

REEF Beat



Australian Government

Great Barrier Reef
Marine Park Authority

*Working together today
for a healthier Reef tomorrow*



ACTIVITY BOOK

An initiative of the Great Barrier Reef Marine Park Authority

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INTRODUCTION

Reef Beat – *Working Together Today for a Healthier Reef Tomorrow* is an innovative teaching resource that includes activities and challenges that will inspire students and teachers to take action to improve their school's sustainability. The teaching and learning opportunities are designed to raise student awareness of the world's environmental values and engage and encourage them to explore how they can assist in improving the environment and in particular, the Great Barrier Reef, now and into the future. Students are then encouraged to explain what they have done and why, and describe and evaluate their actions and the outcomes.

The GBRMPA recognises that a hands-on stewardship approach, through building partnerships and engaging with those who rely on the Great Barrier Reef for their lifestyles or livelihoods, is essential to help preserve the Reef's immense social, economic and environmental value. Reef Guardians is a voluntary program that aims to showcase the environmental actions already being undertaken within coastal communities and industries both in the Great Barrier Reef catchment and in the Marine Park. It is an important vehicle for behaviour change and the uptake of practices that can ultimately improve the resilience of the Great Barrier Reef.

Through this resource and its associated activities, we aim to show that everyone everywhere can be a Reef Guardian, by looking after their local environment.

This activity book and the associated posters are also available online on the GBRMPA website (www.gbrmpa.gov.au).



Stewardship – what does this mean?

The theme for Reef Guardians in 2011 is stewardship. Stewardship is about taking care of something that you don't actually own. In the case of Reef Guardians, it is about working together to actively engage in ensuring the long term health and resilience of the Great Barrier Reef. Working together as Reef Guardians of the Reef, we can help to look after and protect our Great Barrier Reef for the future.

Why get involved?

Everyone can participate in being a Reef Guardian! You can start in your own back yard or school yard. All schools can reduce their carbon footprint by creating healthy habitats, caring for their catchments, reducing their resource use, reusing or recycling where possible and conserving water and power where possible. Wherever you are, you can consider the everyday actions that can assist in delivering environmental sustainability. This will help us to look after the Reef too!

How to use this resource

This resource is designed to be used as a teaching tool in classrooms as well as a “how to” guide to Reef Guardianship both within the catchment of the Great Barrier Reef and worldwide. We all have a role to play in looking after the earth. While only Great Barrier Reef Catchment area schools can apply to be Reef Guardians, all schools everywhere can assist through sustainability actions to protect the Reef for the future. In this booklet, each activity is designed to get everyone involved in “taking action”. All activities can be tailored to any year level, by adopting the content and the outcomes to suit your requirements. We have linked the activities into the Australian National Curriculum which defines where they might be completed, but all activities can be done at any learning stage, with any age group.

How does this fit into the curriculum?

This year's *ReefBeat* has been linked to the Australian National Curriculum. We have tried to include all curriculum links in this document, but there are certainly other areas that could be explored. The curriculum may change after printing. Check www.australiancurriculum.edu.au for current content.

We have linked the activities to relevant year levels in the science curriculum, but the posters can be used for any year level as can the ideas – they can be used as the basis of discussion for the stage that you are at with your students.

Sustainability features heavily, as does scientific investigation and this is where all of these activities have their basis. Your school may have a sustainability action plan, a school environmental management plan or a science improvement plan and these topics and activities can fit into any of these.

Reef Guardian Schools Overview

The Great Barrier Reef Marine Park Authority's Reef Guardian Schools program provides students, teachers and their communities with the opportunity to instigate positive change for the environment in the face of emerging threats like impacts of a changing climate. Schools recognise that they can be part of the solution, and can participate in building the resilience of the Reef through habitat rehabilitation, water quality projects, waste minimisation as well as direct emission reductions such as energy saving and transport initiatives.

The key objective of the Reef Guardian Schools program is to create awareness, understanding and appreciation for the Reef and connected ecosystems. This fosters stewardship and creates a community culture towards Reef protection. It is designed to empower students and give them a sense of participation in the bigger picture and the belief that they really can make a positive difference. Participating schools have reported and demonstrated many positive educational, economic, social/cultural and environmental outcomes as a result of student involvement.

Currently in its ninth year, this action-based education program involves more than 60 000 students in over 230 schools across Queensland.

For more information: www.gbrmpa.gov.au

POSTER 1 - Waste watchers

This poster is designed to encourage the individual student to get involved in looking after the environment, by participating in waste management activities. Imagine how much less waste there would be in landfill if every Reef Guardian was a Waste Watcher?



Key messages

- Rain that falls in the catchment eventually flows to the Reef and can take pollutants along with it.
- Ensuring that litter goes into the bin will reduce the amount of rubbish that ends up in drains, making its way to marine environments.
- Every school can refuse, reduce, reuse, and recycle waste in their school.
- All schools can reduce the amount of green waste going to landfill by creating a compost area or starting a worm farm.
- Students can get involved in recycling or reusing plastic bags at school.

Linked activities

- What a waste – what is waste? Why is it so indestructible?
- Solutions to Pollution – which kinds of waste are the worst pollutants? When is waste not bad?
- Reusing stuff – a creative exercise

Science Understanding (Year 4)

Chemical sciences

Natural and processed materials have a range of physical properties; These properties can influence their use

- describing a range of common materials, such as metals or plastics, and their uses
- investigating a particular property over a range of materials
- considering how the properties of materials affect the management of waste or can lead to pollution

I. What a waste

Overview: Students consider what materials are in the rubbish bin. What kind of materials are they? Why are they chosen for their purpose?

Aim: Conduct an in depth investigation into one of these materials – say plastic.

Outcomes: Why is plastic good? Why is it bad? What can we do to reduce our use of it?

What's in the bin?

- Have students collect all of the rubbish from one lunch break, and create a bar graph of the different types of materials used in packaging food.
- Have a discussion about the most common material/s.
- How could you reduce the amount of waste being generated in the school?

Why is plastic such a popular material to make things out of?

- What properties make plastic so multi-purpose?
- What is plastic made out of?
- How much plastic that gets thrown away could be reused or recycled?
- Why is it that plastic is the most common type of debris found in beach clean ups?

Rubbish and the waste stream

- Contact your local council to ask about visiting your local waste transfer station.
- Find out what plastics can be recycled locally and which cannot.
- Find out which materials are the easiest to recycle.
- Can you improve the recycling system at your school?

Reduce your use

- Enact a dramatic role play of a shopping experience where children are presented with a variety of food or products that are wrapped in a variety of materials ie paper/ cardboard/ plastics.



- Children actively choose and interact with each other about the product they would purchase and why based on litter produced.

Science as a Human Endeavour (Year 3)

Use and influence of science

Science knowledge helps people to understand the effect of their actions

- deciding what characteristics make a material a pollutant

2. Solutions to Pollution?

Overview: Students consider which kinds of waste are the worst pollutants.

Aim: Where do you find pollution? Why is it that these waste materials end up in the wrong place? What can we do to ensure that waste ends up where it should?

Outcomes: Identify features of your waste, and determine when waste becomes pollution.

Plastic bag adventures

- Discuss why plastic bags are so often found where they shouldn't be.
- Have students come up with a creative writing short story to describe the life of a plastic bag. For inspiration watch "the majestic plastic bag, a mockumentary" on Youtube.
- After they have written their stories create a mind map to describe how many different NEW uses students might be able to come up with to reuse plastic bags.

Worm farming or reuse of green waste

- Waste does not have to always enter the rubbish bin. Fruit scraps and sandwich crusts and some newspaper can be turned into great food for your school gardens by creating a composting area or starting a worm farm! There are heaps of great options for big and small schools – your local council might even help you get started, just ask!

Science Understanding (Year 4)

Chemical sciences

Natural and processed materials have a range of physical properties; These properties can influence their use

- describing a range of common materials, such as metals and plastics and their uses
- investigating a particular property across a range of materials
- selecting materials for uses based on their properties

3. Reusing stuff – a creative exercise

Overview: Students consider what the properties of waste materials are and what other uses they may have.

Aim: What are some "waste products" that could easily transform to be used in another way?

Outcomes: Identify features of your chosen materials – are they tough? Stretchy? Colourful? Textural? What could you do to transform these items into something else entirely?

Recycled fashion competition

- Collect materials that have different properties, and put them together using tape or a stapler to create something new, like a costume. How creative can your students be? Work in groups if need be and have students present an oral report on their final outfit.

Create a sculpture from reuse materials

- Contrast and compare the qualities of different materials found in the waste stream. What were they originally used for? Could they be used for something else entirely based on their qualities? Can your students create a sculpture based on this waste?

Have an op-shop recycling challenge day

- How can you creatively reuse some materials no longer needed in your house or school? Why not hold/host an op shop swap day at school?



POSTER 2 - Habitat heroes



This poster is designed to encourage groups of students to get engaged in looking after the environment by choosing a habitat at risk and caring for it. Imagine how much biodiversity could be improved if every Reef Guardian could be Habitat Heroes.

Key messages

- Every school yard is a habitat to birds, butterflies and insects.
- All schools can improve the biodiversity of their grounds by planting appropriate native trees.
- Students can get involved in protecting local habitats that are in need of assistance.
- Schools can create a virtual healthy habitat in a classroom if students choose an inaccessible habitat to study (like the Great Barrier Reef).

Linked activities

- Habitat – your local environments.
- Habitat boost – can you improve biodiversity locally?
- Virtual habitat – create an ecosystem in your classroom.

Science Understanding (Year 1)

Biological sciences

Living things live in different places where their needs are met

- exploring different habitats in the local environment such as the beach, bush and backyard
- recognising that different living things live in different places such as land and water
- exploring what happens when habitats change and some living things can no longer have their needs met

I. Habitat – your local environments

Overview: Students consider what habitats are and where they occur in the school or local community and whether they think those areas are natural habitat areas or man-made.

Aim: If you were in charge of your local habitat, what would you do to keep it healthy? Is there anything you could do to improve it? How can you improve biodiversity?

Outcomes: Determine a program of care and maintenance of your local habitat.

What can you do for your local habitat

- Who cares for your local habitats? Is it your local council? Queensland Parks and Wildlife Service? Your groundskeeper? Find out what you can do to keep those habitats healthy. What kind of science/s is/are needed to understand how to keep the habitats healthy? Why not ask a scientist?

What animals live in your local park/garden area

- Spend a lunch break in or near your chosen habitat. Notice all of the different animals living there. Discuss what that animal is doing in the habitat and what its needs in the habitat are. How could you encourage more animals into that habitat?

How do we make it even better – care program

- Have the students come up with some suggested changes that would make the habitat healthier. Compile the suggestions (perhaps with some relevant artwork to compliment your suggestions) and send these ideas to the appropriate person/group that looks after the habitat.

Science Understanding (Year 1)

Biological sciences

Living things have a variety of external features

- identifying common features of plants such as leaves and roots
- describing the use of plant parts for particular purposes such as making food and obtaining water

Science Inquiry Skills

Communicating

- discussing with others what was discovered from an investigation

3. Virtual Habitat

Overview: Students choose a habitat that interests them and creates a representation of their habitat including its important features.

Aim: What is found in your habitat? What does it look like?

Outcomes: Identify features that your habitat has, both biotic and abiotic.

Students create a habitat in a bottle

- Using an empty and cleaned 1.25 litre bottle, carefully cut the top half of the bottle off. Have students create a mini habitat in their bottle using dirt, mulch and some small seedlings (maybe beans/peas). Have students grow their plant in their bottle, and learn the names of all of the features of their plant.

Run tests/investigations on it

- Have students come up with some tests they would like to run on their mini habitats based on their understanding of what plants need to survive. Have students predict-observe-explain their investigations.

Tell a story about their habitat in a bottle

- Have the students come up with a short (written or verbal) discussion or story piece about their plant and the changes it has undergone during the investigation period. Perhaps have the students tell the story from the plant's perspective.

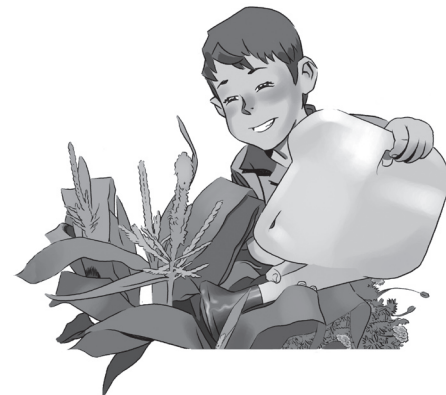
Turn your classroom into a habitat

- Why not turn your classroom into a virtual habitat using artistic creativity to represent the habitat's abiotic and biotic components.



POSTER 3 - Water warriors

This poster is designed to encourage classes/year levels of students to get engaged in looking after the environment by reducing their water use. Imagine how much water would be saved if every Reef Guardian School were Water Warriors.



Key messages

- Water is precious and is limited, so we should all work together to reduce our use.
- All waste water (after treatment) ends up in the ocean.
- Schools can reduce their water consumption by planting water wise gardens.

Linked activities

- Stormwater – natural and man-made aquatic landscape features
- Water, water, everywhere – water use, consumption and reduction
- Water watching – how to measure water use, simple auditing techniques

Science Understanding (Year 1)

Earth and Space Sciences

Observable changes occur in the sky and landscape

- exploring the local environment to identify and describe natural, managed and constructed features

Science Inquiry skills

Use a range of methods to sort information, including drawings and provided tables

- using matching activities, including identifying similar things, odd one out and opposites

I. Stormwater activity

Overview: Students consider where rain collects in the school or local community and whether they think those areas are natural water collecting areas or man-made.

Aim: Where is water stored/channelled in your school – drains, sinks, wetlands, bird bath, down pipes, frog pond, swimming pool etc.

Outcomes: Identify features of man-made and natural water collecting areas. Do some features overlap? How can you tell if an area is natural? What is stormwater?

Natural or man made

- Spend an hour walking around the school (or a section of it) to determine what different types of water based features make up your school environment. Make a list of all the words that come up.
- Back in the classroom create a “natural” and “constructed” board and have students drop the words into each of these categories.
- Discuss what features or materials give clues as to whether the area is natural or constructed.

Journey of a rain drop

- Have students imagine themselves as a rain drop falling from the sky. Where do they fall and what do they encounter? Have students write a short creative writing piece on their raindrop and the adventure it goes on, from the sky to the Great Barrier Reef.

Clean seas for me

- Investigate your schools stormwater drains. Are they clean? If they are the starting point to the journey of rain to the Great Barrier Reef are you creating the cleanest possible start to that water’s journey? Are these natural or constructed features? How do you know? What would have happened to the rain if those drains were not there?

Science Understanding (Year 2)

Earth and Space Sciences

Earth's resources, including water, are used in a variety of ways

- identify earth's resources including water, soil and minerals, and describing how they are used in the school
- describing how a resource such as water is transferred from its source to its point of use
- considering what might happen to humans if there were a change in a familiar available resource such as water
- identifying actions at school such as turning off dripping taps, that can conserve resources

Communicating

- discussing with others what was discovered from an investigation

2. Water, water, everywhere activity

Overview: Students look at where water is used in the school and if consumption can be reduced.

Aim: Take a tour of the school to see where water is used in the grounds. Identify ways to reduce this use.

Outcomes: Develop water wise gardening.

Water detectives

- Divide the school into sections and give small groups of (supervised) students the challenge of investigating where water is used in the school. Have students report back to the class on their findings.
- Have students identify, based on their findings, where the most water in the school is used, and have them come up with some ideas on where it could be reduced.
- Have students develop a suite of persuasive posters that could be positioned in areas where water use occurs to try and reduce water use.
- Have students present some of their ideas on parade.

Science as a Human Endeavour (Year 2)

Use and influence of science

People use science in their daily lives, including when caring for their environment and living things

- monitoring information about the environment and Earth's resources, such as rainfall, water levels and temperature
- identifying the ways humans manage and protect resources, such as reducing waste and caring for water supplies

3. Water watching

Overview: Students identify where water is coming from and going to and how/what they might measure to determine use/waste (simple water auditing techniques).

Aim: School wide audit of water consumption.

Outcome: Tour the school buildings and record where water is used. Discover how liquids are measured. Figure out how you would measure how much water is used.

Water investigations

- Predict, observe and explain the actual use of water in certain buildings eg. the toilet block.
- Create a bar graph of water use around the school where water is used most.
- Have an ongoing update of water use and which area/ group has been best at reducing their use (you could have a boys vs girls toilets challenge).

Water police

- Have students investigate where their water comes from, and where it goes to.
- Have students monitor rainfall for a month at school. Discuss where the rain in your school goes to.
- Have students come up with some slogans for reducing wasting water.

POSTER 4 - Energy smart

This poster is designed to encourage the whole school to get engaged in looking after the environment by participating in power saving activities. Imagine how much less power would be used if all Reef Guardians could be Energy Smart.



Key messages

- Every school can find ways to reduce power consumption.
- Students can get involved in saving power at school and at home.
- Schools can find out about sustainable energy sources and green power.

Linked activities

- Power monitors / energy auditing
- Catch phrases for power consumption reduction – climate heroes
- Sustainable sources of energy

Science Understanding (Year 6)

Physical Sciences

Energy from a variety of sources can be used to generate electricity

- investigating how moving air and water can turn turbines to generate electricity

Use and influence of science

Scientific understandings, discoveries and inventions are used to solve problems that directly affect peoples' lives

- investigating how electrical energy is generated in Australia and around the world

I. Power monitors

Overview: Students consider where power comes from and how it is used both within their classroom and in the school, and investigate/discuss ways that this consumption can be reduced.

Aim: What appliances do you have in your classroom? What uses power?

Outcome: Where is your energy produced? How do you use it at school?

Power up

- Research your local power provider and find out more about where your power comes from.
- Back in the classroom create a diagram of the process of generating power.
- Discuss this process and its effect on the environment.

Power down

- Have a tour of your buildings and work out the number of appliances in your classroom or the building where your classroom is.
- Discuss the use of these appliances and come up with some strategies to reduce their use.
- Put these strategies into place and encourage other classes to participate too.

Science Understanding (Year 6)

Physical Sciences

Energy from a variety of sources can be used to generate electricity

- investigating the use of solar panels

2. Climate heroes

Overview: Students consider which kinds of energy production are the worst pollutants?

Aim: How can we produce energy without carbon emissions?

Outcomes: Students consider solar power if it is used in their school, and if that would be a suitable form of alternative energy production.

Using the sun as an energy source

- Does your school have solar panels?
- Create a solar oven to look at using the sun as an energy source.
- Work out how much power your school uses and using that figure, how many solar cells you would need to power the school.

Science Understanding (Year 6)

Physical Sciences

Energy from a variety of sources can be used to generate electricity

- considering whether an energy source is sustainable

Use and influence of science

Scientific knowledge is used to inform personal and community decisions

- considering how personal and community choices influence our sustainable sources of energy

3. Sustainable energy

Overview: Students describe how energy can be generated sustainably.

Aim: Students discover if sustainable energy could power their school.

Outcome: Students experience a range of ways of finding information and ideas, including internet research.

Sustainable energy options

- Find out what kinds of sustainable power options exist, including wind power, wave power, geothermal power and others and make a list of these options.
- Have small groups choose one of these forms of alternative energy, and research more about it.
- Have students develop a poster on their chosen form of alternative energy, and present their findings to the class including a recommendation as to whether your region would be suitable to support this form of energy production.



POSTER 5 - Wetland warriors

This poster is designed to encourage your school to work in partnership with your local environmental organisations to look after the environment by caring for a local wetland ecosystem. It could be a lake, creek, billabong, beach, stormwater drain, river, estuary, swamp or pond. Imagine how many wetlands could be improved if all Reef Guardians were Wetland Warriors?



Key messages

- Wetlands provide a habitat for many fish, prawns and seafood. In fact, around 75 per cent of commercially caught species spend part of their lifecycle in a wetland.
- Keeping wetlands healthy helps improve water quality on the Reef.
- Students can get involved in helping a local wetland by working in partnership with their local council, Landcare or catchment group.
- Schools can study a wetland in or near your school – like a stormwater drain or a pond – they are wetlands too!

Linked activities

- What is in a wetland? – Classification and food webs
- Who eats who? - Create a wetland in a container
- Wetlands importance in the landscape - Catchment management mapping activity
- Wetland warriors – Restoration of a local wetland

Science Understanding (Year 7)

Biological sciences

There are differences within and between groups of organisms; classification helps organise this diversity

- considering the reasons for classifying such as identification and communication
- grouping a variety of organisms on the basis of similarities and differences in particular features
- considering how biological classifications have changed over time
- classifying using hierarchical systems such as kingdom, phylum, class, order, family, genus, species
- using scientific conventions for naming species
- using provided keys to identify organisms surveyed in a local habitat

I. What is in a wetland?

Overview: Students consider what wetlands are and where they are found.

Aims: What are some natural and constructed wetlands you have around your local area?

What plants and animals do you find in them? What features make them similar?

What features make them different?

Outcomes: Identify features of the wetlands – what do animals and plants need to survive? Why are they important?
What happens to living things when their needs are not met?

Similar and different

- Spend an hour walking around your school (or a section of it) to determine what areas hold water, either permanently or temporarily, when it rains. Discuss what different features make a wetland. Compare these areas with other wetlands found in your local area, or more famous wetlands (research, research!).
- Back in the classroom create a “similar” and “different” board and have students drop the words relating to features into each of these categories.
- Discuss what features or materials give clues as to whether the area is natural or constructed.

Create a key to your local wetland bugs or birds

- Choose six (or as many as you like) of the students’ favourite wetland animals.
- Come up with a list of features that each animal has.
- Use these features to differentiate between animals – and use this differentiation to create a dichotomous key.

- Once students have created their keys, find out the scientific names of their chosen six animals. Try and have students name (at least one animal) using the hierarchical system of kingdom, phylum, class, order, family, genus, species.

Wetland food web

- Spend an hour at a wetland to determine what different types of animals and plants make up your wetland environment. Make a list of all the animals and plants that come up.
- Back in the classroom create a word wall or collage of all of these words.
- Using a double sided drawing or picture of each animal or plant, create a three dimensional food web using wool or string to connect food pathways (create holes using a hole punch).

Science Understanding (Year 7)

Biological sciences

Interactions between organisms can be described in terms of food chains and food webs; human activity can affect these interactions

- using food chains to show feeding relationships in a habitat
- constructing and interpreting food webs to show relationships between organisms in an environment
- classifying organisms of an environment according to their position in a food chain
- recognising the role of micro organisms within food chains and food webs
- investigating the effect of human activity on local habitats, such as deforestation, agriculture or the introduction of new species
- exploring how living things can cause changes to their environment and impact other living things, such as the effect of cane toads
- researching specific examples of human activity, such as the use of fire by traditional Aboriginal people and the effects of palm oil harvesting in Sumatra and Borneo

2. Who eats who?

Overview: Students consider what kind of food chains and food webs exist in wetlands and represent an example of a wetland food chain in miniature – in a container!

Aim: **Who eats who in a wetland? From microbes to megafauna – create linkages in these areas and describe what happens if these links break down.**

Outcomes: Students should be able to describe what would happen to their ecosystem if different human impacts occurred to their system.

A world without micro organisms

- Micro organisms in wetlands have the important roles of being either a primary producer of energy or a decomposer of materials. Without these two roles, the wetland ecosystem would collapse quickly. Give students scenarios that might have either of these roles effected (eg a new virus wipes out the microbes- or there is a chemical spill that kills microbes) and have them consider what the flow-on effects might be.

Who eats who in wetlands

- Have students investigate the insect world of your local wetland to discover what kind of bugs are there. Determine what role they have in the ecosystem based on what they eat and what eats them. What would happen to these animals if humans have an impact on their wetland? Discuss a few possible scenarios.

Wetland in a bottle

- Have students study simple food chains and food webs (see above). Develop a representative food chain, and have students represent this in miniature in a container. Open the container and add dirt/mud, plants and any other items that might be found in a wetland. You might wish for students to draw this instead as a cross section of the wetland. Have students present their wetland to the class or to a small group – describing using appropriate language the different elements that are represented in their mini wetland. Encourage students to describe the processes required and the different elements of the possible food chains that might exist – including the sun as the initial energy source.

Science Understanding (Year 7)

Earth and space sciences

Water is an important resource that cycles through the environment

- considering the water cycle in terms of changes of state of water
- investigating factors that influence the water cycle in nature
- exploring how human management of water impacts on the water cycle

Nature and development of science

Science knowledge can develop through collaboration and connecting ideas across the disciplines of science

- considering how water use and management relies on knowledge from different areas of science, and involves the application of technology
- identifying the contributions of Australian scientists to the study of human impact on environments and to local environmental management projects

3. Wetlands' importance in the landscape

Overview: Students investigate the roles their chosen wetland plays in the local environment/catchment.

Aim: Students find out what roles their chosen wetland plays in the local environment/catchment.

Outcome: Students investigate water cycles and begin mapping connectivity.

Water use and management

- Find out who manages water in your catchment – both the water you drink, the water you swim in, the water you go fishing in and the water that the environment needs to prosper. Are they all managed by the same organisation?

Wetlands in the picture

- Create a water cycle map/visual representation for your local area. Discuss or describe how water moves through the cycle and what it encounters along the way. What role/s do wetlands play in the bigger picture of water quality?

Science Understanding (Year 7)

Use and influence of science

Science and technology contribute to finding solutions to a range of contemporary issues; these solutions may impact on other areas of society and involve ethical considerations

- considering issues relating to the use and management of water within a community
- considering how human activity in the community can have positive and negative effects of the sustainability of ecosystems

Use and influence of science

People use understanding and skills from across the disciplines of science in their occupations

- recognising that water management plays a role in areas such as farming, land management and gardening

4. Wetlands warriors

Overview: Students discuss management of wetlands and who is involved.

Aim: How do we keep wetlands healthy for the future?

Outcome: Actively participate in the restoration of a local wetland.

Who is managing this wetland?

- Students investigate (in pairs or small groups) – what organisations or agencies are responsible for local ecosystems (or your chosen wetland), and what types of jobs/occupations are involved in maintaining this ecosystem. Students may then develop a management plan for this ecosystem, taking into consideration the community wishes and issues or impacts relating to the ecosystem.

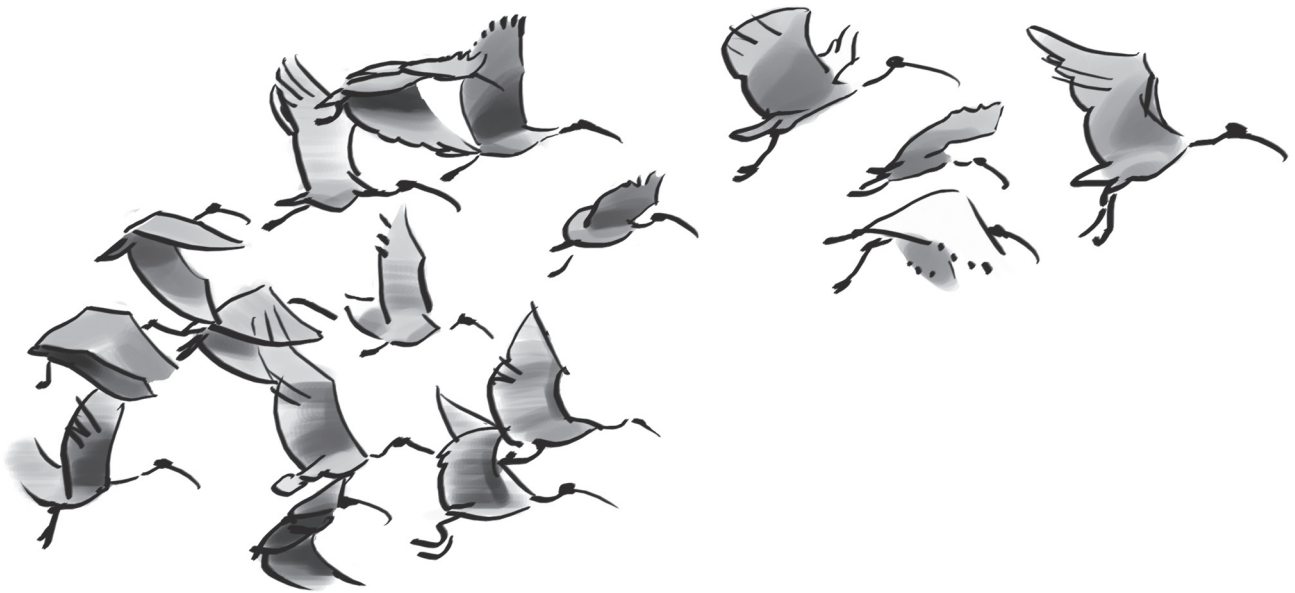


Humans and wetlands

- Create a futures wheel for your chosen wetland to have students come up with possible futures for your ecosystem. Consider human impacts from both a negative and positive perspective ie what happens if we intervene and start looking after the wetland? What happens if we don't? How do humans impact this system positively and how do they impact it negatively? How can we ensure a sustainable future for this ecosystem?

What can I do to help my local wetlands?

- Students can consider what direct effect they can have on their wetland. Both positive and negative. How could you and your students increase the positive effects that you have on that ecosystem? Could you plant trees? Start a waste management program? Work with a community group to restore its ecological functions?



POSTER 6 - Farmers and Graziers

This poster is designed to encourage your school to investigate your local agricultural land uses, and to get involved in looking after the environment by participating in caring for your catchment. Everyone can participate in effective land management – how can you help your garden, backyard or schoolyard or farm to be more sustainable?



Key messages

- We need farmers and graziers to grow crops and raise animals for our food.
- There are many sustainable practices occurring across the Great Barrier Reef catchment.
- Land management is an activity that everyone can be involved in, in your back yard or school yard.
- You can practice good land management in your school in your vegetable patch or garden beds or native forests in your school.

Linked activities

- Land management activity
- Sustainable farming practices
- Practice farming sustainably

Science Understanding (Year 7)

Biological sciences

Interactions between organisms can be described in terms of food chains and food webs; human activity can affect these interactions

- investigating the effect of human activity on local habitats, such as deforestation agriculture or the introduction of new species

I. Land management activity

Overview: Students consider what crops or animals are farmed / grazed in their local area (or regional area) and what sort of land management practices are used.

Aims: What plants and animals are supported by good land management?

Outcomes: What land use activities (agricultural or all activities) would you identify in your local area if you saw it from above? Can you translate this onto a map of local land use?

Map your school and the gardens/plants that you have within your grounds

- What kinds of gardens do you have in your school? On a small, medium or large scale, map your school land uses/gardens and identify locations that can/do create habitat for animals in your school. What areas could you potentially restore or make-over to increase biodiversity in your school grounds? Do you need to remove some weeds? Could you develop a native garden to encourage birds to visit?

Map your local catchment and the land uses that fall within that area

- Get hold of a map of your local area – you could use an online mapping tool if your local council or library does not have a topographic map. Have students (using tracing paper over the top of the map) determine the boundaries of the catchment area, shade in different land uses, and create a key to those uses on the side of the map. Have students come up with their own opinions on what affect they think these land uses have on local habitats. What sorts of land management practices are in place to mitigate these impacts?

How can your local area support biodiversity

- Using your land use map (see above) determine (and map) some ideas and strategies to assist local wildlife. Can you find ways to ensure more sustainable futures for populations?

Science as a Human Endeavour (Year 7)

Use and influence of science

People use understanding and skills from across the disciplines of science in their occupations

- recognising that water management plays a role in areas such as farming, land management and gardening

2. Sustainable farming practices

Overview: Students consider how water and fertilisers are used in local farming areas.

Aim: Discover water management as it pertains to farming.

Outcomes: Identify practices that would assist in the reduction of water use on farms or in your school.

Create a future for farming practices

- Develop a futures wheel to determine the future of farming in your local area. What sorts of sustainable options are available for farmers to be better land managers? What kind of practices could/should be put into place to ensure a sustainable future? Can you find out more about locally sustainable practices?

Be water wise in the garden

- Find water wise options for your school gardens. You could install or create trickle feed watering systems or simply find plants that are suitable to grow that don't require a lot of water.

Water recycling

- Create a garden bed underneath or next to your handwashing station or bubbler area. Could you use some of the water from this to water the garden? In what other ways could you save water around school?

Water management and farming

- Have a look at different methods for watering crops. Are there some methods that use less water? Do some farmers use mulch as a way to reduce water loss? Find out more about your local farms, and their water management practices.

Science Understanding (Year 1)

Biological sciences

Living things have a variety of external features

- identifying common features of plants such as leaves and roots
- describing the use of plant parts for particular purposes such as making food and obtaining water

3. Practice farming sustainably

Overview: Students consider what types of plants grow best in their local conditions and also investigate the different seasons to plant different things.

Aim: What yummy foods can you grow in your garden?

Outcome: Students grow a range of fruits or vegetables and identify features of these plants as well as the best ways to grow them.

Sustainable vegie gardening in your school

- Dig into gardening! Have a chat to your groundskeeper and see if there is a nice sunny spot in your schoolyard where you could start a vegie garden.
- Plan your garden and ask for expert advice from parents and friends of the school.
- Have a working bee to get the garden started!

Investigate organic farming

- Create an organic garden! Discover how different fruits and vegetables taste with no sprays. Keep the garden simple, and keep an eye out for bugs!
- Determine which different plants work best at different times of the year. You might want to consider planting in a certain order to keep your soil healthy, or companion planting to reduce the need for pesticides. Contact your local permaculture group for more information.

Investigate plant growth

- Use your vegies growing in the garden to discover how plants grow, and what they need to grow fast and healthy.
- Use your vegies to look at what parts of plants we eat – compare carrots, beans, tomatoes and corn for example.
- Use your vegies in the garden to learn the correct words for different plant parts such as leaves, roots, flowers, stem etc.



POSTER 7 - Fishers

This poster is designed to show that there are many fishers who are doing the right thing for the Reef. Everyone who goes fishing, from a commercial fisher to a fishing family, can participate in sustainable fishing. We will have fish for the future if we manage our fisheries sustainably now.



Key messages

- Fishing is an important economic and social activity on the Reef.
- There are a range of fisheries regulations in place to manage fish stocks.
- Commercial fishers use a range of technology (such as Turtle Exclusion Devices) to ensure that vulnerable or endangered species do not end up as bycatch.
- The fishing industry recognises that healthy fish stocks need healthy habitats and healthy spawning sites.
- Zoning is in place to protect and maintain biodiversity but also provides safe areas for fish, thereby supporting fish populations and fisheries into the future.
- Some fishers are reducing their carbon footprint by changing their business practices. This helps the planet, and can save money too!

Linked activities

- Sustainable habitats, sustainable fisheries
- The science of fisheries management
- Maintaining fish stocks

Science as a Human Endeavour (Year 8)

Use and influence of science

Science and technology contribute to finding solutions to a range of contemporary issues; These solutions may impact on other areas of society and involve ethical considerations

- investigating strategies implemented to maintain part of the local environment, such as bushland, a beach, a lake, a desert or a shoreline

I. Sustainable habitats, sustainable fisheries

Overview: Students consider what habitats support fish populations and create strategies to care for these habitats.

Aim: Where do fish live? Where do they spawn?

What do they need to survive and spawn?

Why do fishing rules exist during spawning times?

Outcomes: Identify features of your chosen habitat/s – what do fish need to survive?

Sustainable fishing – spread the word

- Find out more about sustaining fish populations by looking at what requirements they have for survival. Develop a management plan to keep that species sustainable by managing the habitats and food requirements that it has. Develop a persuasive poster or advertising campaign to keep fishing sustainable into the future and share these messages with your school and school community. You may wish to include other sustainable fishing messages such as how to release an undersized fish, how to remove a hook and messages around keeping our fishing areas healthy including taking bait bags and other rubbish home with you when you go fishing.
- You could translate this learning into a sustainable fishing day where you invite the school or community to a family fun day where you practice the catch and release of fish. Make sure you get lots of messages of sustainability out on that day to ensure there are fish to catch for future generations too!

Habitats support fisheries

- Create a map of your local area, including the areas that are popular for fishing. Include on this the habitats that support those fishing spots – including seagrass beds, mangrove areas, freshwater rivers creeks and streams as well as any barriers for fish including weirs and dams and marinas. You might also

like to investigate some fish migration devices including fish ladders. Create a management plan to support fish populations into the future.

Biodiversity planning

- Create a biodiversity plan (or habitat plan) for your local area to ensure the future sustainability of locally caught fish populations. You may wish to use ICT skills to develop this as an interactive mapping tool or you might use your own mapping skills to develop this. You might choose to develop this biodiversity action plan to support a targeted fish population, or an animal that can sometimes end up as bycatch including sharks or dugongs.

2. The science of fisheries management

Overview: Students consider how fisheries managers come up with size and bag limits and how zoning works to assist breeding sanctuaries

Aim: What are the regulations where you are for recreational fish take?

Outcomes: How do scientists study fish? What new technology is out there to assist management? What new technology assists in reducing bycatch?

Bag your limit

- Investigate bag and size limits for certain fish and regulations for those fish including any closed seasons. You can find out more about your local fisheries regulations via Queensland Fisheries. Use these rules and regulations to generate discussions around why different species have different rules. Perhaps in small groups, choose one species and find out more about its life cycle. Use this information to generate a persuasive poster informing others about the management of that particular species.

Investigate fishing techniques

- Research the different methods of fishing in the Marine Park. What types of impact minimisation techniques do they use? Have small groups present a poster or powerpoint on one of the types of fishing, eg trawling, reef line fishing, net fishing, collection fisheries etc, showcasing where on the Reef this type of fishery occurs and what sustainability actions they are undertaking to look after the Reef.

Bycatch reduction

- Find out about bycatch reduction devices eg TED's (turtle exclusion devices) or Popeyes (these use hydrodynamic effects to selectively reduce bycatch) and make a mini one to test how they work – try using paddle pop sticks and a small net – like the bag that oranges come in (for a TED). Or why not create a new one of your own using design and technology – you could revolutionise the industry!

Science Understanding (Year 9)

Biological Sciences

Ecosystems consist of communities of interdependent organisms and abiotic components of the environment; matter and energy flow through these systems.

- examining factors that affect population sizes such as seasonal changes, destruction of habitats, introduced species



3. Maintaining fish stocks

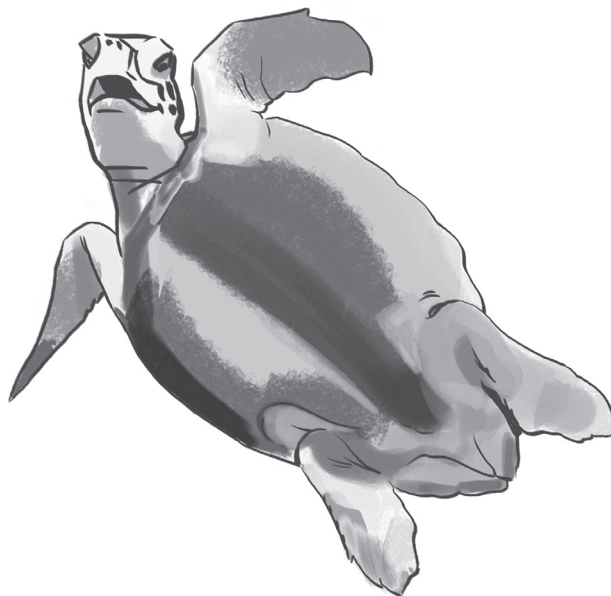
Overview: Students investigate factors that can affect fish populations.

Aim: What is the result of climate change to your chosen fish species? What would occur if mass habitat destruction occurred – via cyclones for example? What happens if new pest species are introduced?

Outcome: Identify the variables that must be managed to ensure sustainable fish stocks into the future.
Create a fish management plan for your local area for a chosen fish species.

Changing species composition, changing fish populations

- Find out about introduced or pest species in your local area. Try and figure out how they got there. Can you educate your local community about these pests? Can you eradicate these pests?
- Hold a pest species eradication day – for example you could fish for tilapia. Perhaps contact Queensland Fisheries in your local area to find out what pest species are found in your local waterways (much of Queensland has a problem with Tilapia). Find out the best ways of catching these pests and what you will need to do with them once caught (usually euthanize them with clove oil and bury them far away from the water course).



Changing climates, changing fish populations

- Research the effects of a changing climate on one of the locally popular fish species. Investigate its life cycle, diet and habitat requirements and make some predictions on the future sustainability of this species. Create a management plan to preserve the species' sustainable future.

Changing habitats, changing fish populations

- Research the effects of changes to habitats on your chosen species. You might like to pose this as a scenario investigation where students look into the effects caused by a new development in a coastal area nearby. You might even base this on an actual development. Look into the requirements for survival of a chosen species, to determine what it requires for habitat and food and spawning. Come up with some management recommendations to ensure the future sustainability of the species.

Ghost netting

- Research the impacts of ghost nets on fish stocks. What are ghost nets? Where are they found? How do they end up in Australian waters? What types of animals are caught accidentally in ghost nets? What can we do about the problem of ghost nets?

POSTER 8 - Communities

This poster is designed to encourage whole communities to work together to help the environment. Collectively great outcomes can occur if people work in partnership. Think global and act local. Be a part of the solution.



Key messages

- Collaboration between schools, local council and environmental groups can achieve great outcomes for the environment.
- Ask local businesses if they will help too.
- Working together on a community wide project keeps everyone focused on the same goal.

Linked activities

- Acting locally thinking globally
- Get involved in your community

Science as a Human Endeavour (Year 9)

Use and influence of science

People can use scientific knowledge to evaluate whether they should accept claims, explanations or predictions

- considering the impacts of human activity on an ecosystem from a range of different perspectives

I. Acting locally thinking globally

Overview: Students investigate how humans create impact on ecosystems.

Aim: To consider from a range of perspectives our ecological footprints.

Outcomes: Students recognise their role in reducing their impact on the environment.

Save a local endangered or vulnerable animal

- Research a local animal that is considered endangered or vulnerable. It could be a turtle, a mahogany glider or a cassowary in North Queensland or another locally relevant species elsewhere.
- Have students create a persuasive written or spoken report. It may be in the form of a poster, a short story or a scientific text.
- Students may present this story from the perspective of the animal, or from a range of different stakeholders perspectives, including from the perspective of different relevant agencies that would be responsible for managing that animal.

Find a local area that needs help and create a community working bee

- Have students come up with plan to save a local struggling ecosystem. Find out who is responsible for looking after it, and ask permission to assist.
- Create a community working bee for the event – perhaps pitch the idea at the next Parents and Friends committee meeting.
- Make sure you put a sign up at your working bee area to let the community know what you are up to.

Share the news with the news

- Make sure that your local community is hearing about your good work by coming up with a media plan. Invite the local paper or news to your working bee day and make sure you let the TV news team or local radio know too.

Science as a Human Endeavour (Year 8)

Use and influence of science

People use understanding and skills from across the disciplines of science in their occupations

- recognising the role of knowledge of the environment and ecosystems in a number of occupations

2. Get involved in your community

Overview: Students investigate the types of occupations involved in caring for the environment.

Aim: To recognise that it takes a huge range of skills to manage the environment.

Outcomes: Students recognise that they can be involved in looking after the environment and that there are a range of careers that students could follow in this field.

Youth environment council

- Contact your local council and find out if they already have a youth council, and if not – start one yourself. You might like to include environmental representatives from all schools in your region or cluster to make it a real representation of local youth.

Start a community project

- Why not have a look around your community and come up with a project that everyone can work on together? Maybe something like a community garden?

Create or participate in a community event

- Find out about what is on in your community – maybe your council runs an annual environmental event like Ecofest? Why not hold a stall at something like this? Or a float in a community parade? Or start your own event? You can showcase your schools amazing environmental achievements and maybe recruit some new participants in your next community working bee!



POSTER 9 - Combating Climate Change

This poster is designed to encourage everyone to work together to combat climate change. Everyday actions can form part of a big picture solution.



Key messages

- Climate change is affecting the Reef in a range of ways.
- Everyone can reduce carbon emissions.
- All sustainable actions, big or small, can help the big picture.
- Encouraging others to participate is part of the challenge.
- Together we can be stewards for the Reef/Earth.

Linked activities

- Acting locally thinking globally
- Cause and effect
- Sea level study
- Biodiversity action plan

Science Understanding (Year 10)

Earth and space sciences

Global systems, including the carbon cycle, rely on interactions involving the biosphere, lithosphere, hydrosphere and atmosphere

- investigating how human activity affects global systems
- modelling a cycle, such as the water, carbon, nitrogen or phosphorus cycle within the biosphere
- explaining the causes and effects of the greenhouse effect
- investigating the effect of climate change on sea levels and biodiversity
- considering the long term effects of loss of biodiversity

1. Acting locally thinking globally

Overview: Students investigate how human activity affects global systems.

Aim: To determine what impact an individual's actions have on global scales.

Outcomes: Students recognise their role in creating a better environmental future.

Investigate global systems

- Have students consider the earth as an interconnected set of systems, after researching relevant cycles such as the water cycle.
- Look into humans roles in changing these systems. Perhaps just choose a local ecosystem as a microcosm of the global issues.
- Look at the human activities influencing it and current or potential mitigation options.
- Develop an action plan that can be used to help manage that chosen ecosystem.
- Suggest management strategies that would assist the long term sustainability of that area and include them in an effective communication to the organisation that looks after that ecosystem.

2. Cause and effect - the greenhouse effect

Overview: Students investigate the causes and effects of the greenhouse effect.

Aim: To create a clearer picture of the greenhouse effect, and actions to reduce it.

Outcomes: Students understand what is contributing to the greenhouse effect.

Investigate the greenhouse effect

- Have students research the greenhouse effect. Create persuasive posters or an advertising campaign alerting other students to the issues. Have students find ways for your school to take action to reduce your eco-footprint.

- Conduct a debate in the classroom with each side taking a stance on the greenhouse effect. Have students decide what the argument topic will be. Perhaps stage the discussion as a United Nations meeting – with different students representing different countries.

3. Sea level study

Overview: Students investigate the effect of climate change on sea levels and biodiversity.

Aim: Students investigate what the future holds for some iconic coastal species.

Outcome: Increased awareness around the issue of sea level rise.

Investigate sea level rise and the impacts it may cause

- Have students develop an environmental impact assessment for your school or local area for potential future impacts based on current research of proposed sea level rise/s over the next 20, 50 or 100 years.
- Have students determine how they would like to present the material – it may be through a topographic map or using a computer modelling system.
- Encourage students to develop a set of recommendations for habitats and species that may be effected by the change in sea level.
- Present findings on parade to encourage others to be more eco-friendly.

4. Biodiversity action plan

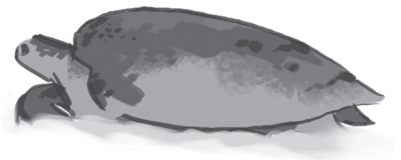
Overview: Students consider the long term effects of loss of biodiversity.

Aim: What are our ecosystems that are going to be/are effected?
What does this mean for biodiversity?

Outcome: Students create a biodiversity action plan for a local iconic species.

Investigate climate related biodiversity changes

- Have students choose an animal that they would consider to be locally iconic. It could be a terrestrial, aquatic or marine species, it doesn't matter.
- Have students develop a biodiversity action plan including detailing information on the species' ecological requirements and a plan of management to ensure its sustainable future.
- Have students educate others about the plight of their chosen animal.



POSTER 10 - Interconnectedness

This poster is designed to showcase that working together can improve the future for the Reef. It's important to remember the big picture, to think global, and act local.



Key messages

- Everyone has a role to play in ensuring the future resilience of the Great Barrier Reef.
- All sustainable actions, big or small, can help the big picture.
- Encouraging others to participate is part of the challenge.
- Working together is the key to the future of the Reef.

Linked activities

Take your environmental message and make it viral – using YouTube

- Challenge students to create a claymation film about an environmental issue of relevance to them. Upload the movie to YouTube to share the message with others.
- Have the musically talented students come up with a song that represents your schools environmental projects or philosophies. Then create a music video using either still images of your local habitats/projects or using video segments of your environmental works to go with the music video clip. Make sure you let your school community know where they can find their talented group online!

Get your family and friends to take part too

- Find simple projects that can be shared with friends and family – maybe composting ideas?
- Invite parents and friends to participate in your school's next working bee.
- Have a family fun day – either a day at the beach or river doing fun environmental activities and games.

Start a column in your local paper or do a radio segment

- Approach a local newspaper about writing a column, or submitting something to their education section.
- Ask your local community radio station about the possibility of sharing environmental messages through their community forum, or creating short community segments for use as gap fillers.
- Start a school newspaper sharing news and events in your local community.

Start an environmental blog about sustainable actions

- Using social media, create a blog sharing your environmental ideas and messages.
- Create an ongoing insert into your school newsletter for enviro tips.
- Why not include some information on your school's website!?

Become a sister school and teach them too

- Perhaps you could mentor a school locally?
- Or interstate or even across the world!
- Or what about sharing ideas with your local child care centre?



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