

# Wetlands +

An Education Guide to  
Wetlands and Coastal Activities  
in the Seychelles islands



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### **Acknowledgement:**

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This guide was written by Lyndy Bastienne, with contributions from Terence Vel, Michel Martin of the Wildlife Clubs of Seychelles, Nanette Laure, Vanessa Zialor, Elvina Hoarau, Pugazendhi Murugaiyan, Jean Claude Labrosse of the Department of Environment

Proof reading and validation by Wildlife Club & Eco-School Leaders

Layout by Allen Gervais Comettant, DOE



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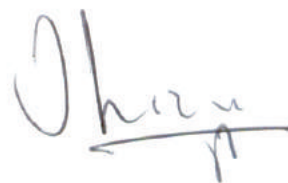
There is extensive evidence of the need for people to learn and understand the value of the wetland ecosystem and the wealth of biodiversity that it holds. Inappropriate, destructive practices in wetlands such as pollution, reclamation, deforestation leads to habitat and biodiversity loss that can be irreversible.

Every Seychellois boy and girl knows about wetlands within their community. This is through the annual wetlands day celebration at their schools or at national level or simply because each school has been involved in one way or another in some sort of wetlands project, wetlands visit or a wetland topic in their class work. What is more striking is that more and more children are now advocating for wetlands and biodiversity protection publicly; be it the habitat itself, the animals and plants dwelling there such as the mangrove ecosystem.

We are hopeful that in the near future, more people including the adult circle will appreciate and make good use of the educational and entertaining values of wetlands ecosystems in their communities. We hope to see people watching shorebirds and other wildlife, others doing restoration works or those simply out for a stroll enjoying the fresh air and the natural beauty of our wetlands. Wetlands are not only for wildlife but also for people. If people contribute to its conservation, they will be more fascinated by it and will be more convinced to protect nature. The best way to reach this passion is through education. This is why we welcome this wetland education guide, for what it will do to bring forth to the public the value of protecting wetlands, their surrounding environment and conserving biodiversity.

Children, whatever you are learning today, be sure to live it and never to forget it as you grow up. Adults need learning too. Believe in the power of education and put it into good practice. For it is what we learn that will lead us to appreciate our existence with the natural world and therefore participate in protecting the environment.

**So, let's enjoy our communities' wetlands activities!**

A handwritten signature in black ink, appearing to read 'Joel Morgan', with a horizontal line underneath the name.

by Minister Joel Morgan



# Introduction

## About the guide

This activity guide is designed to help any age group, gain an insight into some interesting activities to be carried out about and in wetlands. It has strong links to some national curriculum programmes of both primary and secondary schools mainly in the sciences and social studies. Leaders are encouraged to use the provided facts to select appropriate activities for the levels of their learners and follow up classroom learning with outdoor experiences to motivate learners. The guide also provides some brief information about the Seychelles wetlands, their management and activity sheets to use before, during and after a site visit. A variety of discovery activities for in and outdoors and hands – on learning experience for both learners and leaders with pictures or drawings and instructions that are simple to follow. Sufficient photocopies of the activity sheets should be made for learners to use during a visit. The book introduces the amazing variety of plants and animals to be found in wetlands. Through these informative and fun activities they will discover how creatures are designed to live in and adapt to certain habitats and they will learn about inter-relationships and our responsibilities to the natural world. The guide occasionally refers to leaders and learners as it is equally made to encourage community groups to explore wetlands around them and learn of their values to wildlife and people.

### **Environment Education in Seychelles**

The Ministry of Education has long set out an environmental education programme in schools, implemented across the curriculum at the will of dedicated teachers and staff. Wildlife clubs in schools, led by trained teachers as club leaders, are a perfect setting for outdoor learning, getting children to compare and contrast the diversity of life in different plant and animal homes. A mixed of local publications have been put to the use of teachers for environmental education, but this one exclusively dedicated to wetlands education, will bring children of all age groups to gain first-hand experience of natural places through a series of innovative activities. Feedback is encouraged from teachers.

Further learning activities may include use of equipment such as binoculars, pond dipping nets and other resources which can be loaned from the Department of Environment or the Wildlife Clubs of Seychelles. Schools can equally request for talks and organised visits from the Departments.

Wetlands are incredibly important resources for wildlife, the public and to you as educators. These productive and diverse ecosystems can be used to teach young people about many different concepts including the water cycle, food chains, food webs, the importance of habitat, human impacts and how to get involved in conservation activities. This guide is a collection of background information and activities relating to wetlands. Use it in conjunction with the other resources to create a “wetland constituency” for your learners. The activities are easy, interactive, and can be conducted in your own classroom or in the community with materials that are readily available.

## **Links to National curriculum**

### **The wetlands information and activities in this guide leads to multiple concepts of the National Curriculum:**

In the **Sciences** students will learn and enjoy being young scientists on the field through; Learning about interdependence of organisms, energy and organization in living systems, consistency, change, inquiry and measure, unifying concepts and processes, behavior of organisms, science in personal and social perspective, environmental quality, technology in local, national, and global changes. Whereas for **Social Studies** students will benefit in terms of discovering, people, places, environments and society, global connections and their characteristics, the characteristic and spatial distribution of ecosystems on the Earth's surface as a living environment... As **Technology** findings they will learn basic operations and concepts and be proficient in the use of technology and research tools to locate, evaluate, and collect information from a variety of sources (e.g., libraries, databases, computer networks, video) to gather and synthesize information. For **Language and the Arts** learners can adjust their use of spoken, written, and visual language and vocabulary to communicate effectively with a variety of audiences and for different purposes and to create and communicate knowledge and experiences for learning, enjoyment, persuasion, and the exchange of information. Overall the **environmental education** learning in this guide will develop in students and adults various skills such as questioning, analysing and investigating environmental issues, understanding and addressing these issues: These will further develop their appreciation and create awareness of the natural environment, leading them to contribute positively in decision-making and improve their eco - citizenship skills.

**Good luck in introducing to your students  
the fascinating world of wetlands!**

# **Section 1 - General Characteristics of Wetlands**

## **What is a wetland?**

A wetland is any place that is regularly flooded with fresh, brackish, or salty water. They are also swamps (usually with trees) or marshes (grassy-looking). There are different types of wetlands in the Seychelles. They are found on offshore and near-shore islands, the coasts, coastal plains, mountain slopes and even on mountain peaks. Coastal wetlands are found on the shore and coastal plains.

Wetlands form anywhere that standing water gathers. They may contain fresh, brackish, salty or super – salty water. Some wetlands are always present, others are seasonal, and appear only very rarely, after exceptionally heavy rain or high tides. Appearance varies but all wetland soils are saturated with water for at least a week during the growing season every year. Such soils are called hydric soils and have an anaerobic layer at the surface.

Wetlands have often been seen as wastelands, with developers seeking to drain them for health purposes or for more development. Fortunately with enforced laws, swamps and marshes are coming back as we understand the important roles they play in regulating water quality and quantity, providing a critical habitat for plants and animals and influencing the local climate. Wetlands capture and retain rainfall, and prevent valuable sediments from being washed into rivers and seas.

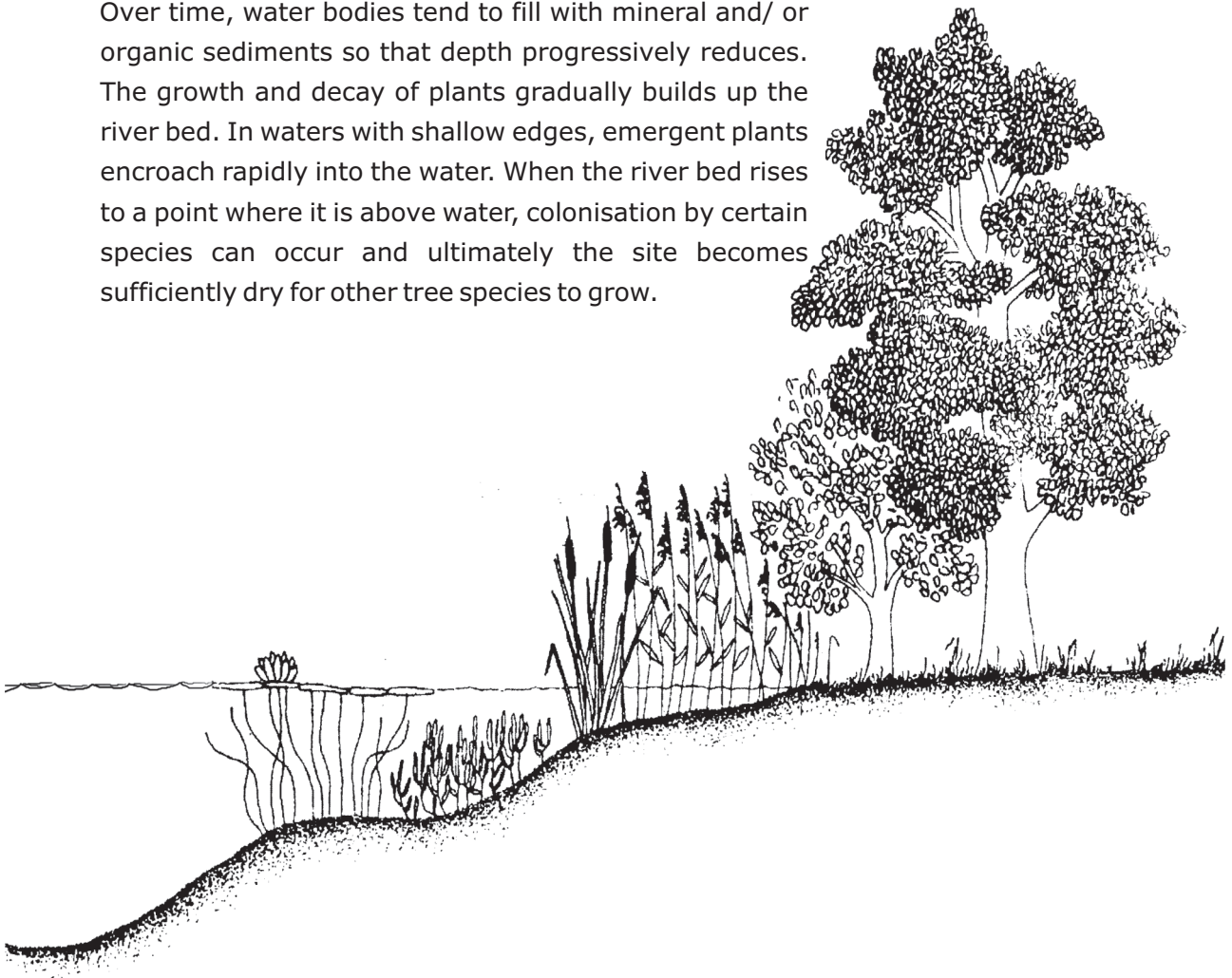
They add moisture to the atmosphere, which falls as rain and cools the environment. A good wetland acts both as a sponge and filter. It holds water, and allows a river to be released more slowly. It keeps the rivers flowing. In dry season it keeps the streams trickling. It gives time for the water to recharge the aquifer and keeps the water table up. Without this sponge function, rivers flow faster and carry off valuable nutrients, soil and organic matter from up –stream. Wetland acts as a natural purifier. Marshes not only filter out the impurities but recycle nutrients as well providing food for the invertebrate, which in turn provide nourishment for fish, corals and birds.

## **Water Depth, Water Level and succession in wetlands**

Water depth and water table Management of wetland habitats is very important to make them attractive to wildlife. If the water levels of a shallow lake are not managed, it may eventually silt up and over a long time become a woodland. This is called succession. Water level is the primary environmental factor controlling numbers and variety of plants and animals in wetland habitats. Shallow water areas, less than one metre deep, are very productive. They are colonised by a wide variety of plants, support many breeding invertebrates and fish, and are the essential feeding area for many water birds and their young.

Control of water levels is necessary for a number of specific management purposes; mainly the provision of ideal feeding conditions for some ducks and wading birds. Control may be achieved by sluices which permit partial or complete draw-down to restore levels and, ideally, to flood areas as required.

Over time, water bodies tend to fill with mineral and/ or organic sediments so that depth progressively reduces. The growth and decay of plants gradually builds up the river bed. In waters with shallow edges, emergent plants encroach rapidly into the water. When the river bed rises to a point where it is above water, colonisation by certain species can occur and ultimately the site becomes sufficiently dry for other tree species to grow.



The question is, "Should we let natural succession proceed in wetlands, eventually converting it into woodland or, should we manage the wetland by dredging, desilting or other means to maintain the wetland in its present state?"

## **What are the main types of wetland in the Seychelles?**

Wetlands are very diverse; there are different types in the Seychelles. The most common include mangroves and associated habitats such as lagoons, salt ponds, fresh and brackish marshes, mudflats and salinas as well as freshwater marshes, and swamp forests of many kinds.

## Some common types of Seychelles Wetland and associated habitats

Adapted from: The Ministry of Environment Website 2008; <http://www.env.gov.sc/html/wetlands.html>

TYPE	DESCRIPTION AND HABITAT
Estuaries	Where rivers meet the sea and salinity is intermediate between salt and fresh water (e.g. delta mangrove areas in Port Glaud, Anse Etoile, Roche Caiman)  Or Shallow, muddy intertidal areas, formed by the accumulation of silt at the mouth of large rivers. May include mangrove and freshwater marshes.
Marine	Not influenced by river flow; shorelines and coral reefs. Areas of sea water not exceeding 6 metres at low tide (e.g. East Coast of Mahé, Ste Anne areas.) Good areas for snorkelling
Riverine	Land periodically inundated by river overtopping (e.g. Lanmar Soupap – La Digue)
Palustrine	Where there is more or less permanent water (e.g. North East Point, Mare aux Cochons, La Plaine Hollandaise on Praslin)
Lucustrine	Area with permanent water with little flow (same areas as above like North East Point, La Plaine Hollandaise – Praslin)
Tidal creeks	Channels that carry seawater into and out of a wetland, according to the tides. Usually fringed with mangroves (e.g. Anse Etoile...)
Lagoons, salt ponds, Salinas and Sounds	These are various types of shallow bodies of water near the coast. Surrounding vegetation may include mangroves, shrubs, and sedges, depending on conditions. (e.g. Pasquere Bay, Praslin)
Mud flats or tidal flats	Very shallow muddy areas along or near the shoreline that are exposed during low tide (e.g. English River, Roche Caiman...)
Mangrove	Found in salty and tidal areas along coastal riversms, tidal creeks, around ponds and lagoons, and on coastal cays and islets. Dominated by different species of mangrove (e.g. Port Launay, East Coast areas on Mahe, Aldabra...)
Freshwater and brackish marshes	A freshwater pond or lake that has become filled with rooted or floating herbs and grasses such as Bulrushes or cattails (e.g. The Sanctuary at Roche Caiman), Phragmites, Water Lilies, Water Hyacinth and Water Lettuce Swamp (e.g. North East Point...)
Coastal woodland	Low, scrubby, trees on the beach adapted to tolerate sea spray and breezes. Includes Sea Grapes, Beach Mahoe, and Hippomane, beach morning glory (e.g. Anse Royale beach...)

***Some examples are illustrated in the following pictures. You can find out more.***





Grand Anse Mahe, Coastal Wetland



Mare Aux Cochons, upland fresh water marsh on Mahe





La Plaine Hollandaise, upland fresh water marsh on Praslin



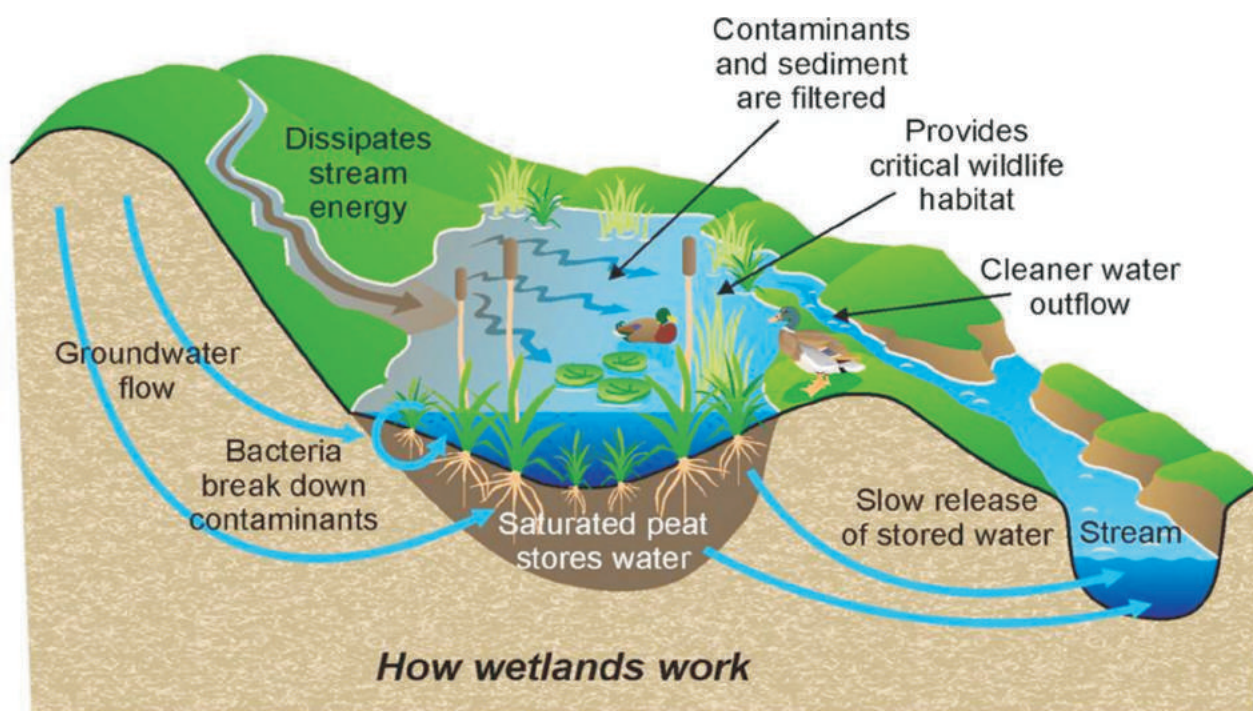
Grand Police, Coastal Wetland



## Section 2 - Information sheets

The following is a set of information pages followed by some associated teacher guided activities for teachers' preparatory work,

### 1. Function of a healthy wetland



A good wetland acts both as a sponge and filter. It holds water, and allows a river to be released more slowly. It keeps rivers flowing. Wetland acts as a natural purification, filter out impurities and recycle nutrients. In a healthy, intact condition, wetlands can greatly contribute to reduce the water related impacts of climate change.

The Seychelles wetlands though not very big in land area, still provide major protection to the coastal region; they protect fisheries and other threatened species habitats, store water for flood and storm runoff by reducing the magnitude of floodwater from damaging properties and maintains the stability of stream or coastal banks through reduction of scouring and erosion.

## 2.The water Cycle

### Importance of water

Water covers more than two thirds of the Earth's surface and forms the basis of all life in this world. Without it nothing lives, nothing grows, it is "the liquid of life.". It is a home for thousands of animals and plants and it also transports minerals and nutrients that feed the animals and plants. Water is also vital to human survival. Clean water which many of us take for granted is essential to our health and well being and that is where wetlands play a vital role. As water flows through wetlands, it is slowed down by vegetation, which is very important in wetlands. Suspended solids in the water are trapped by the stems and root masses. When the water flows out of the wetland, or percolates into the groundwater, it is much cleaner.

A vital element of our environment, **water**, determines the existence of a wetland and is in turn influenced by the wetland.

- ♦ Have a learner explain how water travels from the air to the Earth and back to the air in a continuous cycle. Use the Water Cycle activity sheet to illustrate this.

Water can follow three major routes when it reaches the ground:

1. It can be absorbed into the topsoil. This water may then be used by plants to grow.
2. It can seep through the topsoil and collect above the bedrock. This is called groundwater and is the source of springs and wells.
3. It can flow from the surface of the ground into nearby rivers, streams and wetlands including seas. This is called run-off. If the run - off carries soil away with it, the process is called erosion.

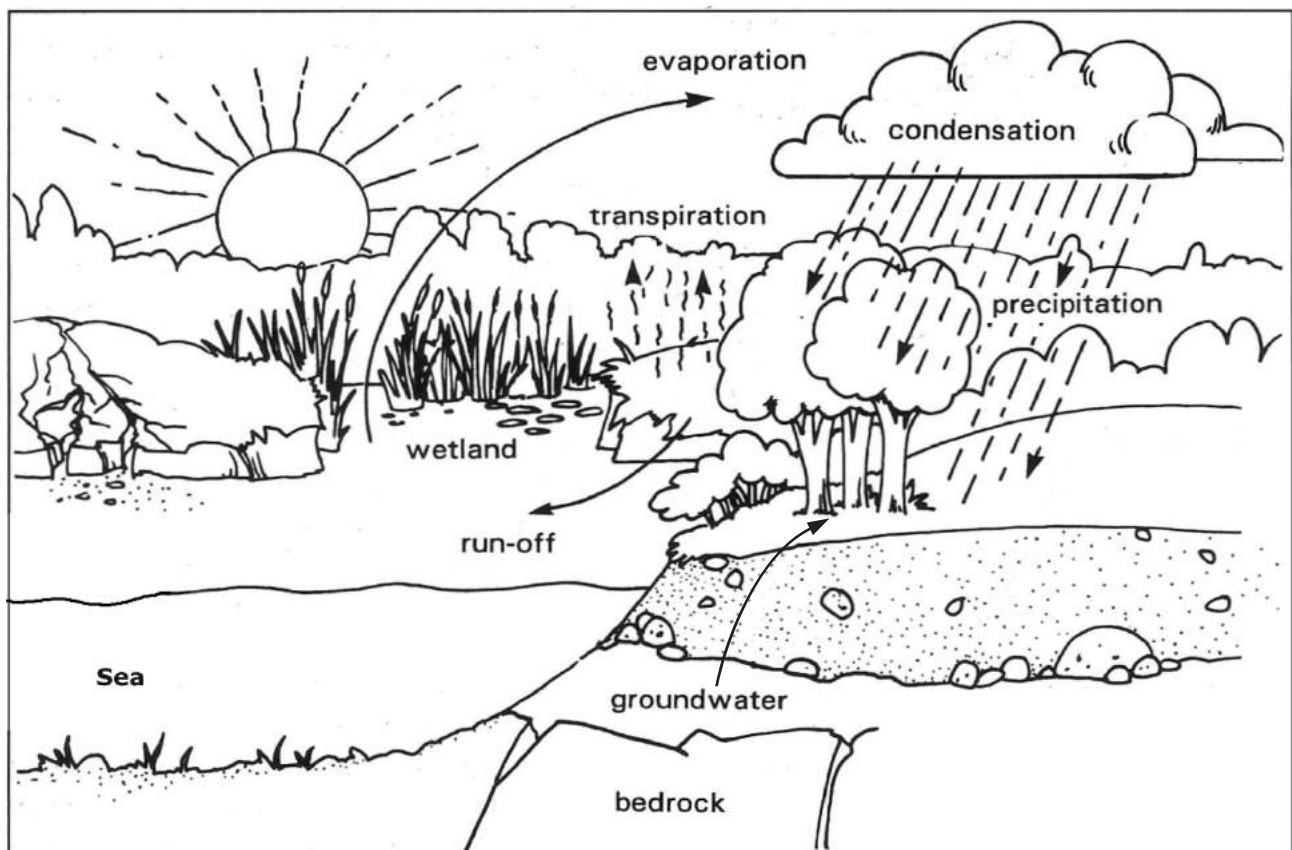


Illustration of the water cycle

In the water cycle, water returns to the air as a gas (water vapour) via evaporation from land and open water. As the water vapour rises, it cools and turns back into a liquid through the process called condensation. The water droplets collect around minute dust particles to form clouds. When the clouds can no longer hold the moisture, there is precipitation, which falls down as rain back to the land.

Humans have greatly affected the natural water cycle. Many wetlands have been drained or filled in. This reduces water in some areas and increases it lower down in the drainage basin. Plants, animals and our environment have been greatly affected by these changes to the natural water cycle.

- ♦ *Ask learners to think of all the ways that they use water in their homes. Then ask them to imagine what their lives are like when there is shortage of clean water.*

### **3. Wetlands and Climate Change**

#### **Sustaining and restoring wetlands: an effective climate change response**

Mangrove forests and coral reefs are natural buffers against impacts of sea level rise and storms. Marshes, peat lands and lakes reduce peak flood flows in periods of extreme rainfalls or glacier melt. Due to their ability to store and slowly release water, these wetlands are a vital lifeline in periods of extreme droughts.

All over the world, wetlands are being lost faster than any other ecosystems. This continuing trend considerably magnifies the problems that climate change brings to nature and people, especially those who are the most strongly dependent on this natural resources will suffer. Sustaining and restoring wetlands form a cost –effective strategy for climate adaptation with strong benefits for poverty reduction, livelihoods and biodiversity conservation.

#### **Here are some examples**

##### **Mangroves protect tropical coast**

Global warming will lead to sea level rise and increased storm intensity. Maintaining and restoring healthy ecosystems along coastlines, such as mangroves, salt marshes and coral reefs reduce the impact of these climate related disasters.

##### **Values for adaptation**

Many coastal wetlands can adapt to sea level rise; some mangrove forests can accommodate rise of up to 9 millimeters per year through sediment trapping and accumulation of organic matter. Mangroves also serve as buffers against saltwater intrusion. It was somehow proven that many coastal communities in Asia having thick mangrove belts were saved from the destructive December 2004 Tsunami.



### **Increased freshwater floods due to rainfall extremes**

This leads to loss of property and life, water pollution due to overflow of sewage systems, and damage to production systems and agriculture areas. Wetlands like mountain mashes or swamps and flood plains can reduce peak flood flows by decaying and storing part of the excess precipitation and release the water after the rain fall in a steady flow. They can also detain pollution flood waters and improve their quality.

### **Coastal inundation as sea levels rise**

Due to sea level rise, many of the world's most economically important areas are at risk of inundation and salt water intrusion. Most of the Seychelles' infrastructure development are situated in coastal areas of the islands.

Mangroves, reefs and other coastal wetland ecosystems can increase the resilience of coastal areas through alluvial plain accumulation and create freshwater buffer, preventing saline intrusion.

### **Rising temperatures, less rainfall**

Climate Change will make droughts and water shortage more extreme especially in arid [dry] areas. Rainfall may decrease and evaporation increase considerably with higher temperatures. As a result, food production may drop, waterways become unavailable [for transport] and salinisation will occur.

Marshes, lakes and floodplains can attenuate these impacts by:

- ◆ Releasing wet season flows slowly during drought periods
- ◆ Providing diversification during drought period
- ◆ In addition, mangroves and other coastal wetland ecosystems can guard against saltwater intrusion when coastal fresh water areas dry up.

### **Increased frequency and intensity of storms affecting coastal zones**

Warmer seawater is the fuel behind storms like cyclones and hurricanes. Increased sea water temperatures will lead to increased frequency and intensity of storms. Coastal wetlands like mangroves and reefs can attenuate these disasters by absorbing storm power, providing alternative sources of food and building materials and are havens for species during and after storms.

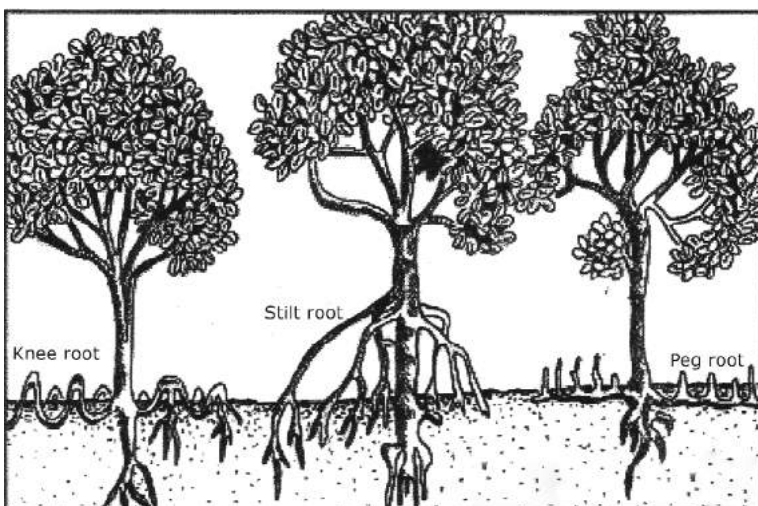
Through community-based restoration, the resilience of coastal communities on small islands can be improved. Linkages between biodiversity, water/wetlands and climate change present some of the best examples whereby nature can help us cope with Climate Change. Such ecosystem-based adaptation approaches do not only improve sustainability, but also greatly reduce adaptation costs. Establishing and effectively managing protected area systems to ensure the continued delivery of ecosystem services that increases resilience to Climate Change.

**Investing in children's education about how to adapt to Climate Change is the best investment for the future!**

## 4. Mangroves, a valuable habitat, an asset for human well-being



**Mangroves** known as **wetland heroes** are salt – tolerant trees that grow in muddy soil with little air along estuaries, lagoons, bays, tidal streams and inlets, mixing fresh and sea water. To cope with high salinity, mangroves have specialised root cell membranes that prevent or greatly reduce, the entry of excess salt. They also remove excess salt when they shed their leaves, or secrete salt through their leaf pores. To cope with the waterlogged environment in which they grow, mangroves have developed spreading, breathing roots (called **pneumatophores**) which increase breathing capabilities of the plants in such environments.



Mangroves have developed various adaptive features to survive their environment e.g. specialised roots (knee, stilt and peg roots), and buttressed trunks for support in the unstable, soft mud.

# Importance of mangroves

A rich coastal environment and habitat providing :

- ◆ Feeding areas for larger fish like snappers to feed on small fish & other organism
- ◆ Shelter for coastal / marine creatures like fishes, oysters, crabs, prawns...and safe sites or nursery for the young of some species to grow before moving out to deeper waters
- ◆ Good roosting and feeding sites for migratory and resident birds
- ◆ Contributes to economies such as fisheries and small scale crab harvesting in Seychelles



## Roles and functions

- ◆ Mangrove areas are habitats for different kinds of fish, birds and other animals
- ◆ They stabilise shoreline, control erosion and purify water (the kidneys of the planet)
- ◆ They trap and retain sediments and other pollutants
- ◆ They help mitigate the effects of climate change and protect coastal areas against natural disasters
- ◆ A source of livelihood for millions of people in coastal communities
- ◆ Mangroves maintain the balance of fish stock and other crustaceans and has a high potential for tourism

**There are seven types of mangroves in Seychelles** (see checklist page 55)

Mangliye Rouz	-	<i>Rhizophora mucronata</i>
Mangliye Blan	-	<i>Avicennia marina</i>
Mangliye Lat	-	<i>Bruguiera gymnorhiza</i>
Mangliye Zerof	-	<i>Ceriops tagal</i>
Mangliye Fler	-	<i>Sonneratia alba</i>
Mangliye Ti fey	-	<i>Lumnitzera racemosa</i>
Mangliye Ponm	-	<i>Xylocarpus granatum</i>

**Port Launay is the perfect local site on Mahe to identify all the 7 species. Aldabra and Curieuse islands also have healthy mangrove ecosystems.**



# Impacts of people on mangroves

Mangroves are an important natural resource for people. They perform many crucial physical and ecological functions as well as provide economic benefits to humans.

Mangroves protect the coastline from erosion and protect outlying coral reefs by absorbing fresh water run-off from the land. Excess fresh water alters the salinity of the sea water and leads to reef damage. Mangroves also trap debris, sediments, excess nutrients and toxins. Through this natural filtering process the water quality of tidal rivers that drain through mangroves is improved.



## Mangrove Facts

- ◆ We have learnt that communities in the Indian Ocean with very thick mangrove belts were saved from the disastrous 2004 tsunamis thanks to the coastal protection value of mangroves
- ◆ Mangroves act as wave breaks, stabilise the coastlines, promotes accretion and serve as natural defense against storms, preserving coastline, preventing erosion and it is also a very good source of carbon sequestration (captures CO<sub>2</sub> from the atmosphere)

## Mangroves Awareness and actions – what can you do!

Mangroves are increasingly threatened by human activities. Mangrove forests are lost when they are reclaimed or converted for other purposes such as agriculture, aquaculture and other development activities. These supposedly bring greater profit to people. Pollution also affects mangroves adversely. People often wrongly perceive mangroves as unsightly and want them removed so as to enhance the environment. Mangroves then often become garbage dumps and are thought to be breeding grounds for mosquitoes. This, in reality, is untrue because mosquitoes cannot breed in salt water!

If we lose our mangrove forests, we also lose the physical, ecological and economic benefits they provide. For example, if mangroves are destroyed coastal erosion may become more prevalent. Furthermore, the roosting, feeding and nesting sites for large water birds and many species of migratory birds will be destroyed too. Some birds could become locally extinct, thus affecting the whole mangrove ecosystem.

We should value and appreciate the closeness to a natural area and help restore the sites, respect and participate in on-going works. Coastal developers should use wetlands in a sustainable manner and ensure their protection, their restoration and their positive promotion; zero tolerance on their destruction.

## **Mangroves, people and development can co-exist**

Mangroves are endangered because of the alarming rate of its destruction. By educating the population of its benefits maybe one day, mangroves and people will be able to live together in harmony of a balanced ecosystem

## **5. Wetlands Protection**

Wetlands in Seychelles are protected under the Environment Protection Law and through the “Seychelles National Wetland Conservation and Management Policy”. It is the hope of the younger generation today that with increased education and awareness, people will learn to understand wetlands values and contribute to their protection and also that the authority will be more firm with those who break the law. Young people are now advocating for the protection of all the important mangrove species in the Seychelles.

Seychelles is equally a member of the **RAMSAR Convention**; the convention on wetlands which is an intergovernmental treaty adopted on 2nd February 1971 in the Iranian city called RAMSAR. This is why World Wetlands Day is celebrated annually on the 2nd of February. It denotes the “wise use” of wetlands as sustainable utilization for the benefit of mankind in a way compatible with the natural properties of the ecosystem [www.ramsar.org](http://www.ramsar.org). Some wetlands areas have also seen prospective eco-tourism development with large hotels pledging support for their protection and good management. In Seychelles four wetlands have been declared RAMSAR sites; Port Launay, Aldabra, Mare aux Cochons and La Plaine Hollandaise.

Much education and research in natural sciences are being conducted in wetlands and serious efforts are expected of the government and every citizens to reverse the wetland losses, modification or degradation by incorporating wetland functions in resource planning, decision – making for national projects, monitoring and enforcement and promoting its functions and values and adopting measures for their wise use. Concerned people must also try to prevent outside influences from harming the habitat.

What can private citizens do to help protect wetlands?

1. Write letters to government officials and whoever is the source of the threat.
2. Help advocate for mangroves to be added to the list of protected plant species .

♦ *Ask learners for other suggestions.*

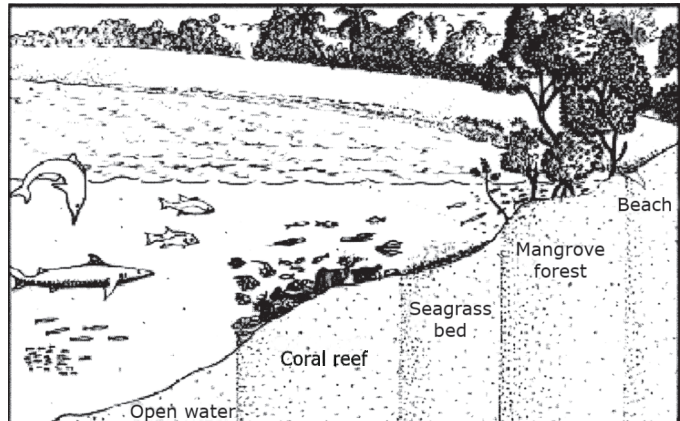
For any advice and guidance on wetlands activities and best practices, visit or call the Coastal Management and Wetlands Unit in the Department of Environment.





## 6.The Seashore, Seas and Oceans

**Coastal Ecosystems** are rich in biodiversity and connected with each other - for e.g. through some fish feeding in one ecosystem (on coral) but breeding in another (in mangroves). Other direct links would be rivers bringing fresh water to estuaries such as mangrove areas which bring nutrients to the sea, and evaporation of the sea providing moisture in the atmosphere which falls as rain. Coastal ecosystems also provide opportunities for recreation to locals and tourists. As they are interlinked, things that affect one ecosystem may affect others even far away.



**The Ocean** is a continuous body of salt that covers two thirds of the earth's surface. According RAMSAR, the definition of wetlands is "an area of mangrove, marsh, or swamp which is permanently or temporarily submerged under fresh, brackish or salt water that is static or flowing. This equally includes areas of marine water in which at low tide, the depth does not exceed 6 meters". Like all wetlands, the sea also affects the weather and climate as the atmosphere and the ocean are always moving, affecting each other in a complex interaction, simplified by the water cycle. Marine resources are important to humans; these include fisheries, minerals and plants.

### The Seashore

Seashores also known as **shorelines** or **coasts** are where the land meets the sea. There are different types of shores in Seychelles: sandy shores, rocky shores and muddy shores



muddy shore, Roche Caiman



rocky shore, Anse Marie-Louise



sandy shore, Intendance

They are dynamic features and often change with the changing seasons and the influence of other factors including geological, climatic and oceanographic processes.

**Beaches** are formed by particles of material washed ashore by waves and currents, or, in some cases particles carried from inland by rivers. The beaches of Seychelles derive their sand from erosion of the surrounding granitic, limestone or basaltic rocks. Seashores are rich in fauna and flora, mostly adapted to survive well in this unstable environment. Shorelines are ecologically and economically important. For example, the sandy beaches are important **nesting habitats for**

**marine turtles**, and also offer **recreational areas for tourists and locals**, providing a relaxing, attractive environment, **a source of income and employment** for coastal communities. Muddy beaches **support a variety of animals** which are preyed upon by different bird species be it migratory or residents. Otherwise the seashore **accommodates a variety of plants and animals** in different zones from land to sea which include coconut palms, mangroves, seagrasses and seaweeds for plants. Animals from the upper shore include barnacles, limpets, chitons and winkles on rocks, ghost crabs and sand-hoppers on the sand and lower down the shore, shy crabs, sea cucumbers and brittle stars are common, while corals, sponges, giant clams and some fish species occur at the lower edge of the sea.

**Coastal wetland plants** such as seagrasses, mangroves and others are important for providing food and nursery grounds for fish and shrimps and they stabilise the coast and the beach helping to reduce wave action during high tide, thus reducing coastal erosion.

**Corals reefs** are very important ecosystems and among nature's most spectacular creations with their multitude of colourful creatures and they are among the most biologically diverse and productive ecosystems known to man. They have many functions such as providing food and shelter to fish, crabs, lobster, clams...thus support important fisheries. Coral reefs protect the seashores from erosion acting as natural barriers against wave actions and storms and also provide sand which build up beaches and shorelines. They equally provide scenic view for divers and snorkelers.



Human activities at the coast



Hermit Crab on the beach



Green back heron in sedges



Coral reef fish

## 7.Threats to wetlands

In a balanced ecosystem, nutrients are recycled between the producers, consumers and decomposers. Oxygen and carbon dioxide are recycled between the plants and animals, and water is cycled through the water cycle. Although many elements in a balanced ecosystem are recycled, there is the constant need for energy input from the sun. Additional nutrients may come from precipitation, run-off and sediments washed into the ecosystem.



When something happens to upset the balance, the effects may range from a slight disturbance to a catastrophe. Nature has some built-in mechanisms that help to keep the balance in check. Unlike humans, wildlife cannot simply grow more food when the supply runs out. The population size must change to match the availability of food.

Although nature can compensate for some of the natural upsets in an ecosystem, there is a limit to the amount of stress that can be placed on an ecosystem before it collapses. In many areas, wetlands are being pushed past their tolerance limit and are being destroyed. Natural catastrophes such as excessive flooding and drought can cause temporary setbacks, but these natural events are actually critical to the long-term survival of some wetlands. In fact, people are the single biggest cause of the destruction of wetlands. In some regions of the country as much as 90% of the original wetlands are gone!

### What are the main threats to wetlands?

The problems are caused by dumping of rubbish, pollution from sewage and farm effluent, by attempts at drainage and reclamation, and poorly managed sluices which allow infiltration of the fresh water by sea water. There is also the problem of alien invasive plants such as water hyacinth and water lettuce.

Learners should discuss each of the threats and suggest what people can do to stop or reverse them. How will such changes affect people?

1. **Draining:** Drainage of wetlands for farmland or other development is one of the major threats. Many drainage projects have not been subject to environmental impact assessments, or cost-benefit analysis. Experts who have studied the draining of wetlands have expressed concern that the benefits that have been gained have not always equaled or surpassed the long term costs involved in the project. While our society requires economic development, it must be done in a sustainable way to ensure both the long term health of our economy and environment.

2. **Filling:** Wetlands are often filled in for housing projects, highways, factories, airports and other developments. Wetlands have traditionally been areas of cheap land that are bought up for development and filled in. The short-term and long-term costs of the wetland loss has usually not been measured.



3. **Dredging:** Shoreline wetlands have been dredged for the construction of marinas and harbours. In addition, waterfront owners have cleared shoreline vegetation for docks and "clean-up" purposes. The destruction of the vegetation results in habitat loss, particularly for nesting waterfowl, and the loss of shelter for the young of many species. Without vegetation, the shores are more vulnerable to erosion due to wave action and run-off.

4. **Polluting:** Air and water pollution contribute to the disruption and potential destruction of balanced wetland ecosystems. The addition of pesticides and industrial wastes, sewage and other pollutants can result in the death of plants and wildlife.

5. **Introduction of Exotic Species:** In a balanced ecosystem, the creatures are adapted to living in the particular habitat and are adapted to co-existing with other members of the habitat. When a "stranger" appears, it can cause many changes. North East point wetlands are currently suffering from the invasion of the exotic plant called water lily accidentally introduced as ornament for ponds. It has now spread at an alarming rate into the entire wetlands, with nothing to stop it from spreading, outcompeting native plants such as sedges, choking out other floating and submerged aquatic vegetation. The major invasive water weeds in Seychelles are water hyacinth, water lettuce and water fern. The loss of the open habitat means many species of birds, mammals, amphibians suffer and some even die losing their shelter and food supply. The invasion of exotic fish species is also a serious problem in marshes. Such species include those that people breed in aquarium then release in wetlands when overpopulated. They can eat most kinds of soft aquatic plants and also stir up sediments during spawning and feeding, creating very cloudy water. This reduces the amount of light reaching under water plants and cuts down on their ability to photosynthesize.

***How would you imagine the world without wetlands and the plant and animal life associated with them?***

- ◆ *Learners can make a picture, write a poem or choose another form of expression to explain their thoughts.*



Invasive water Lettuce in North East Point marsh

## 8.Guidelines to successful bird watching pond dipping and some other conservation codes

### Bird watching

In some places, special Bird Hides are built to get close to birds, in comfort and without disturbing or scaring them away. In places however where there are no such features, people can still bird watch while observing the same rules not to disturb the birds. Wetlands are the best places to see birds, to observe their behaviour and their characteristics. It provides you with the enjoyment of watching birds acting naturally and raising environmental awareness as well as monitoring our environmental health.



A good time for watching migratory bird species is between the months of October and May, especially early morning and late afternoon. However some other birds do visit many bird areas all year round. You might be lucky to spot one of the rare species at any time of the day!

**Rules:** Birders need to be very quiet when listening to birds. Total discretion should be observed; people should not be seen by birds, stay hidden at all times.

### Pond dipping

Pond dipping is a simple and enjoyable exercise to get young people hands on with underwater species. They get to see and identify aquatic species. You need simple equipment like a hand net, shallow trays, bugs viewers or hand lenses.

#### ***Instruction for pond dipping:***

- ◆ Cover the bottom of the tray with a few centimetres of water
- ◆ Slowly dip the hand net in the water, you can drag the net at the bottom once you're done with near surface dipping
- ◆ Tip the contents carefully into the tray and examine them using lens
- ◆ Discuss or record your findings then gently return all samples to the water

#### ***Important notice:***

- ◆ Ensure that live specimens are not left in the sun
- ◆ Return samples to the water by submerging the tray carefully and allowing them to escape
- ◆ Pond dipping should always be done in the safer location of the wetland and with an adult supervising the activity
- ◆ Remember to stay SAFE near water – Stay Away From the Edge!

### On the seashore

- ◆ Tread carefully and avoid stepping on marine animals or algae when walking across a rock platform or seashore. Your weight will kill most animals and dislodge algae.
- ◆ Avoid taking out rock pool animals. Rough handling may damage their skin or they may dry out. You may learn more by patiently observing the animals in their own habitat. Write down your observations.



- ◆ Many shore animals are found under rocks and boulders. Roll rocks over carefully in order to look underneath. Remember to always return them carefully to their original position, so that you do not damage any creatures found there. Be especially careful of soft bodied animals.
- ◆ Many of our shores are marine protected areas, where all animals, plants and shells are protected from any human interference. You may visit them but you should not remove or harm any species there.

When you visit a shore or any wetlands, never remove any animal from its habitat to take home. It will die and this gives it no chance in producing further offspring to repopulate the environment. Remember never to litter. Always dispose of rubbish properly in a bin or take it home with you.



## Section 3 - Teacher-guided activities

This section provides a series of teaching and learning activities that can be conducted indoors or during field trips

### 1. Wetlands are not waste lands

Wetlands played an important part in the history of our country. Many people relied on wetland plants and animals for food, medicines and materials. Much of the early exploration of the Seychelles islands was prompted by the desire for fresh water, and wetland animals such as fish, sea turtles and crocodiles. When European pioneers arrived and began farming the land, they tended to avoid wetland areas and thought of them as mosquito-infested wastelands. Unfortunately, this idea that wetlands are somehow bad or useless has persisted.

Today many people still think of wetlands as wastelands that should be dredged, filled in, dumped on or drained.

- ◆ *Ask your learners why they think people might have this view.*

Answers might include:

- ◆ some people don't understand the importance of wetlands in nature
- ◆ some people don't understand that many fish, mammal, bird species and most reptiles and amphibians must have wetlands to survive. Without a sufficient number of diverse wetlands distributed across the landscape, many wildlife species will become extinct.
- ◆ some people don't realize how their actions affect wetlands
- ◆ some people don't realize how many members of the community are affected when wetlands are damaged
- ◆ some people don't care

Discuss these and other reasons. What suggestions can learners think of to get people to care about wetlands? What might they do to protect wetlands?

Possible activities include cleaning garbage out of a small local wetland or making a sign to be put up in a wetland giving reasons for not dumping there.

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This section discusses other sources of pollution, with particular emphasis on waste and litter.

#### Specific objectives

Learners should be able to:

- Understand what pollution means,
- List sources of waste and litter, and
- Propose ways of controlling and reducing wastes and litter.
- Ability to observe and identify various pollutants and litter, and to dispose of waste properly.
- Recognition of the importance of keeping our surroundings clean, and the effects of pollution on the environment, therefore adoption of good behavior and attitude

Wastes are discarded domestic or industrial products. They may be solid (litter), gaseous or liquid. When these get into the environment, pollution takes place.

Pollution affects the impression people have of an area's quality. Litter carried by wind, runoff and streams is present on many beaches. Most coastal pollutants originate from activities on land. Wastes thrown onto streets is washed into storm water drains, rivers and eventually into the sea.

The impacts of litter on the marine environment can be broadly classified into biological and economic impacts. Biologically, litter can be harmful to marine organisms. In economic terms, it has a negative impact on coastal communities whose livelihood (from fishing, coastal tourism, etc.) and recreational activities depend on clean waters and beaches.

### **Facts about litter**

- a) Litter is waste in the wrong place and is always caused by people,
- b) The beauty of an area is reduced by litter, and
- c) Litter is a health hazard and may attract pests (e.g. rats), birds (e.g. Indian crows) and insects (e.g. flies, mosquitoes) which can spread diseases.

### **Possible ways of controlling waste**

There are many ways through which people can control coastal littering and pollution:

- a) Make sure that all litter goes into bins for appropriate disposal. Don't let it get washed down the drain as it eventually ends up in the sea.
- b) Use better methods to dispose of domestic waste (e.g. by recycling it or taking it to special dumping sites and landfills).

Organise frequent clean-up of beaches

## **2. The seashore**

### **Specific objectives**

Learners should be able to:

- a) Define the seashore,
- b) State the importance of the seashore, and
- c) Describe the natural processes taking place there.
- d) To describe and identify the main features and processes taking place on the seashore.
- e) Take responsibility, care, show appreciation and willingness to conserve the seashore.

### **Field trip**

Organise a visit to nearby seashore to observe the different aspects of the shore, such as: shore type, quality, etc. Include a walk along the seashore. Give them a guide or checklist on what to do. The guide could include observing the following:

- a) Type of shoreline,
- b) Shape of the shoreline,
- c) Types of animals observed (alive or dead). Establish why?
- d) Types of plants observed (alive or destroyed). Why?
- e) List of observable human activities, including any harmful activities.

See Checklist: Beach life Survey



## **Further discussion**

After the field trip, arrange a discussion of all that has been recorded during the trip.

## **Essay Writing**

Ask learners to select any organism they identified and write a short essay describing the following: its form (e.g. shape, colour, size); its habits (e.g. its diet, protection, reproduction, movement, etc), any interesting or unusual features; and ways in which it might be affected by human activities and how it might be protected.

Learners may prepare a brief 2-3 page essay on 'Why coastal ecosystems such as seashores and wetlands are important to all of us'.

## **Field trip**

Teachers should take learners on trips to the beach during low tide to mark the level of the tide (on a pole, harbour wall or on the beach). As the tide comes in, over the following six hours, the level of the sea should be monitored until high tide, thus obtaining the tidal range for that day. Different groups should be involved during spring tides (full moon and new moon) and neap tides (half moon). The difference between low tide and high tide can be measured with a ruler or tape measure. Learners should be told to watch the changes of the moon and the tides, especially the level of high tide on the beach.

## **Field observations**

After the last of the above field trips learners should answer these questions:

- a) Are the highest tides with the new, full or half moon?
- b) Do they come exactly with the moon extremes (full and new moon), or a day or two before or after?

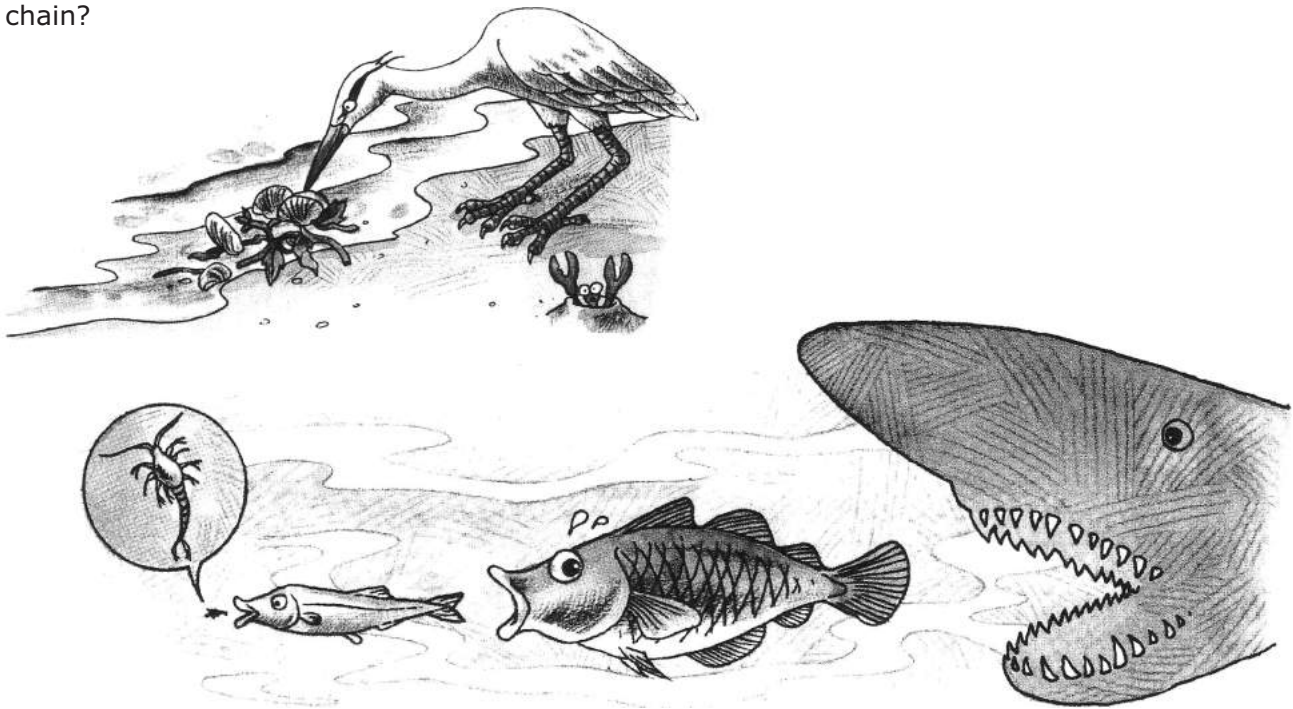
Besides field trip to the beach, teachers can organise a guided visit at the Meteorological Services at the Seychelles International Airport to learn about the subject.

The Department of Environment can also assist schools wishing to join the Sand Watch programme where they can perform other activities such as beach profiling, recording etc...

### 3. Food chain at the coast

Many interesting types of plants and animals make their home along the seashore, changing and adapting themselves to survive comfortably in this environment. They play an important part in the marine **ecosystem**. For example, small animals such as crabs, mussels and limpets often go looking for food and shelter among the seaweed (algae). During storms waves tear weaker seaweed from the rocks and throw them into the sea with the little animals still hanging on to them! This of course is good for seabirds, such as the herons and egrets, which eat them with delight!

The following is just a tiny link in the complex **food chain** that exists in the marine ecosystem ( adapted from Marine Education kit of Seychelles). Can you think of what comes next in the chain?



*A simple food chain link in the marine ecosystem*

### 4. Coral Reefs

#### Specific objectives

Learners should be able to:

- a) Understand what coral and coral reefs are and their importance
- b) Discuss the ways in which corals and coral reefs are being degraded.
- c) Recognise different types of coral reefs and the understanding of their importance to humans and the coastal ecosystem.
- d) Behave in a manner that shows care and willingness to conserve and preserve coral reefs.

## Management of coral reefs

People can stop the destruction of coral reefs through:

- a) Restricting or preventing altogether activities that damage the corals such as anchoring, trawling and with flippers.
- b) Raising awareness of the importance of corals and the need to conserve them.

## Excursion

Go out in small groups onto the reef at low tide (being especially careful not to step on any living animals). Let each group choose a small area and explore the animals that live down among the dead coral and sand, making notes of all that they see. On returning to the classroom allow each group to give a five-minutes presentation about their observations.

**Note to teachers:** Participants should wear adequate footwear to prevent injury and be sure to check the tide with the Meteorological office before proceeding with the trip

## Other follow-up activity by oral presentation or writing composition

Imagine the coral reefs ecosystem as a factory or industry. Who works there and what do they produce?

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# 5. Mangroves

Mangrove is a good and rather simple habitat to study at low tide and the animals are more visible and quite easy to see at the surface. But be careful; sandy mangrove soil is firm and easy to walk on, but muddy soil can be quite thick and soft, so everyone should take great care. Additionally, as mangrove areas have for long been used as rubbish dumps, beware of broken bottles and rusty tins; wear proper footwear. We can also find that the muddy soils are often a bit smelly; note that this is not a dangerous bacteria but hydrogen sulphide gas produced by bacteria which is a very important part of the habitat!

## Activities:

### Specific objectives

Learners should be able to:

- a) Understand what mangroves are
- b) Be able to distinguish the different types of mangrove trees
- c) Understand the importance of mangroves and the role they play in coastal/marine ecosystems
- d) Recognise harmful human practices in mangrove forests, and how this could affect coastal communities in Seychelles
- e) Propose ways to conserve mangrove forests and increase understanding of the mangrove ecosystem
- f) Develop a sense of responsibility to take action and conserve the mangrove ecosystems



## Group excursion

Organise for an excursion to study mangroves and their associated components. At the site:

- a) Identify the existence of different mangrove species at different zones; use mangrove identification checklist
- b) Observe the variety of creatures you can see; birds, crabs, fishes and others left behind after the tide has ebbed, and where they are found; use mangrove habitat checklist
- c) Make a checklist of human uses of mangroves or look for signs of the various activities or issues that may destroy mangroves;
- d) Look for signs of conservation efforts in the area.

## Further follow up activities

- ◆ Get learners to list what we would have to live without if we allowed mangroves to disappear from Seychelles? Think also of the economic impact of such losses.
- ◆ Work in groups, learners will discuss their views and feelings about the possible loss of mangroves and the consequences, its effect on the environment and what each of them can do to conserve the mangroves in the Seychelles. Present discussion points to the others.
- ◆ Get learners to research or debate the followings:
  1. If there is only one kind of mangrove tree growing in a place, can other mangrove species grow there too? What conditions are necessary? How can other kinds of mangroves trees reach this place?
  2. Should we drain more mangrove areas and make them into farmlands and buildings? Should we leave the mangroves undisturbed and encourage them to grow again?
  3. Create a mini herbarium of the seven mangrove types in Seychelles by collecting and pressing leaf samples.

See also *"Conserving the Seychelles environment" -Chapter 3, Mangroves by Katy Beaver for more of the importance of mangroves and some teacher-guided activities*



## 6. Wetland Wildlife



Discover the slimy, scaly, feathered and flying wildlife found in wetlands. Many of us will recognize some of the inhabitants, but may not know why they live in wetlands. Find out how unique adaptations enhance their ability to survive.

**Encourage learners to play a role in educating the community by making a wetland wildlife display board.** Not will they learn as they work on the project, but their efforts will be put to good use.

**Do a good turn - have learners build a nesting box or bird feeder.** These activities help learners know more about wildlife and develop a sense of caring for it. It is important to remind students that even the "common" species of today could become the endangered species of tomorrow if we take them for granted.

### **What roles do wetlands play in nature?**

Using learners' homes as example of a habitat, ask them **why their home is important to them?**

Answers may include providing shelter, a place to eat, sleep or play, a meeting place, storage, protection and security. Explain that wetlands are a home (habitat) for many different types of wildlife. Have them think of reasons why wetlands are important to wildlife. Wetlands provide shelter and protection, feeding and drinking, cooling off, breeding, nesting and nursery sites for many species. They are also used by many bird species as gathering places during migration. Frogs, toads, tree frogs and other amphibians breed there, some fish spawn and/or feed in the warm, shallow waters of marshes, many species of birds that inhabit or visit Seychelles' wetlands every year nest, breed and feed there, other insects make their homes there too.

- ♦ *Ask learners what they think happens to wildlife when wetlands are destroyed*

The plants in a wetland provide food for many animals which, in turn, provide food for larger animals. Fewer wetlands mean less vegetation and less food for all of the animals that depend on them. Many species starve or have no place to live. Some animals may move on to another wetland habitat, but others are not able to. For wetland wildlife to survive there must be wetland habitat.

Wetland vegetation is vital to the safety of wildlife. A variety of fish, amphibians, birds and invertebrates lay their eggs among the plants in order to hide them from predators. The young of many animals including turtles, ducks, fish and frogs shelter in shoreline vegetation to escape predators. Waterfowl including migratory ones breed among the plants in wetlands while hiding to escape danger during this flightless period in their lives. Many insects shelter on the stems and leaves of wetland plants when they are undergoing metamorphosis. If they were not hidden, they would be easy prey.

Wetlands provide permanent as well as temporary homes. Turtles and aquatic insects are some of the permanent residents. Migratory birds find a temporary resting place in wetlands, while toads and frogs visit them to breed in. Other animals feed in marshes but live in other habitats nearby.

Learners can be asked to further find out other factors that can impact on wetlands ecosystems such as climate change. How can it affect the wildlife, what measures can be taken to reduce the impacts.

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## 7. Wetland Web of Life

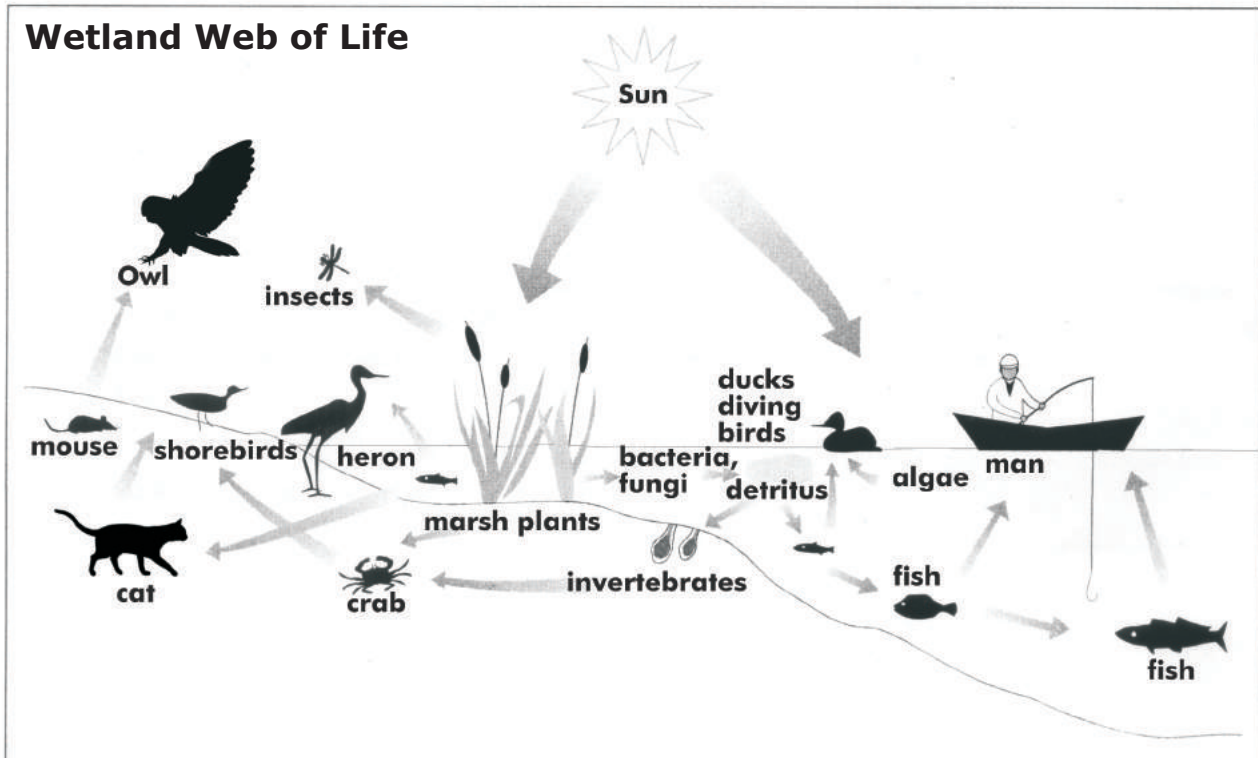
### Specific Objectives

- a. Students will learn about the connections between wetland plants and animals.
- b. Hold discussion of food chains and food webs illustrating one of the most important ways animals depend on plants.
- c. Have an opportunity to study a pyramid of life and see why it takes a large number of plants and small organisms to feed very few top predators.

**Food Webs** – The vast amount of organic matter that accumulates in wetlands is the beginning of food webs for thousands of aquatic plants and animals. Because of their nutrient-rich waters, coastal wetlands are among the most productive ecosystems in the world. When plants die, their tissues are broken down by bacteria and fungi into detritus; nutrient-rich fragments are flushed out with the tides and made available to fish, shellfish and invertebrates. These organisms in turn are preyed upon by larger wetland inhabitants – larger fish, herons and other shorebirds. The balance between the producers and consumers in an ecosystem can be upset by many threats, both natural and human. A food web is always shaped in the form of a pyramid. The number of plants, or producers, greatly exceeds the number of animals, or consumers. Due to the connections between plants and animals in an ecosystem, changes in any link in a food web will be felt by many species. Humans may also be part of a wetland food chain. Fish, ducks and other animals that use wetlands are eaten by people. Several wetland plants are part of the diet of many communities.

The following illustration shows part of a food web. Discuss it.





#### Activity:

- ◆ After examining how wetlands are threatened ask learners to take on the role of a wetland protector or destroyer in an impromptu situation and see the issue of human threats to wetlands food web from different points of view.
- ◆ Using the above example of part of a food web, ask learners to predict how the decline in, for example, the frog population might affect the ecosystem?
- ◆ The decline in frogs would cause its predators to shift to other prey species. This could result in too much feeding pressure on the other species causing their population to crash. Either another prey species would be selected, or the predator would decline due to lack of food. This, in turn, would lead to a decline in herons. It is possible, also, that the decline in frogs could lead to less pressure on the water boatman population. More water boatmen would eat more algae and the base of the food chain would "shrink." This would mean that fewer species could be supported in the ecosystem.
- ◆ Visit a wetland, draw the area with different species of plants and animals observed on the site. Make your wetland more interesting and lively by adding other species and colouring them.

## 8. Wetland Water Quality

### Specific Objectives

- a. Learner will learn to use specific equipment and materials for measuring water quality
- b. Learners will discover the different conditions that determine the quality of wetlands water

### Materials:

Topographic map, compass, thermometer, colored pencils, paper

### Activity

1. Locate the wetland on your topographic map. Draw the wetlands onto a blank sheet of paper, using the topographic map for reference. (Don't trace the map -the tracing will be much too small). Draw an enlarged picture on a separate piece of paper.
2. Map the flow of water in the wetland. Show the location of any channels, ponds, flowing river or areas of standing water. Use arrows to show the direction of flow.
3. Observe the water flowing through the wetland. Is it moving fast or slow?  
\_\_\_\_\_
4. On your map, color areas where the water is muddy.  
Does the water get less muddy as it flows through the wetland?  
\_\_\_\_\_
5. Look for fine particles on the bottom, especially around vegetation.  
Do you see any sediment that have settled out of the water in the wetlands? \_\_\_\_\_

Color these areas a different color.

6. **Choose five different sites.** Record the following information about each site:

Information	Site 1	Site 2	Site 3	Site 4	Site 5
Water Temperature:					
Cloudiness/Turbidity (suspended sediment particles):					
Color:					
Debris or trash seen:					
Observations of plant and animals (What kinds, how many, behavior, etc.):					

## 9. Wetland Plant Study

**Specific Objectives:** Learners will identify plant species in a wetland

They will discover where various plants grow and why

They will observe and discuss the relationship between plants and animals in the wetland

**Materials:** hand lens, paper, pencil, Plants checklist books by Katy Beaver, containers, meter stick, string, four stakes, crayons, labels, boots, gloves....

1. What percent of the wetland is covered by plants?  
(a) 0-5% (b) 5-25% (c) 25-50% (d) 50-75% (e) 75-95% (f) 95-100%
2. How many different types of plants do you see?
3. Are there any plants living in the middle of the wetland?
4. Are there any plants growing along the shores of the wetland? Take a closer look at one of these plants. Does it have roots? stems? leaves?
5. Are there any plants that seem to be growing out of the water? What parts of these plants are above water; roots, stems, leaves or flowers? What parts are underwater?
6. Are there any plants living completely underwater? Do they have roots? stems? leaves?
7. Use your hand lens to look very carefully at some wetland plants. Draw a detailed picture of a single leaf from five different plants. What pattern is formed by the veins?  
Are the edges of the leaf smooth? Does the stem or leaf have hairs on it? Does the leaf have a stem?
8. Place one of the leaves underneath a sheet of paper and rub crayon lightly over the paper. How does this crayon print compare to your drawing?
9. Look at the underwater stems and leaves of plants. Can you see any insects or other animals on the stems and leaves? Describe them.
10. Mark out a one meter square along the shore with strings and stakes. Count how many kinds of plants are in that area. Estimate percent of coverage of each kind of plant. Estimate percentage of bare ground.
11. Do you think there are any plants you can't see with the naked eye? Collect one container of water from still water and one container from flowing water. Take them back to view under a microscope to find out if there are any plants that you cannot see with the naked eye.



12. Draw a vegetation map of the wetland that shows which plants are most abundant in different parts of the wetland. After the field trip, try to identify the different kinds of plants you found.
13. Take one last look at the wetland. How many different kinds of plants do you see now?

### Illustration of a *Typha Javanica* or Zon in creole



Zon is a common native plant found in coastal wetlands. It has an invasive property as its tubular roots propagate rapidly under water. In well-managed wetlands, Zon is controlled to avoid the potential of the whole wetland system being clogged up. Zon can also be used in craft work.

# 10. Wetland Brainstorming

## Specific Objective:

Learners get to say what they or others think of wetlands and they have the chance to turn negative perception into positive ones

Wetlands are under threat throughout the Seychelles and several examples exist of the problems facing conservation of this important habitat type, as many people still do not understand the values of wetlands.

Below are many ideas that can be generated on the subject of wetlands. Get learners to generate their own list in saying the first word that comes to their mind about wetlands. Use the list below to add to learners' suggestions.

Group the words into positive and negative categories. If there is a wetland in the community get the help of others to organise a wetlands programme to tackle the problems in an attempt to find solutions.

- |                      |                             |                     |
|----------------------|-----------------------------|---------------------|
| 1. Smelly            | 26. Black                   | 51. Oil             |
| 2. Dirty             | 27. Parasite                | 52. Coco yam        |
| 3. Rotten eggs       | 28. Water' table            | 53. Breeding ground |
| 4. Mud skipper       | 29. Useful                  | 54. Yam             |
| 5. Insects           | 30. Trees                   | 55. Ground water    |
| 6. Frogs             | 31. Algae                   | 56. Baskets         |
| 7. Terrapin (mating) | 32. Crocodiles              | 57. Disease         |
| 8. Rushes            | 33. Crops                   | 58. Microbes        |
| 9. Sponges           | 34. Wasps                   | 59. Caecilians      |
| 10. Roosting         | 35. Crabs                   | 60. Endemic Species |
| 11. Natural habitat  | 36. Endangered species      | 61. Turnstone       |
| 12. Moorhen          | 37. Dangerous               | 62. Fauna/flora     |
| 13. Dumping ground   | 38. Safari                  | 63. Education       |
| 14. Fertile          | 39. Waste of space          | 64. Peaceful        |
| 15. Sluice gate      | 40. Ferns                   | 65. Human Being     |
| 16. Cattle           | 41. Unhygienic              | 66. Rodents         |
| 17. Decay            | 42. Eels                    | 67. PUC             |
| 18. Pollution        | 43. Adventure               | 68. Nutrients       |
| 19. Mosquito         | 44. Swiftlets               | 69. Snail           |
| 20. Water lettuce    | 45. Interesting             | 70. Snake           |
| 21. Tilapia          | 46. Slimy                   | 71. Holes           |
| 22. Birds            | 47. Canoeing                | 72. Sewage          |
| 23. Wetlands         | 48. Bats (Sousouri bannann) | 73. Silt            |
| 24. Rubbish dump     | 49. Gourzon                 | 74. People          |
| 25. Wasteland        | 50. Mangrove                | 75. Wildlife        |

The following is a series of activities through various subjects that can help teachers find ways to engage students in appreciating wetlands as a positive learning environment

Through these activities teachers can have a clearer idea of how all lessons are directly or indirectly linked to human interaction with their surrounding environment, thus lead the students to make wise decisions when it comes to wetlands protection.

**PSE -Religion** - Ethics/morality of wetland destruction, Religion-creation stories from different faith, gospel music

**Agriculture** -uses of wetlands for agriculture, medicinal purposes...

**Creative Arts** – Drawing, Pressing flowers and making pictures from them, weaving from marshland plants, Photography, music, poems, storytelling, models of wetlands fauna, plaster casts/papier maché, collages, sculpture

**Mathematic** – Graphs, statistic, data recording sets, venn diagrams, pie charts, ratios, quadrats for vegetation surveys, approximations, estimation symmetry and reflections area, percentages and fractions eg vegetation and water cover or leaf litter,) counting, weighing, measuring

**Languages:** Writing letters to authorities, to polluters, speaking, debating on environmental concerns, persuasion...

**Social Studies** – Spatial distribution, soil type, population count, History of Seychelles wetlands

## 11. Wetlands in Your Community

Wetlands are vital natural habitats for wildlife. They can also be important in the lives of members of the human community.

- ♦ *Ask your learners how local wetlands are used. Have them identify users as well as uses.*

For example, if someone mentions canoeing, users might include families, naturalists, hotels and local canoe clubs. Other uses may include fishing, nature hikes, bird watching, farming or irrigation, etc. Make a list of activities and users on the board.

Discuss how wetlands can be destroyed through **dredging** for harbours and marinas, **filling** in for road and house construction, **draining** for agriculture, and through peat **mining** and **pollution**.

- ♦ *Ask learners how the loss of local wetlands might affect their community.*

They can even do this through a simple community survey asking people about: 1. their knowledge of wetlands values, 2. Their behavior or attitude towards wetland and 3. Their willingness to help protect wetlands.



## Developing an information leaflet

### Specific Objectives:

Teachers can use different elements of the curriculum to produce an interesting piece of work. Learners will produce an information leaflet to tell people about the wetlands and other wildlife in their community.

The activity will help learners develop the following skills: writing, art and design, research and computer skills

Good leaflets produced can be printed and copies distributed to the community, shops, travel tours and hotels. Others can be used in local exhibitions.

### Simple ways to develop the leaflet:

Discuss who the leaflet is for (local people, tourists).

Discuss and identify the most important things you want to tell people about wetlands and other wildlife of the island.

Discuss the need to avoid having too many words.

Discuss the need to include colourful pictures to help people to visualise what the birds or plants or other animals look like.



*An example of children's information leaflet*

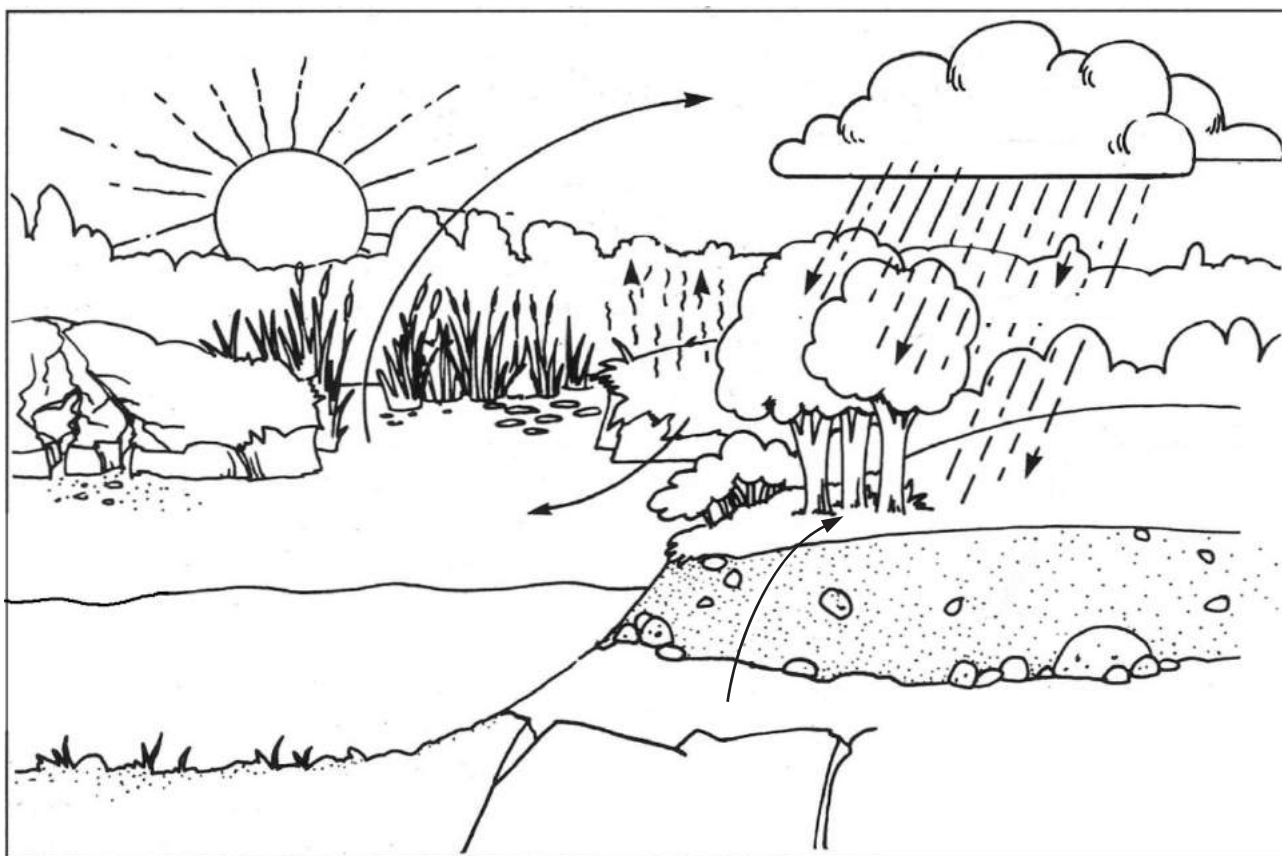
## Section 4 - Activity Sheets

### 1. Water Cycle Words

Match the words in column "a - g" with their definition in column 1-7

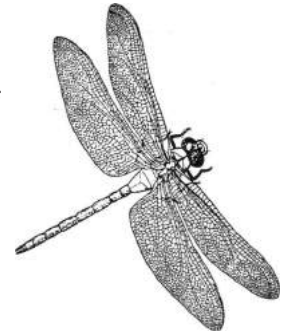
a	precipitation	1	The change of water vapour to a liquid
b	evaporation	2	The process whereby water travels from the earth to the air and back to the earth
c	condensation	3	The release of moisture by living things
d	run-off	4	Water collected below the soil on the bedrock
e	groundwater	5	The change of water from a liquid to a gas
f	transpiration	6	The flow of water from land into a lake
g	the water cycle	7	The flow of water from land into a river or wetland

Now that you understand the water cycle processes, label the diagram with words "a - f"



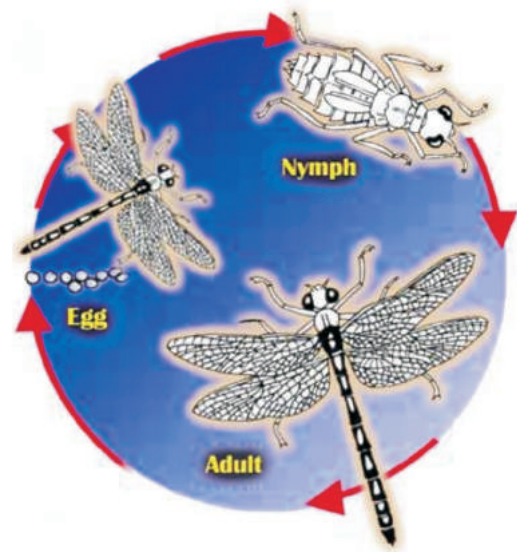
## 2. Life Cycles in a Wetland

Some species of wildlife spend only part of their lives in wetlands. Their life stage determines the habitat in which they live. For example, several types of aquatic insects and amphibians hatch from eggs that are laid in the water. They spend their immature stages in the water, but live on the land or in the air as adults.



**Read below the life cycles of a dragonfly and a frog.**

The **dragonfly** is a familiar and interesting inhabitant of fresh water wetlands. The adult female dragonfly lays her eggs on the submerged stems of wetland plants. When the eggs hatch, aquatic nymphs emerge. Life begins underwater, feeding on other aquatic creatures. When the nymph is ready to become a dragonfly it crawls up the stem of a water plant and emerge out of the water and from the skin. After emerging, the dragonfly's body and wings grow rapidly as it pumps fluids into them.



An **adult frog** spends its life on land. During breeding seasons, the frog comes to a wetland to breed. The female lays the eggs in the water and the male fertilizes them. The eggs hatch into aquatic larvae called tadpoles. Over the next few weeks, the tadpoles grow, develop limbs, lose their tail, and become adult frogs. The adults leave the water and live on the land.

1. Name the stages of the life cycle of a dragonfly in 3 short sentences

1. ....
2. ....
3. ....

2. Draw the life cycle of a frog or any other wetlands animal species that you know.

### 3. Act Up! The situation cards below can be photocopied and cut out

Pick up one of the Situations cards while thinking about how wetlands are threatened and why people endanger or destroy them. By acting out the situations, learners understand what goes on in battles over wetlands protections. We also learn the many sides of the controversies and we can decide where our own priorities lie. In pairs discuss the situation and act it up to defend any of the causes. If you wish you may use laws as part of your argument.

#### **Situation 1:**

Your neighbours at the village decide to fill in the wetland in front of their shoreline to extend their property. You are upset and call a meeting of the villagers in the area.

No one can see anything wrong with the idea and it is up to you to convince them that the wetland serves a valuable purpose. You must let them know that the destruction will affect everyone.

#### **Situation 2:**

You have just purchased a large piece of land on which to build a new apartment block. You are very pleased since the land was sold cheaply due to its poor drainage.

You plan to fill in the wetland and build the apartments. A public meeting is called and an environmental group strongly opposes your plans. Debate the issue.

#### **Situation 3:**

Part of your property includes a small wetland area that backs onto a stream. In hot periods you can't stand the mosquitoes biting so you decide to spray the area with insecticide. A horrified neighbour catches you and gives you a lecture on the effects of insecticides on the wetland, as well as surrounding plant and animal life.

The neighbour points out the other areas in your yard where mosquitoes can breed. You respond to your neighbour's complaints.

#### **Situation 4:**

You have just won first prize from the local garden competition for your beautiful and consistent garden. You are proud and pleased with the results of your hard work and years of dedication.

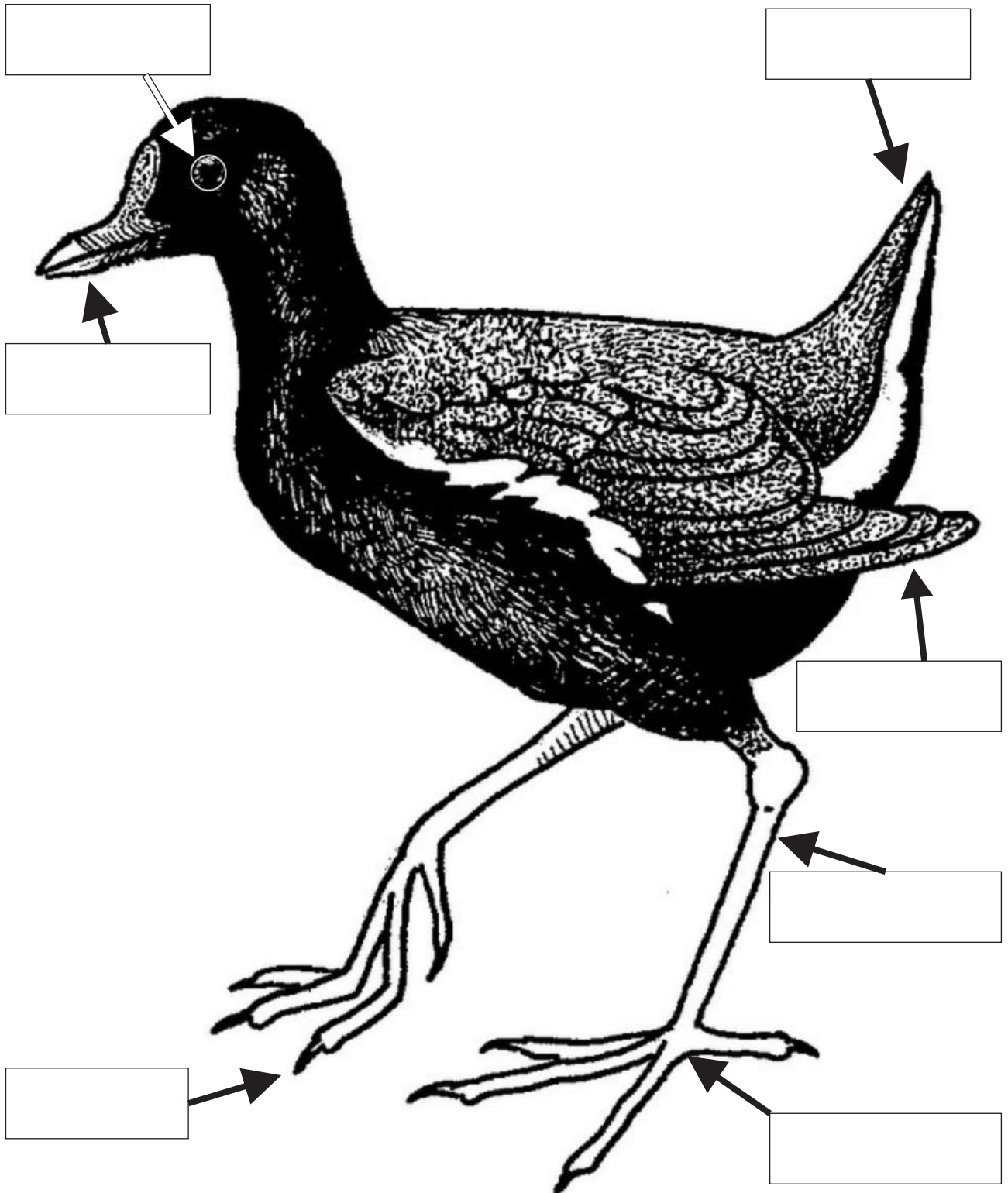
A biologist from a local research station arrives and tells you to pull up the water hyacinth in your garden pond and destroy it because it is a hazard to local wetlands. You don't even know what a wetland is and you don't really care.



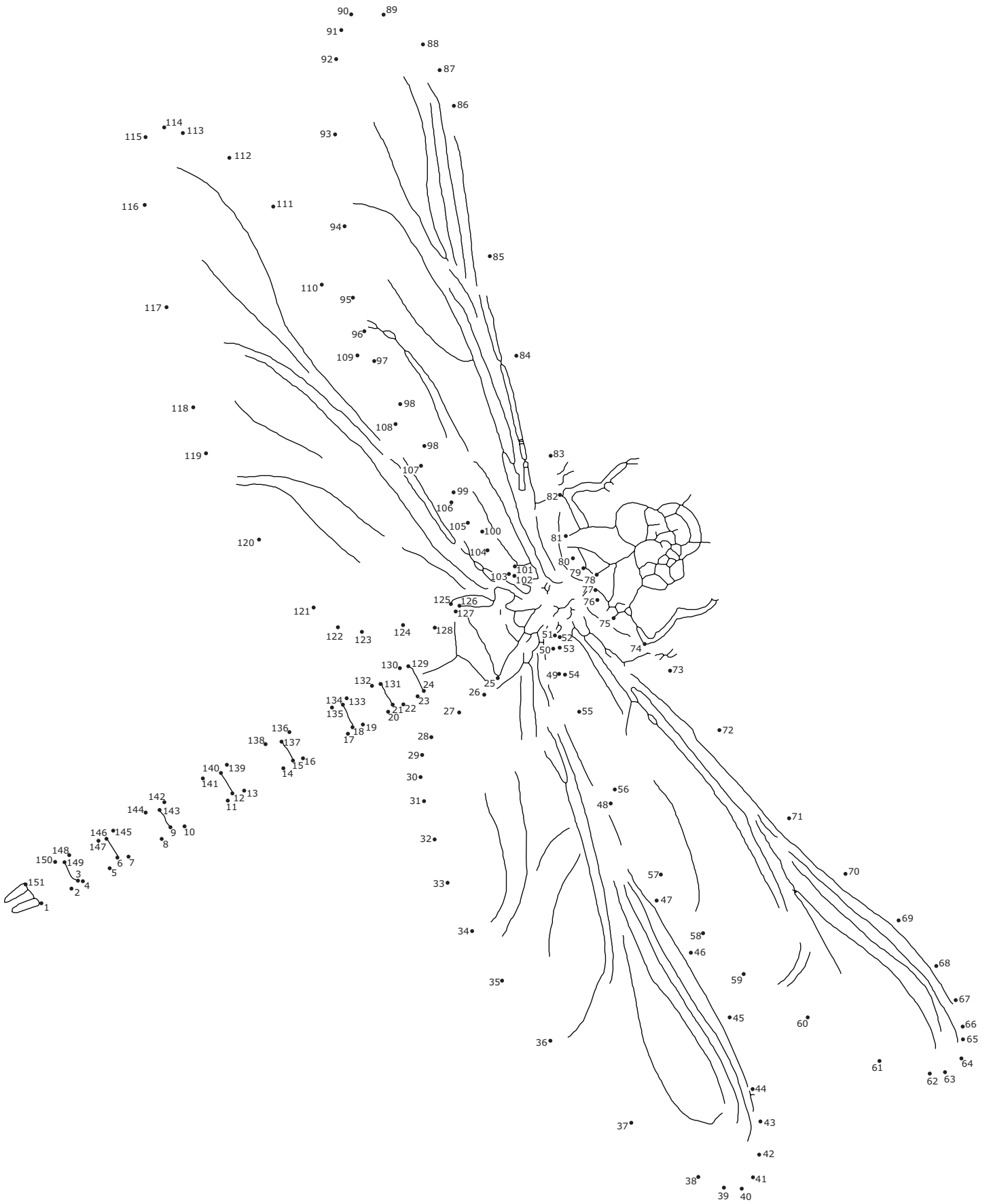
## 4. Name the parts

Label the parts of the Moorhen.

**Tail - Wing - Leg - Beak - Claw - Foot - Eye**

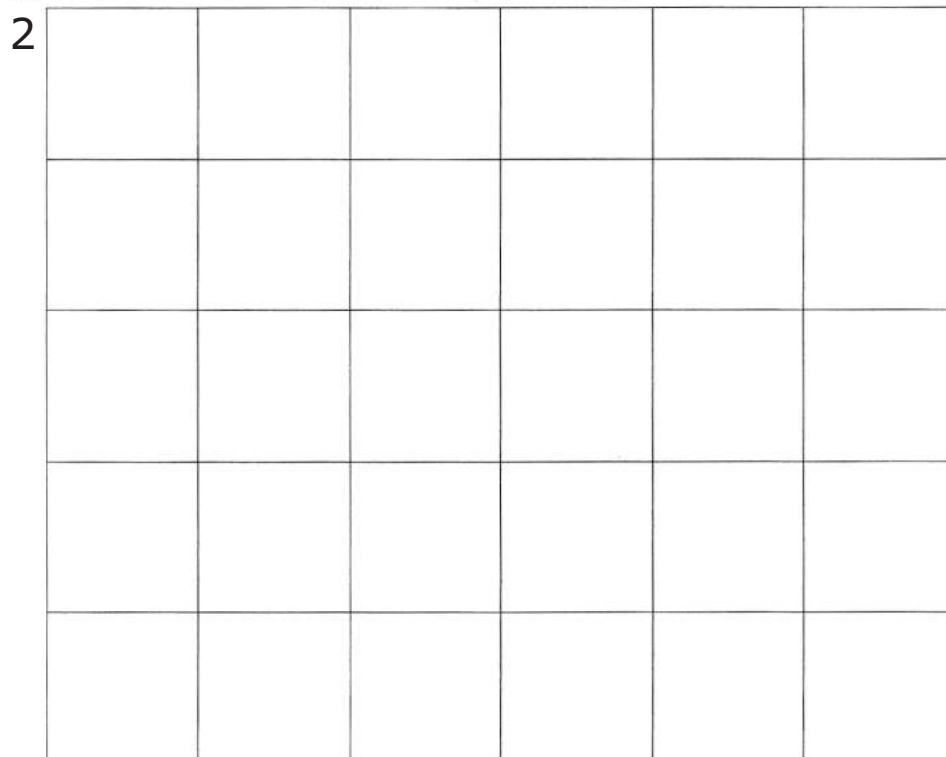
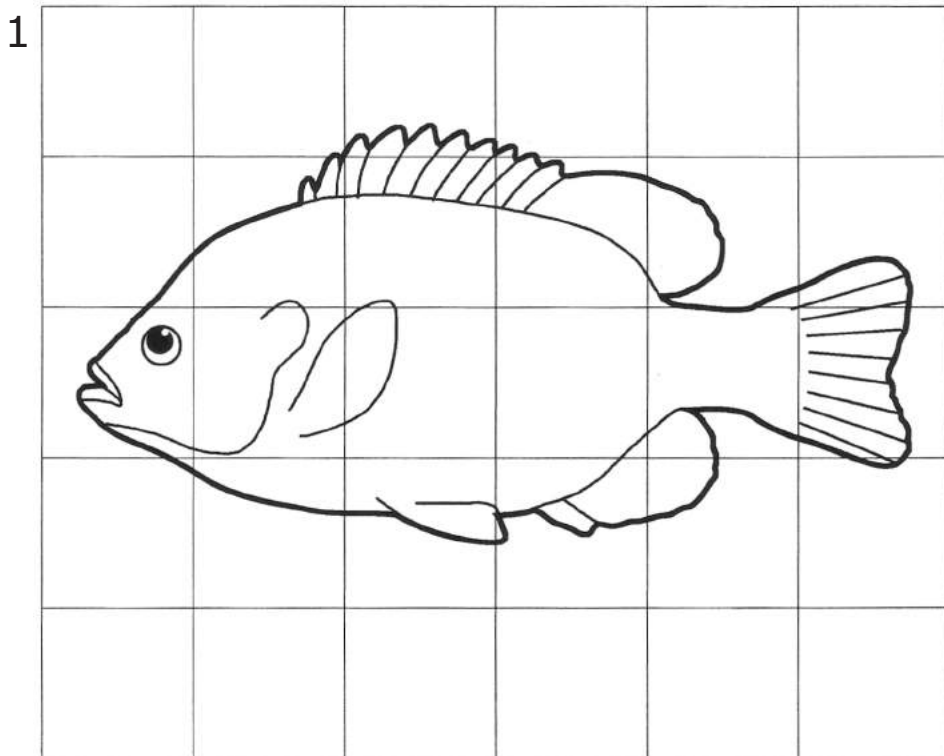


# 5. Connect the dots and name the animal



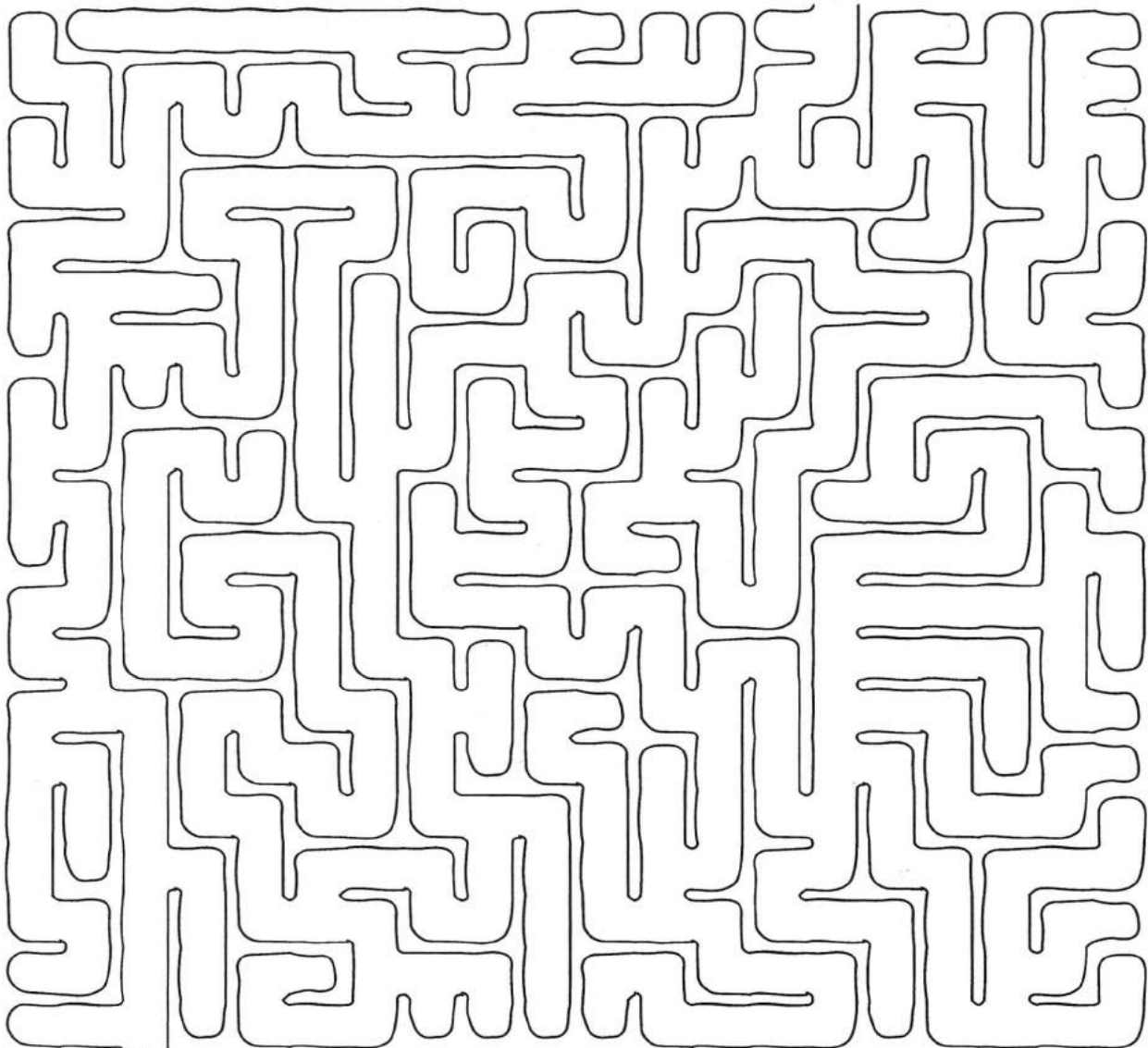
## 6. Be an Artist!

See if you can draw the fish into grid 2 as it is in grid 1



## 7. Wetland Maze

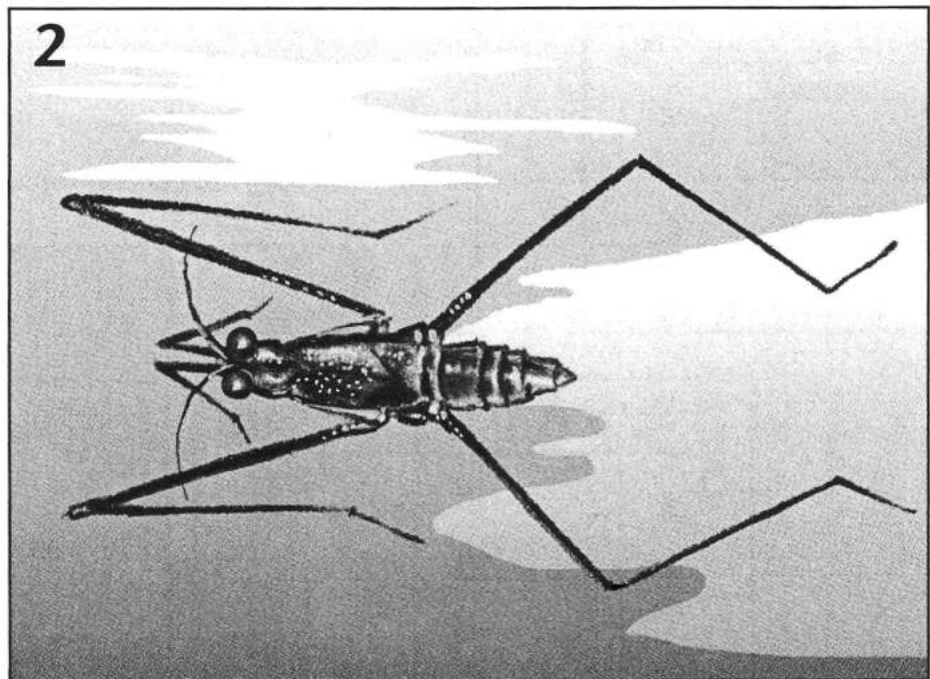
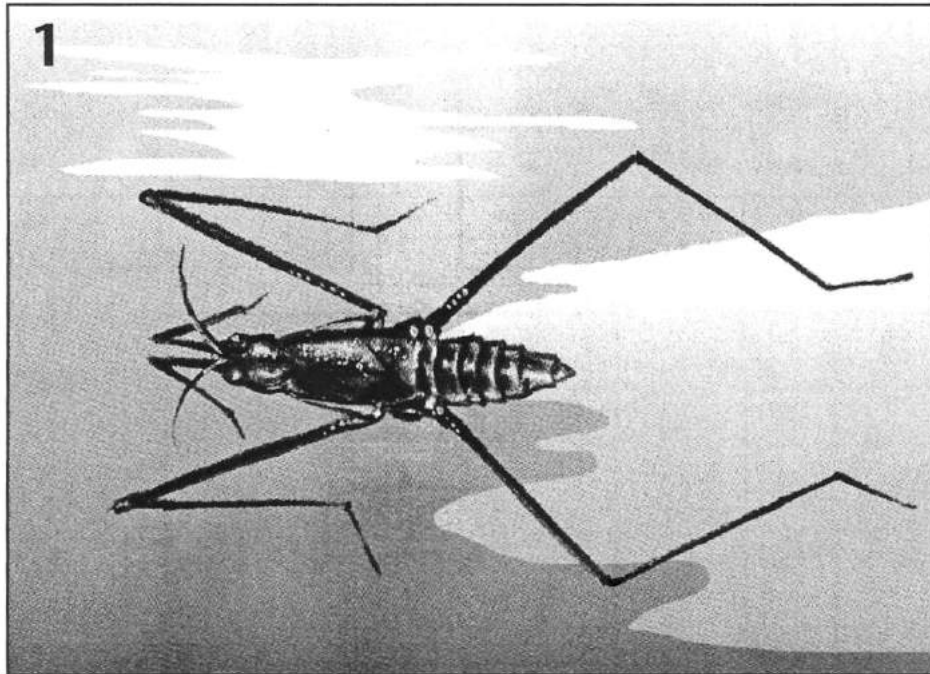
Help the mother frog find her tadpoles






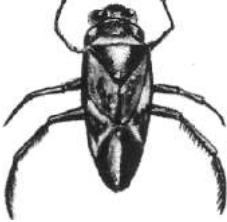





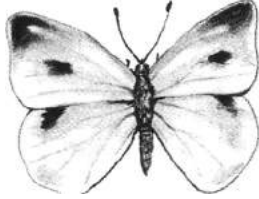
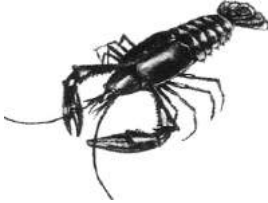
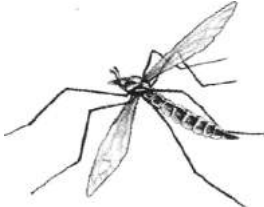
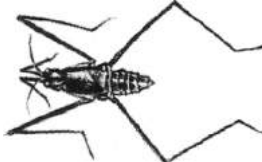

## 8. Spot the Differences

Can you spot at least five differences between the water striders?



# 9. Odd one Out

In each row, circle the creature that is different from the others. Say why.

	A	B	C	D
1				
2				
3				

Try to find the names of the creatures. (See pond life and mini-beast checklists)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

# 10. Water Web

Make food chains by drawing lines with an arrow to point to what eats what in this freshwater habitat



Microscopic water plants (algae)

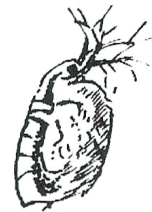
Bird



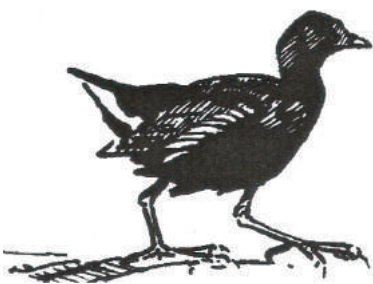
Fish



Floating plants



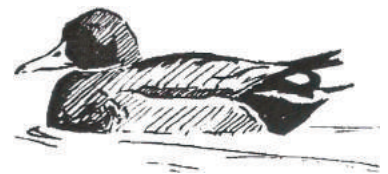
Invertebrate (water flea)



Moorhen



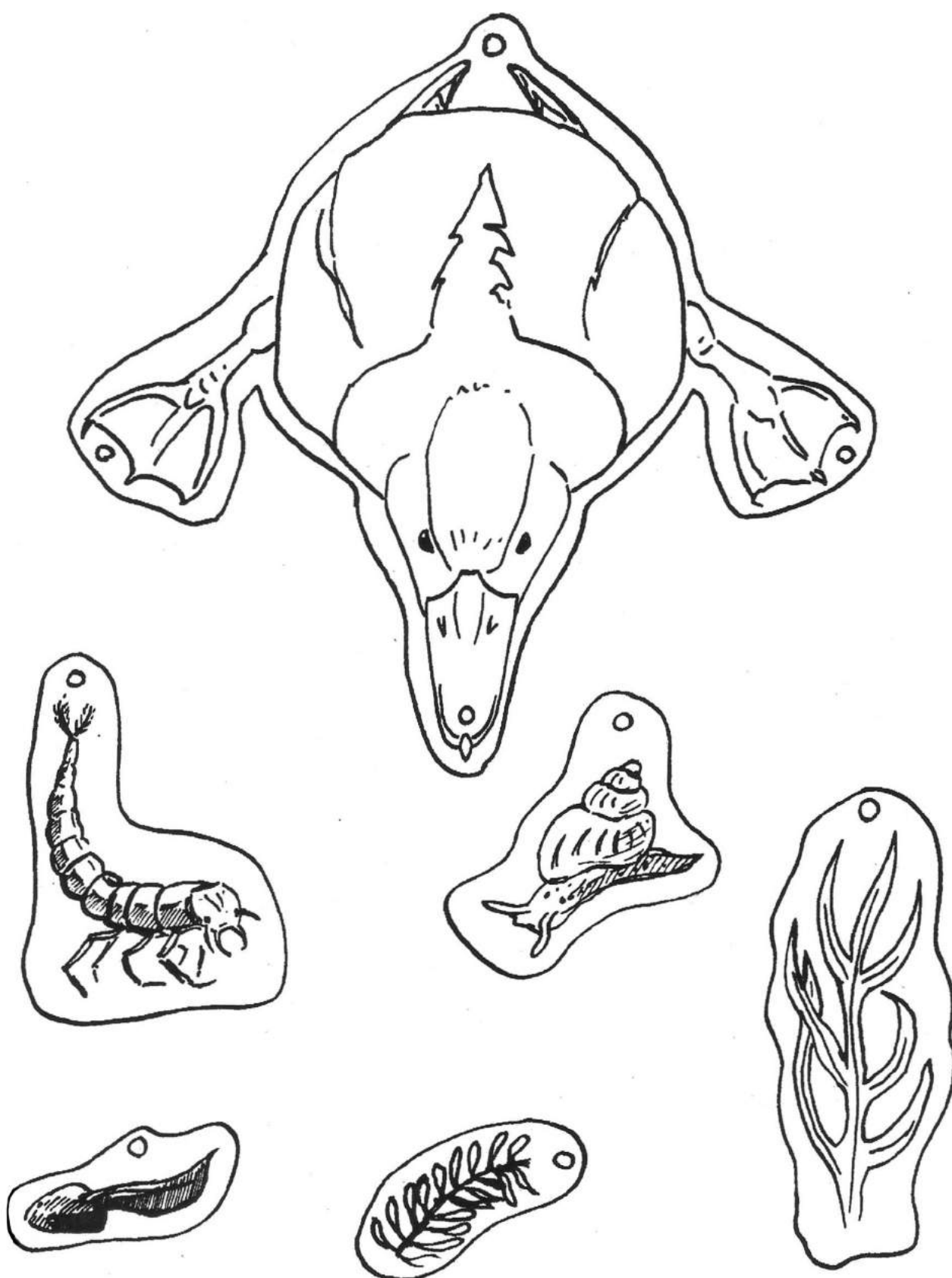
Water beetle



Duck

# 11. Food Chain Mobile

Make a food chain mobile as a reminder of one food chain you have been studying. Colour and cut out each plant and animal.





## 12. Making Words

The crocodile is a large reptile that lives in wetlands in many countries in the world. In the Seychelles history crocodiles lived in our seas and these salt water crocodiles as show in the photograph were named 'Caiman'

Try to make as many words as possible from the letters in the name crocodiles:

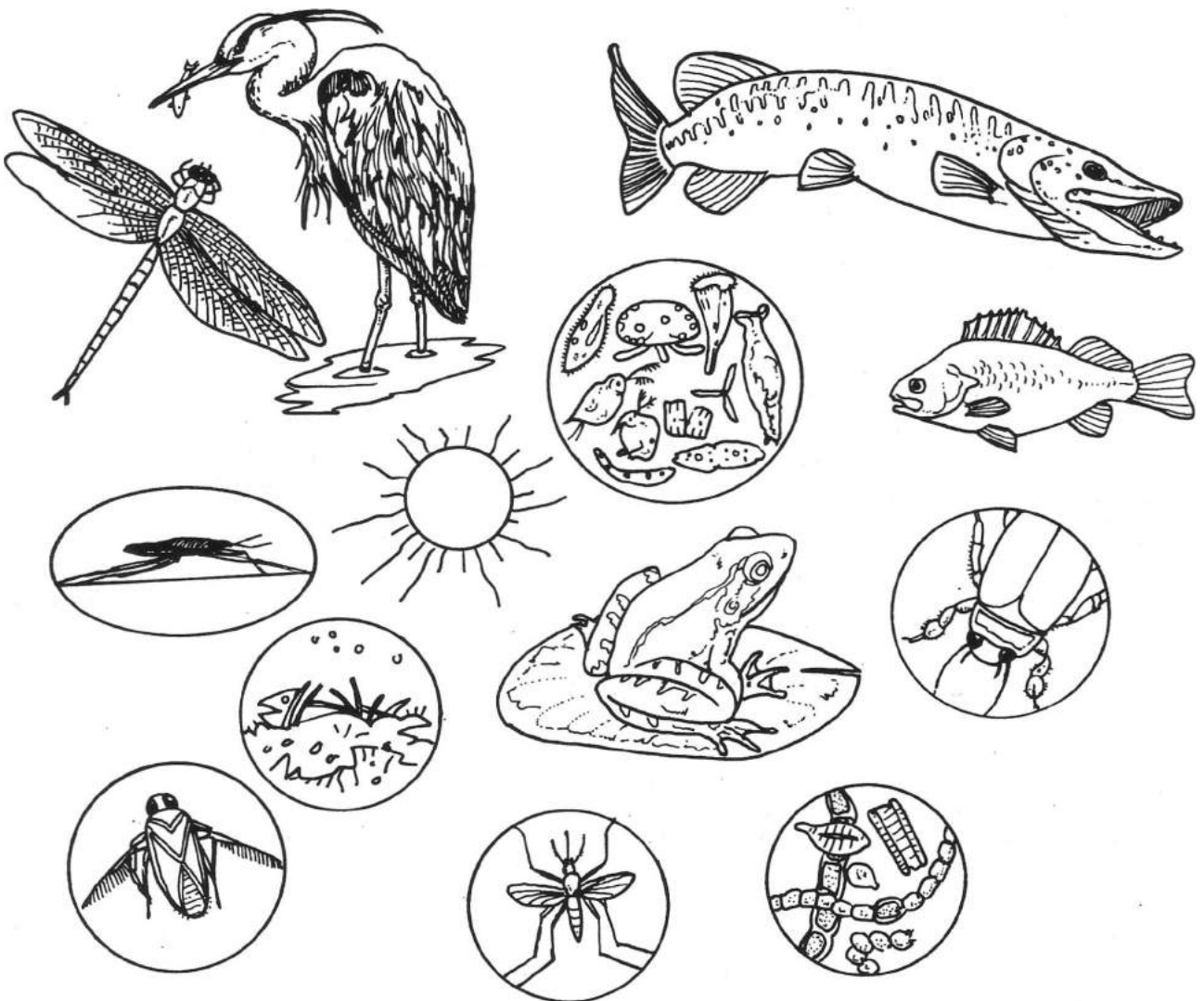


# CROCODILES

# 13. Build your own Food Web

Match the name below with the correct picture. Cut out the pictures and labels, and glue them onto a sheet of paper to form a food web. Use arrows to indicate the direction of energy flow. Remember that some animals eat more than one thing.

sun - algae - fish - water boatman – grey heron - frog - decomposing matter - water strider - mosquito - dragonfly zooplankton - diving beetle - fish



# 14. Unscramble names

Unscramble the following names of wildlife that live in wetlands. When you have solved the six scrambles, write down each letter that is highlighted to solve a mystery word

1. smdkprupei

--	--	--	--	--	--	--	--	--	--



2. rdfleid racb

--	--	--	--	--	--	--	--	--	--



3. megnravos

--	--	--	--	--	--	--	--	--	--



4. noermho

--	--	--	--	--	--	--



5. sihf

--	--	--	--



6. lgaea

--	--	--	--



Now unscramble the highlighted letters and you will find the name of the Seychelles only true fresh water fish hidden in the puzzle

# 15. Crossword

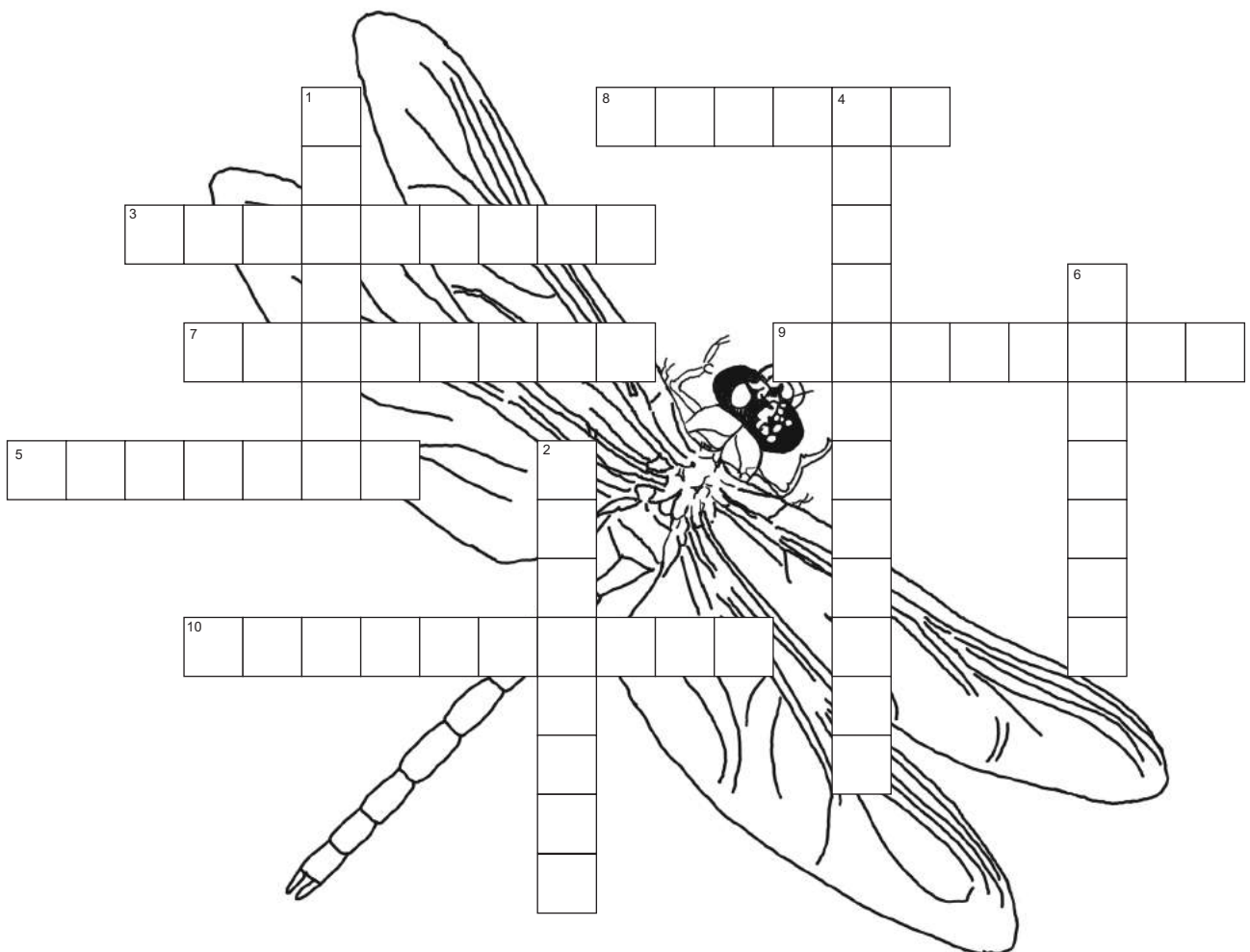
Word puzzles can be used at leisure or during spare time when other work is finished, or be used as a fun break from other types of work.

### Down

1. When something happens to upset the -----of nature in a wetland, the whole ecosystem is affected
2. The ----- of wetlands for farm land is a major problem.
4. The plant in clue number 6 down grows in Seychelles glacia forest and it is the floral emblem of a Canadian Province. Name the province (some extra research is needed here).
6. One example of an insect -eating plant is the ----- plant.

### Across

3. Air and water ----- contribute to the disruption of a balanced ecosystem.
5. Unscramble the following two words to show one way in which plants and animals are connected within an ecosystem: OOFD EWB
7. Fill in the missing word: producer - ----- - decomposer
8. The swarming of insects during hot season is a sign of what activity?
9. Dragonflies eat an insect which can be a nuisance to some wildlife and people. Name this blood-sucking insect.
10. Herbicides, fungicides and insecticides are all different types of what?



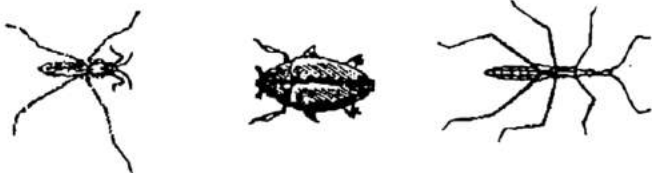

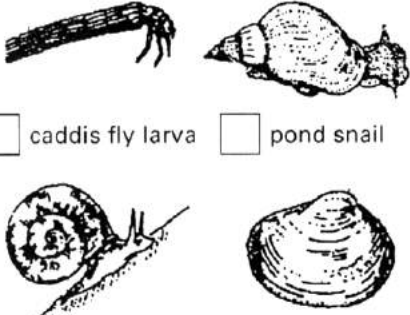
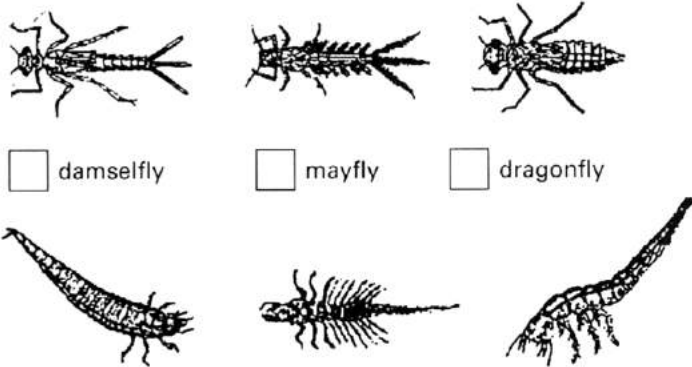
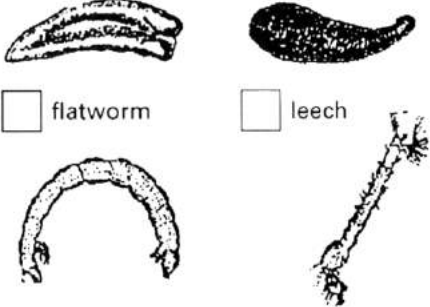





# Section 5 - Checklists

## 1. Pond life checklist

Note in the boxes how many of the wetland creatures you have caught or found on your site. These species are found mainly in fresh water wetlands, but some have also adapted to survive in brackish water.

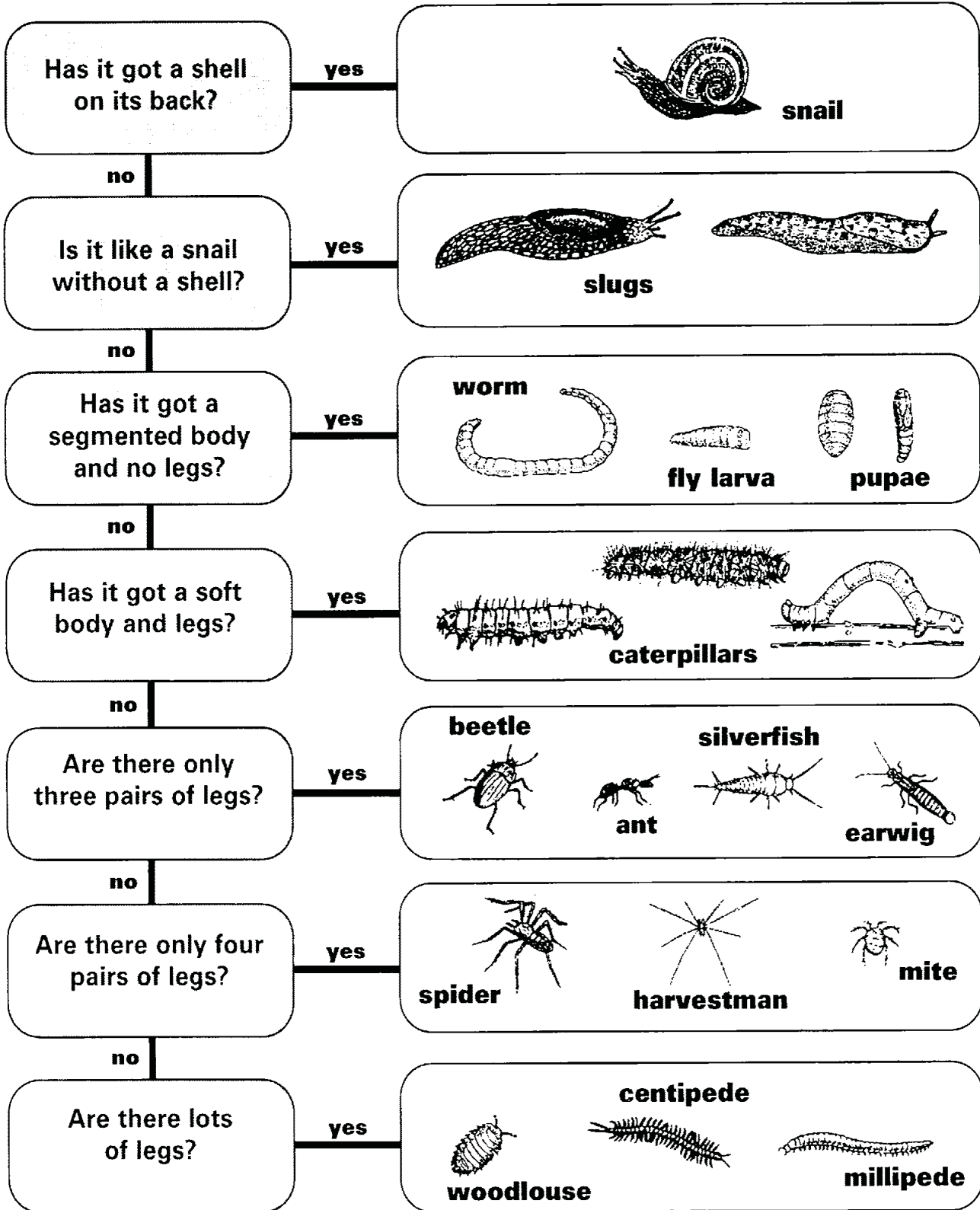
You can use a microscope to identify the smallest species.

<p><b>Found on the surface</b></p>  <p><input type="checkbox"/> pond skater   <input type="checkbox"/> whirligig beetle   <input type="checkbox"/> water measurer</p>	<p><b>Very small</b></p>  <p><input type="checkbox"/> cyclops   <input type="checkbox"/> daphnia   <input type="checkbox"/> water mite</p>
<p><b>With a shell or tube</b></p>  <p><input type="checkbox"/> caddis fly larva   <input type="checkbox"/> pond snail  <input type="checkbox"/> ramshorn snail   <input type="checkbox"/> pea cockle</p>	<p><b>Six legs and a segmented body</b> <i>Nymphs and larvae</i></p>  <p><input type="checkbox"/> damselfly   <input type="checkbox"/> mayfly   <input type="checkbox"/> dragonfly  <input type="checkbox"/> water beetle   <input type="checkbox"/> alderfly   <input type="checkbox"/> great diving beetle</p>
<p><b>No legs</b></p>  <p><input type="checkbox"/> flatworm   <input type="checkbox"/> leech  <input type="checkbox"/> midge larva   <input type="checkbox"/> mosquito larva</p>	<p><b>Six legs and a hard wing case</b></p>  <p><input type="checkbox"/> water scorpion   <input type="checkbox"/> water beetle   <input type="checkbox"/> water boatman</p>
<p><b>Gills, and a swimmer</b></p>  <p><input type="checkbox"/> Killifish/ Gourzon   <input type="checkbox"/> tadpole   <input type="checkbox"/> Mukanbale  <input type="checkbox"/> Mudskipper</p>	<p><b>More than six legs</b></p>  <p><input type="checkbox"/> water louse   <input type="checkbox"/> water shrimp</p>

## 2. Mini-beast Key:

Other mini-beasts are also visible around wetland sites.  
Try to spot some of them using the following key!

### Start here



Adapted from Royal Society for the Protection of Birds, RSPB

### 3. Mangrove species identification checklist

On your site, try to identify any type of Mangroves you find



Mangliye zonn / mangliye zerof



Mangliye pasyans / mangliye ponm



Mangliye fier



Mangliye blan



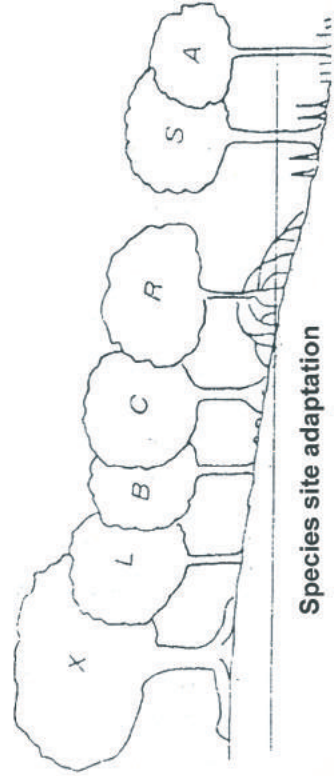
Mangliye lat / Grand manglier



Mangliye pti fey



Mangliye gro pouman / Mangliye oban / Mangliye rouz



Adapted by  
  
 Wildlife Clubs of Seychelles  
 from Mangrove Poster  
 by the Partnership  
 Foundation  
 & Rose-Mary Wise

# 4. Mangrove Habitat Checklist

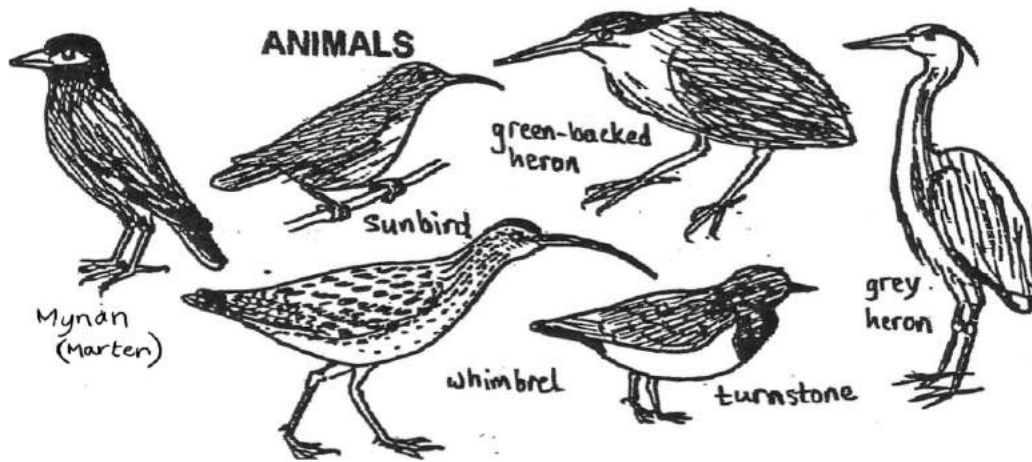
Name \_\_\_\_\_

Date \_\_\_\_\_

**Birds:** Mynah (marten)  Sunbird (kolibri)  Whimbrel (korbizo)

Green-backed heron (mannik)  Grey heron (floranten)  Turnstone (bezros)

Other shorebirds .....

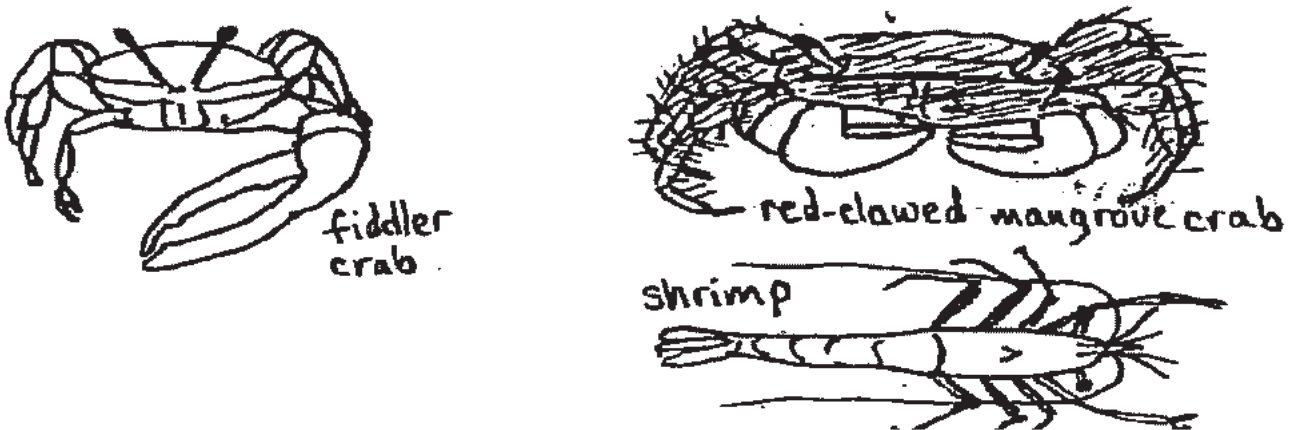


**Animals in shells:** Periwinkle (ti mari)  Mangrove snail (fizo)

Mangrove snail shell with hermit crab (solda)  Fiddler crab (small)  Shrimp

Red-clawed mangrove crab

Other shelled animals.....





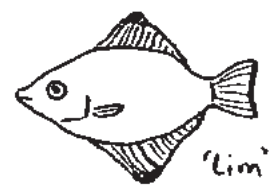
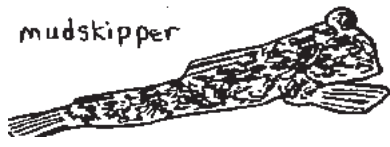
**Fish:** Mudskipper (kabo soter)

Killi fish (Gourzon)

Karp

Tylapia (talafya)

Lim



**Insects:** Spiders

Others: .....

**Plants:** Beach morning glory (patatran)

Mangrove fern (fouzer lanmar)

Derris

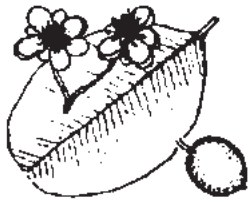


Write or draw other animals and plants found in the mud and around the mangrove habitat:

.....  
.....  
.....  
.....

# 5. Shore life Survey

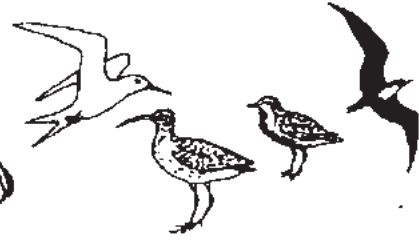
Try to find as many of the following shore life species



Takamaka tree



Crabs (loulou)



Birds (zwazo)



Indian Almond tree (bodanmyen)



Shellfish (kokiy)



Fish (pwason)



Casuarina tree (pye sed)



sea cucumber (banbara)



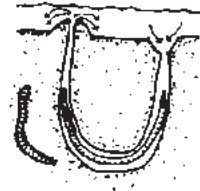
Insects (zensek)



Coconut tree (pye koko)



sea urchin (latannyen)



Worms (ver-d-ter)



Vouloutye



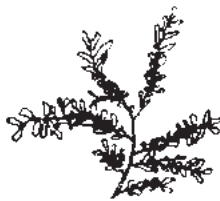
Starfish (zetwal delo sale)



people



Beach morning glory (patatron)



Seaweed (gomon)

How many of these have you spotted down at the beach?



Find a place along the seashore where there are rocks sticking out of the water. Visit at low tide to find some of the amazing plants and animals that are adapted to live in this environment.

Can you find these!



Barnacle (*graban*)

*bigorna*



Chiton (*alang bet*)

Limpet (*bernik*)

Mussel (*mouk*)

Periwinkle (*ti mari*)

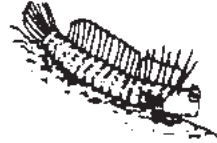


Hermit crab (*solda*)

Sally-light foot crab (*karkasay*)

Brittle star

Starfish (*zetwal delo sale*)



Fan worm

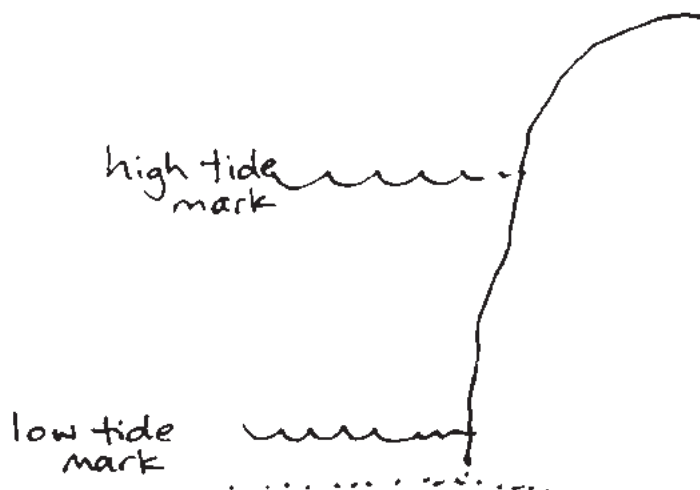
Rock skipper (*kabo soter*)

Seaweed (*gomon*)

Algae on rocks (*gomon*)

Each organism likes to live in a particular 'home' called a "niche". Some like the sun, some like the shade, some like to hide in cracks, some need to stay underwater in rockpools, whereas some can survive out of the water at low tide. Just imagine how hard it is for a seaweed or juicy mollusc to survive drying out under these conditions or being constantly pounded by the waves. It's one of the hardest places on earth for organisms to live.

Find a large rock and study how the animals and plants are arranged vertically. Record their placement on the diagram:



Adapted from Coastal activities book - WCS

## 6. Wetlands Games

Games are important components of one's learning and growing needs. They help children grab and understand concepts more easily and faster. It helps them develop an appreciation for the subject at hand, in this case the special features and characteristics of wetlands and associated wildlife. We encourage teachers and other community group leaders not to miss out on the opportunity of educating the young generation and themselves about our interdependence with nature through these interesting games and mind-teasing activities. For more of these games we recommend the book: 'Superb Seychelles – Environmental Education to capture the imagination' written by RSPB, Nature Seychelles and the Wildlife Clubs of Seychelles.

### Game 1. Food-chain games

Specific Objectives: 1. To understand food chains.

2. To understand the consequences of destroying the plant life (habitat) for the food chains that depend on it

1. In this relay game, students must create wetland food chains faster than their opponents. Divide learners into two or more teams. Tape a large piece of blank paper to different walls (or tree if outdoors) for each team. Have the teams line up in front of the papers. When the leader says 'GO', the first player of each team must race to the paper and write down the name of a wetland plant. The player then rushes back to the line, passes the marker to the next player. The second player must run up and write down the name of an animal that might feed on the plant. The relay continues for two minutes. The team with the longest food chain wins. An example of a list might be: algae, beetle, frog, snake, owl, mosquito, fish, cat...

Remind students that blood-sucking insects and other invertebrates can feed on large predators or that some plants feed on insects.

An alternative to this food chain game could be the following:

2. This is a simple game to reinforce what has been learned about food chains, reinforcing conservation message that when a habitat is destroyed, all the dependent food chains are lost. At least four people can play the game.

#### Instruction

Make picture cards of a food chain and attach them to people's backs. You can make as many food chains as you wish.

An example of a freshwater food chain is:

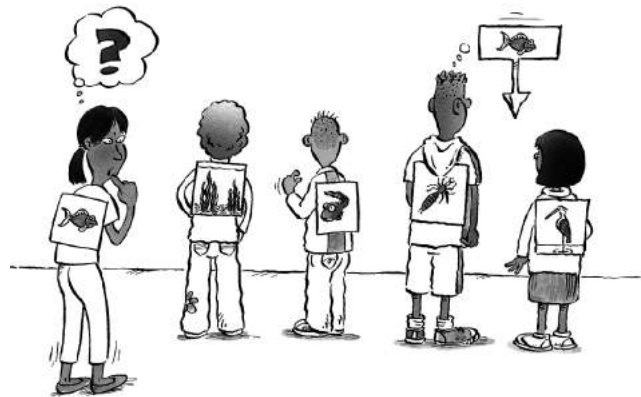
Dead leaves > mosquito larva > fish > grey heron

Example of a marine food chain:

Seagrass > turtle > plankton > shrimp > tropic bird

1. Put a card on each person's back without letting them see it.

2. Tell them they now have to look at each person's card. They have to arrange themselves in



*Adapted from Superb Seychelles*



the correct order of the food chain. They are not allowed to speak, but they can move each other around.

3. Repeat with different food chains for different habitat and discuss interdependency or what will happen if habitats are destroyed.

## Game 2. Why do we need wetlands:

### Specific Objectives:

1. This game demonstrates the importance of wetlands and the need for their Conservation
2. Learners' knowledge on the consequences of destroying a wetland for other uses will be reinforced; loss of the wildlife that is dependent on it.

### Instruction:

Get four or five mats each measuring approximately two meters square, or you could use hoops, sheets of material or rope. If you use cloth, you could paint wetland scenes on each piece. More than 10 participants can play the game. If you wish, make cards illustrating wildlife that use the chosen habitat for each participant.

1. Place the mats around the space being used (at least five metres between each one).
2. Tell the group that each mat represents a wetland. You can give the cards to each person and tell them they are an animal that uses wetlands.
3. Whenever you say 'FLY', they have to fly to another wetland (on migration).
4. Do this three or four times. The next time you say 'fly', remove one of the mats. Tell them that the wetland has been destroyed. Do this again. Any participant who cannot get onto one of the mats is dead. There is a maximum capacity for wetlands (only enough food to support a certain number of species). Repeat a third time. Again, capacity is at a premium. Repeat until there is only one wetland left. When you destroy the final wetland, everybody is dead.
5. Emphasise the need for conserving wetlands, keeping them clean and undisturbed for biodiversity species that are adapted to live there. Destroy the wetlands and you kill the wildlife that rely on them.
6. You can play this game for any habitat. For example, the sea can be affected by pollution or temperature rise caused by climate change.

### Discussion or follow up:

The participants have seen the consequences of habitat loss. Ask if they can think of examples of habitats that have been destroyed near where they live. What wildlife lives or visits there?

What can be done to stop habitat destruction?



*Adapted from Superb Seychelles*

*The followings are other simple games that can be played around wetlands issues reinforcing learning, vocabularies and conservation messages:*

1. **I Spy:** Make up a list of things that students are likely to encounter on their hike to the wetland. Give each student a copy. During the hike, the first one in the group to see one of the items calls out "I spy". Everyone then crosses that item off the list. Make the list as long as you can using many common and moderately common things on it.

2. **Memory:** Play this game after the hike, either on the way back home or back in the classroom. Try to get the students to remember what they saw in the wetland by asking a series of questions, such as: "What did you see that was yellow; pointed; rough; wet; cold? etc.

3. **Nature Alphabet:** The leader names a letter of the alphabet. The next student must name a living or non-living natural object found in a wetland that begins with that letter. The next player must use the last letter of the previous word to name something from a wetland. This continues on through the class until a certain time limit is up.

E.g. Leader starts with letter T - next student says Tree - next one says Estuary – next one says Youngs.

4. **The Picnic:** Have the students sitting in a circle or at their desks. The first one starts off by saying, "I went down to the marsh for a picnic and saw - (e.g. a heron)." The next student in line repeats the same phrase, including what the previous person saw, and then adds his own creature. As the game continues, each student must repeat all the previous sightings and add on another one. The list gets longer until people start to forget. A player who forgets can be thrown out of the game or given penalty points. The game continues until only one person remains who hasn't forgotten any of the list. Names used can be plants and animals as well as non-living things such as earth, rocks and sunshine. Keep the topics related to the wetland.

# Answer Sheets to some activities

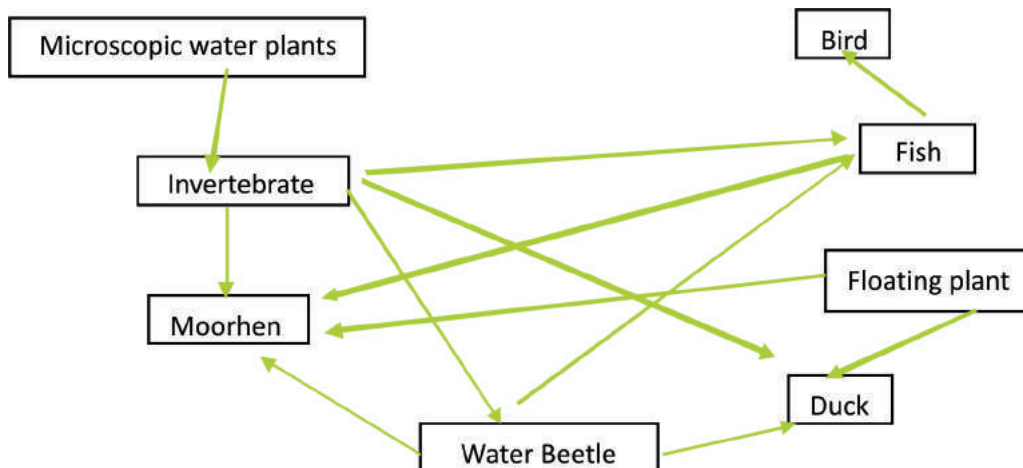
## Activity Sheet 2 – Water Cycle words

a – 6      b – 5      c – 1      d – 7      e – 4      f – 3      g – 2

## Activity Sheet 3 – Stages of the Dragonfly life cycle

1. Female lays eggs on water
2. Nymph grows underwater
3. Adult emerges from nymph skin, hunts for food, grows and mates

## Activity Sheet 11 - Water Web



## Activity Sheet 9 - Odd one out

- 1A, 1B, 1D live in water, 1C does not  
 2A, 2C, 2D are butterflies, 2B is a moth  
 3B, 3C, 3D are insects, 3A is a crayfish

## Activity Sheet 18 - Unscramble words

1. mudskipper    2. Fiddler crab    3. mangroves    4. moorhen    5. fish    6. algae

*Hidden word:* Killifish

## Activity Sheet 19 - Puzzle Problem

### Down

1. Balance    2. Drainage    4. Newfoundland    6. Pitcher

### Across

3. Pollution    5. Foodweb    7. Consumer    8. Mating    9. Mosquito    10. Pesticides

# Useful References

The following references could be useful for further research work and activities around the subject of wetlands.

- ♦ A school Guide to Marine Environmental Education in the Eastern African Region
- ♦ A world in our backyard
- ♦ Conserving the Seychelles Environment 2 – Mangroves, Katy Beaver
- ♦ FAIRBURN INGS – RSPB Nature Reserve, Barry Cooper
- ♦ Marine Education Kit for Seychelles
- ♦ Pond life – Educational GAMES AND Activities for kids of all ages – A pocket naturalist Activity Book
- ♦ Teachers' to Wetlands Activities – Greenwing, Duck Unlimited Canada
- ♦ Tropical Coasts 2008 – Mangroves in a changing Climate; Donald Makintosh, IUCN Asia and Minna Epps, Mangroves For the Future Secretariat
- ♦ Superb Seychelles – Environmental Education to capture the imagination – RSPB, Nature Seychelles, Wildlife Clubs of Seychelles, DICE
- ♦ Why wetlands? Federation of Ontario Naturalists

Other useful resources worth considering for more wetlands educational activities and information:

Internet – based sources

Mangroves For the Future [www.mangrovesforthefuture.org](http://www.mangrovesforthefuture.org)

Ministry of Environment Website [www.ministryofenvironment.org](http://www.ministryofenvironment.org)

RAMSAR [www.ramsar.org](http://www.ramsar.org)

Royal Society for the Protection of Birds, RSPB

Sustainability for Seychelles

Wetlands International [www.wetlandsinternational.org](http://www.wetlandsinternational.org)

Wildlife Clubs of Seychelles Magazines 1 – 10 with varying themes for activities on Biodiversity, Rivers, Wetlands, Nature Trails, Marine life, Water, Climate Change...





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**The guide will be used by school teachers, club leaders and community groups to engage in capacity building and coastal ecosystem awareness for sustainable resource management.**

**ReCoMap** is an Integrated Coastal Zone Management programme implemented in 7 Indian Ocean countries. It is an administrative process for the conservation of coastal zones and the sustainable use of natural and cultural resources, aiming at striking balance between coastal development, economic growth in a sustainable manner where economic development appropriately balance with other environmental and social factors through a set of priority areas to assist communities and institutions including providing substantial funding available for their sustainable use.

ReCoMap is an Integrated Coastal Zone Management initiative for the long-term conservation and sustainable management of coastal ecosystems such as mangroves, coral reefs, wetlands, forests, lakes, rivers, beaches and sandy shores. It provides a platform which brings together the collaboration of different countries, agencies, non-government, government, research institutes and universities, communities and private sectors, in partnership and under a common goal to conserve and sustainably use coastal systems, to sustain human livelihoods, increase resilience and reduce vulnerability among