

Introduction: Marine Resources—Balancing Use and Overuse

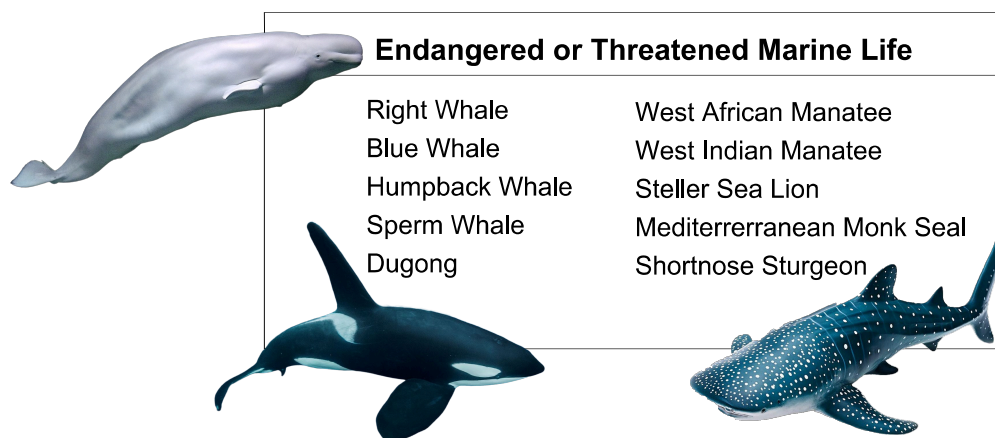
From the earliest moments of civilization, the ocean has provided us with many essential and nonessential **resources**. Marine animals and plants, of course, have provided us with nourishment to survive. Other types of resources including oil and gas have enabled us to develop into industrial societies. Without resources from the ocean, we would not be able to live at the level that many of us enjoy today.

Until recently, many people believed that the ocean would provide *unlimited* resources. As you can well imagine, it is difficult to see any real impact in the ocean even after gathering tons of fish each year or drilling offshore oil wells. However, the ocean's resources have become threatened in a number of different ways.

Some of the ocean's resources such as oil and gas are **nonrenewable resources**. There is no natural process that will produce new reserves of these resources. Once we drain our sources of available oil or gas (or many other nonrenewable resources), we will have to learn to live without them. Some resources such as fish and plants are **renewable resources**. These living resources continue to reproduce and provide us with new stores to replenish our stock.

But even renewable resources are not completely safe from destruction by human activities. As we continue to dump our sewage and toxic chemicals in the ocean, we are continuing to kill some or most—perhaps even all—of the food and other resources that we depend on. We also threaten some renewable resources by harvesting too much of them. If, for example, we catch all of a particular kind of fish, there will be none of this type of fish left to reproduce. If a species of fish or other marine organism became extinct, the food web of the ocean and Earth would be damaged. As

resources from the ocean have begun to diminish, we have become aware of just how fragile is the balance of life in the ocean.



Nonrenewable Resources: The Ocean's Natural Resources

In addition to the obvious natural resources—such as oil and gas—industries also mine some other valuable deposits from the ocean. Sulfur is a nonmetallic element used in the production of rubber, insecticides, and pharmaceutical products. Some of the more important metals discovered on oceanic ridges and the ocean floor include zinc, iron, and copper, as well as silver, lead, gold, and platinum. These metals are used in a variety of ways. Zinc and copper, for example, are used in electrical wiring. Gold is also used as an electrical conductor, as well as in jewelry, and as an international monetary standard.



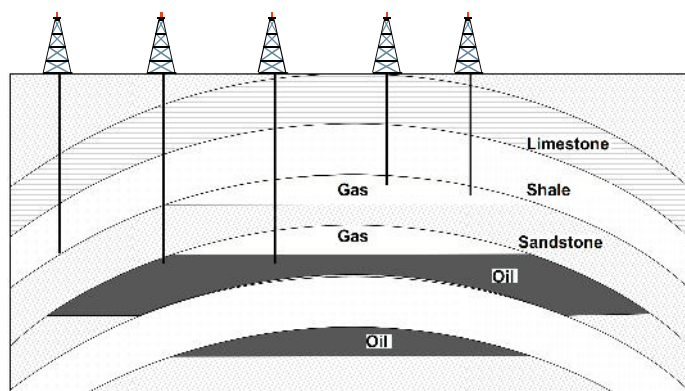
oil rig tower

Some resources mined from the ocean provide the construction industry with building materials. Sand, gravel, and shells are collected from the *continental shelf*. The continental shelf is the relatively flat part of the continent covered by seawater, between the coast and the continental slope (see Unit 7). And red clay and *oozes*, or soft mud, have also been mined from the *abyssal plain*, the large, flat regions on the ocean floor, and used in construction. The agriculture industry mines phosphates from the continental shelf for producing fertilizers.

Natural resources from the ocean are *nonrenewable*. Not only does overuse of these resources threaten our limited supply, but our methods of harvesting these resources often damage the marine environment.

Oil and Gas Deposits: Fueling Our Civilization

In our high-energy society, it is easy to see why oil and gas are the most valuable of marine resources. Oil and gas come from the remains of plants and animals that once lived in the rivers or seas. Long ago their remains settled to the ocean



oil and gas deposits in reservoir rock

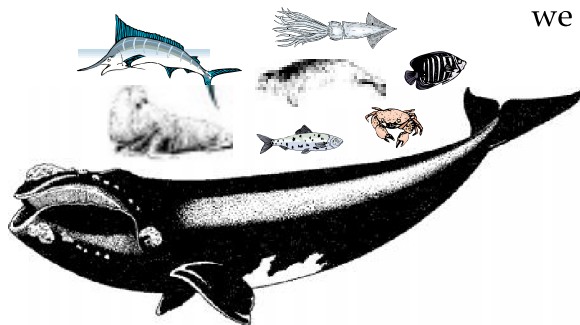
floor. How these remains changed into oil and gas was a long and complex process. Heat, pressure, and time combined to transform these remains into deposits of oil and gas. Oil and gas deposits are usually found in rocks that are no less than two to three million years old. To locate deposits, researchers usually look for areas on the continental shelf that have a thick layer of plant and animal remains. This thick layer is called a **reservoir rock**. Areas of reservoir rock have a high chance of containing productive oil deposits.

Manganese Nodules: A Potential Resource with an Expensive Price Tag

The deep ocean provides an interesting mineral resource called **manganese nodules**. These mineral deposits are round, black and about one inch in diameter. The elements found within manganese nodules have economic value, including copper, nickel, cobalt, and manganese. Recovery of these nodules, however, is quite expensive. Mining of these nodules requires special ships and vacuum-like equipment to sweep them off the ocean's floor. Consequently, mining of manganese is not done on a large scale.

Renewable Resources: Biological (Living) Resources

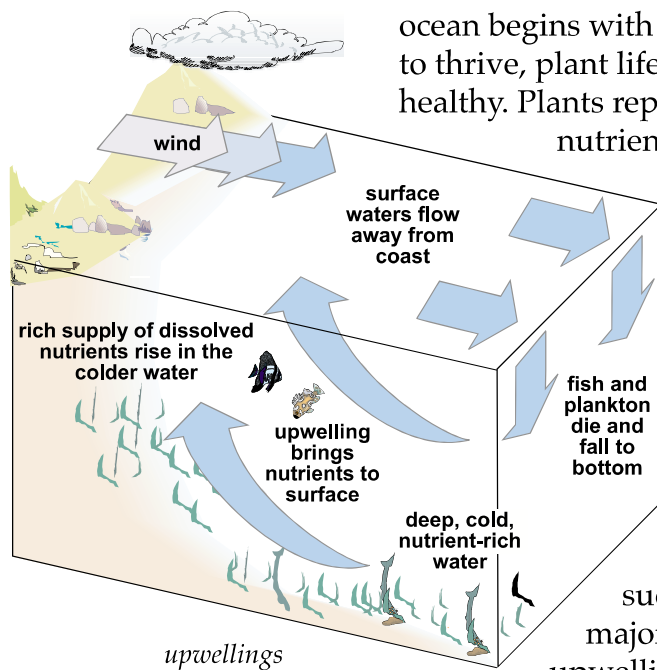
The **biological resources**, or *living* resources, from the ocean are probably the most important in sustaining our lives. Without marine life to feed on, the world's population would suffer even more greatly from famine and hunger. Most of the food we harvest from the ocean is in the form of fish (tuna, salmon, flounder, and others), crustaceans (shrimp, crab, lobster, and krill), mollusks (squid, clams, mussels, and abalone), and marine mammals (whales and seals). From fish,



Most of the food we harvest from the ocean is in the form of fish, crustaceans, mollusks, and marine mammals.

we also harvest oil to be used in producing paints, drugs, and other commercial products. Marine plants are also an important food source (see Unit 13). Red and brown seaweed, for example, are common food sources in many Asian nations.

As you know from your earlier reading, the food chain in the



ocean begins with plants. For marine animals to thrive, plant life must be plentiful and healthy. Plants reproduce plentifully in nutrient-rich waters. Nutrient-rich

waters, however, are often found at lower levels where many plants cannot survive.

Upwelling, or the *upward* movement of water, carries nutrient-rich waters to the ocean's sunlit layers (see Unit 6).

Many regions in the ocean, such as the coast of Peru, are major fishing areas because of upwelling. Marine animals live and migrate to these areas to feed on thriving marine plants and animals.

Fishing is not the only method of harvesting biological resources from the ocean. As long ago as 2000 B.C., "farmers" in Japan and China were "growing" different kinds of fish, crustaceans, and mollusks.

Aquaculture, or *sea farming*, provides many nations with plentiful supplies of food, including oysters, clams, and shrimp, to name just a few.

Oyster farming is an industry in Florida and along the eastern coast of the United States. Baby oysters, called **spats**, float in the currents of the ocean until they come across a shell on the bottom of the ocean floor to which they can attach themselves. To provide the spats with an ideal location to attach and grow, oyster harvesters place shells on the shallow-ocean floor or in an *estuary*. An estuary is an area where a river empties into the ocean or where water from the land drains into the ocean. The spat will stay attached to the shell and grow until large enough to be harvested by the oyster farmers.

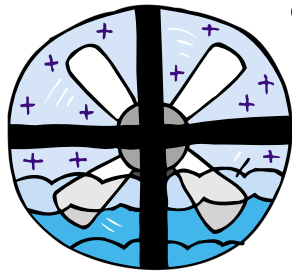
Another method used in harvesting oysters is to suspend shells on a wire in the water column. The spats then attach themselves to these shells. The wire-growing method allows sea farmers to grow more spats in a single area and also removes the growing oysters from natural enemies on the ocean's floor, such as starfish. The wire method of growing oysters is primarily used by the Japanese.

Lobsters and shrimp also do very well in aquaculture systems. These organisms are usually grown in an enclosed system supplied with heated water. The heated water increases the speed at which organisms grow in their natural environment.

Renewable Resources: Physical (Nonliving) Resources

As you learned in earlier units, the ocean has many regions of strong moving water. Scientists and engineers have developed ways to capture this force and convert it into usable energy. Perhaps the most obvious of the ocean's **physical resources**, or *nonliving* resources, is simply its water.

It is estimated that the energy available in ocean waves is about 3,000 times the generating capacity of the Hoover Dam. Energy is collected from the tides, waves, and currents by paddle-like wheel mills called *turbines*.



Turbine blades generate electricity.

When high tides come in, their water is trapped in an estuary; when the tide water flows out during the low tide, the water is channeled to turbine blades, which in turn generate electricity. The stronger the tide or current, the faster the blades will turn and the more electricity will be produced. Because the energy that produces tides, waves, and currents is fairly constant, we can depend on tidal power and wave power as *renewable resources*.

The ocean is one of the most popular areas in which to recreate. It seems that we naturally enjoy the ocean, and so the ocean has always been a recreational resource for us. Many of us use the oceans for sailing, fishing, scuba diving, surfing, and swimming. Tourists flock to Florida, in particular, to take advantage of the state's beautiful coasts and beaches. In fact, much of the state's revenue comes from tourists who visit our state to enjoy the recreational activities provided by the ocean.

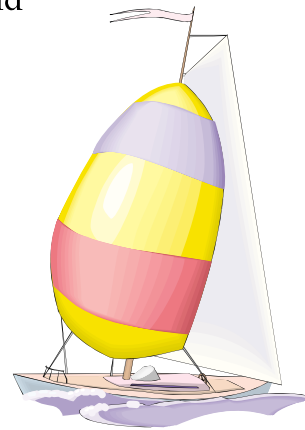
As is true of all resources, overuse and overdependence cause and lead to problems. In Florida, scientists are working on plans that will permit all of us to continue enjoying our water wonderlands without destroying the fragile balance necessary for marine environments to survive.

Summary

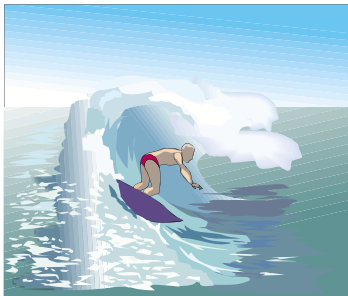
The ocean provides us with both *renewable* and *nonrenewable* resources. Minerals are harvested from the ocean for use in construction, drugs, and other commercial products. Oil and gas are essential in sustaining our high-energy society. Like all natural resources, oil and gas are limited in supply.



Biological resources provide the world with food in the form of fish, crustaceans, and other types of marine life. *Aquaculture*, or sea farming, has been used for thousands of years and continues to help supply the world's population with food.



The ocean also provides renewable energy resources. Tides, waves, and currents turn turbines, which in turn produce energy. The ocean



has always been, and will continue to be, one of the most popular sources for recreation. In part because of its warm waters and beautiful coasts and beaches, Florida has become a leader in tourism in the United States. Great care must be taken to protect both nonrenewable *and* renewable resources for future generations to come.