Wonderful Water

An Environmental Education Programme

A Watery World

Mangrove Ecosystems in TCI

4. Threats to Mangrove Ecosystems

Pupils' Text

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This environmental education programme has been produced by the UK Overseas Territories Conservation Forum (UKOTCF) and the Turks and Caicos Department of Education.

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The project was developed from an original idea by Mr Edgar Howell, Director of Education, Turks and Caicos Islands, and these materials developed by a team co-ordinated by Ann Pienkowski, Environmental Education Co-ordinator, UKOTCF. In particular, thanks to Bryan Naqqi Manco for his input to this unit.

It is hoped that through the teaching materials developed for this project, students in TCI will gain a greater understanding of the importance of the water ecosystems in TCI, and the need to conserve these.

Contents

Before the development, there were more mangroves in this area.

Objectives

You will:

- Find out about threats to mangroves, including clearance, pollution, and from introduced invasive alien species.
- Start to understand how people can change the environment, and affect plants and animals living there.

Introduction

We now have an understanding of how interesting and important mangrove forests are. These trees are important in island formation, serve as a buffer against hurricanes and wave action, and are a haven for many species of organisms. The mangroves also support many food chains and food webs, not only in the mangrove ecosystems, but also in the coral reefs and deeper seas.

Unfortunately, these important ecosystems are threatened by various human activities. The two major threats to the mangrove ecosystem in TCI are destruction and pollution, but invasive species could be a problem in the future.

Mangrove destruction has many causes.

Mangroves are cleared and filled in for the **development** of hotels, resorts, and water front properties. These tourist developments often include golf courses, building of new cruise and ship ports and marinas. A large area of mangrove forest was removed in North Caicos to build the marina where the ferry docks.

North Caicos Marina Development

Coastal destruction, including mangroves, during the hotel development at Leeward.

Mangroves are also cleared in the belief that this will remove the mosquitoes.

In many parts of the world, especially South America and Asia, many mangrove forests are cleared to make space for large shrimp ponds for shrimp farming. The shrimp farms also produce enormous amounts of nutrient waste. This nutrient waste encourages the growth of algae, and this can damage coral reefs. TCI does not yet have shrimp farms. Plans for any future aquaculture ventures (such as shrimp farms) need to be carefully considered to make sure that that are not damaging existing mangroves and other marine ecosystems, such as coral reefs.

Here, at a site in Asia, the mangroves have been cut down so that a shrimp farm can be developed. Once the mangroves are ripped out, as well as the direct effect on all the creatures which live in the mangroves, erosion increases, harming coral reefs and seagrass beds.

Pollution is a major threat to the mangrove ecosystem, which is often unseen until it is too late.

Dirty water running into the mangrove forests which has chemicals in it, such as oil, pesticides and too many nutrients, can kill the mangrove trees and affect the living things in the mangrove food web. Such water can come from hotels, boats and farms if their waste water is not treated correctly before it is discharged into the sea.

Oil pollution can come from oil spills at sea, or from spills from local boats and marinas. Some people even put oil or diesel into ponds thinking that this will get rid of mosquitoes. This is very damaging to all the wetland wildlife, including the mangroves and the coral reefs. The water from these ponds eventually enters the sea, taking with it all the chemical pollutants which are in it. The small animals which are food for the larger fish can easily be killed by chemical pollution. If this happens the larger fish have less food, so there will not be as many large fish. Some of these larger fish are eaten by people, so pollution could mean that there are less fish for the fishermen to catch.

The Deep Horizon oil spill in the Gulf of Mexico, in April 2010, caused a great deal of damage to coastal ecosystems, including Mangroves. This egret was one of many victims. There were fears that this pollution could reach TCI.

Mangroves have been found to be particularly sensitive to oil.
Due to lack of air in the ground where the mangroves grow, Black Mangroves have specialised snorkel roots called pneumatophores to help them breathe. Each Black Mangrove tree sends up hundreds of pneumatorphores from its root system. Each snorkel root has special pores called lenticels. These pores enable the mangrove to get the air that it needs to thrive in an otherwise airless environment. Oil can clog the pores on the snorkel roots of black mangrove trees, causing them to suffocate and die. You can see oiled snorkel roots in the picture above.

Invasive alien species are animals or plants which have been introduced to an area accidentally or on purpose, and they cause a lot of damage to the ecosystem. They may use up resources which the native plants or animals need, or they may kill native animals. They are often aggressive predators.

One of the most invasive species affecting the Caribbean marine environment is the Lionfish. This species is native to the Pacific Ocean. They eat up many smaller fish and invertebrates, but in the Caribbean there are very few predators which eat them. Lionfish can live for a very long time, and the females lay thousands of eggs, so the numbers of lionfish are growing very rapidly.

Lionfish are a particular threat to the coral reefs. They eat the reef fish, of course, but as many of the small reef fish graze on seaweed, the seaweed increases and can smother the corals.

Lionfish amongst Red Mangroves

However, Lionfish also come into the mangrove forest, and eat large numbers of the juvenile and small fish which shelter there. As many of these juvenile fish in the mangroves grow into larger fish which live in the ocean, and are food for people as well as other animals, lionfish in the mangroves are a big problem too.

Lionfish are a threat to the fishing industry and our food supply.
Lionfish are a threat to important ecosystems.
Lionfish are an environmental menace.

Another possible threat to Black Mangroves is an invasive insect called the Wax Scale. This has only recently been discovered in TCI, so it is not known what the effect will be. It certainly is not helping the tree. Scientists in TCI are concerned, because of the devastating effect which another invasive scale insect has had on the Caicos Pine tree.

The value of mangroves

The mangrove ecosystem plays an extremely important role for people. Mangroves protect against erosion and flooding caused by storms and hurricanes; they stabilise and build land, they provide nursery areas for young fish and so are important for fishermen; they protect coral reefs by filtering water runoff from the land; as well as providing habitat for many plants and animals.

In the Caribbean, researchers have found that coral reefs with mangroves nearby tend to have more of certain fish that are valued as seafood. And some species, such as rainbow parrotfish, are dependent on mangroves, disappearing in areas where the trees have been removed. In the Gulf of California, scientists found that fisherman bring in larger catches of fish and blue crabs in areas with mangroves fringing the coast.

Mangroves are also a valuable resource for ecotourists, who like to view amazing wildlife in quiet places. These roles are called "ecosystem services", and their $ value can be estimated. It has been estimated that a hectare of mangrove forest (100m x 100m) has a value of at least $12500 per year. So when a mangrove forest is lost, these ecosystem services are lost. If the mangrove ecosystem is damaged, then the value of the ecosystem services is reduced.

Think about it

People need to think carefully before destroying or damaging mangroves, and ask themselves some questions about the benefits and costs of destroying mangroves.

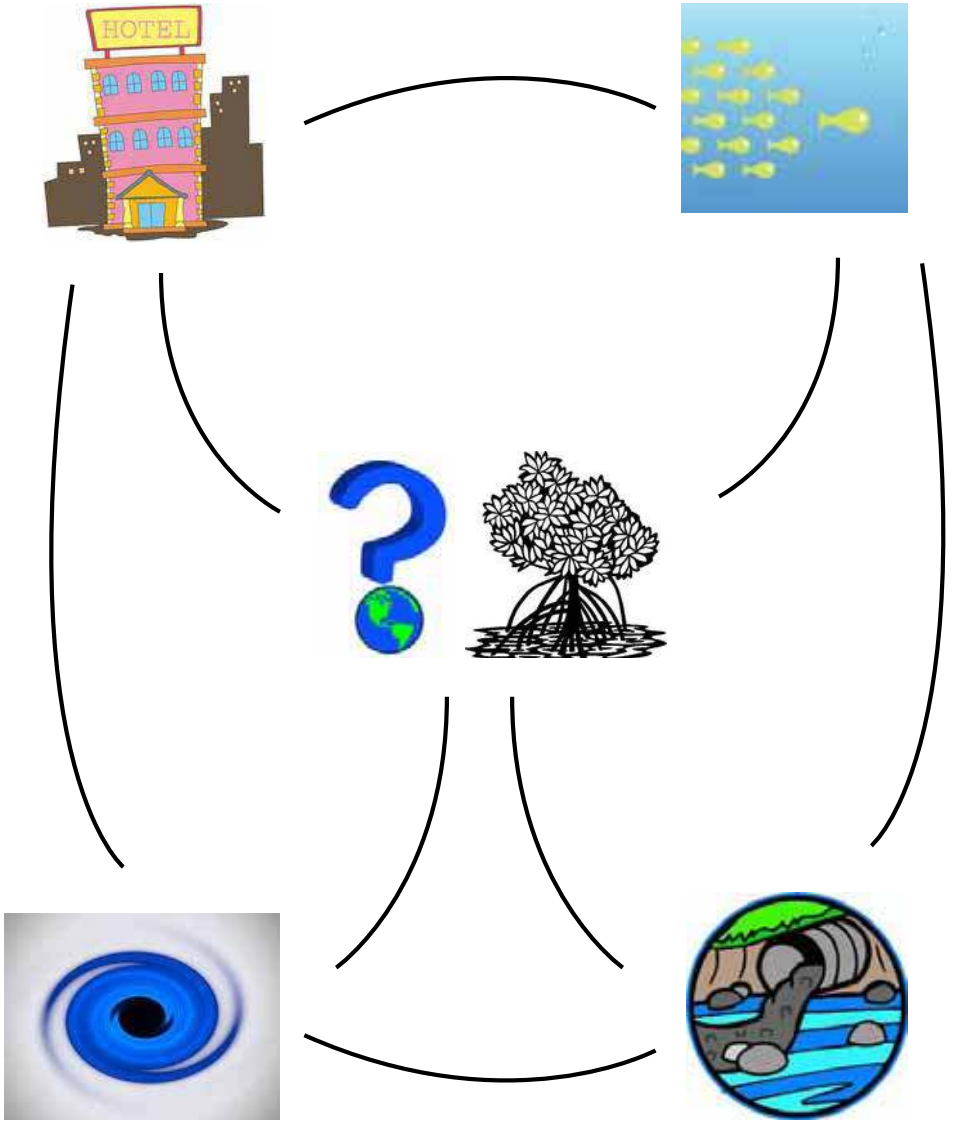
Some things to think about and find out about:

What do you think the benefits of clearing mangroves for a hotel would be?
What will happen to the young fish which use the mangroves as a nursery?
What might happen during the next hurricane of the mangroves are cleared?
Do the benefits of the hotel balance what will be lost if the mangroves are cleared?

What will happen to oil which is poured into the water?
Where will it go?
What will it damage?
How will this affect other living things?

Are chemicals (like fertilisers) used in the hotel garden?
What happens to the water used in the garden?
What chemicals get into other water used in the hotel (laundry, showers, toilets, ...)
What happens to the waste water from the hotel?
Is it cleaned before it is discharged into the sea?
What effect might these chemicals have?

By thinking about these questions, and trying to find answers, you will start to understand how people can change the environment, and how these changes might affect the plants and animals living there, including people.



Think about the connections.