

# Wonderful Water

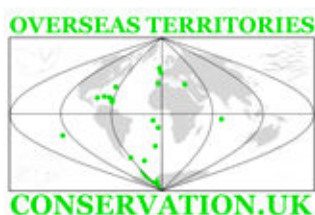
## An Environmental Education Programme

### A Watery World

### Mangrove Ecosystems in TCI

### 6. Caring for Mangroves

### Teachers' Guide



TCI  
Education Department



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## An Environmental Education Programme

### A Watery World

### Mangrove Ecosystems in TCI

## 6. Caring for Mangroves

### Teachers' Guide

Target Age Group - 9 - 11 years

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. 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.

As a possible model to assist environmental education in other areas of the Caribbean (especially UK Overseas Territories) these materials will be made available to a wider audience.

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## Introduction

In devising these teaching materials, reference was made to the TCI Science Curriculum for Grade 5 and 6, and the science teaching materials currently being used in primary schools in TCI.

A curriculum framework has been developed, which links the Wonderful Water themes to curriculum requirements. As part of the curriculum framework, expected levels of achievement for a particular stage in a students' education have been developed into statements of competency which can be used to assess the levels students have reached. The purpose of these statements of competency is to support teachers in their review of students' progress. The objectives given in the pupils' materials relate to these statements of competency.

### Assessment criteria / Statements of competency

These level statements relate to levels of attainment given in the Science National Curriculum for England, but are compatible with such statements about expected attainment in many other curricula.

This table gives the level (L) a child is expected to achieve at a particular stage in their schooling:

End of grade:	Expected attainment related to curriculum levels (from National Curriculum for England)		
	Slower progress	Most pupils	Faster progress
4	L2	L3	L3/4
5	L2/3	L3/4	L4/5
6	L3	L4	L5

### 6 - Caring for our Mangroves: statements of competency

The assessment criteria / statements of competency, which relate to the unit on Caring for our Mangroves are given below. These can be used to guide progression

#### Geography:

**L2:** Recognise how people affect the environment.

**L3:** Recognise how people seek to improve and sustain their environment.

**L4:** Understand that people can both improve and damage the environment

**L5:** Recognise how people try to manage environments sustainably

#### Science

**L2:** Know that different living things are found in different places because they need different things to live.

**L3:** Identify things in the [wetland] environment which the animal or plant needs to survive.

**L4:** Identify ways in which the plant or animal might be threatened.

**L5:** Identify ways in which the [wetland] environment might be damaged, and suggest suitable conservation

The pupils' text provides key information for pupils.

The teachers' guide contains further information and resources for teachers, suggested activities for pupils, and example pupil worksheets.

The illustrations in this guide, and those in the pupil text, will be provided as powerpoint pdfs.

The suggested pupil activities and worksheets can be carried out by individuals, pairs or small groups.

These materials are a working draft, and any suggestions for further activities, amendments and improvements are welcome.

Any comments / suggestions should be sent to the UKOTCF Environmental Education Co-ordinator, Ann Pienkowski. Email [apienkowski@ukotcf.org](mailto:apienkowski@ukotcf.org)



A National Park Sign from the 1990s.

## **Background**

This section draws together some of the material previously covered in Section 4 Threats to Mangrove Ecosystems, and Section 1 Mangrove Ecosystems in TCI and their Importance. So use of this material is not dependent on students having worked through these other sections. The teachers' guide gives further background information, and suggestions for activities for students.

The main focus, on caring for mangroves, introduces students to the Protected Areas in TCI, and the laws and regulations which apply to them. Many countries have initiated management plans that make it illegal or very difficult to cut down mangroves. Some countries have also established initiatives that address several factors affecting mangroves. These include minimizing agricultural runoff, installation of pollution control devices, and regular monitoring of water quality.

In some parts of the world, where mangroves have been destroyed for aquaculture, such as prawn and shrimp farms, much work has been done on sustainable aquaculture in mangroves, and restoration of areas damaged by intensive shrimp farming. At present, this is not relevant to TCI, but could be an issue for consideration in the future.

This section also introduces ideas about how mangroves can be used sustainably for tourism.

A useful reference for much information about mangroves is available from the Mangrove Action Project website:

<http://mangroveactionproject.org>

## **Requirements for life**

The basic requirement for life of animals and plants are revisited briefly, to put conservation and environmental protection into context.

Some video clips about respiration are available at:

<https://www.bbc.co.uk/search?filter=bitesize&q=respiration>

## **Protected Areas - National Parks Regulations**

The National Parks Ordinance is currently (2018) under revision. The current one can be downloaded from:

<http://extwprlegs1.fao.org/docs/pdf/tci107731.pdf>

This sets out what can, and cannot be done, in the protected areas. Some relevant points are extracted below:

The following are prohibited within all national parks:

### **National Parks Regulations**

- (a) the taking of any animal or plant by any method on land or at sea, except to the extent permitted in any fishing zone;
- (b) the taking of any artifact;
- (c) the destruction of, or damage or injury to, any animal or plant;
- (d) the removal of sand, rock, coral, coral-rag or any calcareous substance;
- (e) anchor damage to coral reef structures living or dead and associated marine plant and animal life;
- (f) the anchoring of vessels greater than 60 feet in length other than in an anchoring zone;
- (g) jet skis and hovercraft;
- (h) water skiing, except in a water-ski zone;
- (i) the dumping of refuse, abandoned vehicles, toxic or other wastes, bilges, oil and other petroleum products, pesticides and other items harmful to animals or plants, or unsightly items;
- (j) the driving or riding of motor vehicles and bicycles other than on public roads declared under the Road Traffic Ordinance or in a parking zone;
- (k) car parking except in a parking zone;
- (l) the making of fires, other than in a portable stove or grill;
- (m) camping except in a camping zone or with the prior written approval of the Director;
- (n) erecting any structure unless authorized by the Director of Planning;
- (o) playing a game to the discomfort of other persons;
- (p) playing any musical instrument, radio, cassette player, record player, television or other item which produces or reproduces music, to the discomfort of other persons;
- (q) operating a vessel in excess of 15 miles per hour unless within an aquatic sports or water-ski zone.

No person, other than a Park Warden acting in the course of his duties, shall use or have in his possession within a national park, nature reserve, sanctuary or area of historical interest any type of firearm, air gun, spear gun, cross bow, bow and arrow or other similar weapon.

Subject to sub-regulations, the following are permitted within national parks, nature reserves and areas of historical interest:

- (a) pedestrian access routes designated by the Director;
- (b) vessels, subject to:
  - (i) their not entering the swimming zones except if they are rescue vessels, Fisheries vessels, police vessels, or DOE vessels engaged in placing, repairing, replacing or removing fixed DOE buoys or performing rescue, but provided that persons involved in such operations cause no unnecessary damage to the environment within the zone and that the vessels leave the swimming zone upon completion of the operation within the zone;
  - (ii) their not depositing on the land or in the water of the national park nature reserve or area of historical interest any refuse, waste produce or other item or substance which does or is likely to diminish or restrict the enjoyment of the amenities of the national park, nature reserve or area of historical interest; and
  - (iii) the occupants of such vessel committing no other breach of these Regulations;
- (c) anchoring on clear sandy bottom, provided sub-regulations are not contravened.

A dive vessel or charter vessel shall only be permitted within a national park or nature reserve subject to the conditions that:

- (a) the owner or operator of the vessel applies in form NP2 for a licence in form NP3 permitting him to operate within the national park or nature reserve;
- (b) the vessel moors only to fixed DOE (Department of Environment) buoys approved by the Director;

### **International Recognition of important wetland sites**

The North, Middle and East Caicos Nature Reserve is also protected by an international agreement, the Convention on Wetlands of International Importance, called the Ramsar Convention. The UK Government is responsible for designations under this treaty on behalf of the UK Overseas Territories.

### **The Ramsar Convention on Wetlands**

The Ramsar Convention is the only global environmental treaty that deals with a particular ecosystem. The treaty was adopted in the Iranian city of Ramsar in 1971 and the Convention's member countries cover all geographic regions of the planet.





The Convention's mission is “the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world”.

The Convention uses a broad definition of the types of wetlands covered in its mission, including lakes and rivers, swamps and marshes, wet grasslands and peatlands, oases, estuaries, deltas and tidal flats, near-shore marine areas, mangroves and coral reefs, and human-made sites such as fish ponds, rice paddies, reservoirs, and salt pans.

At the centre of the Ramsar philosophy is the “wise use” concept. The wise use of wetlands is defined as “the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development”. “Wise use” therefore has at its heart the conservation and sustainable use of wetlands and their resources, for the benefit of humankind.

More information about the Ramsar Convention is available from their website

<http://www.ramsar.org>

### **Protected Areas in TCI supporting Mangroves**

In addition to the examples cited in the pupils' text, other protected areas in TCI support important mangrove areas. These include:

Providenciales: North West Point Pond and Chalk Sound National Park,



North West Point Pond Nature Reserve,  
Providenciales



Chalk Sound National Park, Providenciales

North Caicos: Dick Hill Creek and Bellefield Landing Pond Nature Reserve; Pumpkin Bluff Pond Nature Reserve and East Bay Islands National Park,



Dick Hill Creek and Bellefield Landing Pond Nature Reserve, North Caicos



Pumpkin Bluff Pond Nature Reserve,  
Cottage Pond Nature Reserve, and  
part of  
North, Middle and East Caicos  
Nature Reserve  
International Ramsar Site  
North Caicos

East Bay Islands National Park,  
North Caicos







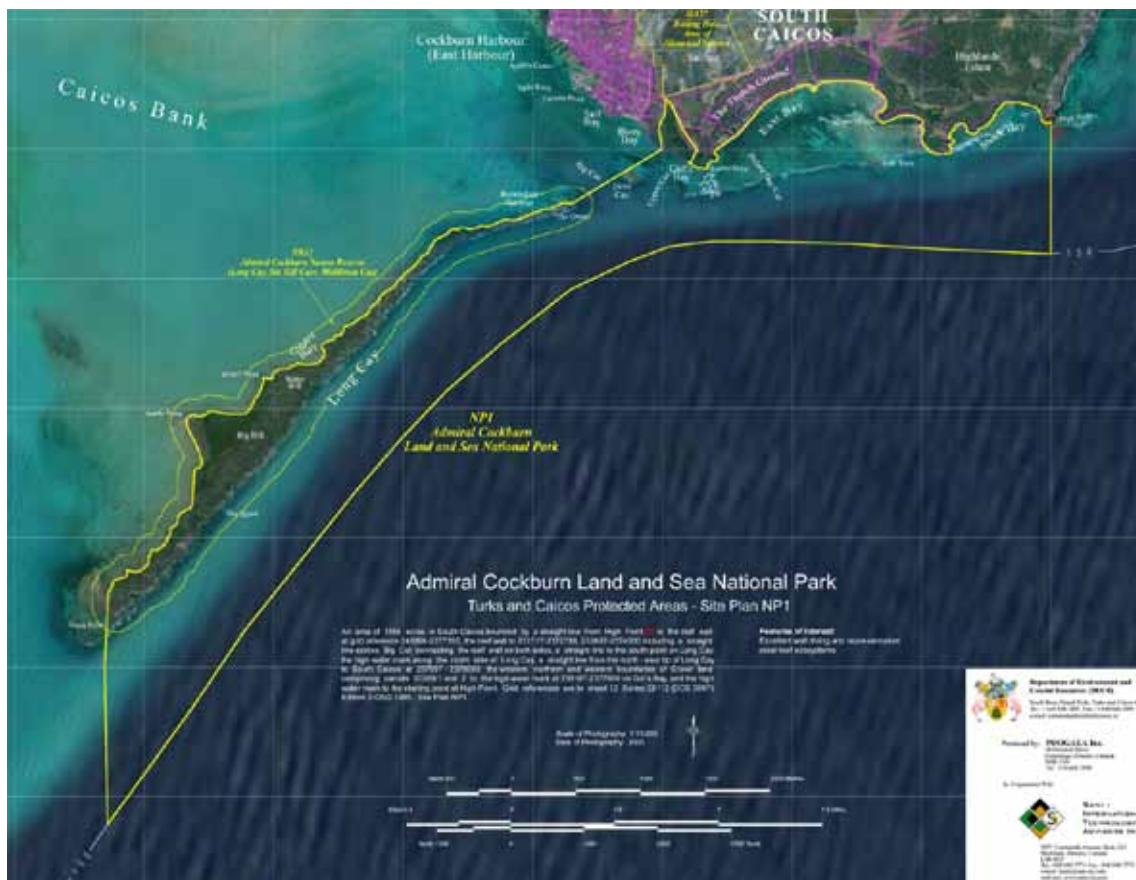
South Caicos: Bell Sound  
Nature Reserve, Boiling Hole  
area of Historical Interest,

Bell Sound Nature Reserve,  
South Caicos

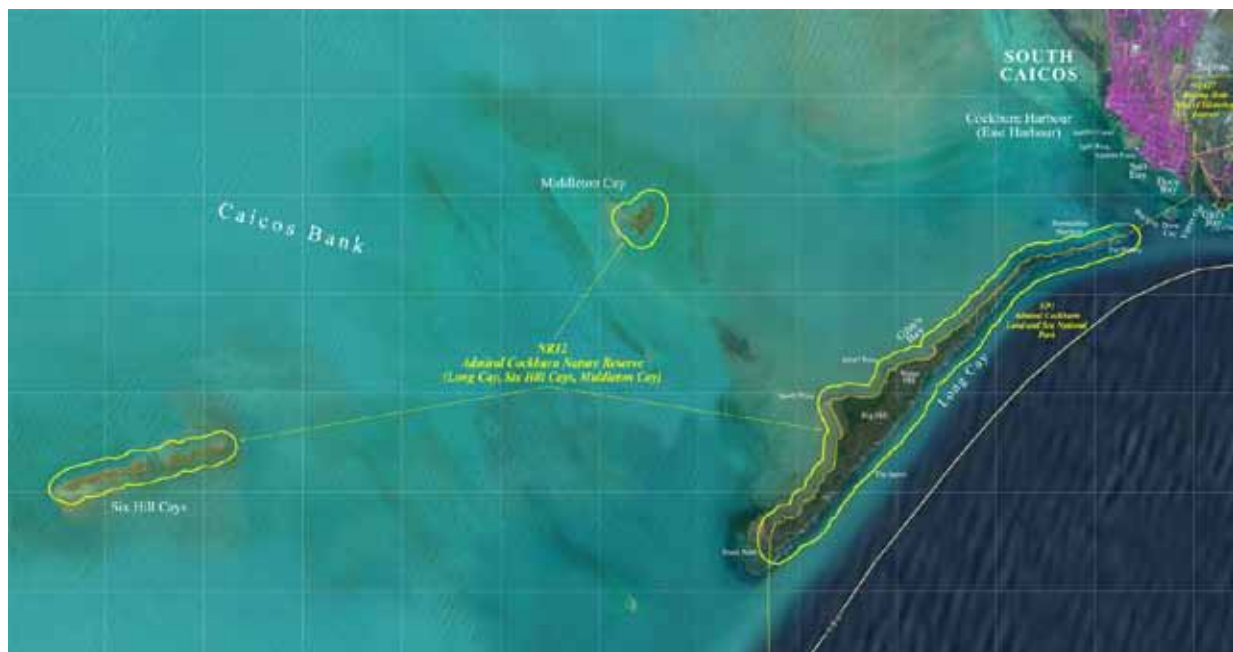
Admiral Cockburn National  
Park and Nature Reserve.



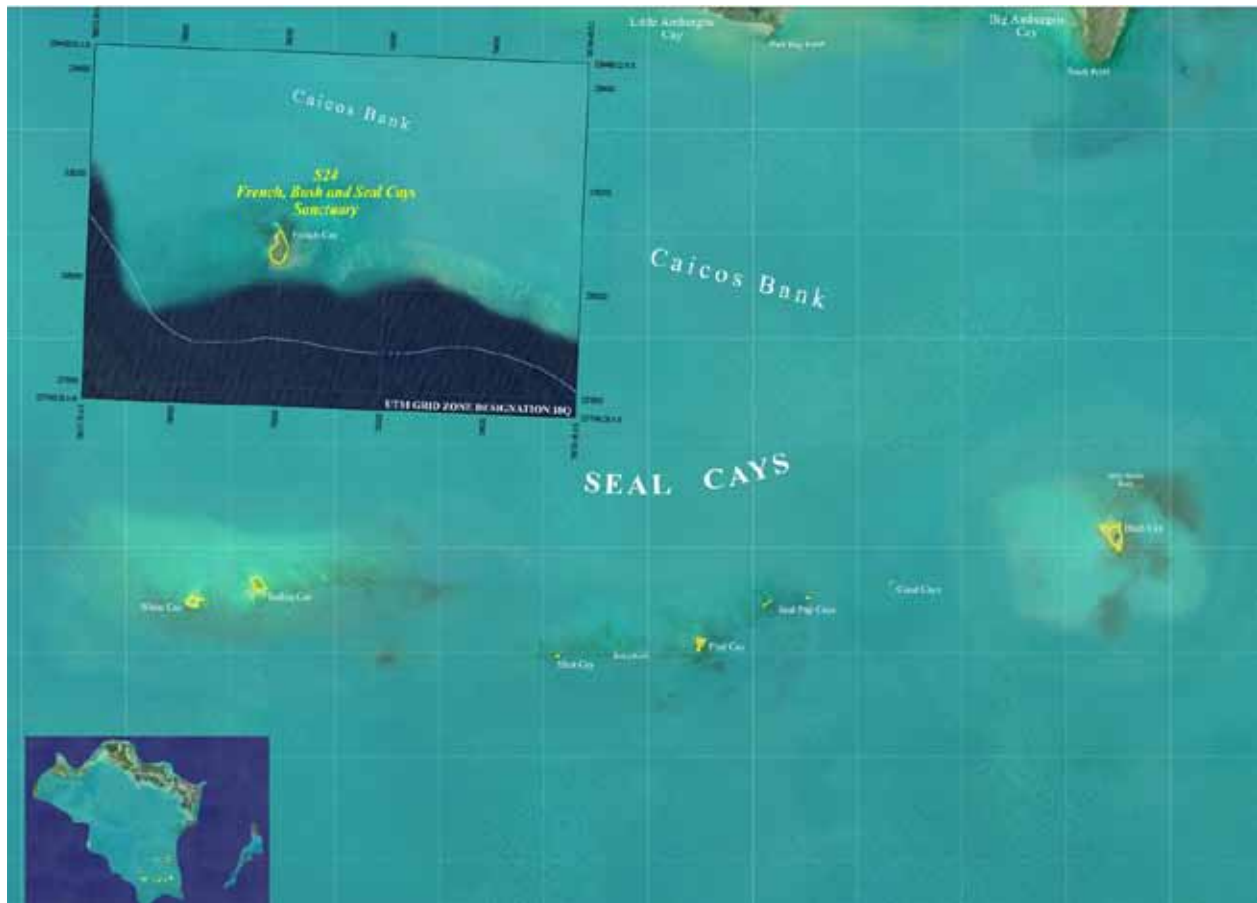
Boiling Hole area of Historical Interest, South Caicos



Admiral Cockburn National Park, South Caicos



Admiral Cockburn Nature Reserve, South Caicos



Caicos Bank: French, Bush and Seal Cays Sanctuary,

Although these sites, and others, are protected by law, to be effective, there has to be enforcement of the law. This is difficult in a country like Turks and Caicos, with limited financial and human resources, but extensive, hard-to-reach, protected areas. This problem has not been raised in the pupils' materials, but could form a valuable point for discussion and debate with students, if appropriate.

## **Mangrove Planting**

Invite personnel who are involved with the Turks and Caicos native plant nursery into school to talk about mangrove re-planting and restoration projects, and the growing of mangroves for re-planting. As has been suggested in Section 1, students can also grow their own mangroves. There is a lot of different information about ways of doing this.

Instructions for growing mangroves were given in the Teachers' Guide for Section 1 – mangrove ecosystems in TCI and their importance (p 24).

Some slightly different instructions are reproduced here (p 20). Investigating the best conditions for growing mangrove plants from seeds (propagules, sometimes called sea pencils) could make a good science enquiry project. Students can be asked to devise fair tests to find out what are the best conditions for growing mangroves.

Some things to consider could be:

- What type of soil?
- Drainage holes in pot, or none?
- Water with fresh or salt water?
- In bright sun or shade?
- Etc.

When collecting mangrove seeds or propagules, get permission first from the Department of the Environment and Coastal Resources (DECR).

## **Ecotourism**

Invite local tour operators who guide tourists in the mangroves, for example for kayaking, snorkelling, bird watching, into your classroom to give a talk. Students can do their own research, via email, internet (if available) or telephone and letter, to enquire of tour companies about their eco-tourism activities, and then the students can produce the invitation to give a talk.

## **Education and Public Awareness**

Overseas Territories Conservation UK (UKOTCF) has worked with various partners in TCI for over 30 years. Their website has a territory page for TCI with lots of information:

<https://www.ukotcf.org.uk/turks-and-caicos-islands>

UKOTCF resources for education and public awareness include guide books, interpretive panels at the TC National Museum site in Providenciales, and videos. Books and videos are available from the website.

There is also a DECR Facebook page for environmental education and outreach.

## **Additional ideas for student activities**

### **Slogans**

Slogans can be used as a stimulus for discussion, reports, survey, posters, etc. Students can be tasked with creating their own slogans, but here are some suggestions:

- Protected Areas – Keeping Nature Beautiful
- Take only pictures, Leave only bubbles
- Let us enjoy our Protected Areas
- Wetlands for Life
- Keep wetlands wonderful
- Community in partnership for parks
- National Parks are our national treasure – Guard them well
- Protect your home – protect ours (picture of an animal)
- We don't know what we've got till it's gone
- Coral reefs are good for business – Protect your interests
- Here today gone tomorrow
- Conserve today, reap the reward tomorrow
- Protect Fish Nurseries
- Don't squander our wealth
- Protected Areas, protected futures

### **Reading and Comprehension**

Many of the activities suggested in other sections can be used to consolidate learning:

- Question and Answer Quizzes
- Written accounts and reports
- Oral presentations of information
- Acrostic (=vertical) poems
- Letters of enquiry to tour companies about ecotourism
- Invitations to tour companies and others (eg Department of Environment staff) to visit school to give a talk.
- Learning key vocabulary via wordsearches and crosswords, and student-created glossaries.
- Creation of public awareness posters, leaflets, brochures
- Devising and conducting surveys to find out what people think

### **Wondrous West Indian Wetlands Teachers' Resource Book – Relevant Activities**

Chapter 5, entitled Save the Wetlands – Save the World, has useful background information and suggested activities (see pages 185 - 214).

This includes information about the Ramsar Convention, and Ramsar sites in the insular Caribbean.



Activity 5-B: Be an Activist, encourages students to take the initiative in identifying environmental problems in their area, and developing an action plan.

Activity 5-D: Mangrove Controversy, enables students to role-play a town hall meeting, and thus gain some understanding of different viewpoints in land-use issues, and the process of land-use planning and decision making.

Activity 5-E: Bouncing Back, gives two examples of conservation success stories from the Bahamas. These could provide a stimulus for discussion, including any comparisons which could be drawn for TCI.

Activity 5-F: Marine Debris – Collection and impact, would fit well with any beach or coastal clean-ups.

Activity 5-G: Wet Work, gives students an opportunity to think about career opportunities in the area of the environment.

If you, or your school, do not have a copy of this resource, copies should be available from DECR or the Education Department. If you are unable to find a copy, please contact [apienkowski@ukotcf.org](mailto:apienkowski@ukotcf.org)

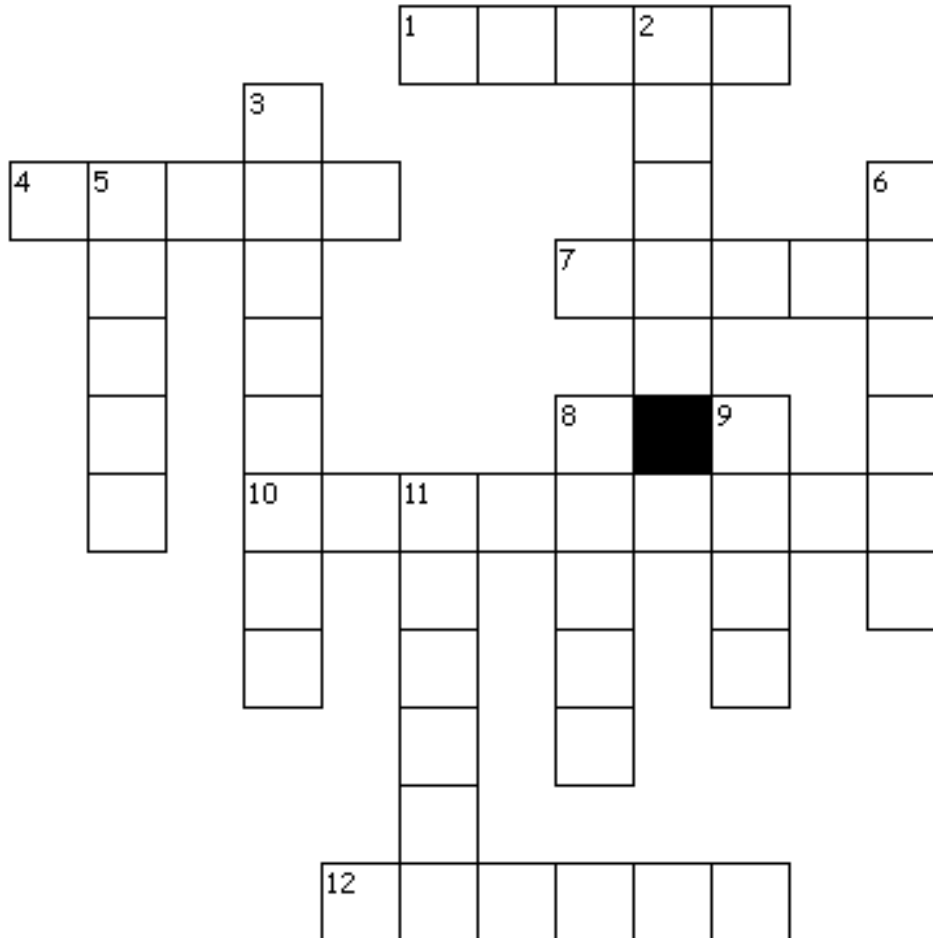
## Caring for Mangroves Keywords Wordsearch

### Caring for Mangroves



#### Words to find:

awareness, ecotourism, education, information, knowledge, law, national, nature, nursery, park, protect, ramsar, replant, reserve, respect, restore, sanctuary, sustainable, understanding, value.

**Caring for Mangroves Crossword Puzzle****Protected Areas Do's and Don'ts****Across**

1. Do follow the National Park \_\_\_\_\_.
4. Do not \_\_\_\_\_ wildlife.
7. \_\_\_\_\_ is one of the animals you must not remove or damage.
10. Let people know how \_\_\_\_\_ the protected areas are.
12. Do get a \_\_\_\_\_ to visit a Sanctuary.

**Down**

2. Do \_\_\_\_\_ the National Parks.
3. No \_\_\_\_\_ on buildings, caves or old stones.
5. Keep National Parks \_\_\_\_\_.
6. Do not damage or remove \_\_\_\_\_ or animals.
8. Do take your \_\_\_\_\_ home with you.
9. Do not remove \_\_\_\_\_.
11. Be considerate of other \_\_\_\_\_.

## **Growing Mangroves Instructions**

Red Mangrove tree seeds germinate, split open and grow a 6- to 12-inch-long cylindrical root called a propagule while still attached to the tree. These then fall, stick into the mud and grow. In nature, propagules can float on the ocean currents for up to a year before landing and sprouting.

### **Things You will Need**

- Mangrove propagule
- Potting soil
- 3-inch plastic flower pot (a similar sized plastic pot can be substituted, eg bottom of soda bottle – but you might need to make drainage holes)

1. Select a propagule that has not sprouted any roots or leaves. It should be about as thick as your finger, shiny green and relatively straight. It may have a red tint on the fat end. Avoid shrivelled propagules or ones with visible scars and broken tips. The thin end should taper to a green point.
2. Fill the plastic flower pot with the soil to the top of the rim. Gently firm it up by pressing down on the surface. The surface of the potting mix should be about a quarter of an inch below the pot rim after firming.
3. Poke a hole in the center of the soil with your finger. It should be about 1 to 2 inches deep.
4. Insert the bottom of the mangrove propagule into the hole. The bottom is the fatter part that is usually slightly reddish. The top is pointed and slender.
5. Firm the soil around the mangrove propagule so that it stands up right on its own without support. If it leans or falls over, then pull it out and bury it a little deeper.
6. Water the mangrove thoroughly, with fresh water so that water drains out of the bottom of the pot.
7. Place the mangrove in a bright location, but not in direct sun which may overheat it. It should sprout in a week or two, and the first set of leaves will develop on the top. Keep the soil moist at all times. Mangroves do not like to dry out. As the plant grows it can be moved into a sunnier location.

### **Tips**

Use a mangrove propagule that has not sprouted any roots or leaves yet.

Any type of potting medium will work as long as it holds moisture.

Periodically wipe the leaves off with a damp paper towel. As mangroves grow, they expel salt from glands around the leaves that would naturally wash away in rain. This needs to be manually removed when indoors.

After several sets of leaves have grown and the plant is well established, the top set of leaves can be pinched off to cause branching and bushiness.

Never let the soil dry out. Mangroves normally grow directly in water or in very moist soil.