

Wonderful Water

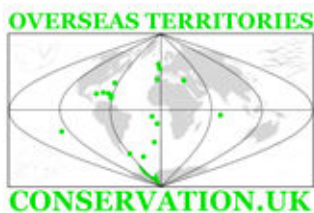
An Environmental Education Programme

Mangrove Ecosystems in TCI

Overview and Field Trips, and

1: Mangrove ecosystems in TCI and their importance

Pupils' Text



TCI
Education Department



Wonderful Water

An Environmental Education Programme

Mangrove Ecosystems in TCI

Overview and Field Trips

and

1: Mangrove ecosystems in TCI and their importance

Pupils' Text

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

It was part-funded by the Overseas Territories Environment Programme (OTEP) of the UK Department for International Development and the Foreign and Commonwealth Office.

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

Introduction	4
Objectives	4
What is a mangrove ecosystem?	4
Species in the mangrove forest in TCI	6
Why are mangroves important?	10



Photo © Mike Pienkowski

Red Mangroves

Introduction

Mangroves are amazing plants, and the mangrove forest is an amazing ecosystem. Water is a precious resource for all life, but most plants need freshwater to stay healthy. The amazing mangroves can live in salty sea water. They help support a wide variety of life, and are very important for people.

Objectives

These materials will help you to find out more about the mangrove ecosystem, and why it is so important.

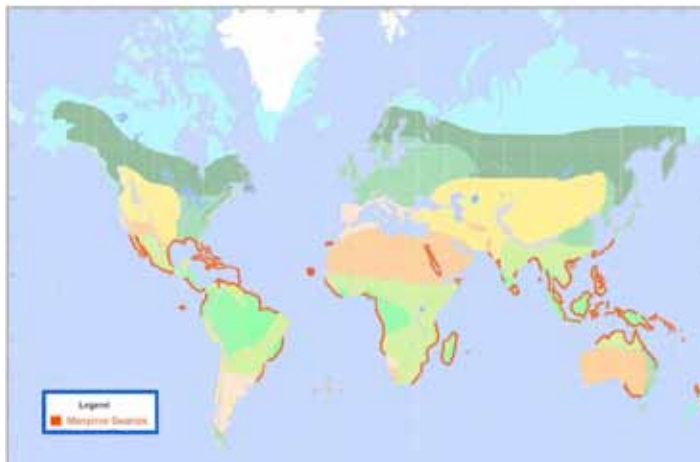
You will:

- find out about the different zones in a mangrove ecosystem
- find out about the different mangrove tree species found in TCI
- find out that there are many different kinds of living things that live in the mangrove ecosystem
- find out that there are many reasons why mangrove ecosystems are important, and what some of these reasons are.

What is a mangrove ecosystem?

A mangrove is a woody plant which lives between the sea and the land, in the intertidal area. Salt can be very damaging to plants, it usually kills them. But mangroves are adapted to live in salty areas.

Mangrove ecosystems need warm temperatures, so they are found in tropical regions all around the world.



They need sheltered coasts, creek mouths and lagoons, so this is where they are found in TCI.



Photo © Mike Pienkowski

In TCI, as in other areas where mangroves grow, mangroves are found in sheltered lagoons and creeks, and along sheltered coastlines. This photo shows a typical mangrove area.

A healthy mangrove ecosystem has a rich biodiversity which means it has many different kinds of living things. Birds like pelicans, herons, Mangrove Cuckoos and small warblers nest, roost and feed in the leafy branches. Insects and spiders also live here, including the mosquito (which people do not like, but many birds do!). Below the waterline the roots provide shelter and food for a variety of different groups of animals, including young fish, turtles, crabs, conch, lobster, worms and the "upside-down" jellyfish. Other animals and plants settle on the prop roots, like algae and barnacles. The drier parts of the mangrove forest provide ideal habitat for land crabs, like the great blue land crab.

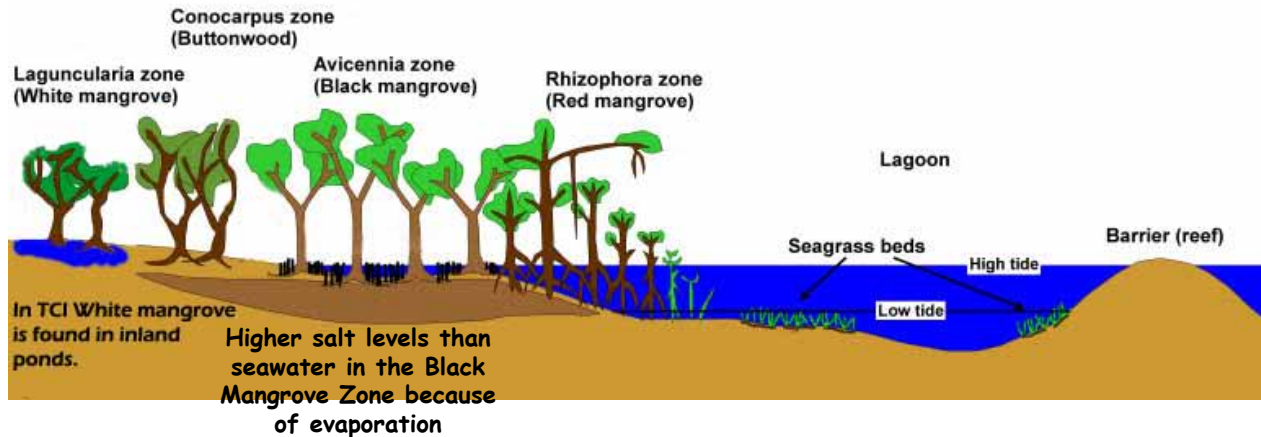
Many of the animals which depend on a healthy mangrove ecosystem are important for people too, so it is important to learn about, and protect mangrove ecosystems.

Over time, sand, mud and other materials are trapped by the mangrove roots, so mangroves actually build land. Parts of the Turks and Caicos Islands were made this way. Because the mangrove roots help to keep the sand and mud in place, they protect the shore from being washed away (erosion) and protect other land areas from high tides and storm surges, including hurricanes.

You will learn more about these things in other sections of this unit.

There are approximately 40 species of mangroves around the world,

but in the Turks and Caicos Islands there are just four kinds in the mangrove ecosystems. These are Red Mangrove, Black Mangrove, White Mangrove and Buttonwood. Each species of mangrove is found in a different part of the intertidal area.



Which zone does the photo on page 3 show?

The soil near the sea can be saltier than the ocean water itself! During each high tide, some sea water soaks into the soil, the water evaporates and leaves its salt behind. During the next tide, the same thing happens and more salt is deposited. After several high tides, salt in the soil reaches very high levels. The only way that this salt can be removed from the soil is through rainfall. So, when rainfall is low, the amount of salt in these soils can reach extremely high levels.

Species in the mangrove forest in TCI

Red Mangrove

Red Mangroves are the trees that are most often thought of when people speak about mangroves, as it is the tree that lives furthest out in the sea. Red Mangroves have very large reddish roots that stick out of the water, so that the tree can get



Is this photo taken at high or low tide?

oxygen. These are called "prop roots" because they prop the tree up and out of the water. The trees look like they are standing on stilts or arches. The prop roots keep salt from getting into the tree's tissues and also keep the leaves above the sea water. The oval waxy green leaves also keep water in.

Black Mangrove



Photo © Mike Pienkowski



Photo © Mike Pienkowski

Nearer the land, in areas nearer the tide line, lives the Black Mangrove. This tree is less tolerant of water and is found in areas that only get wet during high tide. At high tide, the roots of the tree will be under water, and at low tide the roots of the tree will be dry. The Black Mangrove does not have prop roots, but you can identify it from another kind of root called a pneumatophore. Pneumatophores sprout up from the ground around the base of a Black Mangrove tree. They look like little black straws or snorkels sticking up in the air. In fact, the pneumatophores act like a snorkel because they suck in oxygen from the air above the water-logged ground. The soil where the Black Mangrove grows is saltier than the sea. The sun evaporates the water, leaving salt behind. The Black Mangrove can grow here because it is more tolerant of salt than the Red Mangrove.



Photo © Mike Pienkowski

**Black Mangrove
Pneumatophores**

The leaves of the Black Mangrove are dark green on top and pale

grey underneath. Black Mangroves also need to remove salt from the water before they can use it, but they do it differently from Red Mangroves. Black Mangroves take salt water up through their roots, into their trunks, and up to their leaves. The bottom of the leaves have special pores that remove salt from the water and push it out. You can always tell a Black Mangrove from other mangroves because of its pneumatophores and because the bottom of its leaves taste salty. This method of removing salt from water is very effective and allows the Black Mangrove to live in areas that are even too salty for the Red Mangroves.

White Mangrove

White Mangroves are quite rare in the Turks and Caicos Islands. This species can live in the same kinds of places as black mangroves, in areas that are wet, but not all the time. In TCI they prefer inland salt ponds that dry up and flood seasonally.

White Mangroves can have prop roots, like Red Mangroves and pneumatophores, like Black Mangroves, but often they will not have either. Their prop roots are not as impressive as those of the Red Mangrove, and usually, they will just look like regular roots that the soil has washed away from. If they have pneumatophores, they usually only have a few, and they are short, stubby and knobby.



The White Mangroves remove salt from their water in another way. They take water up through their roots into their trunks and towards their leaves. At the base of each leaf are two salt glands. These glands take the salt out of the water before it enters the leaves. This method of removing salt is more effective than the Red Mangrove, but less efficient than the Black Mangrove. The White Mangrove is therefore usually found in areas that are too salty for Red Mangroves but not as salty as the Black Mangrove areas.

The White Mangrove has green velvety flowers that look like ribbed bags. The leaves are bright green and oval shaped.

Buttonwood

Finally, furthest inland, is the Buttonwood zone. This tree is not a true mangrove species, but is a mangrove associate. The Buttonwood does not like to live at the tide line or in the water, but it is usually found near the shoreline in muddy swamps or along rocky shorelines.



Photo © Mike Pienkowski

Unlike the other mangroves, the Buttonwood can survive a long time with no water at all. This makes it an excellent tree in the Turks and Caicos Islands, where it sometimes does not rain for months. It can also grow in low nutrient soils.



Photo © Mike Pienkowski

Green Buttonwood



Photo © Mike Pienkowski

Silver Buttonwood

The leaves are narrow and pointed, and extend from the branches in an alternate pattern. In the three true mangrove species, leaves on either side of the branch are directly across from each other. The flowers of the Buttonwood tree resemble little buttons, hence the name Buttonwood. TCI has a special and beautiful variation of the Buttonwood called the Silver Buttonwood. The leaves are silvery, rather than green. Like the White Mangrove, the Buttonwood has salt glands at the base of its leaves which remove salt from the plant.

Why are mangroves important?



Photo ©Mike Pienkowski

**Have you visited a mangrove forest?
If so, what did you think of it?**

Many people have the idea that mangrove forests are bug infested, smelly, useless swamps, and that the best thing that can be done with a mangrove swamp is to remove it! Now, it is true that mangroves can be buggy. The mosquitoes might be a nuisance to people, but there are ways of dealing with them which do not damage the environment, and the mangrove forests are important in so many ways, that they need to be valued and protected.

In this section you will learn some of the ways in which mangrove forests are important for us, and other living things.

Mangroves help keep the coral reefs healthy.

Many tourists come to visit the Turks and Caicos Islands to dive and snorkel on the coral reefs. The mangroves act as filters, catching soil which is washed from the land by heavy rain. So they help keep the surrounding sea water clear. This helps the coral reefs to survive, because reefs need clear water to live. They also filter nutrients from the water. If too many nutrients reach the coral reef, algae start growing on the corals, and smother them.

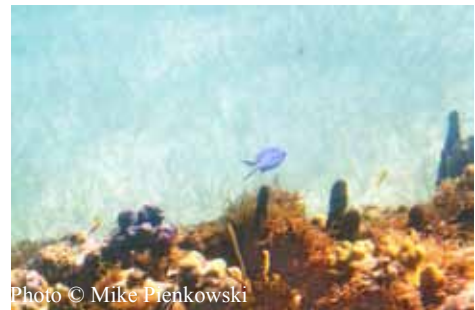


Photo © Mike Pienkowski

Mangroves are important for fishermen

Many people in the Turks and Caicos Islands depend on reef fish for food as well. Not only do the mangroves protect the reefs, but they provide a nursery for many of the reef fish to reproduce. Scientists have estimated that the value of the reef to TCI for all the important services it provides is \$57 million every year.



Photo © Mike Pienkowski

Small fish in the mangroves can grow into larger reef fish or provide food for the larger fish.

Mangroves help keep the seagrass beds healthy.

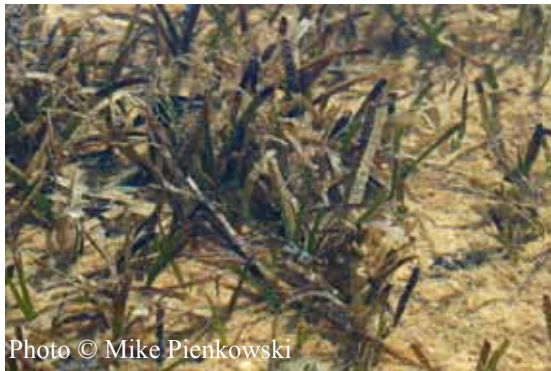


Photo © Mike Pienkowski

A healthy seagrass bed

The mangroves help to slow down wave action that can harm sea grass beds, which need calm waters to grow well. The seagrass beds are a safe place where many young fish, turtles and molluscs like conch feed and grow.

Mangroves protect against erosion and flooding caused by storms and hurricanes.



Photo © Mike Pienkowski

The mangroves on the right of the photo slow waves down and protect the land. On the left mangroves have been cleared, so there is nothing to stop the waves.

The mangrove forest acts as a buffer against strong wave action, high tides and storm surges. It reduces the power of the waves. So not only do they protect the coastline against storms and hurricanes, they protect inland areas as well. Mangroves are so efficient at protection against bad weather, that boats are regularly placed in mangrove lagoons when there is the threat of a hurricane.

Mangroves stabilize and build land.

The dense root systems trap sand and mud. Over time, as the mangrove forest grows bigger, more sand and mud are trapped, and more land is made.



Photo © Mike Pienkowski

Mangroves provide habitat for many kinds of plants and animals.



Photos © Mike Pienkowski

The photos show some of the animals which live in the mangrove ecosystem: snail, palm warbler, spider, tricolored heron, upside down jellyfish in turtle grass, young shark.

Mangroves provide safe areas for young fish to live before they are old enough to go out into the open oceans or onto coral reefs. The leaves of the mangroves drop into the water and provide a surface for algae and other microorganisms to live on. Juvenile fish eat these organisms.



Photo © Mike Pienkowski
Mangrove Cuckoo

This is the beginning of the marine food chain. Above water, the mangrove trees provide shade, shelter and food for birds and insects. The Mangrove Cuckoo is one of the birds which finds shelter and food in the mangroves.

Mangroves are a great tourist attraction for ecotourists.

Many people enjoy watching wildlife, and take their holidays in natural, unspoilt places where they can see a variety of different kinds of plants and animals. The mangrove forests of the Turks and Caicos Islands are attractive to bird watchers. Other tourists like to take kayak tours, where they can enjoy peace and quiet, and watch wildlife up close. Tourism is very important for the economy of TCI. Many tourists come for the fabulous beaches and coral reefs. But unspoilt mangrove forests help protect coral reefs, and offer another kind of tourist attraction, so mangrove forests are an important part of the tourism industry.



Photo © Mat Simpson
Kayaking in the mangroves.

Mangroves reduce carbon levels, and help against global warming.

Mangroves help reduce carbon dioxide levels in the air. Carbon dioxide is one of the causes of global warming. Like all plants, they use the energy from the sun and carbon dioxide from the air to make their own food. It is the leaves of the plant which do this, and the process is called photosynthesis. Mangroves are particularly good at this.



**The bright, intense sunshine helps the mangroves to photosynthesise well.
They remove a lot of carbon dioxide from the air to do this.**

What might happen if the mangroves were removed?