**Coral Reefs in Peril**

Introduction to Coral Reefs in Peril

An ambitious plan to protect and study the coral reefs of the United States was announced in March 2000 by the U.S. Coral Reef Task Force. The task force, comprised of representatives from several federal agencies and led by the National Oceanic and Atmospheric Administration and the Department of Interior, began examining U.S. policies on reefs and threats to their health as a result of an executive order in June 1998 from President Bill Clinton. The new plan called for the government to designate 20 percent of U.S. coral reefs as “no-take” ecological reserves (areas in which all taking of marine organisms is prohibited) by 2010. The plan also provided for the mapping of all U.S. coral reefs by 2009 and the establishment of a comprehensive system of reef monitoring.

Throughout the 1990's scientists reported alarming changes in the world's coral reefs. The U.S. plan joined other international efforts to obtain a better understanding of coral reefs and to curb their further decline.

Coral reefs are one of the planet's most biologically diverse environments, harboring a vast number of species, including one-quarter of the world's known marine fishes. Coral reefs are also important to the economic well-being and the health of human populations. In Hawaii and the Florida Keys alone, tourism and other activities related to coral reefs provide more than $2 billion in annual revenue. Reefs act as barriers to incoming waves, protecting shorelines and coastal property from erosion and storm damage. People in many island nations around the world depend on the fish, shellfish, and other organisms that dwell in reefs as a primary source of food. And chemical compounds found in some coral reef organisms show promise as disease-fighting agents.

How Coral Reefs Are Built

Coral reefs are limestone structures built over time by small marine animals, the stony corals. Most corals live in colonies, with numerous individuals, called polyps, living together on top of their limestone skeletons. Each coral is basically a ring of tentacles surrounding a central mouth that sits in a cuplike hole in the underlying skeleton. At night, a coral extends its tentacles to feed on drifting particles and plankton (tiny floating organisms). A coral's skeleton is created by cells in the base and walls of the polyp, which secrete calcium carbonate (limestone). Only the surface of a reef is alive. The underlying structure is made of limestone rockold coral skeletons.

All reef-building corals have tiny algae called zooxanthellae that live inside their tissues and help them create their limestone skeleton. In a mutually beneficial partnership called symbiosis, the algae receive protection and can use the coral's waste products as fuel for photosynthesis (the use of energy from sunlight to combine carbon dioxide and water to make food and grow). Coral polyps, in turn, get an efficient means to eliminate wastes and a source of oxygen, a by-product of the algae's photosynthesis. Working together, the coral and algae create the framework of the coral reef. The reef's complex structure provides a home for many other creatures, including sponges, fish, octopuses, crabs, starfish, and sea anemones.

The shallow, clear waters of the tropics provide optimal conditions of sunlight, warmth, wave energy, and food for coral reef growth. However, if these environmental conditions change, the health and survival of a reef can be put at risk.

The Effects of Overfishing and Water Pollution

Scientists agree that the most widespread threat to coral reefs is overfishing. Researchers believe that the excessive taking of fish, particularly large species, can cause significant and potentially damaging changes to a reef. For example, heavy fishing of herbivorous (algae- or plant-eating) fish may cause a reef to become overgrown with algae. A blanket of algae can smother the underlying corals and prevent young corals from attaching to the reef and growing into adults. Moreover, in some regions, cyanide, bleach, and even dynamite are used to take large quantities of fish. These practices cause great damage by poisoning reef organisms and destroying the structure of a reef.

Another serious threat to coral reefs is pollution from land-based wastes, such as sewage and agricultural runoff. Such wastes are typically nutrient-rich, containing high concentrations of nitrogen and phosphorous. When excess nutrients enter the sea, a blooming (rapid population explosion) of algae can occur. The dense growth of algae can smother the slower-growing corals and substantially reduce the amount of sunlight available for photosynthesis by the algae within the corals' tissues. In addition, the runoff from land sometimes contains toxic chemicals and sediment that can poison or bury the corals.

Coral Bleaching and Coral Diseases

A relatively rapid warming of Earth's climate, from the greenhouse effect (the trapping of heat in the lower atmosphere by gases generated by the burning of fossil fuels and from deforestation) may be partly responsible for a problem called coral bleaching. Corals bleach, or turn white, when the algae—which give the corals their color—are expelled from the corals' tissues, revealing the underlying limestone skeletons through their transparent skin. Laboratory experiments have indicated that corals bleach in response to stress, such as from increased water temperatures. Some corals recover from bleaching, but others die. Scientist also believe that bleached corals may be more vulnerable to disease or storm damage.

These are not the only problems confronting coral reefs. Coral diseases appeared to be on the rise in 2000. The cause of many of these infections was a mystery.

Environmental change has influenced coral reefs since their evolution millions of years ago. Disturbance is, in fact, a natural and important part of life on a reef. Storms, for example, wash out debris, disperse live coral fragments, and provide space for growth. In this way, reefs can recover from such stressful natural events as storms.

However, scientists fear that the added stress from human activities may be too much for the reefs to bear. Therefore, researchers welcomed the plan announced by the Coral Reef Task Force and other efforts to protect reefs. Although the Earth's coral reefs are at risk from numerous interacting factors, scientists hoped these efforts would help prevent further damage to coral reefs and promote the recovery of these beautiful and valuable natural treasures.