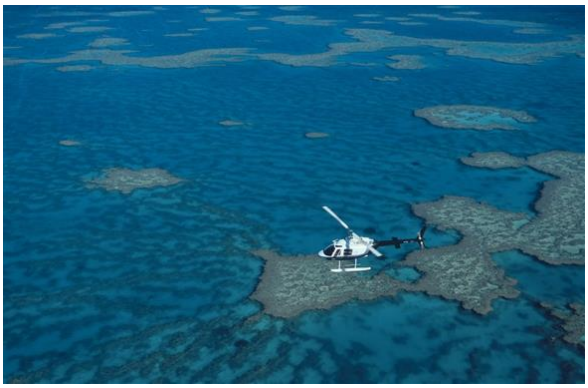
CORAL REEFS



We have looked at the development of coral reefs starting with a volcanic island on which coral starts to appear. Coral is a kind of animal that needs to be in water. Being an animal, it also needs food. It has developed a relationship with a zooxanthella (ˌzōəzanˈTHelə)- a unicellular dinoflagellate that can photosynthesize.

These are frequently found in the deep ocean since the shore they are involved with is the one that was a volcanic island now submerged. The coral can grow where there is enough sunlight for the zooxanthella to photosynthesize so as the island "sinks", the coral is simply building on the coral which was laid down earlier.

Coral reefs are home to many organisms – Provide habitat and shelter for 25 percent of all fish species in the deeper parts of the ocean.

Many of the shore line environments are also home to many organisms and act as nurseries affording protection to the small baby organisms which are living somewhat protected there

Coral Reefs are:

1. About as diverse as rain forest in animals.
2. Great Barrier Reef is more than 1,400 miles long
    a. Started 20,000 years ago Largest structure in the world made by non-human animals
    b. Now world heritage site.
3. Caribbean reefs
    a. many dead
    b. 9% of the world's coral reefs here.
    c. About 1/6 remain. Much of the problem is caused by algae and sponges.
    d. Attempts to restore (tires – disaster)

Kane'ohe Bay Hawai'i.

Eutrophication of bay from sewerage acting as fertilizer caused certain seaweeds and green "bubble" alga to grow extremely rapidly, covering much of the bottom of the bay. The alga began to overgrow the coral and smother it. Phytoplankton increased as the result of the nutrients and clouded the water blocking light.

Some public outcry reduced the amount of pollution and the green alga started to disappear and the coral began to recover – more rapidly than expected.

During the time of the pollution, the coral skeleton had weakened and become fragile and crumbly. When a hurricane hit the island, in 1982, the weak layer collapsed. However recovery continued because the coral had already started to rebound.

By 1990 the recovery seemed to have leveled off, but some areas started to decline and the green "bubble" algae starting to increase again. It is not clear why. The sewerage is no longer released in the bay.

Possible explanations.

1. Some sewerage remained in the sediment and is still being released (but that has been happening since the recovery started)

2. Some of the sewerage now released elsewhere has begun to flow into the bay

3. There is sewerage from boats, septic tanks and cesspools of private homes and other sources. The population is increasing so there is a change here. It seems unlikely though that the sewerage has increased as much as a result of population increase as had been there before.

4. Increased fishing may have reduced the number of fish that graze on the bubble algae.

5. Another seaweed has been introduced into the area which the fish prefer and so have stopped eating the bubble algae allowing it to increase again

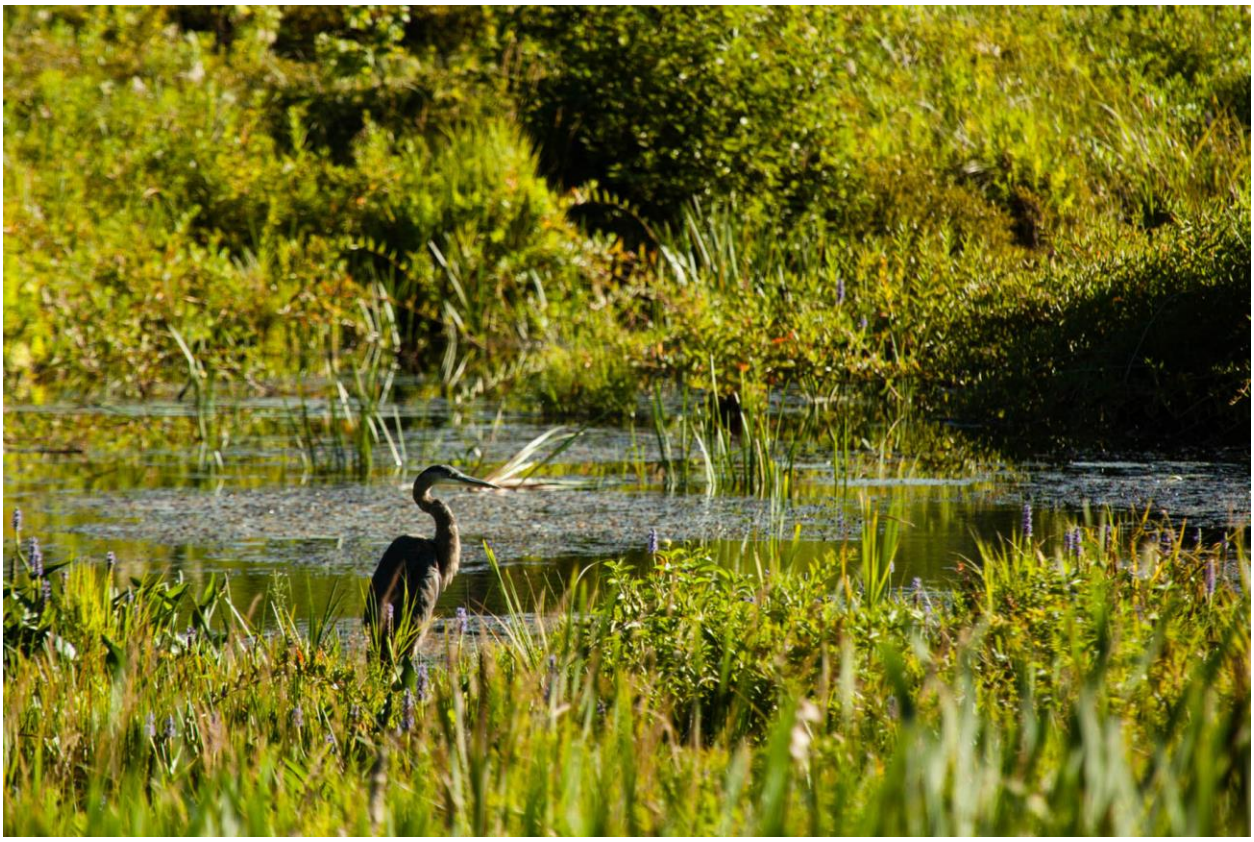
6. Another algae has been introduced which is not a preferred food and so has started to proliferate and is beginning to suffocate the corals.

Eutrophication is not necessarily bad. In some cases is may be good for the zooxanthella and help the coral grow faster. However when the algal grazers are reduced then the eutrophication seems especially damaging.

THE COASTAL AREAS OF THE CONTINENTS ARE CRUCIAL TO MARINE LIFE. WHILE THERE ARE MANY DIFFERENT NICHES ALONG THE SHORE LINE SOME OF THE MOST CRUICIAL AND ENDANGERED ARE VARIOUS WETLANDS

Wetlands

Wetlands are areas where water covers the soil either all year or at different times of the year – which includes the growing season of plants. The kinds of plants and animals found there are determined by the amount of water "saturation" found there. Wetlands are crucial not only for water living organisms but many terrestrial or land living organisms as well. If the water is present, a good deal of the time, then plants that are especially adapted to that condition develop.



Tidal wetlands

In the US these are found along the coastlines. They are linked to the estuaries – places where the rivers meet the ocean and there are complex interactions between fresh water from the rivers and salt water from the ocean which vary the salinity or "salt" content of the water. In addition, the tides cause the water levels to vary as the tides ebb and flow. This is a difficult area for many plants, although some grasses and grasslike plants have managed to deal with these variations in marshes along the Atlantic

Gulf and Pacific coasts. Some wetlands are found further away from the ocean in areas where the salinity is not varying.

If you would like more information about wetlands go to: https://www.epa.gov/wetlands/wetlands-factsheet-series

Estuaries

This is the area where rivers empty into the ocean. These are important areas, rich in nutrients which aid in allowing great numbers of primary producers to survive. Many organisms use estuaries as nurseries since food is so plentiful.

They are critical in that they contain a great deal of sediment that washes down the river that filters the water running into the oceans, purifying it and keeping the ocean from being "swamped" with pollutants. MOST POLLUTION COMES FROM RUN OFF FROM THE LAND. Usually it washes down with rain into streams and into rivers and finally into the ocean. Before it enters the ocean however, it drains through the sediment which has built up from being washed down the rivers and is "cleaned".

Estuaries form a transition zone between river environments and maritime environments. They are subject both to marine influences—such as tides, waves, and the influx of saline water— and to riverine influences—such as flows of fresh water and sediment. The mixing of sea water and fresh water provide high levels of nutrients both in the water column and in sediment, making estuaries among the most productive natural habitats in the world.

Estuaries are popularly known by many names including lagoons, sloughs, bays and rivers. Many formed as a result of rising sea levels at the end of the last glaciation.

Jamaica Bay is a saline EUTROPHIC (lots of nutrients because of sewerage) RICH estuary

Another estuary is Long Island Sound which is a tidal estuary as is the East River (which is not a river)

The greatest threat to them is development of cities along the ocean. New York, London, Tokyo are just a few of the cities located on estuaries. The cities tend to develop along them because they are often associated with good harbors. As a result, estuaries have been dredged, filled, had marinas built on them along with seaport, garbage dumps and industrial parks. Many have been destroyed and other are endangered.

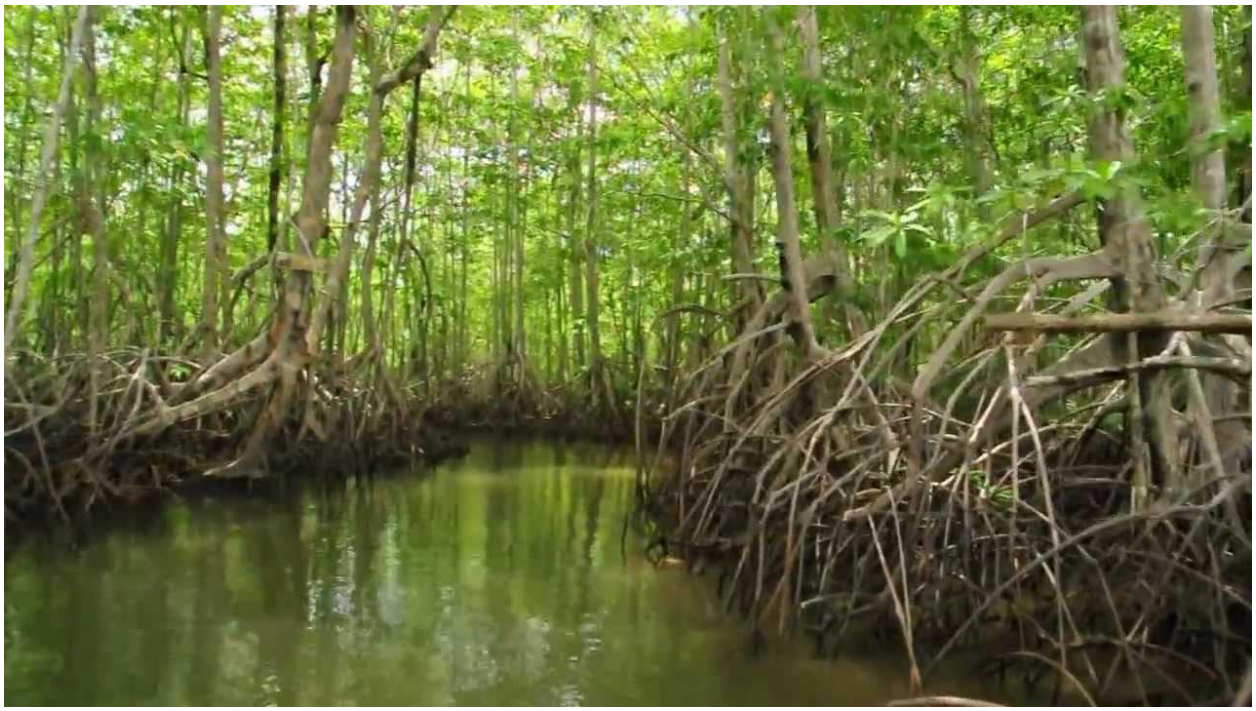
Dredging increases exposure to wave action (the deeper the further in the wave can travel).

Fresh water in rivers for example can be dammed or diverted thus removing the fresh water component from the estuary.

Estuaries have been seen as nuisances as a result of their being a breeding ground for insects and have been used for land fill. Of course the insects have a role in the ecosystem as well (pollination and being a food source for frogs, bats etc.). About 1/3 of the estuaries in the US have disappeared. 67% of the ones in California have been lost.

Mangrove Forests/Swamps

Mangroves a groups of trees and shrubs living in the coastal intertidal zone



Mangrove: Loxahatchee, Florida

These occur in areas where there isn't much oxygen in the soil. The are found only in tropical and subtropical areas near the equator since they cannot survive cold weather.

The tangle of roots above the water makes the mangrove easily recognizable. They need to be able to handle the rise and fall of the tide. Water is slowed and filtered by the roots and allows a build-up of a muddy bottom. This cleans the water of sediment.

The mangroves act as a stabilizing force for the coast line from the wear of tides, storm surges, currents and waves. The complicated root system is attractive to fish that need protection while looking for food. Larger

predators have difficulty getting into the small water areas between the roots.

Mangrove swamps, with salt-loving shrubs or trees, are common in tropical climates, such as in southern Florida and Puerto Rico.

Mangroves provide an array of ecosystem services, from coastal protection to fishery support to carbon sequestration, all of which are at risk in the Indo-Pacific region due to sea-level rise (SLR). SLR can lead to inundation of these habitats and shoreline retreat.

The mangroves are often cleared for crops, urban development, roads and garbage dumps.

About 75% of all sheltered tropical coast line were once covered by mangrove forests, but about ½ have been destroyed. Southeast Asia has a much higher rate of destruction

One of the places from which the water comes into the rivers is underground water. When rain falls, some falls into the ocean some into the rivers and streams and some is absorbed into the land where it permeates the ground and moves underwater to the same places that the rain falls – rivers, streams and ocean. Water moving through the ground brings with it many of the chemicals and materials. This includes fertilizer. Fertilizer is used to make plants grow and it does the same thing in the water that it does on the land. Fertilizer that enters the ocean causes eutrophication and the algae to grow in large numbers called "alga blooms". This increase initially causes an increase in the amount of photosynthesize which will produce a good amount of oxygen and uses up carbon dioxide. Since the algae grow in huge numbers, the cover the surface of the water that blocks sunlight from the plants on the bottom of the water. Without sunlight, they have no light to photosynthesize and die off. Heterotrophs in the water have some difficulty since there food supply is now cut off. On top of that, the algae die off and begin to decompose. The process of decomposition uses up the oxygen in the water and so the oxygen that is needed by the organisms, and so they may die off creating a "dead zone" where things can't live.

The wetlands are capable of purifying some of the water, but as they are destroyed, more of the nutrients from the run off do not get filtered and the eutrophication cycle begins.

In some cases, large bodies of water have formed as the result of rising sea levels over the last tens of thousands of years.

RED SEA: plate movement. As the plates move apart here, the Indian Ocean moved into the space.

ARABIAN GULF: Rising sea levels flooded into the area.