but it is very important to all the organisms that live on the bottom (**benthic organisms**), as well as commercially important as well. The continental shelves and ocean floor are home to many important minerals,

including oil and natural gas. Natural gas and oil play a major role in meeting U.S. energy needs. The outer continental shelf contains more than 50 percent of the nation's remaining undiscovered natural gas and oil resources. Natural gas production in this area was enough to meet the needs of all natural gas users in the United States in 1996!

3. Transportation

Not only are oceans important to sustain life, but also for moving materials that we use. More than 95 percent of U.S. foreign trade (by weight) passes through U.S. ports and harbors. Without commercial ships and barges, transportation of goods from place to place would be much more difficult and expensive. Cities which have good natural harbors have always had an advantage, and even today are some of the largest cities in the world.

4. Climate and weather

Did you know warm ocean waters provide the energy to fuel storm systems that provide fresh water vital to land-dwelling organisms? The oceans interact with and affect global weather and climate. As the air passes over warm waters, it rises due to warming. As it cools, condensation of the water creates rainfall. If the air passes over cooler waters, it cools and sinks. Air moves from high to low pressure areas.

Warm air moves with the Gulf Stream



toward northern Europe. Thus, the winters in Northern Europe are not intolerable. Though this is simplified, it is easy to see how the oceans are connected to climate and weather change.

5. Economy

The ocean is also vital to our economy. One of every six U.S. jobs is marine-related, and more than 66% of the world's population lives within 100 kilometers of the coastline. Realestate, recreation, ocean-related occupations, and other services associated with the ocean generate 54 billion dollars in goods and services per year. Revenue related to the ocean is generated through: kelp (emulsifying agent in food and pharmaceutical products), food, recreation (hook and line fishing, spearfishing, scuba, snorkeling, whale watching, etc.), mining (salt, oyster shells, jade, etc.), shipping and biomedical products. Can you name others?

The ocean provides much more than seafood! Many of the foods and products that we eat, or use as medicine contain ingredients from the sea. Carrageenan, a compound found in red algae, is found in peanut butter and toothpaste. Compounds from ocean sponges and cartilage from sharks are being used in medication to help fight the battle against cancer. Great care is being taken in the research of marine-based drugs to prevent the depletion of important natural marine resources. Furthermore, research is being conducted to synthesize artificial forms of marine compounds. Marinebased drugs are vital because many infectious organisms have developed strains resistant to soil- and plantbased drugs.

The importance of the ocean can not be debated. It truly contains some of the planets most fascinating ecosystems.

FUN FACTS I

- The oceans contain 99% of the living space on the planet. The Pacific Ocean is 25% larger than all the land areas combined.
- The remains of diatoms, (algae with hard shells), are used in making pet litter, cosmetics, pool filters and tooth polish.
 - Coral is used in place of bone grafts, because its structure is close to that of human bone.
 - The average depth of the ocean is 3800 meters (about 2 miles).
 - The deepest place in the world's ocean is found in the Mariana Trench, it is 11,035 meters (6 miles) below sea level.
- Angel falls in Venezuela is the tallest waterfall on land, but the tallest on Earth lies beneath the ocean surface. Below the Denmark Strait, a cascade of water falls 2.2 miles down, over 3 times farther than Angel Falls.
- The pressure found at the deepest place in the ocean is about 8 tons per square inch. That is like a human holding 50 jumbo jets!

For more fun facts like these, visit Ocean Planet and the Center for Marine Conservation on the worldwide web at:

http://seawifs.gsfc.nasa.gov/OCEAN_PLANET/ and http://www.cmc-ocean.org/mdio/atsea.html

If you find any interesting facts, or have any questions that you would like to share with the staff at Project Oceanography, please feel free to call us at: 1-888-51-ocean or e-mail us at: askocean@marine.usf.edu We will answer you either via e-mail or on the air during a broadcast. Visit our web site at http://www.marine.usf.edu/pjocean/

Teacher's Key To Can You Calculate? Activity I-1

- 1. 2225 humans, 519 humans
- 2. 24 Empire State Buildings, 10 humans
- 3. 1528 giraffes, 323 blue whales, yes-with 6798 feet to spare
- 4. 31 elephants
- 5. 11820 more feet, 4856 more feet



Activity I-1. Can You Calculate?

To help you see how extraordinary the ocean is, here are some facts and figures you can use to solve some very interesting math problems. Used with permission from the Center for Marine Conservation 1998 (for more information, write to 1725 DeSalle St. NW, Suite 600, Washington, D.C. 20036 or call (202) 872-0619)

Did you know?

- The **deepest place** in the ocean is, the Mariana Trench: 35,827 feet.
- The **highest place** on land is Mount Everest: 29,029 feet.
- The **average depth** of the ocean is 12,237 feet.
- The **average height** of dry land is 2,854 feet.
- The **biggest animals**: the 90-foot-long blue whale, the 57-foot-long giant squid, the 19-foot giraffe and the 10.5-foot elephant.
- The tallest plants: the 330 foot giant kelp seaweed and the 360 foot giant Sequoia redwood tree.
- The **tallest building** in the world is the Sears Tower in Chicago: 1,559 feet. The Empire State Building in New York City is 1,473 feet.
- The average human is 5.5 feet.
- The **deepest dive** from the surface by a human without breathing equipment: 417 feet.
- The **deepest dive** from the surface by a marine animal: 7,381 feet (sperm whale).

Using the information from the above Did You Know?, can you calculate the following?

- 1. How many humans would you need to make a chain going from the surface to the average depth of the ocean? How many to make a tower the average height of dry land?
- 2. How many Empire State Buildings could fit end to end in the Mariana Trench? How many humans could fit into a giant squid?
- 3. How tall is Mt. Everest in giraffes rather than feet? How tall in blue whales? Could Mt. Everest fit into the Mariana Trench?
- 4. How many elephants would have to stand on top of each other to reach the height of a giant kelp seaweed?
- 5. How much farther would the best human diver have to swim to get to the average ocean bottom? How much further would the best-diving sperm whale have to go?



Activity I-2. Missing Mystery Vocabulary Word

Modified from the Center for Marine Conservation 1998 (for more information, write to 1725 DeSalle St. NW, Suite 600, Washington, D.C. 20036 or call (202) 872-0619)

From the pre-show educational materials, use the information to fill in the missing words below. Then put the letters marked by numbers in the spaces at the bottom to discover the mystery word!

A. The water found in estuaries is _		·
B. Ninety hundred and ninety eight	t has been declared	of
the <u>(2)</u>		
C. Natural gas and(5)	are commercially imp	ortant resources found or
the continental shelf.		
D. A special park called a marine _	(1)	can
help protect sea creatures.		
E. Mooring buoys give captains a p	place to tie up their bo	ats without having to drop
an (3) on	the fragile reef.	
Mystery vocabulary word:		
(1) (2)	(3) (4) (5)	

Activity I-3. Preparation for Year of the Ocean Show II: The Ocean Biosphere - From Microbes to Mammals.

In the show to be aired next week, we will be constructing the Ocean Biosphere. It will be constructed with the following question in mind "What does it take to build an ocean, and where do the materials come from?". Please ask your students to prepare a list of the top ten things that they feel are necessary to make an ocean and where the resources might originate. E-mail them to us at: askocean@marine.usf.edu, and we might use some of your ideas on the show.



<u>Information about the importance of the ocean, and links to other oceanographic web sites</u>

http://www.epa.gov/OWOW/estuaries/coastlines/summer97/hawaii.html

http://www.epa.gov/owow/oceans/yoto/info.html http://ceres.ca.gov/CRA/ocean/html/chapt5j.html

Links to Year of the Ocean

http://www.Yoto98.noaa.gov

http://drifters.doc.gov http://www.seaweb.gov

http://www.uscgo.mil/hq/g-m/yoto98.htm

Links to additional activities

http://podaac-jpl.nasa/edudoc.html

http//satori.gso.uri.edu/satlab/phyto/phytoplankton

http://www.epa.gov

http://www.d1dpa.com/willow.html

http://www.nature/park.com/lesson.html



STUDENT INFORMATION SHEET LESSON I

In today's show, we will introduce you to the first of our three fall units: Year of the Ocean 98. In this unit we will discuss why the ocean is important, the ocean biosphere, marine pollution, the methods used to study the ocean, and the instruments necessary to do so. People enjoy the beauty of the ocean and going to the beach for entertainment, but many do not understand that their everyday actions - boating, construction, improper waste disposal, ignoring protected areas can destroy the ocean and its resources. The Year of the Ocean provides an opportunity for people to learn more about this valuable resource. Since our seas are being abused, the United Nations declared 1998 as the International Year of the Ocean.

The ocean importance is staggering! Did you know the oceans cover greater than 70% of the earth surface? This alone is striking, but did you know that they contain 99% of the living space on earth? The smaller tributaries, reefs and estuaries, which empty into the ocean are extremely important to marine life. The different organisms all work together in symbiosis to create a unique living condition that is beneficial to all.

In 1972, the United States Congress authorized areas of the marine environment as National Marine Sanctuaries. These areas were designed to protect and manage marine environments. Sanctuaries can be very small, to thousands of square miles in size. They may be bays, coral reefs, estuaries, or coastlines.

The ocean floor habitat is one that is not thought of as being as important as coral reefs, the pelagic realm or coastal areas. But it is commercially important. The ocean floor is abundant in natural gas and oil

oceans interact with global weather and

The

climate.
Climate and weather

changes have



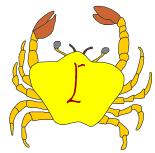
large effects on the economy through tourism, fisheries, crop yields, and destruction of property and lives.

Not only are the oceans commercially important to human beings and their livelihood, but for the protection and continuation of species. The importance of the ocean can not be debated. It is truly one of the planet's most fascinating ecosystems. So many life forms live in it or depend upon it. Without it, survival would be impossible

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Additional information and locations of materials:

Importance of the ocean, and links to other oceanographic web sites

http://www.epa.gov/OWOW/estuaries/coastlines/summer97/hawaii.html

http://www.epa.gov/owow/oceans/yoto/info.html

http://www.marine.usf.edu/pjocean/index.html

http://ceres.ca.gov/CRA/ocean/html/chapt5j.html

Links to Year of the Ocean

http://www.Yoto98.noaa.gov

http://drifters.doc.gov

http://www.seaweb.gov

http://www.uscgo.mil/hq/g-m/yoto98.htm

Links to additional activities

http://podaac-jpl.nasa/edudoc.html

http//satori.gso.uri.edu/satlab/phyto/phytoplankton

http://www.epa.gov

http://www.d1dpa.com/willow.html

http://www.nature/park.com/lesson.html

