Griffith UNIVERSITY
Centre for Coastal Management

COASTED

Proudly supported by
CITY OF GOLDCOAST.

# TEACHER PACK:

# COASTAL ECOLOGY

## LESSON PLANS, ACTIVITIES AND RESOURCES FOR PREP TO YEAR 12

## ACKNOWLEDGEMENTS

This teacher pack on Coastal Ecology was produced by the Griffith Centre for Coastal Management's CoastEd program in collaboration with the City of Gold Coast.

The Centre would like to acknowledge the assistance of the following people in the creation of this pack:

*Text and edits: Catherine Keleher, Maggie Muurmans, Katharina Gihring*

*Graphic design: Zoe Keidge*

*ISBN 978-1-925455-10-6 for Teacher Pack: Coastal Ecology : Lesson plans, activities and resources for prep to year 12.*

# TEACHER PACK:

# COASTAL ECOLOGY

LESSON PLANS, ACTIVITIES AND RESOURCES FOR PREP TO YEAR 12

# CONTENTS PAGE

# WELCOME

## TO COAST**ED**'S **COASTAL ECOLOGY** TEACHER'S PACK

In In this pack you will find a range of ideas, activities, resources and lesson plans, designed to allow you to engage students on the topic of **Coastal Ecology**, facilitate learning and maximise understanding of natural coastal processes and management strategies for the local beaches, foreshores and dunes on the Gold Coast. Resources are created for targeted year groups and include clear curriculum links.

Our coastline is teeming with life. From the great sandy dunes of South Stradbroke Island, to the rocky shore at Burleigh headland, to the coastal wetlands of Coombabah, there is an abundance of plant and animal life of all shapes and sizes. To the naked eye, the sandy beach environment could be likened to a desert. Take a closer look though, and you can find a wide range of flora and fauna. In fact, just one bucket of sand can hold more diversity than an entire rainforest! Dunes are critical to the health of our beaches. They are buffer zones that reduce the impact of shoreline variability on our city. Vegetation is vital to the maintenance of the dune system. It protects the beach from erosive wave action. The dunes, rocky shores and mangroves are home to an assortment of wildlife, including reptiles, insects, birds and mammals.

The resources in this pack allow you and your students to explore the **Coastal Ecology** and its habitats of the Gold Coast, through engaging and thought provoking activities.

## ABOUT COAST**ED**

CoastEd is an award winning education program for schools and community groups. It provides the opportunity to learn about our precious coastal areas from qualified environmental scientists and industry professionals. In curriculum based sessions, students take part in activities such as dune planting, wildlife identification and beach health surveys. The CoastEd program seeks to provide valuable information and resources to schools and the community as well as increasing the capacity of the Gold Coast community to participate in coastal management through increased awareness and participation. More information about CoastEd can be found further in this pack.

## THE GRIFFITH CENTRE FOR COASTAL MANAGEMENT

The Griffith Centre for Coastal Management aims to develop broad research and training agendas for coastal management. The centre works in partnership with the City of Gold Coast, who has subsidised the CoastEd program for the past 15 years.

The Griffith Centre for Coastal Management has a team of award winning staff members working on the latest technology, management techniques and research projects. Integrating their knowledge base throughout the CoastEd programs has ensured credibility, sound information and accuracy.

*Maggie Muurmans*
*CoastEd Coordinator*
*Griffith Centre for Coastal Management*
*coasted@griffith.edu.au*
*www.griffith.edu.au/coasted*

# COASTED PROGRAMS FOR SCHOOLS

# COAST**ED** PROGRAMS FOR SCHOOLS

CoastEd is a community and school based coastal education program that provides the opportunity for Gold Coast community groups, schools and kindergartens to learn about the coastal zone. Primary and Secondary school sessions are matched to the Australian Curriculum and accompanied with optional curriculum based worksheets tailored to the level of the participants.

In partnership with the City of Gold Coast, the program offers a limited number of free and subsidised education sessions covering a wide range of topics that relate to the Gold Coast coastal zone. Our interactive sessions and hands-on activities can be booked for 30 or 60 minutes. There are also options to extend your session or add additional programs for a small cost. All sessions are facilitated by experts in the field of coastal management, coastal engineering, marine science and environmental education.

Sessions can be undertaken at your school, a community hall, on a local beach or at Griffith University Gold Coast Campus. Sessions can include surveys, flora and fauna identification techniques and primary data collection.

The CoastEd programs will be a suitable extension on your lessons in this teacher pack or field study excursion. Please note that new sessions are regularly added .The sessions with a focus on Coastal Ecology are:

## KINDERGARTEN PROGRAMS:

*BeachCare Activity (Incursion)*

Our CoastEd facilitator will visit your centre to teach pre-school aged children about the importance of beach vegetation. After an interactive presentation children will be involved in a planting activity using native coastal vegetation. It is optional for the children to attend a BeachCare event near their location to plant their plants in the dunes.

## PRIMARY SCHOOL PROGRAMS:

*Wild about whales (Incursion & Excursion)*

**Excursion:** During whale migration season students meet a CoastEd representative where whales can be viewed (e.g. Point Danger). CoastEd will give a presentation on whales, their behaviour, migration and history on the Gold Coast. Students will hear whale sounds through recordings and spot whales in the water.

**Incursion:** A CoastEd representative will visit the school to deliver a 30 minute presentation on whales on the Gold Coast. Students will watch a video on some spectacular whale behaviours, listen to a whale songs and talk about how we can ensure whales are safe on the Gold Coast. The activity will close through a handout to the kids on Whales on the Gold Coast (colouring in factsheet or puzzle factsheet depending on year level)

**Keywords:** Endangered species, Biology, Conservation, marine mammals and whales

*Weather and how it affects our coast (Excursion)*

An exciting excursion where students learn about how weather affect our coastline. The CoastEd representative will talk about storms and cyclones in the Gold Coast history. The session will focus

on how we protect our coastlines from weather impacts. Students are able to take temperature measurements of the sand, the air and the water. Through the wind speed meters students are able to record how strong the wind is and its direction. Using the cloud chart, students will be able to identify cloud formations. Simple datasheets will be provided for students to record their findings and report on the management in place by GCCC to protect our shorelines from weather impacts.

**Keywords:** Weather, Climate Change, Cloud identification, coastline protection, data recording

### *Turtles: living dinosaurs (Incursion)*

An interactive incursion provided to primary schools where a CoastEd representative visits the classroom with a short presentation on sea turtles, their biology, threats and behaviour. The representative will bring a turtle shell and other material to illustrate the presentation. The session will conclude with a crafting activity using sand art or origami (depending on the age group)

**Keywords:** Endangered species, Biology, Conservation, marine reptiles and sea turtles

### *Magical mangroves (Excursion)*

An excursion at one of the mangrove locations on the Gold Coast.  A CoastEd representative meets the group in a mangrove environment in either Currumbin, Burleigh Heads or Paradise Point and introduce how mangrove trees are able to survive in a saltwater environment. Students will be able to learn about identifying mangrove trees, threats to mangroves and their importance to our coastal environment. The session will conclude with a mini treasure hunt in the mangroves where students work in pairs to solve questions such as: how many roots are in this square meter, what kind of mangrove tree is this, draw a mangrove tree and its roots and write down the threats to this mangrove environment.

**Keywords:** Ecosystems, Mangroves, Adaptations, Identification techniques and Conservation

### *Rocky rambles (Excursion)*

An excursion at the Rocky shore environment in Burleigh Heads. A CoastEd representative meets the group at the rocky shores and addresses why rocky shores are important for coastal protection. Through a rocky shore exploration students are introduced to the flora and fauna of the environment and how they have adapted to deal with continuous changing environmental factors. Students will learn about a range of wildlife inhabiting the rocky shores including sea cucumbers, limpits, anemones and urchins. Worksheets are provided to assist in the session and to continue their excursion after the introduction to the environment by the CoastEd representative.

**Keywords:** Ecosystems, Rocky Shores, Adaptations, Identification techniques and Conservation

### *What's that plant? & beach care (Excursion)*

Students will learn about dunes and their importance for our coast. This activity will follow into learning about the plants through a treasure hunt in the dunes using the Coastal Plant pocket guide.  E.g students need to find a spiky plant, describe it (its leaves are…, it's xxx cm tall), identify it and draw it. The session will conclude by planting dune plants and as a result students are assisting in actively revegetation the dunes.

**Keywords:** Ecosystems, Dunes, Plant identification, Coastal management and sketching

*Sand stories (Incursion)*

This incursion or excursion will concentrate entirely on sand. Students will learn about the origin of sand, how it ended up on the beach and what sand actually is. Students will split into groups and receive their own sand sample. They are able to look at sand through microscopes and complete a sand studies sheet. This sheet includes questions such as: list or use crayons to show all of the different colours that you see, draw a picture of some of your sand grains, which of the following things can you find in your sand (small rocks, pieces of plants, pieces of shells etc.). The students will be introduced to different sand from different areas in the world and within Australia and learn about why there are such differences in sizes of sand grains, colours and shapes. The session will conclude with students presenting about their sand sample and find out where their sand sample has their origin.

**Keywords:** Geology, Use of Microscopes, Identification techniques and Coastal processes

*Plastic ocean (Incursion)*

This session will focus on the issue of marine debris. A presentation will be delivered by a CoastEd representative on Marine litter, its effects on marine wildlife, how it made its way to the coast and the pacific garbage patch. Students will learn about the types of litter on the coast and what the Gold Coast City council has in place to mitigate this issue. The session will conclude where the class is split up in groups of 4, with each group looking at a sample of rubbish (that has been brought along by the CoastEd representative). Each group will list at least 5 items they are able to identify and note how this item might have ended up on the beach. Each group will also list solutions next to each identified item on how they can prevent that this item will not be found on the beach anymore.

**Keywords:** Marine debris, Environmental threats and Conservation techniques

## SECONDARY SCHOOL PROGRAMS:

*Beach Care (Excursion)*

Caring for our dunes and natural dune vegetation is the focus of this session. The CoastEd representative will briefly introduce the importance of natural dunes with regards to coastal protection, the history of dunes on the Gold Coast and the current work being done to restore them. The session will conclude with planting native dune vegetation to assist the regeneration of the area. It will allow active involvement in revegetation of local dunes and harbour environmental stewardship. This session may incur a cost to buy the plants. The session will take place at one of the 10 BeachCare sites, with a preference to hold the session on a thursday or friday.

**Keywords:** Dunes, Coastal Processes, Revegation, Native plants, Planting

*Studies in Sand (Incursion)*

This incursion or excursion will concentrate entirely on sand. Students will learn about the origin of sand, how it ended up on the beach and what sand actually is. Students will split into groups and receive their own sand sample. They are able to look at sand through microscopes and complete a sand studies sheet. This sheet includes questions such as: list or use colours to show all of the different colours that you see, draw a picture of some of your sand grains, which of the following

things can you find in your sand (small rocks, pieces of plants, pieces of shells etc.). The students will be introduced to different sand from different areas in the world and within Australia and learn about why there are such differences in sizes of sand grains, colours and shapes. The session will conclude with students presenting about their sand sample and find out where their sand sample has their origin.

**Keywords:** Geology, Use of Microscopes, Identification techniques and Coastal processes

### *How to measure the health of a beach (Excursion)*

Griffith Centre for Coastal Management has recently conducted a study to measure indicators which allow to quantify the health of a particular beach. Students will receive an introduction to beach health and a brief presentation on coastal processes/coastal management before they will undertake their individual assessment on a selection of beaches. Factors such as economic, natural and recreational health will all be taken into account and will promote discussion between the students and their assessments.

**Keywords:** Beach health, indicators, survey, coastal management

### *Fragile ecosystems: Mangroves (Excursion)*

Mangrove ecosystems are imperative to protect our coastline.  They provide essential ecosystem services as well as shoreline protection and wildlife habitats. This session will introduce the role of mangrove ecosystems, the flora and fauna and their role in shoreline protection. The CoastEd facilitator will introduce concepts of mangrove tree adaptations, species of mangrove flora and fauna and conservation.

**Keywords:** Mangroves, adaptations, flora, fauna, shoreline protection, biology, climate change, sustaining biodiversity, primary data collection

### *Fragile ecosystems: Rocky Shores (Excursion)*

Rocky shores environments are full of life! This session will focus on the adaptations of flora and fauna in an environment that is constantly influenced by strong wave action, tides and heat. The CoastEd facilitator will introduce some of the marine wildlife in this area and talk about their adaptations. Rocky shores also play amajor role in coastal protection. This session will also talk about natural and engineered shoreline protection.

**Keywords:** Rocky shores, adaptations, flora, fauna, shoreline protection, biology, sustaining biodiversity

### *Fragile ecosystems: Dunes (Excursion)*

Dunes are critical to the health of our beaches.  Dune vegetation plays a vital role in the formation and stability of coastal dunes. This session will focus on formation of dunes, the vegetation on front and mid dunes through plant identification and how dunes are protecting our shorelines. Plant ID booklets will be provided during the session to adopt identification of native vegetation and a history of the dune environment on the Gold Coast will be covered.

**Keywords:** Dunes, Plant identification, shoreline protection, coastal processes, primary data collection

*Climate Change and how it affects the Gold Coast (Excursion)*

This session will focus on the effect of climate change on our coastline. Information will be presented about how climate change has been a constant variable throughout the earth's history. The students will also be taught about how humans have influenced climate change and how it is impacting different environments and communities around the world.

For the Excursion, students will undertake their own primary data collection through beach profiling to determine how 1 meter of sea level rise would effect the beach and foreshore. Furthermore the students will investigate how king tides and spring tides would affect the coastline in combination with sea level rise. From the data and information provided the students will be able to make conclusions about how the Gold Coast beaches are at risk of certain aspects of climate change.

Students will also develop a better understanding of how the Gold Coast City Council conducts management programs such as sand pumping and beach nourishment as well as dune revegetation to help prevent erosion issues and protection of infrastructure.

**Keywords:** Climate change, primary data collection, beach profiling, coastal management

*Cyclones & Storm tide risk assessment in Emergency Management (Excursion)*

Through an interactive presentation at Griffith University, students will be introduced to a computer model which allows for real-time storm risk assessment in emergency management for the Queensland coastline.

Storm tide presents the greatest risk to life in tropical cyclone events. This session will focus on cyclones (hurricanes, typhoons), how they are formed, the destructiveness of their categories and the various effects of the angle of the cyclone hitting the coastline. The students will use the computer model to visualise the differences of intensity of the various categories of cyclones and learn how to identify the most advantageous areas to evacuate in the case of a severe cyclone. They will learn about coastal planning with regards to cyclones and storm tides.

**Keywords:** Coastal Hazard Management, Weather, Cyclones, Storm Tides, Wind speed

For further information on these sessions or bookings please refer to www.griffith.edu.au/coasted or email CoastEd Coordinator Maggie Muurmans or telephone on (07) 555 28823.

# PRIMARY EDUCATION:

## LESSON PLANS: FOUNDATION TO SIX

YEAR ONE

## HUMANS AND ANIMALS

**Aim:**
Develop an understanding of the characteristics of animals you might see at the beach.

**Prior Knowledge:**
No prior knowledge is required.

**Focus Questions:**
What are the characteristics of an animal?

How do these compare to the characteristics of a human?

**Useful Vocabulary:**
Human, animal, characteristics

## ACTIVITY:

**Main Activity:**

Print the images from the Ocean Memory pdf (attached). You will need one set for each group of 3-4 students.

Separate the images that show the animals/human from the body parts.

Divide the class into groups of 3-4.

Give each group a set of the body parts cards. Allow 10 minutes for the group to look at the images and try to match as many animal parts to human body parts as possible (eg 'human eye' with 'turtle eye').

**Option:**

Tell students that there are two animal body parts which can't be matched ("birds' wing" and the "dolphins' fin").

After 10 minutes, give each group the images of the animals and the human. Does this change their matches?

Each group should present at least two matches to their class. Did everyone have the same ideas?

Extension task: discuss the different functions of the body parts e.g. legs of a crab or fins of a dolphin are used for movement.

**Extension task:**

**Link(s) to Australian Curriculum:**

- SCIENCE: Science Understanding: Biological sciences:

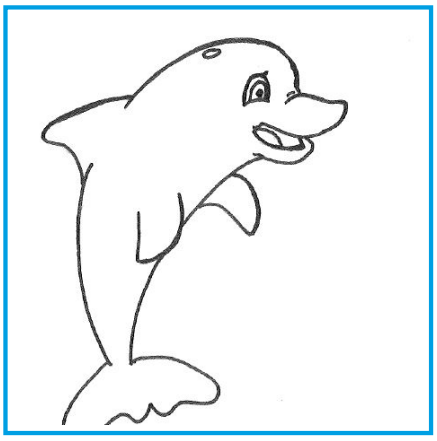
  Recognising common features of animals such as head, legs and wings describing the use of animal body parts for particular purposes such as moving and feeding (ACSSU017)

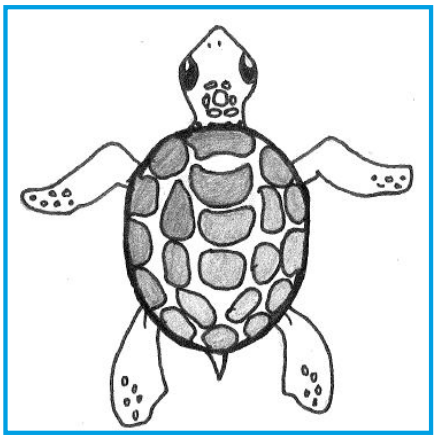
**Teacher resources:**

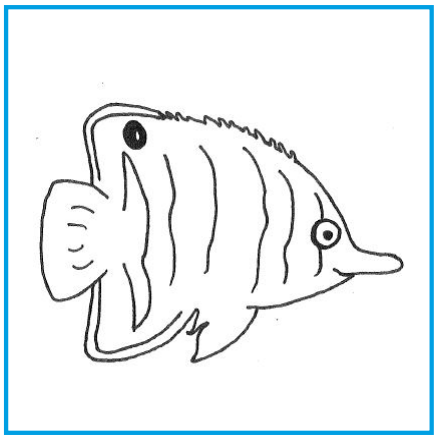
- See attached pdf with ocean memory.
- Queensland museum learning:

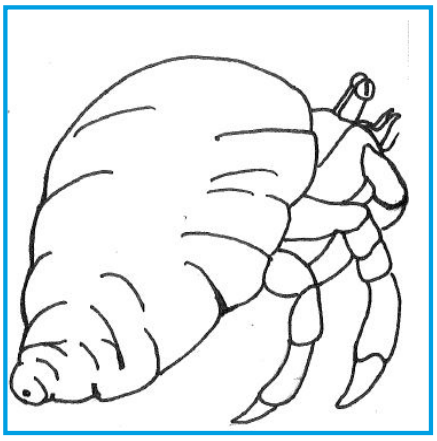
  http://www.cobbandco.qm.qld.gov.au/Learning+Resources/~/media/Documents/Learning%20resources/QM/Resources/Teacher%20and%20student%20resources/external-features-teacher-resource-booklet.pdf

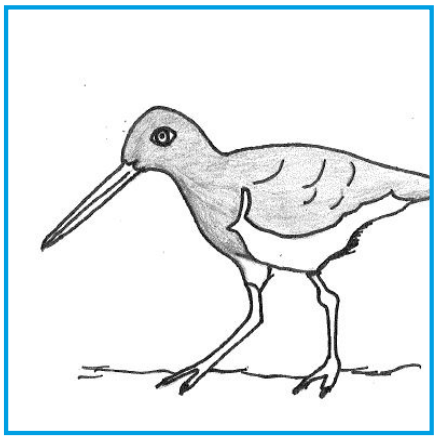
# OCEAN MEMORY

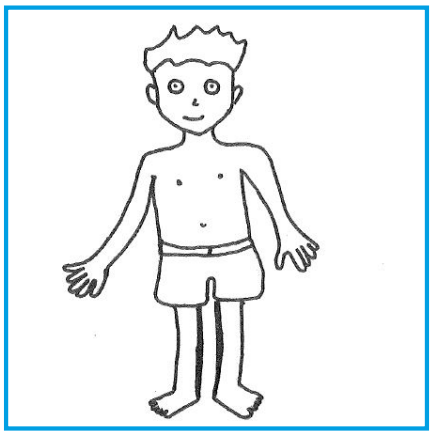




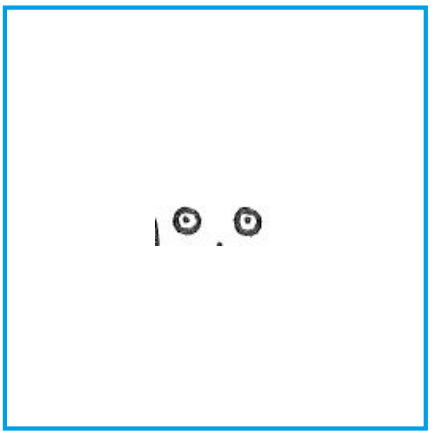




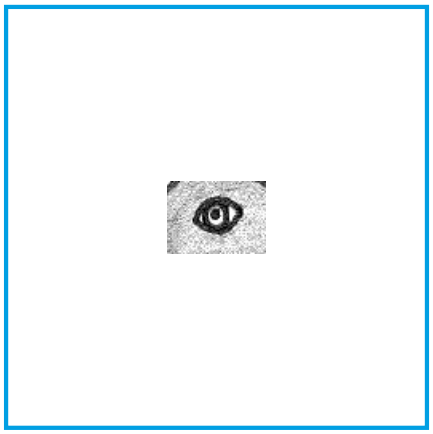




Human Eye



Bird Eye



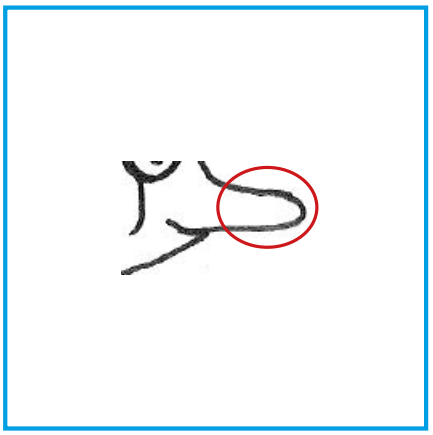
Turtle Eye

Human Nose

Dolphin Blow Hole

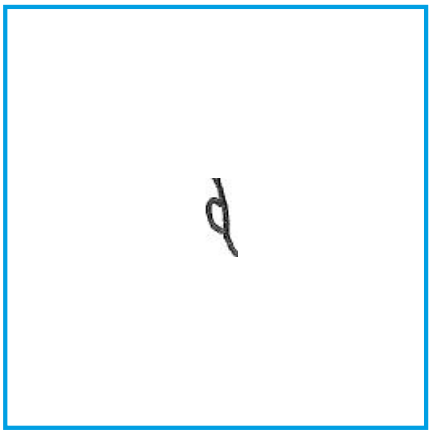
Turtle Nose

Fish Nose

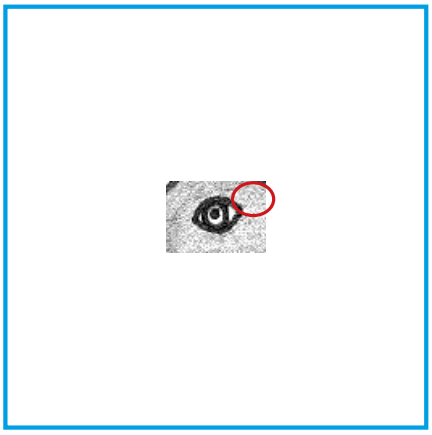


Bird Nose

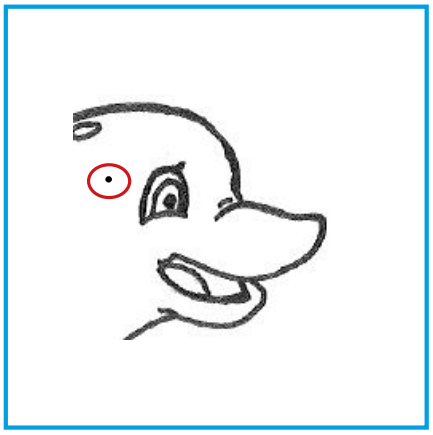
Human Ear



Bird Ear

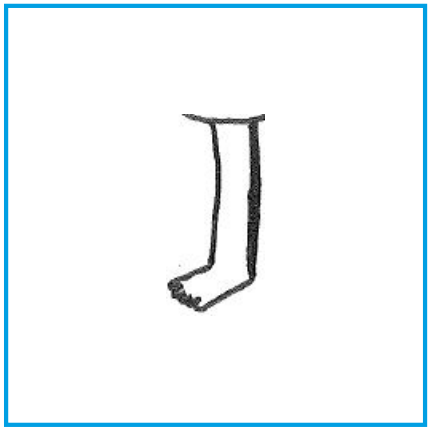


Dolphin Ear

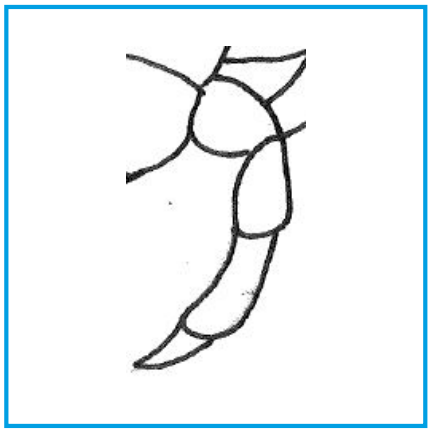


Turtle Ears

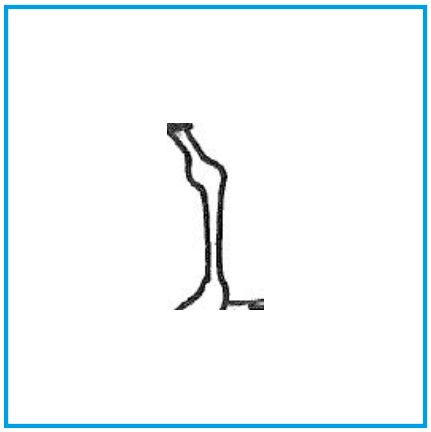
Human Leg



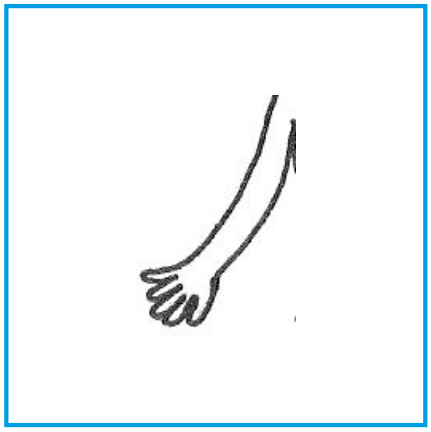
Crab Leg



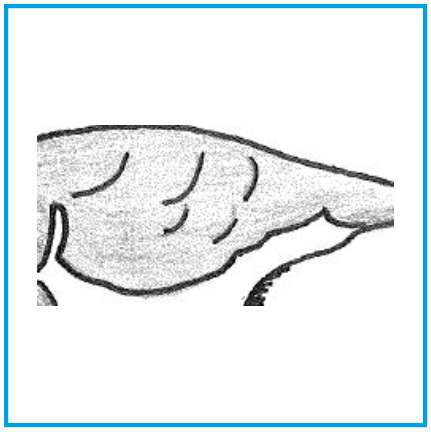
Bird Leg



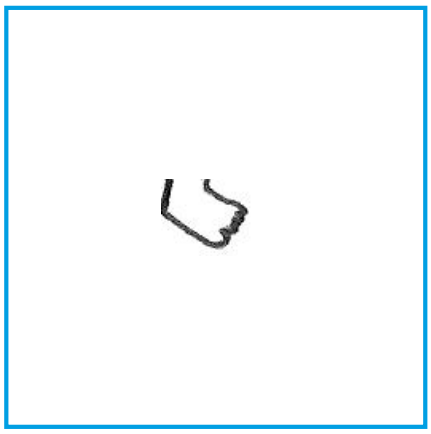
Human Arm



Bird Wing



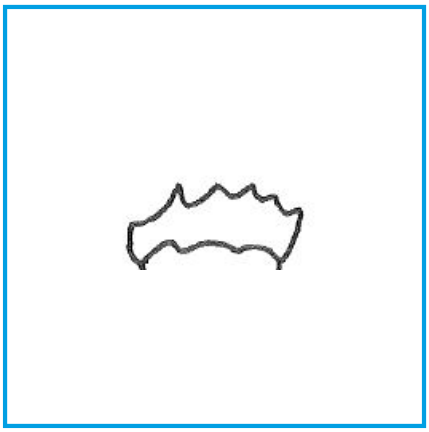
Human Foot



Bird Foot

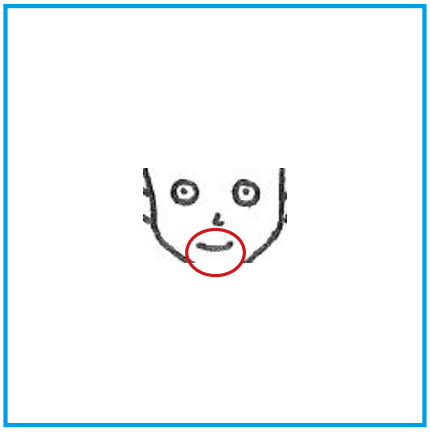
Starfish Feet

Human Hair



Bird Feather

Human Mouth

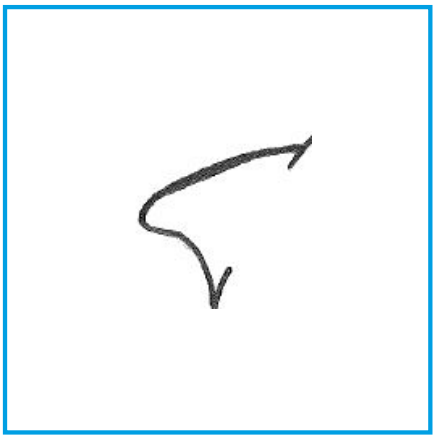


Bird Beak

Dolphin Mouth

Human Hand

Dolphin Fin



YEAR ONE

## GOLD COAST SEAWAY: A MARINE LOVERS' PARADISE

**Aim:**
Learn about the Gold Coast Seaway and why it is important that we protect it and the marine life that live there. Begin to understand the distinction between Natural, Managed and Constructed features of an environment.

**Prior Knowledge:**
No prior knowledge is required.

**Focus Questions:**
Why is the Gold Coast Seaway important?

Who should look after the Seaway?

**Useful Vocabulary:**
Passage, boats, litter, man-made, artificial, seawalls, Wave Break Island, South Stradbroke Island, marine life.

## ACTIVITY:

**Main Activity:**
Have a class discussion, including think, pair, share where appropriate. Consider the following questions:

What can you see in the photograph of the Seaway? (see below)

(Answers; Ocean, boats, sand, plants/ vegetation, buildings etc)

As a class, discuss and divide the features into 3 categories: Natural, Managed and Constructed (manmade).

How do the constructed features (eg buildings and boats) affect the natural features (eg ocean, sand)?

Does anything live under the water here? (Answer: Yes! Fish (404 species), rays, turtles and seahorses). How many different marine animals can you see in this video clip? (3.5 mins)

https://www.youtube.com/watch?v=IEOobrGGq2I

How might they be affected by the things people do here? (eg noise from boats, litter from the beach).

Who is responsible for looking after this area? What can be done? (eg litter pickups, speed limits for boats)

**Link(s) to the Australian Curriculum:**

- HASS: Knowledge and Understanding: Geography

  Using observations of the local place to identify and describe natural features (for example, hills, rivers, native vegetation), managed features (for example, farms, parks, gardens, plantation forests) and constructed features (for example, roads, buildings) and locating them on a map (ACHASSK031)
- SCIENCE: Science Inquiry Skills: Communication:

  Engaging in whole class or guided small group discussions to share observations and ideas (ACSIS029)
- ENGLISH: Literacy: Interacting with others:

  Engage in conversations and discussions, using active listening behaviours, showing interest, and contributing ideas, information and questions (ACELY1656)

**Teacher resources:**

- Griffith Information Sheets:
  https://www.griffith.edu.au/__data/assets/pdf_file/0019/322831/Gold-Coast-Seaway-Marine-Life.pdf
- City of Gold coast
  http://www.goldcoast.qld.gov.au/documents/bf/fs-gc-seaway.pdf
- Gold Coast Waterways Authority:
  http://www.gcwa.qld.gov.au/blog/read/?i=6
- Gold Coast Seaway (8.5min)
  https://www.youtube.com/watch?v=vbw2f9ieU8Y
- Seaway night dive (curtesy of Ian Banks) (3.5min)
  https://www.youtube.com/watch?v=IEOobrGGq2I

Aerial view of the Gold Coast Seaway (Source: Skyepics 2011)

YEAR TWO

## MARINE POLLUTION

**Aim:**
Develop awareness of marine pollution and understand why plastic litter is so dangerous to marine life.

**Prior Knowledge:**
No prior knowledge is required.

**Focus Questions:**
What is marine pollution?

Who is responsible for marine pollution?

Why does it matter?

**Useful Vocabulary:**
Ocean, marine life , tourism, rubbish,litter, clean up.

## ACTIVITY:

There are 2 options for this activity.

**Option 1**
Visit a local beach and collect as much litter as you can.

Sort the litter into two piles – degradable (will break down, e.g. food, leaves) and non-degradable (will not break down, e.g. plastic bags, coffee cups)

- Which pile is bigger?
- Who is responsible for the non-biodegradable litter?
- What will happen if it ends up in the sea? How will it affect marine life? Eg turtles often mistake small pieces of plastic for food and eat them.
- What can we do to ensure the marine environment is not damaged by litter?

**Option 2**
Collect some litter and bring to class for students to sort and answer questions above.

**Link(s) to Australian Curriculum:**

- HASS: Inquiry and skills:

  Making generalisations from data showing patterns and relationships (for example, the relationship between the distance of places and the frequency of visits to them; between rubbish in the school and eating areas; between marine animals and where human rubbish may go; between climate zones and clothing or housing) (ACHASSI041)
- ENGLISH: Literacy: Interacting with others:

  Listen for specific purposes and information, including instructions, and extend students' own and others' ideas in discussions (ACELY1666)

**Teacher resources:**

- Department of Environment:

  http://www.environment.gov.au/marine/marine-pollution
- GRID:

  http://www.grida.no/publications/rr/our-precious-coasts/page/1292.aspx

YEAR TWO

## NARROWNECK ARTIFICIAL REEF ECOLOGY

**Aim:**
Reflect on the effect of creating an artificial reef.

**Prior Knowledge:**
No prior knowledge is required.

**Focus Questions:**
What is a reef?

What kind of marine animals can be found on a reef?

What is the difference between a natural and artificial reef?

Why was the artificial Narrowneck reef built?

**Useful Vocabulary:**
Natural, artificial, reef, ocean, marine animals, coral, tourism, protection, sand bags.

## ACTIVITY:

**Main Activity:**
What is a reef? A ridge of jagged rock, coral, or sand just above or below the surface of the sea. A reef is a habitat for a wide range of marine animals.

Are reefs natural or artificial? Discuss the difference and explain that while most reefs are naturally occurring, they can also be created or man-made.

Narrowneck reef was created to protect that section of the coastline. Can you think of a question you could ask about Narrowneck reef? (eg how was it made, did it work, etc)

Watch this short clip and see if you can find an answer to your question:

http://www.goldcoast.qld.gov.au/thegoldcoast/coastal-videos-resources-23364.html

Class discussion - share what you've learnt about the reef.

What else would you like to know about Narrowneck?

Extension task: Research the answers to any remaining questions.

Use the information sheets below to explore Narrowneck in more detail.

**Link(s) to Australian Curriculum:**

- HASS: Inquiry and skills: Evaluating and reflecting:
  Reflecting on anticipated effects of actions designed to protect and improve places that people perceive as important (for example, places of environmental value, cultural value or historic significance) (ACHASSI060).
- ENGLISH: Literacy: Interacting with others:

Listen to and contribute to conversations and discussions to share information and ideas and negotiate in collaborative situations (ACELY1676)English: Literacy: Interacting with others:

Plan and deliver short presentations, providing some key details in logical sequence (ACELY1677)

**Teacher resources:**

- Griffith Information Sheets:

  https://www.griffith.edu.au/__data/assets/pdf_file/0010/322876/Narrowneck-artificial-reef.pdf

  https://www.griffith.edu.au/__data/assets/pdf_file/0004/286825/Narrowneck.pdf
- International coastal management: http://d6cbwp89cp4qo.cloudfront.net/documents/An-Artificial-Reef-to-Protect-Surfers-Paradise-Beach.pdf
- Boat Gold Coast:

  http://boatgoldcoast.com.au/how-narrowneck-copied-nature/

YEAR THREE

## PALM BEACH: A CHANGING PLACE

**Aim:**
Compare photographs from the past and present of a specific location to identify the change or continuity (similarities and differences over time) associated with people, events/developments, places or ecosystems. Use persuasive language about a citizenship issue.

**Prior Knowledge:**
No prior knowledge is required.

**Focus Questions:**
Has the ecology of our beaches changed over time?

What has changed on the Gold Coast since the first people settled?

**Useful Vocabulary:**
Beach, development, tourism, dunes, buildings.

## ACTIVITY:

**Main Activity:**
As a class, look at a range of historical images of the Gold Coast:

http://www.goldcoast.qld.gov.au/a-day-at-the-beach-9670.html

Compare with modern photographs of Palm Beach:

http://www.goldcoast.qld.gov.au/palm-beach-aerial-imaging-2-may-2011-10884.html

How have the beaches changed? How might that have affected the plants animals that live in the beach habitat?

Can you see any animals on the beach that you wouldn't find there now? (Camels and Donkeys) Why do you think that is? (Non-native species, cultural changes)

**Extension task:**
Watch Currumbin Then and Now (11 mins):
https://www.youtube.com/watch?v=k8o_MttJCEo

And Coolangatta Then and Now (12.5 mins):
https://www.youtube.com/watch?v=tcOqzgBwKWQ

**Debate:**
We are all responsible for looking after the plants and animals on the beach? Do you agree or disagree? Why? Use think, pair, share. Encourage students to begin responding to each other's ideas.

**Link(s) to Australian Curriculum:**

- HASS: Knowledge and Understanding: History:

The history of a significant person, building, site and/or part of the natural environment in the local community and what it reveals about the past (ACHASSK044)

- HAAS: Inquiry and skills: Analysing:

  Compare objects from the past with those from the present and consider how places have changed over time (ACHASSI006, ACHASSI023, ACHASSI039)
- HAAS: Inquiry and skills: Evaluating and reflecting:

  Draw simple conclusions based on discussions, observations and information displayed in pictures and texts and on maps (ACHASSI008, ACHASSI025, ACHASSI041)

**Teacher resources:**

- The history of our gold coast beaches:

  http://www.goldcoast.qld.gov.au/a-day-at-the-beach-9670.html
- Palm Beach photos of today:

  http://www.goldcoast.qld.gov.au/palm-beach-aerial-imaging-2-may-2011-10884.html
- History of Palm Beach:

  http://www.goldcoast.qld.gov.au/thegoldcoast/history-of-palm-beach--10959.html
- Erosion 1967 photos and article:

  http://app.griffith.edu.au/sciencesimpact/seawall-engineering/
- Erosion photos 2009:

  https://www.flickr.com/photos/thetannykid/3656104849/in/photostream/

YEAR THREE

## LIFE ON THE BEACH

**Aim:**
Begin to recognise the characteristics of living things such as growing, moving, sensitivity and reproducing, understand that not all living things are the same. Sort living and non-living things based on characteristics, exploring differences between living, once living and products of living things. Non-living here refers to anything that has never been alive.

**Prior Knowledge:**
No prior knowledge is required.

**Focus Questions:**
How can you tell if something is living, non-living or dead?

**Useful Vocabulary:**
Living, non-living, dead.

## ACTIVITY:

**Preparation Task:**
Ask students to bring in up to 3 photos of things they find interesting on the beach. Explain that each photo must be of 1 item. Students who don't bring photos can write ideas on post it notes.

**Extension:**
1 photo each of something living, non-living (never been alive), dead.

Class discussion – how do you know you're alive? Discuss characteristics, e.g. breathing, moving, talking etc.

Write 3 categories on the board – living, non-living, dead. Ask students to put their photos/post it notes into the correct category. Encourage discussion about why each category has been chosen. Highlight the range of indicators of life, for example a plant is alive because it is green and growing, a bird is alive because it is flying.

**Link(s) to the Australian Curriculum:**
- SCIENCE: Science Understanding: Biological Sciences:

  Recognising characteristics of living things such as growing, moving, sensitivity and reproducing, recognising the range of different living things, sorting living and non-living things based on characteristics, exploring differences between living, once living and products of living things (ACSSU044)
- ENGLISH: Literacy: Interacting with others:

  Listen to and contribute to conversations and discussions to share information and ideas and negotiate in collaborative situations (ACELY1676)

**Teacher resources:**
- Griffith Information Sheets:

  https://www.griffith.edu.au/__data/assets/pdf_file/0005/322871/Dunes-of-the-Gold-Coast.pdf

  https://www.griffith.edu.au/__data/assets/pdf_file/0009/322839/Sandy-beach-ecology.pdf

  https://www.griffith.edu.au/__data/assets/pdf_file/0009/322839/Sandy-beach-ecology.pdf

YEAR FOUR

## MARINE DEBRIS

**Aim:**

Understand the impact of marine debris and create two texts including a prediction based on what you have learnt.

**Prior Knowledge:**

No prior knowledge is required.

**Focus Question:**

What are the consequences of the marine pollution?

**Useful Vocabulary:**
Debris, litter, waste, degradable, non-degradable.

## ACTIVITY:

**Main Activity:**
Look at the infographic on Marine Debris. Which words don't you know? (Entangled, ingested, debris). Find out their meaning.

Which animals are affected by marine debris?

How does marine debris end up in the ocean? (it starts with people dropping litter)

What will happen if we keep allowing our rubbish to end up in the ocean?

What can we do to change things? Watch this clip (95 seconds) about Tallebudgera beach and how the issue has been tackled there:

https://www.youtube.com/watch?v=Me0i6zBy3Pk&list=PLs53dPt8u9lal_YDRljZlmCGLdgMAA0R6&index=29

Draw a picture that shows how you think the ocean will look if we stop littering and how it will look if we don't stop littering - a healthy and an unhealthy ocean. (See example below).

Create a poster encouraging people not to litter. You may use a fact from the infographic to demonstrate why this is important.

**Link(s) to the Australian Curriculum:**

- HASS: Inquiry and skills: Communicating:

  Composing, in a range of different text types, information to communicate findings and conclusions (for example: information presented as imaginative recounts, biographies, journals, reports) selecting appropriate representations (ACHASSI082)

- HASS: Inquiry and skills:

  Using accurate and subject-appropriate terms when speaking, writing and illustrating, for example, using geographical terms (such as 'continents', 'countries', 'natural resources', 'vegetation', 'environments', 'ecosystems', 'sustainability', 'consumption', 'waste' and 'management') (ACHASSI082)

- HASS: Inquiry and skills: Evaluating and reflecting:

  Forecasting a probable future and a preferred future relating to an environmental, local government or cultural issue (for example, developing a futures scenario of what oceans will be like if humans continue to allow waste plastic to enter waterways, and a preferred scenario of what oceans would be like if plastics were to be replaced by degradable materials) (ACHASSI081).

- ENGLISH: Literacy: Interacting with others:

  Use interaction skills such as acknowledging another's point of view and linking students' response to the topic, using familiar and new vocabulary and a range of vocal effects such as tone, pace, pitch and volume to speak clearly and coherently (ACELY1688)

**Teacher resources:**

- BBC:

  http://www.bbc.com/news/magazine-29631332

- WWF:

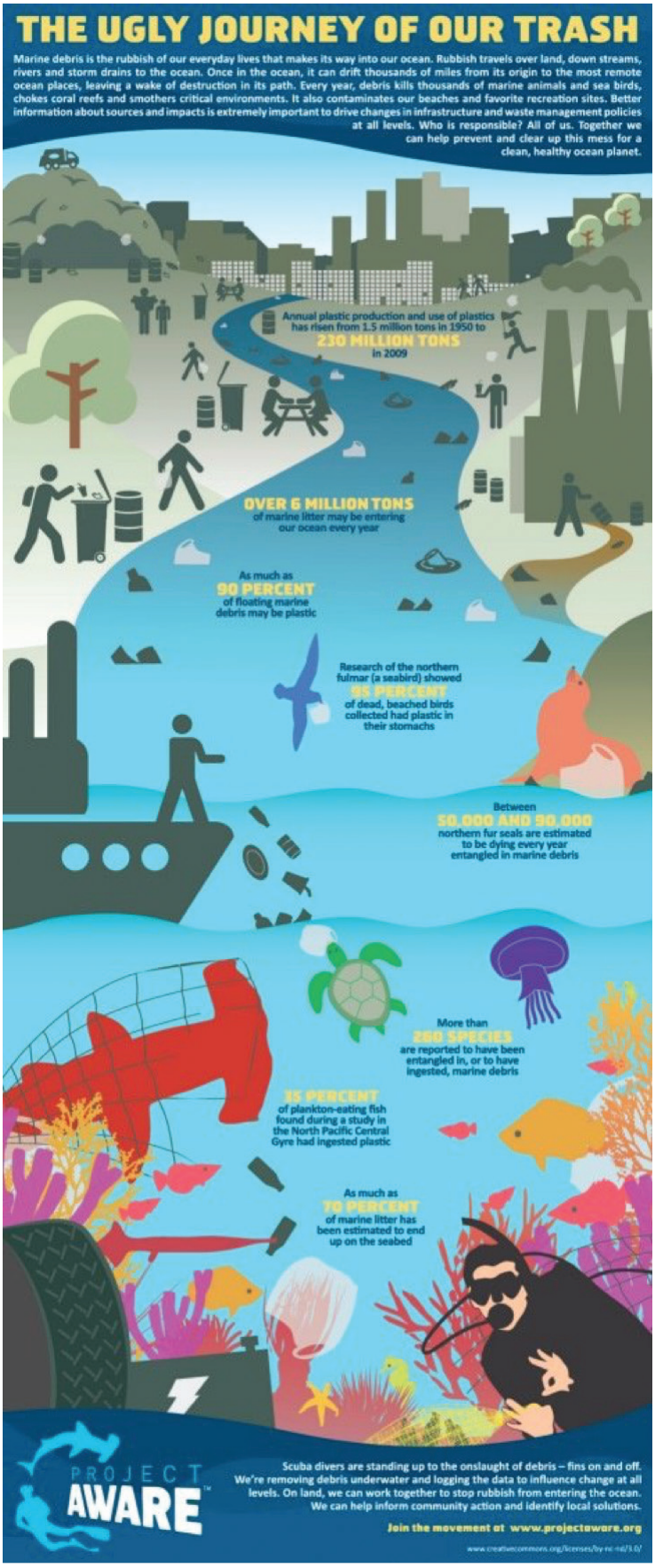
  http://www.wwf.org.au/our_work/saving_the_natural_world/oceans_and_marine/marine_threats/pollution/marine_pollution/

- State of the Planet:

  http://blogs.ei.columbia.edu/2011/01/26/our-oceans-a-plastic-soup/

- Facts about plastic soup:

  http://www.contiki.com/six-two/7-facts-about-plastic-that-will-absolutely-blow-your-mind/


THE UGLY JOURNEY OF OUR TRASH
Marine debris is the rubbish of our everyday lives that makes its way into our ocean. Rubbish travels over land, down streams, rivers and storm drains to the ocean. Once in the ocean, it can drift thousands of miles from its origin to the most remote ocean places, leaving a wake of destruction in its path. Every year, debris kills thousands of marine animals and sea birds, chokes coral reefs and smothers critical environments. It also contaminates our beaches and favorite recreation sites. Better information about sources and impacts is extremely important to drive changes in infrastructure and waste management policies at all levels. Who is responsible? All of us. Together we can help prevent and clear up this mess for a clean, healthy ocean planet.
Annual plastic production and use of plastics has risen from 1.5 million tons in 1950 to 230 MILLION TONS in 2009
OVER 6 MILLION TONS of marine litter may be entering our ocean every year
As much as 90 PERCENT of floating marine debris may be plastic
Research of the northern fulmar (a seabird) showed 95 PERCENT of dead, beached birds collected had plastic in their stomachs
Between 50,000 AND 90,000 northern fur seals are estimated to be dying every year entangled in marine debris
More than 260 SPECIES are reported to have been entangled in, or to have ingested, marine debris
35 PERCENT of plankton-eating fish found during a study in the North Pacific Central Gyre had ingested plastic
As much as 70 PERCENT of marine litter has been estimated to end up on the seabed
PROJECT AWARE
Scuba divers are standing up to the onslaught of debris – fins on and off. We're removing debris underwater and logging the data to influence change at all levels. On land, we can work together to stop rubbish from entering the ocean. We can help inform community action and identify local solutions.
Join the movement at www.projectaware.org

YEAR FOUR

## DUGONGS, TURTLES AND SEAGRASS OF THE GOLD COAST

**Aim:**
Make predictions about what will happen if feeding relationships change. Find connections and draw conclusions on the relationship between plants and animals in an ecosystem.

**Prior Knowledge:**
No prior knowledge is required.

**Focus Question:**
Which animals eat seagrass? (answer: Dugongs and Turtles)

What would happen to these animals if seagrass disappeared?

What would happen to the seagrass if dugongs and turtles disappeared?

What are threats to the seagrass?

**Useful Vocabulary:**
Dugong, turtle, ecosystem, habitat.

## ACTIVITY:

**Main Activity:**

Without mentioning the lesson topic, arrange students in pairs, sitting or standing back to back.

Give one student an image of a dugong and the other student an image of a turtle (see below).

Students take it in turns to describe the animal in front of them without saying what it is, the other student has to try and guess the animal.

**Class Discussion:**

What are the similarities and differences between dugongs and turtles?

Explain that dugongs and turtles both eat seagrass and show the different types of seagrass (see below).

What would happen to the dugongs and turtles if the seagrass disappeared? Think, pair share.

What would happen to the seagrass if the dugongs and turtles disappeared? Think, pair share.

Explain that this is called a feeding relationship and that if this changes, both sides will be affected.

**Extension task:**

Use information sheets (links below) to explore in more detail.

**Link(s) to the Australian Curriculum:**

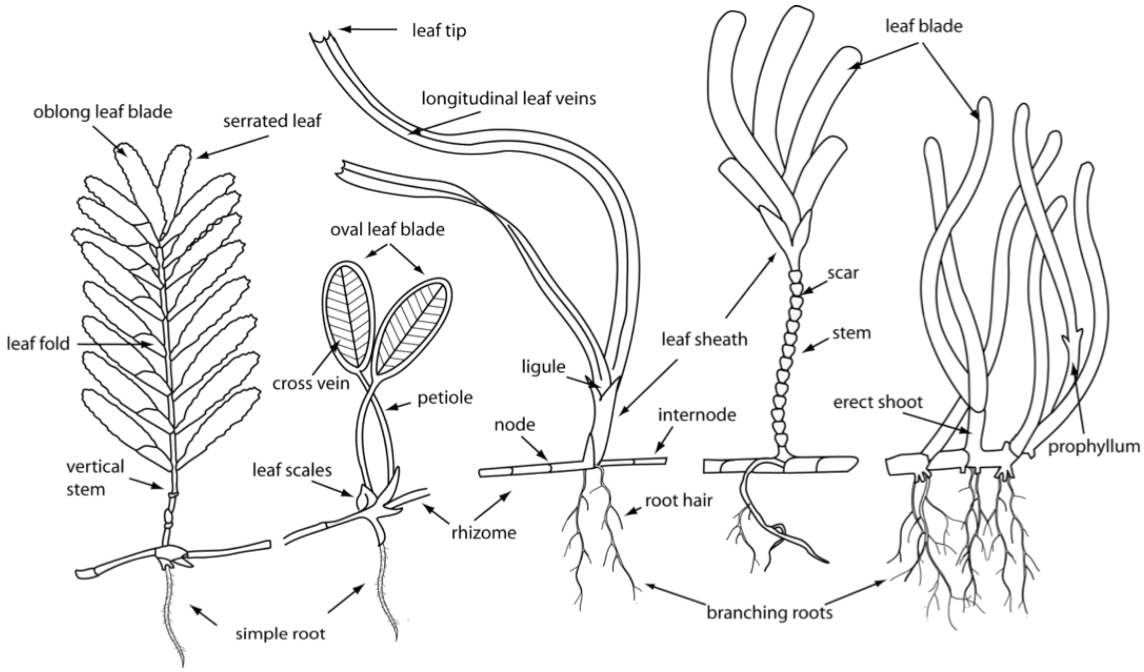
- SCIENCE: Science Understanding: Biological sciences:

  Predicting the effects when living things in feeding relationships are removed or die out in an area, recognising that interactions between living things may be competitive or mutually beneficial (ACSSU073)

- HASS: Inquiry and skills: Evaluating and reflecting:
  Finding connections, in order to draw conclusions, from an analysis of sources (for example, relationships between plants and animals in an ecosystem; (ACHASSI079)

**Teacher resources:**

- Griffith Information Sheet:
  https://www.griffith.edu.au/__data/assets/pdf_file/0015/323241/seagrass.pdf
  https://www.griffith.edu.au/__data/assets/pdf_file/0018/323208/sea-turtles.pdf
  https://www.griffith.edu.au/__data/assets/pdf_file/0004/322870/Dugongs.pdf
- Seagrass Watch:
  http://www.seagrasswatch.org/Info_centre/Publications/Seagrass_a_hidden_treasure.pdf




(Source: Len McKenzie SeagrassWatch 2008)

(Source: GBRMPA, 2011)

(Source: GCCM)

YEAR FIVE

## MANGROVES

**Aim:**
Develop understanding of mangroves and learn how to interpret data from graphs, text and maps.

**Prior Knowledge:**
No prior knowledge is required.

**Focus Questions:**
What are mangroves?

Why are mangroves threatened?

Where are mangroves distributed on a global scale?

How could mangroves be protected?

**Useful Vocabulary:**
Marine coastal environments, adaptable, filtering, roots, spongy tissue, decaying matter, smell.

## ACTIVITY:

**Main Activity:**
Test prior knowledge / make predictions – what is a mangrove? Draw a picture of what you think a mangrove looks like.

**Extension task:**
What does it smell like? Sound like? (Mangrove forests often smell like rotten eggs! The smell shows they are healthy and that leaf litter is being recycled into their roots.)

Mangroves – Guardians of the Coast (30 mins) watch the first 5 minutes to give an impression of mangroves, or longer to develop understanding further. (Link below)

https://www.youtube.com/watch?v=4SY7X9zdZ-U

Were your predictions correct?

As a class, look at the world mangrove distribution map (link below). What do you notice about where the mangroves are? (they are all coastal and near the equator). What might this tell us about mangroves? (they grow in salt water and warm weather).

Now look just at Australia. Where are most of the mangroves? Why do you think that is? (mostly northern, warm weather)

Look at the graph of tree cover loss in mangroves (link below), which shows the area of mangroves lost in a two year period. Which country lost the most? Did Australia lose more or less than other countries?

**Homework:**
Find out why mangroves are important.

**Link(s) to Australian Curriculum:**

- HASS: Inquiry and skills: Analysing:

  Making inferences using sources, such as graphs and thematic maps, that show distribution (for example, the number of electors in some state or federal electorates to discuss representation; the distribution of primary resource industries in Australia and their proximity to cities; the spread of the cane toad across Australia and its threat to environments) (ACHASSI100)

**Teacher resources:**

- Griffith Information Sheet:

  https://www.griffith.edu.au/__data/assets/pdf_file/0009/322884/Mangroves.pdf

- Mangroves – Guardians of the Coast (30 mins)

  https://www.youtube.com/watch?v=4SY7X9zdZ-U

- World Mangrove Distribution Map:

  https://natgeoeducationblog.files.wordpress.com/2014/12/mangrovemap.jpg

- Graph Tree Cover Loss in Mangroves year 2000-2012:

  http://www.wri.org/sites/default/files/uploads/Tree-Cover-Loss-chart-a_global.jpg

- Threats and Pressure on Mangroves in Australia:

  http://www.agriculture.gov.au/abares/forestsaustralia/profiles/mangrove-forest

- General Information IUCN Article:

  http://www.iucn.org/knowledge/news/?5025/Mangrove-forests-in-worldwide-decline

- Threats and Pressure in Australia:

  http://www.mangrovewatch.org.au/index.php?option=com_content&view=category&layout=blog&id=26&Itemid=300161

- Distribution map in scientific paper:

  http://www.marineclimatechange.com/marineclimatechange/bluecarbon_2_files/Girietal2011.pdf

YEAR FIVE

## ROCKY SHORES

**Aim:**
Explore the Rocky Shores habitat and understand that living things have structural features and adaptations that help them to survive in their environment.

**Prior Knowledge:**
No prior knowledge is required.

**Focus Questions:**
What do we mean by Rocky Shores?

Which plants and animals use rocky shores as a habitat?

How have they adapted to life there?

**Useful Vocabulary:**
Adaptation, habitat, environment, camouflage, predator.

## ACTIVITY:

**Main Activity:**
Show students the image collage below. Is there anything living in these pictures?

Are they easy to see? Why might that be? Explain camouflage – they have adapted or changed over time to look like their surroundings as defence against predators (other animals which might eat them).

An adaptation is when plants or animals change over time to give them a better chance of survival in their environment.

Work in pairs to write your own definition of camouflage, predator and adaptation.

What is the name of the habitat in the pictures? (Answer: Rocky Shores)

What is a rocky shore environment? See page below.

Who lives in rocky shores? Matching activity. Either print the sheet (see below) and give to pupils (individually or in pairs) to cut up and match before sticking in their books, or match as a class.

Which adaptations help these creatures to deal with living in a harsh environment? Refer to the information sheet (link below) for more detailed information.

**Link(s) to the Australian Curriculum:**

- SCIENCE UNDERSTANDING: Biological sciences

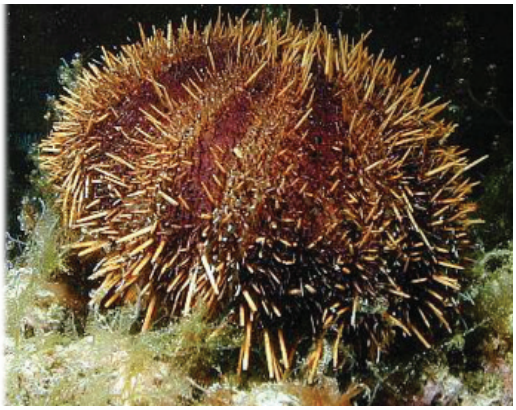
  Living things have structural features and adaptations that help them to survive in their environment (ACSSU043)

**Teacher resources:**

- Griffith Information Sheet:

  http://www.goldcoast.qld.gov.au/documents/bf/fs-rocky-shores.pdf

Clockwise from top left: a sea snake, algal turf, moss, and a periwinkle. All pictures taken at Burleigh Heads, source: GCCC)



Black Sea Cucumber

White Spotted Hermit Crab

Cake Sea Urchin

Snowflake Eel

Silver Gull

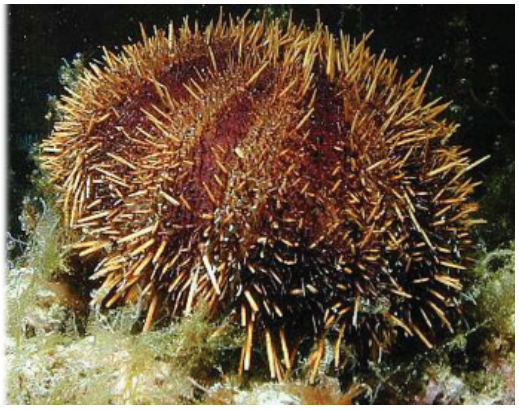
Mulberry Whelk

White Spotted Hermit Crab

Silver Gull

Snowflake Eel

Black Sea Cucumber



Cake Sea Urchin

Mulberry Whelk

# WHAT IS A ROCKY SHORE ENVIRONMENT?


- Rocky Cliffs
- Boulder fields
- Rock Pools
- Platforms
- Extreme weather including intense sunlight and continuous sea winds

YEAR SIX

## CYCLONES AND STORMS

**Aim:**
Develop awareness of how understanding of the causes and effects of cyclones and storm surges has changed over time. Consider their effect on a natural beach ecosystem.

**Prior Knowledge:**
No prior knowledge is required.

**Focus Question:**
How do storms and cyclones affect the Gold Coast?

**Useful Vocabulary:**
Sea level, cyclones, storm surge, flooding, forecasting.

## ACTIVITY:

**Main Activity:**
Either as a class or in pairs, read the Storm Surge Community Information Sheet (link below) and list the dangers of a storm surge and ways previous storms have affected the Gold Coast. How would this affect animals and plants living in a beach ecosystem?

Use the internet to find photos of the Gold Coast from before and after the seven storm cyclones in 1967. Can you find a recent photo from the same area? How have things changed? Is this a desirable habitat for plants and animals?

Share your pictures with the class and make predictions about the future of the Gold Coast – are beach ecosystems going to develop and grow or disappear?

**Link(s) to the Australian Curriculum:**

- Science: Science as a Human Endeavour: Nature and development of science:

  Describing how understanding of the causes and effects of major natural events has changed, as new evidence has become available (ACSHE098)

**Teacher resources:**

- Griffith Information Sheet:

  Article: https://www.griffith.edu.au/__data/assets/pdf_file/0009/598248/CEMDSS-Storm-Surge-Community-Info-Sheet_Final.pdf

  https://www.griffith.edu.au/__data/assets/pdf_file/0008/322874/History-of-Storms.pdf

  https://www.griffith.edu.au/__data/assets/pdf_file/0003/322887/storm-surge.pdf

  https://www.griffith.edu.au/__data/assets/pdf_file/0003/322869/cyclones.pdf

- Griffith Centre for Coastal Management coastal twilight series 1 storm surge and coastal knowledge (1hr 26min)

  https://www.youtube.com/watch?v=mJi5YKjN7tk&list=PLs53dPt8u9lal_YDRljZlmCGLdgMAA0R6&index=3

YEAR SIX

## ECOLOGICAL VALUE OF THE DUNES

**Aim:**
Develop understanding of the dune vegetation of the Gold Coast and it's importance to the lives of people and animals.

**Prior Knowledge:**
No prior knowledge is required.

**Focus Question:**
How does vegetation support the dunes?
Why is it important to the lives of people and animals?

**Useful Vocabulary:**
Sustain, plants, habitat, erosion, beach, dunes, vegetation, habitat.

## ACTIVITY:

**Main Activity:**
What can plants be used for? (Answers: food, medicine, habitat for small animals, etc).

Look at the dune profile (image below) Why do plants grow on dunes? Native plants (naturally occurring) have branching roots that are long and expansive, growing in all directions, supporting and stabilising the dunes. Invasive species (not naturally occurring in the dunes) have roots that go straight down and do not support or protect the dunes. (See image below)

Watch the Dune management video (13.5 mins) (link below) https://www.youtube.com/watch?v=ujKk8KeyFh8

Why do you think dunes are important to the lives of people? They help to protect the beach from erosion, where sand washes away, leaving the local area vulnerable to flooding.

Why do you think dunes are important to animals? Dunes are a habitat for many animals (see the Fauna in the Dunes factsheet below), as well as providing food for birds and other animals.

**Dune vegetation matching activity – Option 1**
Print the worksheet and ask students to cut out photos and names and match them correctly before sticking in their books.

**Dune vegetation matching activity – Option 2**
Complete the matching task as a class and ask students to draw and label the plants correctly.

**Homework:**
Choose one type of dune vegetation and research it's uses.

**Link(s) to the Australian Curriculum:**

- SCIENCE: Science Understanding: Biological Sciences:
  The growth and survival of living things are affected by physical conditions of their environment (ACSSU094)

**Teacher resources:**

- Griffith Information Sheets:

  https://www.griffith.edu.au/__data/assets/pdf_file/0005/322790/Looking-after-our-dunes.pdfhttps://www.griffith.edu.au/__data/assets/pdf_file/0005/322871/Dunes-of-the-Gold-Coast.pdfhttp://www.goldcoast.qld.gov.au/documents/bf/fs-Fauna-in-our-dunes.pdf

  https://www.griffith.edu.au/__data/assets/pdf_file/0010/333685/Beach-erosion.pdf

  http://www.goldcoast.qld.gov.au/documents/bf/fs-Ecological-Response-to-Storms.pdf

- Copies of the Coastal Plant Pocket Guide can be purchased here:

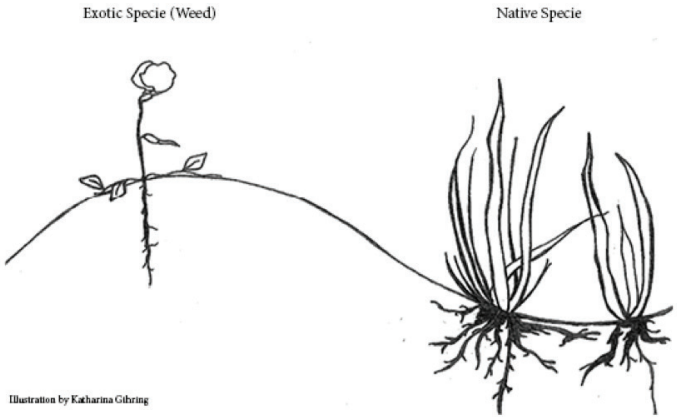
  https://app.secure.griffith.edu.au/griffithpay/Coastal-Plant-Pocket-Guide.html

- City of Gold Coast:

  http://www.goldcoast.qld.gov.au/documents/bf/Shorebirds_of_the_Broadwater.pdf

- Dune management video (13.5 mins)

  https://www.youtube.com/watch?v=ujKk8KeyFh8



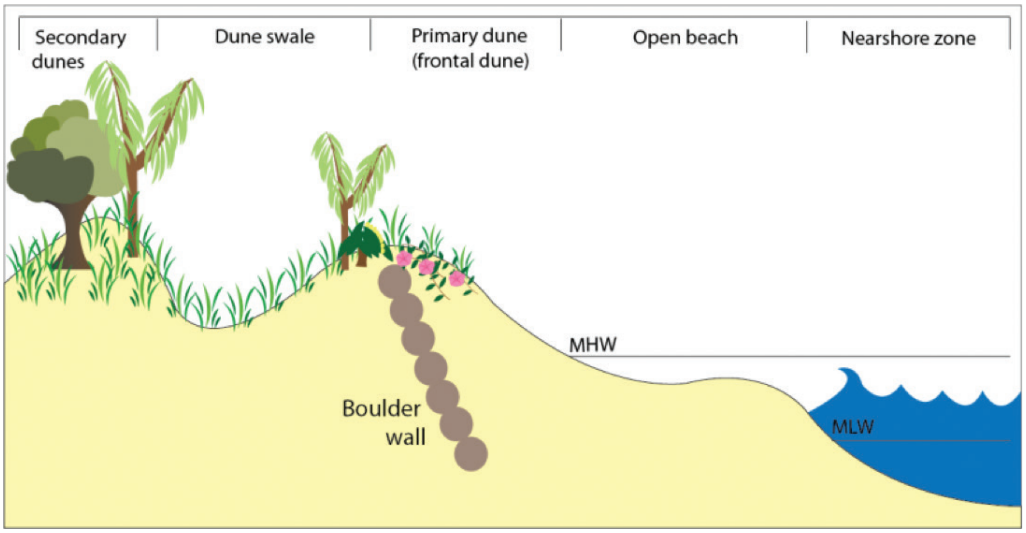




Figure 1. A Gold Coast dune profile

# GOLD COAST DUNE VEGETATION WORKSHEET

Pig Face

Coastal She-Oak

Coastal Banksia

Spinifex Grass

# GOLD COAST DUNE VEGETATION: ANSWER SHEET

Spinifex Grass

Coastal Banksia

Pig Face

Coastal She-Oak

# SECONDARY EDUCATION:

## LESSON PLANS: YEARS SEVEN TO TEN

YEAR SEVEN

## BALANCE IN AN ECOSYSTEM

**Aim:**
Develop awareness that modelling a system can help us demonstrate the connection between the different elements within it. They will also learn that classification is necessary to organise the diverse groups of organisms.

**Prior Knowledge:**
No prior knowledge is required.

**Focus Questions:**
What lives in a coastal ecosystem?

Why is balance necessary in an ecosystem?

**Useful Vocabulary:**
Balance, ecosystem, habitat, fauna, flora, shelter, circulation, hierarchical system.

## ACTIVITY:

**Main Activity:**
Either as a class, or in pairs if there is access to computers, play the marine food chain game (link below).

Choose a habitat (rocky shore, mangrove or beach environment) and draw your own marine food web to show 'who eats who?'. Can you add any plants or animals?

What could change the balance of the ecosystem? For example, if the sharks are all hunted by humans, or underwater plants like seagrass die because of chemicals in the ocean, how would this affect the other plants and animals?

**Extension task:**
Identify Top Predators, Carnivore, Herbivore, Plants.

**Link(s) to the Australian Curriculum:**

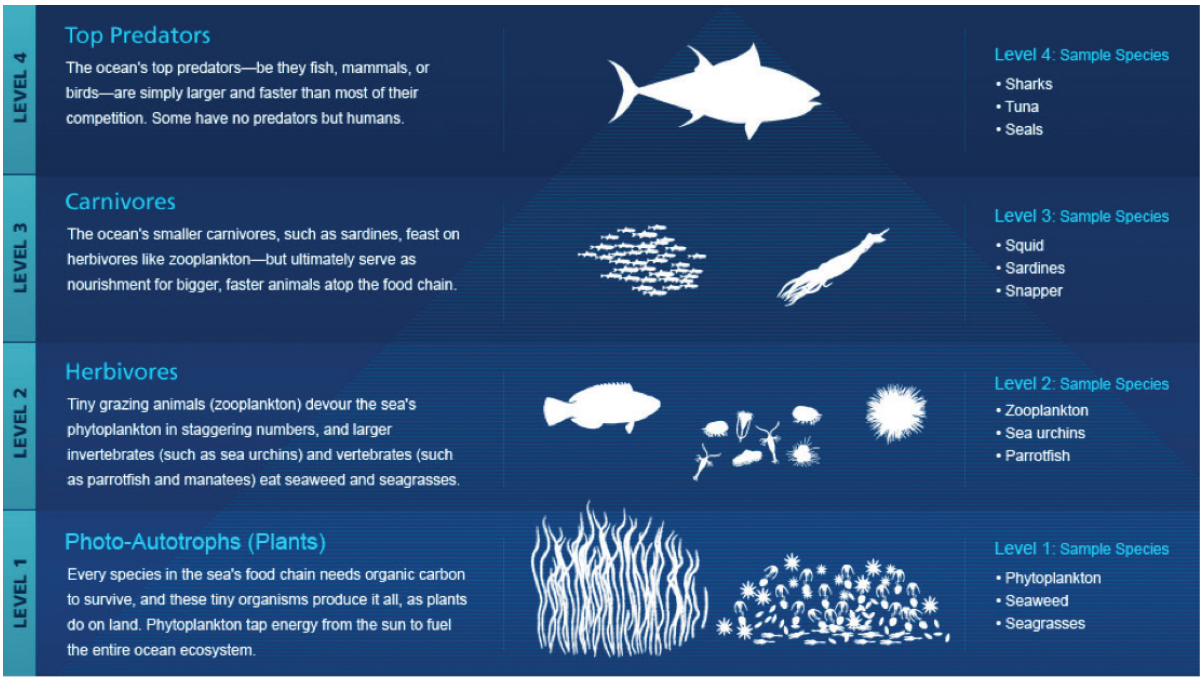
- GEOGRAPHY: Inquiry and skills: Research: Modelling a system (for example, an ecosystem or hydrological cycle) and using it to explain the sequence of effects when elements are manipulated. (ACHASSI155)
- SCIENCE: Science Understanding: Biological sciences: classifying using hierarchical systems such as kingdom, phylum, class, order, family, genus, species. (ACSSU111)

**Teacher resources:**

http://amvelez.com/flash/game.html

- Griffith Information Sheet:
  https://www.griffith.edu.au/__data/assets/pdf_file/0005/322871/Dunes-of-the-Gold-Coast.pdf
- Food web diagram (see page 49):
  http://savethefishsavetheworld.blogspot.com.au/2010/06/japanese-overfishing-crisis-from.html

Food web diagram



YEAR SEVEN

## FLATBACK TURTLE

**Aim:**
Evaluate data to draw conclusions on a current problem. Develop and use scanning skills to find information in a document.

**Prior Knowledge:**
No prior knowledge is required.

**Focus Questions:**
What does a Flatback turtle look like?

Where does it live?

What are the threats to the Flatback turtle?

**Useful Vocabulary:**
Sea turtle, pollution, nesting, range, predators.

## ACTIVITY:

**Main Activity:**
Can you think of the word that is being defined here:

*Look quickly through a document or other text to identify relevant information.*

Answer: scanning

You are going to use scanning to collect information about Flatback Turtles. Complete the Flatback Turtle Question sheet (see below)

Class discussion – what can we do to protect turtles from human impact in the future?

**Link(s) to the Australian Curriculum:**

- GEOGRAPHY: Evaluating and reflecting:

  Evaluating data from a survey to draw conclusions about a current political, social, environmental or business event or issue (ACHASSI159)
- HASS: Inquiry and skills: Evaluating and reflecting:

  Using knowledge of the past to inform views on probable and preferred (individual or collective) futures, explaining reasoning to justify futures scenarios (ACHASSI62)

**Teacher resources:**

- The State of the World's Sea Turtles (SWOT)

  http://www.seaturtlestatus.org/sites/swot/files/swot4.pdf
- Queensland Government Environmental Protection Agency:

  http://www.austurtle.org.au/SeaTurtleBiology/flatback_Garman.pdf
- General Information:

  http://www.seeturtles.org/flatback-turtle/
- Question sheet

# FLATBACK TURTLE QUESTION SHEET

**The State of the World's Sea Turtles (SWOT) Page 20**

1. In which countries can the flatback turtle be found?

2. What makes the flatback turles so special?

3. What does the flatback turtle look like?

4. Why do flatback turtles prefer open mainland beaches or inshore continental islands?

5. What do you think the term "rookery" means?

6. Where are the flatback turtle's nesting beaches located? (see page 24-25)

7. How are flatback turtles' eggs different compared to the eggs of other sea turtle species?

8. What do you think is a "hatchling"?

9. When is the breeding season of the flatback turtle?

10. What do you think is meant by the terminology: 'mean reproductive life'?

11. How often does a female flatback turtle lay eggs?

12. What are the characteristics of the swimming pattern of the Flatback hatchlings?

13. How long can a flatback turtle dive?

**Queensland Government Environmental Protection Agency – Page 33**

14. What threats are flatback turtles facing? Observe the photos on page 33

15. Can you explain what 'anthropogenic' means?

# FLATBACK TURTLE ANSWER SHEET

**Page 20**

1. In which countries can the flatback turtle be found?
The only nesting sites are in Australia, but Flatbacks have been found feeding in the waters of Papua New Guinea and Indonesia

2. What makes the flatback turtle so special?
Flatback turtles are an Australian sea turtle with a unique life cycle, life history, form and function.

3. What does the flatback turtle look like?
The Flatback Turtles have a pancaked body and flared carapace margins—like hydrofoils.

4. Why do flatback turtles prefer open mainland beaches or inshore continental islands?
Flatback shells are covered with only lightly keratinized scutes that tend to be softer and more susceptible to injury than are those of other hard-shelled turtle species.

5. What do you think the term "rookery" means?
It is the turtle's nesting area.

6. Where are the flatback turtle's nesting beaches located? (see page 24-25)?
The nesting beaches are spread from southeast Queensland across the Northern Territory to the Pilbara region of Western Australia

7. How is the flatback turtle's egg different compared to the eggs of other sea turtle species?
The flatback turtles lay the largest eggs compared to their intermediate body size.

8. What do you think is a hatchling?
A hatchling is a baby turtle

9. When is the breeding season of the flatback turtle?
It depends on their genetic stock. The Flatback Turtle laying their eggs on Queensland beaches breed through the Australian summer, while the Flatback turtles at the Gulf of Carpentaria ;lay their eggs in winter months.

10. What do you think is meant by the terminology: 'mean reproductive life'?
A mean reproductive life is the average time a female flatback turtle is able to lay eggs.

11. How often does a female flatback turtle lay eggs?
Every 2 to 3 years

12. What are the characteristics of the swimming pattern of the flatback turtle hatchlings?
Little flatbacks swim consistently during the 24 hours after emergence, and then they gradually switch to a mostly diurnal (day time) swimming pattern. They dive frequently, spending little time at the surface, and they tend to spend more time submerged during dives as they age.

13. How long can a flatback turtle dive?
Between an hour and 98 minutes.

**Queensland Government Environmental Protection Agency – Page 33**

14. What threats are flatback turtles facing? Observe the photos on page 33
Trawl bycatch, beachwashed nets, pigs, Indigenous harvest, and plastic debris.

15. Can you explain what 'anthropogenic' means?
Caused or influenced by humans.

# YEAR EIGHT

## POPULATION DENSITY

**Aim:**
Use mapping to develop understanding of population distribution in Australia and how this puts pressure on our coastal ecosystems.

**Prior Knowledge:**
No prior knowledge is required.

**Focus Questions:**
Which area of Australia is the most populated?

Which Dutch land feature is the most populated?

**Useful Vocabulary:**
Population density, distribution, pressure, coastal ecosystem.

## ACTIVITY:

**Main Activity:**
Create a map (either using the outline below or computer mapping software if available) to show population density and distribution in Australia. Data can be found at the Australian Bureau of Statistics (link below).

Where does the majority of the population live? (Answer: 85% percent of the Australian population lives at the coast).

Extension task: Examine the data for America (link below). Are there any similarities? Differences? Why might that be?

How might this put pressure on the coastal ecosystem?

**Link(s) to Australian Curriculum:**

- GEOGRAPHY: Knowledge and understanding: Changing nations:

  Differences in urban concentration and urban settlement patterns between Australia and the United States of America, and their causes and consequences (ACHGK055)

- GEOGRAPHY: Inquiry and skills: Interpreting, analysing and concluding:

  Interpret geographical data and other information using qualitative and quantitative methods, and digital and spatial technologies as appropriate, to identify and propose explanations for spatial distributions, patterns and trends, and infer relationships (ACHGS051) & (ACHGS059)

**Teacher resources:**

- Australian Bureau of Statistics:

  http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/1270.0.55.007Main+Features12011?OpenDocument

- Rijksinstituut voor Volkgeszondheid en Milieu:

  United States Census Bureau:

  https://www.census.gov/popest/data/maps/2011/County-Density-11.html

YEAR EIGHT

## THE REEFS OF THE GOLD COAST

**Aim:**
Learn about different types of reefs and understand how ecosystems are challenged to sustain themselves because of man made changes in the environment.

**Prior Knowledge:**
No prior knowledge is required.

**Focus Questions:**
What is the difference between a natural and artificial reef?

Why are reefs important?

How are our reefs changing?

What threats are there to our reefs?

**Useful Vocabulary:**
Natural reef, artificial reef, coral, rocky, sand, habitat, biodiversity.

## ACTIVITY:

**Main Activity:**

What is an artificial reef? Watch the Narrowneck reef video (4 mins, see link below).

Work in groups of 3 to research Reefs of the Gold Coast. Your research must include information on the different types of reefs as well as focusing on human-induced environmental changes. How healthy or successful are the reefs? What threats do the different reefs face? To guide research, give each student an information sheets (see links below). Each student must read their sheet and select key information to be included in the group's research, as well as identifying any areas for further investigation.

As a group, collate your research and create a leaflet or powerpoint presentation.

Present research to the class and discuss.

**Extension task:**

Create a SWOT Analysis for Palm Beach Reef (natural, rocky) and Narrowneck reef (artificial). What are the strengths, weaknesses, opportunities and threats?

**Link(s) to Australian Curriculum:**

- GEOGRAPHY: Geographical Knowledge and Understanding: Landforms and landscapes: Different types of landscapes and their distinctive landform features (ACHGK048) Geomorphic processes that produce landforms, including a case study of at least one landform (ACHGK050)

  Human causes and effects of landscape degradation (ACHGK051)

  Ways of protecting significant landscapes (ACHGK052)
- GEOGRAPHY: Inquiry and Skills: Collecting, recording, evaluating and representing:

  Evaluate sources for their reliability and usefulness and select, collect and record relevant

geographical data and information, using ethical protocols, from appropriate primary and secondary sources (ACHGS048) & (ACHGS056)

- GEOGRAPHY: Inquiry and Skills: Communicating:

  Present findings, arguments and ideas in a range of communication forms selected to suit a particular audience and purpose; using geographical terminology and digital technologies as appropriate (ACHGS053) & (ACHGS061)

**Teacher resources:**

- Griffith Information Sheets:

  http://www.goldcoast.qld.gov.au/documents/bf/fs-reefs-gc.pdf

  https://www.griffith.edu.au/__data/assets/pdf_file/0010/322876/Narrowneck-artificial-reef.pdf

  https://www.griffith.edu.au/__data/assets/pdf_file/0011/322877/Palm-Beach-reef.pdf]

- Narrowneck reef

  https://www.youtube.com/watch?v=-dv4n1YoLsY

YEAR NINE

## DOLPHINS

**Aim:**
Develop awareness of how the requirements for life are provided by different body systems within dolphins and develop understanding of how these systems work together.

**Prior Knowledge:**
No prior knowledge is required.

**Focus Questions:**
Which organs does a dolphin have?

What are the functions of the organs?

How similar are the dolphins' organs and systems to the humans' organs and systems?

**Useful Vocabulary:**
Digestive system, respiratory system, nervous system, circulatory system, excretory system, blowhole, echolocation, backbone, flippers.

## ACTIVITY:

**Main Activity:**
IHow are dolphins and humans similar? In pairs, use the internet to research dolphins (see links below to get you started) and see what we have in common with dolphins. (E.g, mammals, breathing, communication by 'talking', etc). What are the differences between humans and dolphins?

Use words and pictures to create an infographic to show how Dolphins breathe.

**Extension:**
Explore how Dolphins use vocalisations or sounds to communicate.

**Link(s) to the Australian Curriculum:**

- SCIENCE: Science Understanding: Biological science:

  Describing how the requirements for life (for example oxygen, nutrients, water and removal of waste) are provided through the coordinated function of body systems such as the respiratory, circulatory, digestive, nervous and excretory systems. (ACSSU175)

  Explaining how body systems work together to maintain a functioning body using models, flow diagrams or simulations. (ACSSU175)

**Teacher resources:**

- Dolphins' reparation:

  http://dolphin4life.weebly.com/repiration.html
- Dolphins' organs:

  http://www.crystalinks.com/dolphin.html

YEAR NINE

## SHOREBIRDS

**Aim:**
Develop awareness of the different factors which affect and/or threaten the population size of shorebirds on the Broadwater.

**Prior Knowledge:**
No prior knowledge is required.

**Focus Questions:**
Where do shorebirds live?

Which factors affect population size?

**Useful Vocabulary:**
Shorebirds, migratory, habitat.

## ACTIVITY:

**Main Activity:**

What do you know about shorebirds? Discuss any prior knowledge.

What would you like to know about shore birds on the Gold Coast? Record questions on the board, ideally a different question from each student. (eg Where do shorebirds live? What do they eat? Do they have predators?, etc)

In pairs, use the City of Gold Coast shorebirds leaflet (link below) to answer as many of the questions as possible, or divide questions among the class so all answers are found.

Discuss findings, with a focus on how population size is affected by external factors.

**Extension task:**
What else have you learnt about shorebirds? (eg why the Little Tern (sternula albirons) is endangered)

**Link(s) to Australian Curriculum:**

- SCIENCE: Science Understanding: Biological science:

  Examining factors that affect population sizes such as seasonal changes, destruction of habitats, introduced species. (ACSSU176)

**Teacher resources:**

- City of Gold Coast:

  http://www.goldcoast.qld.gov.au/documents/bf/Shorebirds_of_the_Broadwater.pdf

YEAR TEN

# INVESTIGATING HUMAN IMPACT ON OUR GOLD COAST BEACHES

**Aim:**
Gather data on human induced environmental changes on our Gold Coast beaches and collect geographical information from secondary sources.

**Prior Knowledge:**
No prior knowledge is required.

**Focus Questions:**
What is the difference between primary and secondary data?

How can we collect and use different types of data to develop understanding of human induced environmental changes on the Gold Coast?

**Useful Vocabulary:**
Primary and secondary sources, human induced environmental changes, coastal management techniques.

## ACTIVITY:

**Preparation task:**
Discuss and define primary and secondary data sources.

The research task can be done as a class excursion or for homework.

**Research Project:**
You are going to visit your local beach and collect evidence of human impact. Human impact could be development like buildings, coastal management techniques such as sea walls, damage to dunes or litter on the beach. How could this be measured? Evidence could include photographs or numerical data (e.g. how many pieces of litter, which types, etc).

Create a data sheet to plan your investigation.

Visit your beach and collect data.

Research your beach and find secondary data related to human impact. How will you know if the source of your data is reliable?

Summarise your findings and present to the class, explaining how the human impact you have found evidence for might change the environment you have researched.

Examine sources from other students and assess their reliability.

**Link(s) to the Australian Curriculum:**

- GEOGRAPHY: Geographical Knowledge and Understanding: Unit 2: Geographies of human wellbeing: Geographical Inquiry and Skills: Collecting, recording, evaluating, and representing:

  Gathering relevant data from a range of primary sources (for example, from observation and annotated field sketches, conducting surveys, interviews and experiments, or taking photographs) about human induced environmental changes (ACHGS073).

Collecting geographical information from secondary sources (for example, topographic maps, thematic maps, choropleth maps, weather maps, climate graphs, compound column graphs and population pyramids, scatter plots, tables, satellite images and aerial photographs, reports, census data and the media) (ACHGS073).

**Teacher resources:**

- Griffith Information Sheets: https://www.griffith.edu.au/__data/assets/pdf_file/0010/333685/Beach-erosion.pdf

  https://www.griffith.edu.au/__data/assets/pdf_file/0008/322874/History-of-Storms.pdf

  https://www.griffith.edu.au/__data/assets/pdf_file/0009/322875/Longshore-drift.pdf

YEAR TEN

## THE GLOBAL CONVEYOR BELT

**Aim:**
Develop awareness of the global conveyor belt and understand that not only sea species depend on it but terrestrial species as well. Learn how to develop hypothesis and present results.

**Prior Knowledge:**
No prior knowledge is required.

**Focus Questions:**
What is the global conveyor belt?

How does the global conveyor belt regulate global climate?

**Useful Vocabulary:**
Deep ocean currents, thermohaline circulation.

## ACTIVITY:

**Main Activity:**
Explanation of the Global Conveyor Belt (link below)

Divide students into groups of 3-4. Each group will research and prepare a 10-minute presentation on one of the following topics:

The role of deep ocean current in regulating global climate

The effects of deep ocean currents on marine life

The effects of deep ocean current on terrestrial life

The effects of deep ocean current in Australia

The effect of climate change on deep ocean currents

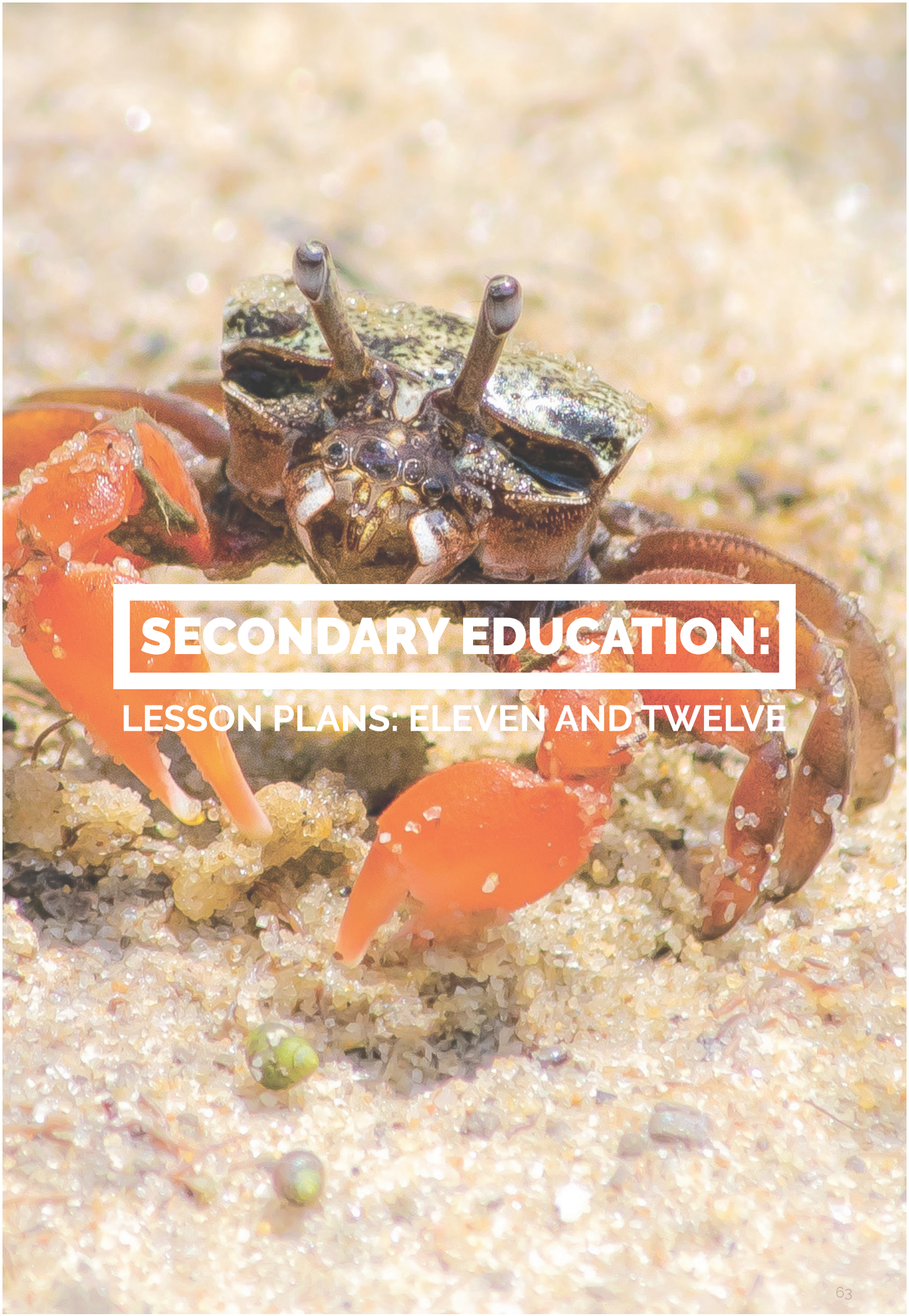
All groups present to the class and discuss.

**Link(s) to Australian Curriculum**

- SCIENCE: Science understanding: Earth and space science:
  Investigating how human activity affects global systems. (ACSSU189)
  Considering the long-term effects of loss of biodiversity. (ACSSU189)
- SCIENCE: Science Inquiry and skills: Questioning and predicting:
  Developing hypotheses based on well-developed models and theories. (ACSIS198)
- SCIENCE: Science Inquiry Skills: Communication:
  Presenting results and ideas using formal experimental reports, oral presentations, slide shows, poster presentations and contributing to group discussions (ACSIS208).

**Teacher resources:**

- Explanation of the Global Conveyor Belt:
  http://oceanservice.noaa.gov/education/kits/currents/06conveyor.html
- Ocean Currents in Australia:
  http://www.redmap.org.au/article/ocean-currents-in-australia/



# SECONDARY EDUCATION:

## LESSON PLANS: ELEVEN AND TWELVE

GEOGRAPHY: UNIT 1

## NATURAL HAZARDS RESOURCES

**Aim:**
the resources provided will facilitate students developing a Natural Hazards depth study with a focus on coastal hazards such as storms and cyclones. The study is intended to investigate one natural hazard, and how the risks associated with the hazard are being managed. Activities will familiarise students with coastal hazards, demonstrate potential methods of collecting primary data and provide sources of secondary data.

**Prior knowledge:**
Own experience of the beach and how the coastal environment is affected by Natural Hazards.

Previous Coastal education, eg CoastEd sessions or lessons.

**Focus questions:**
How does erosion affect the Gold Coast coastline through wind, storms and cyclones?

How can Coastal Management techniques reduce or mitigate the impact of storms and cyclones?

**Useful vocabulary:**
Coastal management, erosion, cyclone, longshore drift

NOTES: All lessons are flexible and it may take more than one hour to effectively complete the activities, according to the needs and abilities of the students. Teachers may choose to teach one or more of the lessons, in any order. Options are provided for extending or simplifying tasks.

**Links to the Australian Curriculum:**

***Geographical Knowledge and Understanding***

- Depth study of a natural hazard
- The nature and causes of the selected hazard and explain how the activities of people can intensify its impacts (ACHGE016)
- The magnitude, frequency, duration, temporal spacing and effects of the hazard (ACHGE017)
- The spatial distribution of the hazard, and how an understanding of biophysical and human processes can be used to explain the patterns that are identified (ACHGE018)
- The physical and human factors that explain why some places are more vulnerable than others (ACHGE019)
- The environmental, economic and social impacts of the hazard in a developed country such as Australia compared with at least one developing country or region (ACHGE020)
- The sustainable risk management policies, procedures and practices designed to reduce the impacts of the hazard through preparedness, mitigation, prevention and adaptation (ACHGE021)

LESSON ONE

## INTRODUCTION TO STORMS, CYCLONES AND TSUNAMIS ON THE GOLD COAST

**Aim:**
Develop understanding of the nature and causes of the selected hazard and explain how the activities of people can intensify its impacts (ACHGE016)

Consider the magnitude, frequency, duration, temporal spacing and effects of the hazard (ACHGE017)

Develop understanding of the spatial distribution of the hazard, and how an understanding of biophysical and human processes can be used to explain the patterns that are identified (ACHGE018)

**Introduction:**
History of Gold Coast Storms – students use images and information (see below) to create a timeline.

What is erosion? How does it happen? Why does it matter? Either brief class discussion, or more detailed explanations here:

https://ees.as.uky.edu/sites/default/files/elearning/module14swf.swf

In the context of our coastlines, erosion is the movement of sand by waves and wind, usually a gradual process, but accelerated by storms and cyclones.

**Main Activity:**
Students to work in pairs to define storm/storm surge, cyclone, tsunami and discuss the difference between them. (5 mins)

Give each pair a factsheet (Cyclones (PDF 631kb), Storm Surges (PDF 326kb), Tsunamis (PDF 350kb)), paper and pens. Allow 10 minutes to create an infographic explaining what's on their sheet, using no more than 10 words, but as many images, symbols, etc as they like.

Class feedback to clarify and record definitions.

**Extension task:**
How do these Natural Hazards affect the Gold Coast area?

Consider different viewpoints – resident (adult/child), tourist, local business owner, council member

**Feedback & Evaluation:**
How confident are you that you understand the difference between storms/storm surges, cyclones and tsunamis?

1930s
1940s
1950s
1960s
1970s
1980s
1990s
2000s

TC = T


Kirra Beach 1936

### 2009

March: Tropical cyclone Hamish generated large swells causing beach erosion

May: East coast low causing beach erosion


Main Beach 1954

### 1954

Erosion at Main Beach: tropical cyclone crossing land at Coolangatta causing severe beach erosion


Mermaid Beach 1974

### 2000

April: Tropical low generated large swells causing beach erosion

July: East coast low bringing flooding

October: Tropical low causing beach erosion

### 1936

Tropical cyclone, with ocean waters washed into Kirra Surf Club and many houses damaged at Palm Beach


Palm Beach 2009

### 1974

January: Tropical cyclone Wanda, extensive beach erosion and intensive rainfall with the Nerang River rising to a record 9.91m

February: Tropical cyclone Pam caused beach erosion and the seawall was overtopped by waves

March: Tropical cyclone Zoe causing beach erosion


Gold Coast 1967


Palm Beach 2000


Gold Coast 1967

### 1967

January: Tropical cyclone Dinah crosses as a category 4 cyclone causing extensive damage to buildings

February: Tropical cyclone Barbara crosses the coast at Byron Bay causing extensive erosion to Gold Coast's beaches

March: A continental low brought heavy rains and large swells Tropical cyclone Elaine caused localised flooding and beach erosion

April: Tropical cyclone Glenda moved south to offshore Brisbane causing extensive beach erosion and damage to buildings

May: East coast low

June: East coast low causing more beach erosion and flooding East coast low, a severe storm, beach erosion and buildings damaged

July: East coast low causing further beach erosion

# History of coastal storms on the Gold Coast

**1930s**

1929 TC
1931 TC
1936 TC
1938 TC

**1940s**

1948 TC

**1950s**

1950 ECL
1951 TC
1954 TC

**1960s**

1960 TC
1962 TC
1963 TC Annie
1967 TC Dinah, TC Barbara, ECL, TC Elaine, TC Glenda ECL, ECL, ECL, ECL

**1970s**

1972 TC Daisy
1974 TC Wanda, TC Pam, TC Zoe
1976 TC David

**1980s**

1980 TC Paul, TC Ruth, ECL
1981 TC Cliff, ECL
1983 ECL
1984 TC Lance
1987 ECL
1988 ECL
1989 ECL

**1990s**

1990 TC Nancy
1992 TC Betsy, TC Fran
1993 TC Roger
1996 ECL
1998 TC Yali
1999 ECL

**2000s**

2000 TL, ECL, TL
2001 ECL
2004 HC
2005 Extreme rainfall
2006 ECL, HC
2008 ECL, ECL
2009 TC Hamish, ECL

### 1936

Tropical cyclone, with ocean waters washed into Kirra Surf Club and many houses damaged at Palm Beach

### 1954

Erosion at Main Beach: tropical cyclone crossing land at Coolangatta causing severe beach erosion

### 1967

January: Tropical cyclone Dinah crosses as a category 4 cyclone causing extensive damage to buildings

February: Tropical cyclone Barbara crosses the coast at Byron Bay causing extensive erosion to Gold Coast's beaches

March: A continental low brought heavy rains and large swells Tropical cyclone Elaine caused localised flooding and beach erosion

April: Tropical cyclone Glenda moved south to offshore Brisbane causing extensive beach erosion and damage to buildings

May: East coast low

June: East coast low causing more beach erosion and flooding East coast low, a severe storm, beach erosion and buildings damaged

July: East coast low causing further beach erosion

### 1974

January: Tropical cyclone Wanda, extensive beach erosion and intensive rainfall with the Nerang River rising to a record 9.91m

February: Tropical cyclone Pam caused beach erosion and the seawall was overtopped by waves

March: Tropical cyclone Zoe causing beach erosion

### 2000

April: Tropical low generated large swells causing beach erosion

July: East coast low bringing flooding

October: Tropical low causing beach erosion

### 2009

March: Tropical cyclone Hamish generated large swells causing beach erosion

May: East coast low causing beach erosion


Kirra Beach 1936


Main Beach 1954


Gold Coast 1967


Gold Coast 1967


Mermaid Beach 1974


Palm Beach 2000


Palm Beach 2009

TC = Tropical cyclone; ECL = East coast low; HC = Hybrid cyclone; TL = Tropical low

LESSON TWO

## ENVIRONMENTAL, ECONOMIC AND SOCIAL IMPACTS OF STORMS, CYCLONES & TSUNAMIS

**Aim:**
Consider the environmental, economic and social impacts of the hazard in a developed country such as Australia compared with at least one developing country or region (ACHGE020)

Begin to apply generalisations to evaluate alternative responses to geographical issues at a variety of scales (ACHGE010)

Propose individual and collective action, taking into account environmental, social and economic factors; and predict the outcomes of the proposed action (ACHGE011)

**Introduction:**
Who will be affected by storm damage? Pupils to write: People Animals Plants in the centre of a page and use to create a mind map. Be as specific as possible – which people, animals, plants? How will they be affected?

**Main Activity:**
Divide the class into groups of 4 or 5 students. Give each student a role within the group.

**Resident:** (in groups of 5 students, there can be 2 residents; 1 adult, 1 child.) You live and work/go to school in the area. You visit the beach in your spare time.

**Tourist:** You visit the area for your holidays every year.

**Business Owner:** Your company is based near the beach and the success of your business depends on visitors to the beach.

**Environmentalist:** You are concerned about protecting the local environment, including animals, plants and their habitats.

*Individual thinking time.* Students may write or record their ideas in any way they find helpful.
Instructions for students:

1. Consider your character's situation.
2. How might storm damage to the coastline affect your character?
3. What would your main concerns be?
4. Will it affect you financially?
5. Will it affect your social life or hobbies?
6. Is anyone worse affected than you?
7. What do you think should be done to resolve the situation?
8. How will you persuade others to agree with you?

*Group discussion.* Staying 'in character', take it in turns to explain your opinion to the rest of the group. Once each person has spoken, the rest of the group may ask questions. Decide what should be done to resolve the situation.

**Extension task:**
Choose a developing country where the beach environment is significant, eg Thailand, India. Do you think people there would have the same reaction as you? How might their concerns be different to yours? Would the same solution be suitable?

**Feedback & Evaluation:**
Who do you think will be most affected by the storm damage?
How effective will the suggested solutions be? What is the best solution? Why?

LESSON THREE

## COASTAL MANAGEMENT TECHNIQUES

**Aim:**
Develop an understanding of the sustainable risk management policies, procedures and practices designed to reduce the impacts of the hazard through preparedness, mitigation, prevention and adaptation. (ACHGE021)

**Introduction:**
All pupils to attempt to answer questions on the quiz sheet (below). Don't go through the answers, but discuss how many they think they've got right. Explain that the main activity is going to help answer all of the questions.

**Main Activity:**
Market place activity. Divide the class into 7 groups and give each a factsheet (links below). Each group has 15 minutes to read the factsheet and create a poster using a maximum of 15 words and as many images, symbols, diagrams as they like to communicate the information on the factsheet. Timing/word count can be adjusted as required. The activity can be split over two lessons.

Then each group nominates two 'knowledge seekers' to go into the marketplace and learn as much as they can by visiting all of the other groups. The remaining members of the group stay with their poster and explain it to visiting knowledge seekers.

Once knowledge seekers have visited all groups, they return to their original group and explain their findings to the other members of their group.

Beach Erosion: Coastal Processes on the Gold Coast (PDF 410kb)
Longshore Drift: Coastal Processes on the Gold Coast (PDF 773kb)
Gold Coast Beach Nourishment (PDF 463kb)
Northern Gold Coast Beach Protection Strategy: Improving Beach Width (PDF 519kb)
Training Walls PDF(323kb)
Dunes of the Gold Coast (PDF 483kb)
Looking After Our Dunes (PDF 613kb)

**Extension task:**
Pupils have time to record all of their learning in any way they like – writing, pictures, diagrams etc.

**Feedback & Evaluation:**
Re-do the quiz. Now how many right answers have you got? Mark quiz and discuss activity. Which parts were most useful? Most challenging?

# COASTAL MANAGEMENT TECHNIQUES QUIZ

1. What is sand erosion?

2. What is sand accretion?

3. What is coastal management?

4. Name 5 coastal management techniques:

5. What is longshore drift?

6. In which direction does longshore drift occur on the Gold Coast?

7. Why are sand dunes important?

8. How can sand dunes be protected? Name 3 strategies.

9. What is sand bypassing?

10. Why was narrowneck reef created?

# COASTAL MANAGEMENT TECHNIQUES QUIZ: ANSWERS

1. What is sand erosion?

   Movement of sand away from the beach.

2. What is sand accretion?

   Movement of sand onto the beach.

3. What is coastal management?

   Coastal management is a range of strategies that defend against flooding and erosion.

4. Name 5 coastal management techniques:
   - Artificial dunes / dune management
   - Sand Replenishment
   - Sea walls
   - Training walls
   - Artificial reef

5. What is longshore drift?

   Longshore drift is the movement of sand along the coastline.

6. In which direction does longshore drift occur on the Gold Coast?

   North.

7. Why are sand dunes important?

   They act as buffer zones that reduce the impacts that shoreline variability and beach erosion have on our city.

8. How can sand dunes be protected?
   - Control weed encroachment.
   - Minimise encroachment of adjoining properties
   - Prevent the removal or pruning of native dune vegetation
   - Restrict uncontrolled access in actively forming dune areas
   - Minimise wind erosion resulting from loss of appropriate vegetation heights and arrangements construction and maintenance of boardwalks, vehicle access tracks and paved areas.

9. What is sand bypassing?

   Moving sand (either mechanically or hydraulically) from one area to another across a barrier to natural sand transport.

10. Why was narrowneck reef created?

    The artificial reef was designed to decrease wave energy and thus the potential for storm waves to strip sand off the upper beach.

LESSON FOUR

## CASE STUDY – PALM BEACH

**Aim:**
Use a case study to examine the physical and human factors that explain why some places are more vulnerable than others (ACHGE019)

**Introduction:**
Do you have a favourite beach? Close your eyes and imagine your favourite beach (or a beach you have visited). What can you see? Can you think of 5 things you can see at the beach? Discuss with the person next to you. Did they have the same things as you, or different?

Is the beach the same every time you go there? What changes the beach?

Brief recap of erosion and the effect of wind, storms and cyclones

**Main Activity:**
Create a case study for Palm Beach. Watch the following video clips and read/listen to the information on each web page. In your pairs, one person focus on recording the problems or challenges. One person focus on recording the solutions that are being discussed.

http://www.goldcoast.qld.gov.au/thegoldcoast/the-challenge-10961.html

http://www.goldcoast.qld.gov.au/thegoldcoast/palm-beach-shoreline-project-10919.html

Create a poster / infographic using words and pictures to demonstrate your findings. You may refer to the information sheet attached (below)..

**Extension task:**
Why is Palm Beach more vulnerable than other beaches?

Can you think of another beach that is affected in this way?

**Feedback & Evaluation:**
Do you think the solutions being suggested will work? Why?

What else would you like to know about this topic?

LESSON FIVE

## RESEARCH AND EXAMINE EXISTING DATA FOR PALM BEACH

**NOTES: Students will need access to computers for this lesson. There are two approaches to the main activity, depending on the needs and abilities of students.**

**Aim:**
Evaluate the reliability, validity and usefulness of geographical sources and information (ACHGE005)

Analyse geographical information and data from a range of primary and secondary sources and a variety of perspectives to draw reasoned conclusions and make generalisations (ACHGE006)

Identify and analyse trends and patterns, infer relationships, and makes predictions and inferences (ACHGE007)

**Introduction:**
Show students the table below, from a report on Palm Beach written in 2001.

What does it tell them about erosion on Palm Beach? Can you spot a trend or pattern? What statement can you make based on this evidence?

Review erosion and accretion as required. Give reading and thinking time, to allow students to practise interpreting and analysing data.

**Main Activity:**
Create a case study for Palm Beach. Watch the following video clips and read/listen to the information on each web page. In your pairs, one person focus on recording the problems or challenges. One person focus on recording the solutions that are being discussed.

http://www.goldcoast.qld.gov.au/thegoldcoast/the-challenge-10961.html

http://www.goldcoast.qld.gov.au/thegoldcoast/palm-beach-shoreline-project-10919.html

Create a poster / infographic using words and pictures to demonstrate your findings. You may refer to the information sheet attached (below)..

EXTENSION: How useful is this data? Why?

**Table 5.4 – Erosion of the visible beach and seabed equilibrium**

| Waves conditions | Sand Supply in the active prism | | | State of seabed (including storm bar) | |
|---|---|---|---|---|---|
| | + | = | - | | |
| Normal Waves | A | A | A | - | Flat seabed |
| (<1.8m) | A | A | A | + | Accreted seabed |
| Mid Waves | E | E | E | - | Flat seabed |
| (1.8-2.5m) | A | A | A | + | Accreted seabed |
| Storm Waves | E | E | E | - | Flat seabed |
| (>2.5m) | A | A | E | + | Accreted seabed |

**E**: BERM EROSION / **A**: BERM ACCRETION
**Sand supply**: **+** Accretion of the active prism
**=** No sand volume variations in the active prism
**-** Erosion of the active prism

D'Agata, M. (2001). Palm Beach Protection Strategy. Technical Report: Coastal Processes Assessment for PBPS, Vol 1. GCCM Research Report No.5. 68 Pages. Report Date: 2001

https://www.griffith.edu.au/__data/assets/pdf_file/0006/634137/2000-to-2014-Reports.pdf

Class discussion, should lead to the conclusion that bigger waves = more erosion.

**Main Activity:**

**Version 1:**
Direct all students to spend some time exploring the data at:

***Wave height data for Palm Beach:***

http://ci.wrl.unsw.edu.au/current-projects/central-gold-coast-palm-beach/archived-data/week-page/

Consider: when was the lowest wave recorded? When was the highest wave recorded? What do the results tell you? Can you spot any trends or patterns?

***Beach width analysis:***

http://ci.wrl.unsw.edu.au/current-projects/central-gold-coast-palm-beach/archived-data/beach-width-analysis/

Consider: How has the beach width changed over time? What might affect the width of the beach? Can you spot any trends or patterns?

Use the data to create a presentation, including graphs of your findings. Students can work individually or in pairs, with some presenting their findings to the class.

**Version 2:**
Divide students into groups and give each group a research topic:

***Wave height data for Palm Beach:***

http://ci.wrl.unsw.edu.au/current-projects/central-gold-coast-palm-beach/archived-data/week-page/

***Beach width analysis:***

http://ci.wrl.unsw.edu.au/current-projects/central-gold-coast-palm-beach/archived-data/beach-width-analysis/

***Information on data collection for the Palm Beach project:***

http://www.goldcoast.qld.gov.au/thegoldcoast/technical-data-10975.html

***Palm Beach flora and fauna studies:***

http://www.goldcoastflorafauna.com.au/default.aspx?control=studysearch

***Griffith University Coastal management reports bibliography:***

https://www.griffith.edu.au/__data/assets/pdf_file/0006/634137/2000-to-2014-Reports.pdf

***Griffith University Palm Beach Research:***

http://www98.griffith.edu.au/dspace/search?query=palm+beach&submit=Search

Their task is to explore the research and create a presentation on their findings.

All groups to present their findings to the rest of the class. The aim is to summarise the research findings and analyse the research methods and data.

**Extension task:**

Research other data collection projects, eg COPE (coastal observation program-engineering), Delft Report, etc. This could be classwork or homework.

Depending on needs and ability, teachers could direct students to the COPE report:

https://publications.qld.gov.au/dataset/706c1ee1-cda6-4474-be70-03947fe7cd4b/resource/ead93392-743a-4381-bb4f-44441ce7564c/download/surfersparadisegoldcoast197383.pdf

And provide questions to structure research as required.

Information sheets:

Coastal Monitoring (PDF 495kb)

Delft Report: Key Recommendations (PDF 327kb)

Coastal Observation Program-Engineering (COPE) PDF(415kb)

**Feedback & Evaluation:**

Which data set was easiest to read? Why? Can you think of a way to improve any of the data collection methods or the ways in which data is presented?

LESSON SIX

## DATA COLLECTION METHODS

**NOTE: This lesson can be completed in a classroom or on a local beach.**

**Aim:**
Collect geographical information incorporating ethical protocols from a range of primary and secondary sources (ACHGE003)

Record observations in a range of graphic representations using spatial technologies and information and communication technologies (ACHGE004)

**Introduction:**
How can we tell if a beach is healthy? Class discussion.

**Main Activity:**

***Classroom lesson:***

In pairs, read the information sheets (Field Investigations on Gold Coast Beaches(PDF 260kb) and Coastal Monitoring: Shoreline Position (PDF 647kb)) and list as many surveying methods as you can. Which of these methods would you be able to use?

As a class, read through the Beach health survey, discussing how to approach each item.

HOMEWORK: visit a local beach and complete the Beach health survey.

***Beach lesson:***

In pairs, complete the Beach health survey.

HOMEWORK: read the information sheets (Field Investigations on Gold Coast Beaches(PDF 260kb) and Coastal Monitoring: Shoreline Position (PDF 647kb)) and list as many surveying methods as you can. Which of these methods would you be able to use?

**Extension task:**
Which of these measures would be useful when looking at the effect of storms or cyclones on the coastline?

**Feedback & Evaluation:**
Were all of the questions easy to answer? How useful are these measures? Would you make any changes? Could you make any improvements?

# BEACH HEALTH ASSESSMENT

Beach : _____

GPS coordinates: S _____/ E _____

## 1. Tourism & Recreation

| | | | | | | | | | Score |
|---|---|---|---|---|---|---|---|---|---|
| **Clean water** | Good (5)<br>No vegetation such as seaweed, litter or oil near water's edge or floating on water | | Adequate(3)<br>Some vegetation such as seaweed, litter or oil near water's edge or floating on water | | Poor(0)<br>A lot of vegetation such as seaweed, litter or oil near water's edge or floating on water | | | | |
| **Clean sand** | A+ (5)<br>No pieces of litter | A(4)<br>Maximum 3 pieces of litter | B (3)<br>Maximum 10 pieces of litter | | C (2)<br>Maximum 24 pieces of litter | D (0)<br>Minimum 25 pieces litter | | | |
| **Scenic surroundings**<br>**(circle all that apply)** | Cliffs (1) | Sand (1) | Rocky Shores (1) | | Dunes (1) | | | | |
| **Commercial Tourism** | Historic buildings > 50 years (5) | | Light (3) | | Heavy (0) | | | | |
| **Noise** | None (5) | Little(3) | Tolerable(1) | | Intolerable (0) | | | | |
| **Access** | Parking (5) | | No parking (0) | | | | | | |
| **Bathing safety** | Present (5)<br>Lifeguard present | | Absent (0)<br>No lifeguard present at any time | | | | | | |
| **Facilities** | 10+ (5) | 6-10 (3) | 1-5 (1) | | None (0) | | | | |
| | **Include any of the following:** Showers & feet washers, umbrellas and hammocks, Restaurant/bars & kiosks, bins, facilities for children, disabled access, sanitary facilities, telephone, information, sports facilities, signposting, public transport. | | | | | | | | |
| **Beach width** | Good (5)<br>Width 40-70 m | | Adequate (3)<br>Width 20-40m and 70-100m | | Poor (0)<br>Width 0-20m and >100m | | | | |
| **Beach crowding** | Optimum (5)<br>Sand availability 8m²/user (urban beach), 12m²/user (suburban beaches) | | Overcrowded (0)<br>Sand availability <4m²/user (urban beach), <8m²/user (suburban beaches) | | | | | | |
| | Urban beaches: Main beach, Surfers Paradise, Broadbeach, Burleigh beach, Coolangatta | | | | | | | | |
| **Public stewardship** | Present (5)<br>Active public involvement in beach management activities such as BeachCare and Responsible Runners. | | Absent (0)<br>No active public involvement in beach management activities such as BeachCare and Responsible Runners. | | | | | | |
| | | | | | | | | | |
| **Total score** | | | | | | | | | **/54** |

# BEACH HEALTH ASSESSMENT

**2. Protection**

| | | | | | | Score |
|---|---|---|---|---|---|---|
| **Coastal Management Techniques** | Good (5)<br>Strategies below are visible and effective | | Adequate(3)<br>Some evidence of coastal management | | Poor(0)<br>No evidence of coastal management | |
| | **Include any of the following:** Dunes, seawall, groynes, sand bypass, reef (natural or artificial), boardwalk/walkways | | | | | |
| **Dune quality** | Yes (5)<br>Dune present | | No (0)<br>No dune present | | | |
| **Dune vegetation** | Excellent (5)<br>100%-76%of the dunes are covered in vegetation | Good (3)<br>75%-51% of the dunes are covered in vegetation | Adequate (2)<br>50%-26% of the dunes are covered in vegetation | Poor (1)<br>25%-1% of the dunes are covered in vegetation | None (0)<br>0% of the dunes are covered in vegetation | |
| | | | | | | |
| **Total score** | | | | | | **/15** |

**3. Beach ecology**

| | | | | | Score |
|---|---|---|---|---|---|
| **Organism density per m3 of sand** | Abundant (5)<br>21 or more crab holes | Some (3)<br>11-20 crab holes | Little (1)<br>1-10 crab holes | None (0)<br>Zero crab holes | |
| | Measure between base of dune & high tide line. Draw a 1 m² quadrant in the sand. Count crab holes per m² of beach. | | | | |
| **Wildlife (e.g shorebirds)** | Abundant (5)<br>20> organisms | Some (3)<br>11-20 organisms | Little (1)<br>1-10 different organisms | None (0)<br>Zero wildlife observed | |
| **Dune vegetation** | Abundant (5)<br>50% to 100% of the dunes is covered in vegetation | Some (3)<br>10% to 50% of the dunes is covered in vegetation | Little (1)<br>1% to 9% of the dunes is covered in vegetation | None (0)<br>0% of the dunes is covered in vegetation | |
| | | | | | |
| **Total score** | | | | | **/15** |

# BEACH HEALTH ASSESSMENT

1. Which of the 3 indicators would have priority to a City Council and why?

2. Do you think Tourism & Recreation, Protection or Beach ecology needs more attention on this beach?

3. The beach health indicators and their ratings are taken from the European model of Beach Health Assessment. Which indicator measurements would you suggest changing as they may not apply to a Gold Coast beach and why?

4. What actions need to be undertaken to improve the score of the Tourism & Recreation indicator?

5. What actions need to be undertaken to improve the score of the Protection indicator?

6. What actions need to be undertaken to improve the score of the Beach ecology indicator?

7. Vegetation on dunes is an indicator for Protection and Beach ecology. Why?

8. Which indicators could be used to measure the effect of storms and cyclones?

# BEACH HEALTH ASSESSMENT ANSWERS

1. Which of the 3 indicators would have priority to a City Council and why?

   Depending on the location of the beach a city council would for example look at the potential income revenue from tourism and recreation and would value that as an important priority. The same would count for the protection indicator. If the value of restoring and repairing of the damage to beach side property is high, the importance of protection would be higher than e.g tourism and recreation.

2. Do you think Tourism & Recreation, Protection or Beach ecology needs more attention on this beach?

   The healthiest beach would have the highest scores within all 3 indicators. The indicator with a low score within a given indicator would need attention.

3. The beach health indicators and their ratings are taken from the European model of Beach Health Assessment. Which indicator measurements would you suggest changing as they may not apply to a Gold Coast beach and why?

   An example may be beach crowding. As the European culture is fairly tolerable with the close proximity of other beach goers on the beach, this may be a different case on the Gold Coast, where people already view the beach as overcrowded when there are beach users within the proximity of $12m^2$

4. What actions need to be undertaken to improve the score of the Tourism & Recreation indicator?

   Actions could be a presence of lifeguards on the beach, providing more facilities or more litter cleaning services.

5. What actions need to be undertaken to improve the score of the Protection indicator?

   More dune vegetation would improve the protection as well as added sand, so actions could include planting more dune vegetation or beach nourishment techniques.

6. What actions need to be undertaken to improve the score of the Beach ecology indicator?

   More dune vegetation would attract more wildlife. Clean sand would attract more wildlife (keeping it litter free). Vehicles on the beach would also affect the beach ecology.

7. Vegetation on dunes is an indicator for Protection and Beach ecology. What would be the reason?

   The importance of dune vegetation is very high as their roots provide stability to the dunes and the plants act as a sand 'bank' for the dunes in the event of storms and erosion. More vegetation also attracts more wildlife such as insects and birdlife.

8. Compare your scores to other groups. Where do you see differences in total scores? Why?

   As many of the ratings of the indicators are subjective and dependant on when the measurement is taken, some of the scores can be up for discussion. Maybe one group thought the noise was intolerable and another group decided it was little.

LESSON SEVEN

## FORMULATE YOUR QUESTION AND PLAN YOUR INVESTIGATION

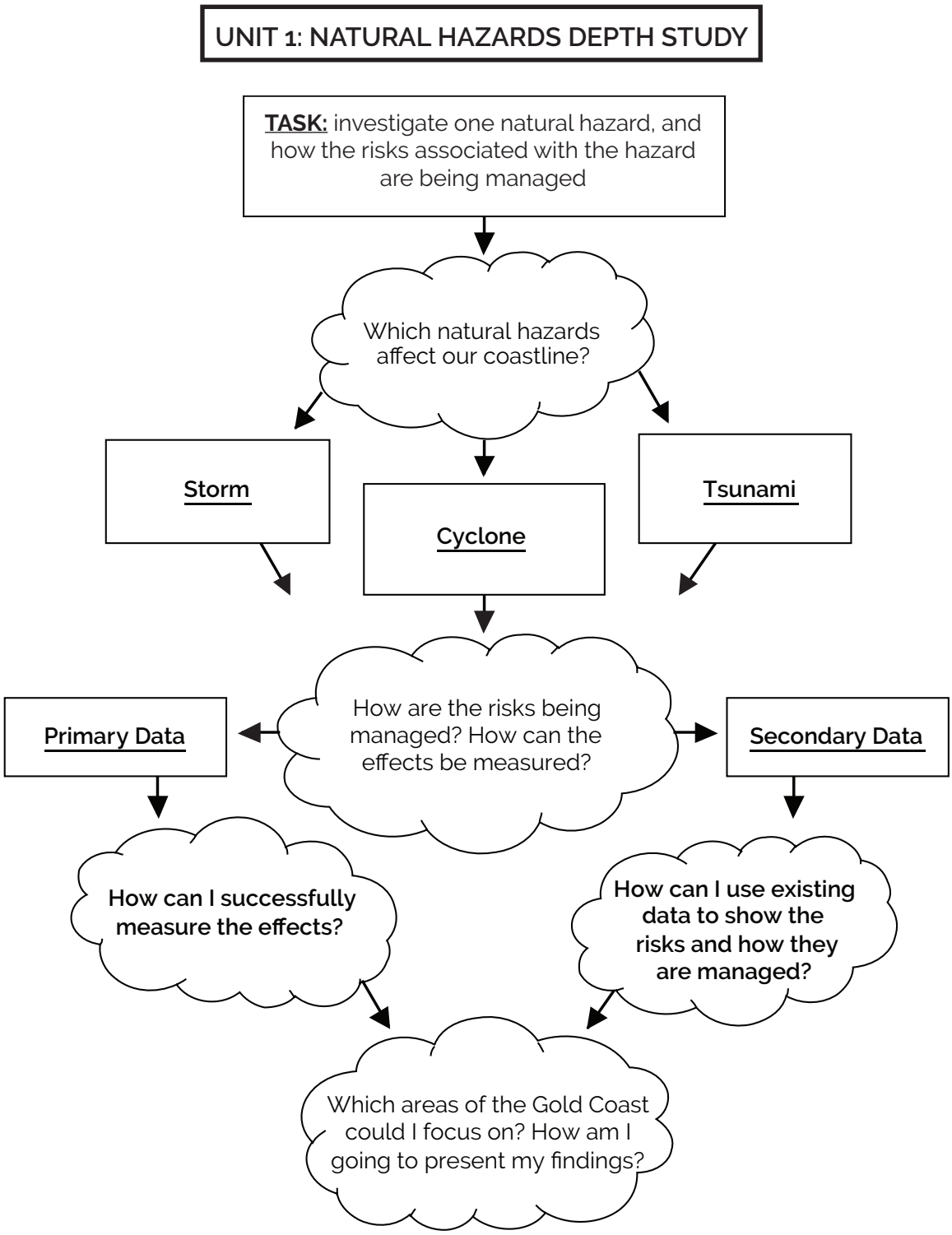
**Aim**
Formulate geographical inquiry questions (ACHGE001)
Plan a geographical inquiry with clearly defined aims and appropriate methodology (ACHGE002)

**Introduction:**
How can we measure the effect of a storm or cyclone on our coastline? Where might we find existing data? What do we call these types of data? (Primary/secondary data) Why are both important?

**Main Activity:**

Use the infographic to create a focus question and plan your depth study.

**Feedback & Evaluation:**
Explain your question and plan to the person next to you. Discuss strengths and weaknesses of each other's ideas. Can you suggest any improvements?


UNIT 1: NATURAL HAZARDS DEPTH STUDY
TASK: investigate one natural hazard, and how the risks associated with the hazard are being managed
Which natural hazards affect our coastline?
Storm
Cyclone
Tsunami
How are the risks being managed? How can the effects be measured?
Primary Data
Secondary Data
How can I successfully measure the effects?
How can I use existing data to show the risks and how they are managed?
Which areas of the Gold Coast could I focus on? How am I going to present my findings?

# REPRESENTATION

## REPRESENTATION OF GENERAL CAPABILITIES

**Literacy**
Literacy involves students using their literacy skills to explore, interpret and evaluate geographical phenomena and issues and communicate geographically. Students work with oral, print, visual and digital texts to gather, synthesise and analyse information from a range of sources, and present and justify ideas, conclusions and opinions within a broad range of geographical contexts. They understand how language is used and modified for specific purposes, and question attitudes and assumptions embedded in texts. Students also develop visual literacy skills as they make meaning of information communicated through modes including maps, graphs, cartoons and other images.

**Numeracy**
Numeracy involves students using numeracy skills to identify and describe a wide range of patterns and relationships, including those that can be visually represented on a graph or map. Students also apply their numeracy skills to interpret and manipulate data. These skills help students to realise and describe change as it occurs over time. Students demonstrate numeracy capability by making connections between apparently diverse facts and suggesting solutions to problems in a range of circumstances, for example, the relationship between weather patterns and the likelihood of natural hazards such as storms or cyclones.

**Information and Communication Technology (ICT) capability**
Information and Communication Technology (ICT) capability involves students using ICT to develop geographical understanding and support the application of geographical skills. Students use digital tools, including spatial technologies, to support their inquiries into geographical phenomena and issues. They also use these tools to collect and analyse data, represent it in a digital form, access and manipulate databases, and model conceptual constructs. In addition, students critically analyse the quality of digital information and sources of information. They also create multimodal and multifaceted reports and presentations to represent and communicate the results of geographical inquiry.

Students recognise the relative possibilities, limitations and consequences of using different forms of digital information and methods of distributing this information, and apply sophisticated understandings of social and ethical practices in the use of digital information and communications. In particular, they consider how geographical and demographic data may be used and the ethical considerations involved.

**Critical and creative thinking**
Critical and creative thinking processes and skills are used by students when examining diverse interactions between people, perspectives, interpretations, phenomena and environments. Through multifaceted problem posing and solving they explore the interconnections, uncertainty and consequences of these relationships.

Thinking laterally, visualising possibilities, testing options using criteria, and making judgments are essential skills for conducting geographical investigations connected with the environment, space, sustainability, scale and change. When seeking answers to questions students think holistically and spatially using skills such as analysis, interpretation, extrapolation from trends, synthesis of relationships and exploration of anomalies evident in patterns.

Through developing dispositions such as intellectual openness, curiosity and initiative they investigate biophysical and human phenomena. As independent and autonomous thinkers who seek explanations and value discovery, students turn creativity and innovation into action, apply new knowledge to identified gaps, and justify their action.

**Personal and social capability**
Personal and social capability involves students taking responsible personal, social and environmental action against, or in support of, decisions by organisations, governments or other bodies. Through the study of Geography, students are provided with learning opportunities to help them to develop, rehearse and refine their skills in listening to, respecting and acknowledging diverse perspectives and opinions. Students participate in collaborative investigative group-work to make ethical, rational social decisions and solve problems that relate to their social and environmental contexts. Developing these personal and social capabilities positions them positively to advocate for opportunities and methods for change in a democratic society.

Personal and social capability occurs when responsible social and environmental actions and participation are promoted and this should be a logical outcome of many geographical investigations.

**Ethical understanding**
Ethical understanding plays an important role in geographical inquiry. Students uncover and assess ethical considerations such as the links between human rights and responsibilities and the ways diverse perspectives, values and cultures impact on geographical issues. Through geographical inquiry students have opportunities to analyse, qualify and test their own attitudes, values and beliefs and explore how people's knowledge, attitudes and values affect judgments, decisions and actions as they apply to their interactions with environments. They become aware of the need for social responsibility when confronted with alternative opinions and when seeking to resolve problems. Students apply ethical standards to guide their use of digital representations of phenomena and statistics associated with biophysical and environmental factors and relationships.

**Intercultural understanding**
Students deepen their intercultural understanding as they examine geographical issues in a broad range of cultural contexts. This involves students in developing their understanding of the complexity and diversity of the world's cultures and evaluating alternative responses to the world's environments and challenges. It enables students to find interconnections and sustainable solutions in an internationally integrated world, and consider the implications of their responses from different cultural responses.

## REPRESENTATION OF CROSS-CURRICULUM PRIORITIES:

**Aboriginal and Torres Strait Islander histories and cultures**
Students are provided with a range of opportunities to learn about Aboriginal and Torres Strait Islander histories and cultures in Geography. They can, for example, investigate how Aboriginal and Torres Strait Islander People may be unequally affected by natural and ecological hazards, are represented in the challenges faced by places, have contributed to land cover change in Australia through their land management practices over time, and have been affected by land cover change and the process of international cultural integration. More broadly, students develop a range of capabilities that enable them to independently construct informed responses to the range of geographical issues involving Aboriginal and Torres Strait Islander Peoples.

**Asia and Australia's engagement with Asia**
Students could investigate a wide range of contexts that draw on Asia and Australia's engagement with Asia through Geography. This priority can be addressed through: the study of natural and

ecological hazards and how the risks associated with such occurrences can be managed to eliminate or minimise harm to people and the environment; the challenges faced by megacities in developing countries, particularly those from the Asia region; human-related land cover transformations; and other transformations taking place as a result of economic and cultural integration.

**Sustainability**
Students can explicitly address Sustainability in Geography through an investigation of the approaches to sustainability and through an evaluation of alternative responses to geographical issues and phenomena. In doing so, they use economic, social and environmental criteria to frame investigative questions and to measure the capacity of something to be maintained indefinitely into the future.

**Teacher resources:**

**City of Gold Coast website**
Griffith Centre for coastal Management -> CoastEd -> Information Sheet Series
https://www.griffith.edu.au/engineering-information-technology/griffith-centre-coastal-management/community-projects/coasted/programs/resources/coasted-resources-and-information-sheet-series

**Hazards**

- History of Coastal Storms on the Gold Coast (PDF 655kb)
- Cyclones (PDF 631kb)
- Storm Surges (PDF 326kb)
- Tsunamis (PDF 350kb)

**Coastal Management Techniques**

- Beach Erosion: Coastal Processes on the Gold Coast (PDF 410kb)
- Longshore Drift: Coastal Processes on the Gold Coast (PDF 773kb)
- Gold Coast Beach Nourishment (PDF 463kb)
- Northern Gold Coast Beach Protection Strategy: Improving Beach Width (PDF 519kb)
- Training Walls PDF(323kb)
- Dunes of the Gold Coast (PDF 483kb)
- Looking After Our Dunes (PDF 613kb)

**Case studies**

- Narrowneck Artificial Reef Ecology (PDF 361kb
- South Stradbroke Island: Beach Ecology and Management (PDF 372kb)

**Data collection**

***Existing data:***

- Coastal Monitoring (PDF 495kb)
- Delft Report: Key Recommendations (PDF 327kb)
- Coastal Observation Program-Engineering (COPE) PDF(415kb)

*Data collection methods:*

Field Investigations on Gold Coast Beaches(PDF 260kb)

Coastal Monitoring: Shoreline Position (PDF 647kb)

**City of Gold coast local studies library, Southport**
http://www.goldcoast.qld.gov.au/library/local-studies-library-10111.html

**To find out how you can prepare for a storm surge, visit**
http://www.goldcoast.qld.gov.au/council/disaster-management-120.html

**Natural Hazards in Australia, Identifying Risk Analysis Requirements**
https://d28rz98at9flks.cloudfront.net/65444/65444.pdf

# FACTSHEET AND VIDEO LIST

# COASTAL ECOLOGY FACTSHEET & VIDEO LIST

***Griffith Centre for Coastal Management Fact Sheets***

**Cyclones**
https://www.griffith.edu.au/__data/assets/pdf_file/0003/322869/cyclones.pdf

**Dugongs**
https://www.griffith.edu.au/__data/assets/pdf_file/0004/322870/Dugongs.pdf

**Dunes of the Gold Coast**
https://www.griffith.edu.au/__data/assets/pdf_file/0005/322871/Dunes-of-the-Gold-Coast.pdf

**Gold coast Seaway: a marine lovers' paradise**
https://www.griffith.edu.au/__data/assets/pdf_file/0019/322831/Gold-Coast-Seaway-Marine-Life.pdf

**Looking after our dunes:**
https://www.griffith.edu.au/__data/assets/pdf_file/0005/322790/Looking-after-our-dunes.pdf

**Mangroves of the Gold Coast**
https://www.griffith.edu.au/__data/assets/pdf_file/0009/322884/Mangroves.pdf

**Narrowneck Artificial Reef: Ecology**
https://www.griffith.edu.au/__data/assets/pdf_file/0010/322876/Narrowneck-artificial-reef.pdf

**Palm Beach Reef**
https://www.griffith.edu.au/__data/assets/pdf_file/0011/322877/Palm-Beach-reef.pdf

**Reefs of the Gold Coast**
https://www.griffith.edu.au/__data/assets/pdf_file/0004/322879/Reefs-of-the-Gold-Coast.pdf

**Rocky shores of the Gold Coast**
https://www.griffith.edu.au/__data/assets/pdf_file/0012/323220/Rocky-shores-of-the-Gold-Coast.pdf

**Seagrass of the Gold Coast**
https://www.griffith.edu.au/__data/assets/pdf_file/0015/323241/seagrass.pdf

**Sea Turtles of the Gold Coast**
https://www.griffith.edu.au/__data/assets/pdf_file/0018/323208/sea-turtles.pdf

**Sandy beach ecology: the hidden world**
https://www.griffith.edu.au/__data/assets/pdf_file/0009/322839/Sandy-beach-ecology.pdf

**South Stradbroke Island: Beach ecology and management**
https://www.griffith.edu.au/__data/assets/pdf_file/0011/322886/South-Stradbroke-Island.pdf

**Storm surges**
https://www.griffith.edu.au/__data/assets/pdf_file/0003/322887/storm-surge.pdf

**The Broadwater- A dynamic estuarine environment**
http://www.goldcoast.qld.gov.au/documents/bf/fs-the-broadwater.pdf

**Tsunamis**
https://www.griffith.edu.au/__data/assets/pdf_file/0011/323210/tsunamis.pdf

*City of Gold Coast References*

**Fauna in the dunes**
http://www.goldcoast.qld.gov.au/documents/bf/fs-Fauna-in-our-dunes.pdf

**Our coastal zone**
http://www.goldcoast.qld.gov.au/documents/bf/fs-our-coastal-zone.pdf

**Shorebirds of the Gold Coast**
http://www.goldcoast.qld.gov.au/documents/bf/fs-shorebirds-of-the-gold-coast.pdf

*Videos*

**Griffith Centre for Coastal Management Youtube channel:**
https://www.youtube.com/channel/UCnm1Jyh6clfEZilhvNzJxzg

**Qld Beaches our heritage (16min)**
https://www.youtube.com/watch?v=2LdZTNU6QV0

**They can be saved (15min)**
https://www.youtube.com/watch?v=SPcHmsyl-Hw

**Seaway night dive (curtesy of Ian Banks) (3.5min)**
https://www.youtube.com/watch?v=IEOobrGGq2I

**The shrinking coastline (17min)**
https://www.youtube.com/watch?v=WtguUZL8o9o

**Gold Coast Seaway (8.5min)**
https://www.youtube.com/watch?v=vbw2fgieU8Y

**Dune Management; it's worthwhile (13.5min)**
https://www.youtube.com/watch?v=ujKk8KeyFh8

**Coastal Management Centre Youtube channel:**
https://www.youtube.com/playlist?feature=edit_ok&list=PLs53dPt8uglal_YDRljZlmCGLdgMAA0R6

**Griffith Centre for Coastal Management coastal twilight series 1 storm surge and coastal knowledge (1hr 26min)**
https://www.youtube.com/watch?v=mJi5YKjN7tk&list=PLs53dPt8u9lal_YDRljZlmCGLdgMAA0R6&index=3

**Sam Smith conversation about Gold Coast Beaches. (11.5 min)**
https://www.youtube.com/watch?v=HI5Uj4eI9t4&list=PLs53dPt8u9lal_YDRljZlmCGLdgMAA0R6&index=4

**A river of sand – longshore drift processes on the Gold Coast (4min)**
https://www.youtube.com/watch?v=XIfvVcVss7Y&list=PLs53dPt8u9lal_YDRljZlmCGLdgMAA0R6&index=18

**More than meets the eye Gold coasts dynamic coastline (3.5min)**
https://www.youtube.com/watch?v=X6Qr1KiYCdI&list=PLs53dPt8u9lal_YDRljZlmCGLdgMAA0R6&index=19

**City of Gold Coast video resources:**
http://www.goldcoast.qld.gov.au/thegoldcoast/coastal-videos-resources-23364.html

**Shaping our coast – dredging and nourishment**
https://www.youtube.com/watch?v=8QBBY6p95bc

**Narrowneck reef**
https://www.youtube.com/watch?v=-dv4n1YoLsY

**Qpro dynamic coast**
https://www.youtube.com/watch?v=Xj8z1wmXpl8

**Qpro wave climate**
https://www.youtube.com/watch?v=L7uVIC3WIXY

# LINKS TO COURSES

## COASTAL ECOLOGY LINKS TO COURSES AT GRIFFITH UNIVERSITY

**Griffith University offers a range of courses related to the topic ecology. These courses are:**

**Bachelor of Marine Science (Gold Coast campus)**

***Career opportunities:***

Marine biologist

Environmental consultant

Pollution control and mitigation

Fisheries and aquaculture

Modelling and meteorology

Oceanographer

Coastal planning and marine parks

Tourism

Environmental assessment and planning.

Not all science graduates work as scientists - the transferrable skills developed through the degree provide a springboard to careers where critical thinking, the ability to analyse and investigate new information and evidenced-based decision making are valued.

**Bachelor of Science (Gold Coast and Nathan campus)**

***Majors:***

Applied Mathematics, Biochemistry and Molecular Biology, Chemistry, Clinical Sciences, Geography, Marine Biology, Microbiology, Physics, Wildlife Biology

***Career options:***

Depending on the major, you will be prepared for work in environment-related jobs, for example as an environment consultant, environmental scientist or mine environment officer; in biological, chemical and clinical sciences as a microbiologist, pharmaceutical scientist, biochemist, chemist or biotechnologist; in physics and maths as a mathematician or physicist; or, with further study, in a broader role, for example as a patents officer or science teacher.

**Bachelor of Environmental Science (Gold coast and Nathan campus)**

***Career opportunities:***

*ECOLOGY AND CONSERVATION*: Environmental consultant, Wildlife biologist, Conservation ecologist.

*Environmental Management*: Environment consultant, Environmental scientist, Environmental manager, General scientist.

*Soil and Water Science:* Environmental chemist, Soil scientist, Catchment restoration and management officer.

*Urban Environments:* Urban ecosystems are the largest growing environment on earth with a major in urban environments you will work with urban and regional councils dealing with urban specific issues such as pest animals and plants, urban storm water management or advising urban planners.

**Bachelor of Environmental Management (Nathan campus)**

***Majors:***

Environmental Protection and Pollution, Environmental Sustainability, Physical Environmental Science

***Career opportunities:***

You will be prepared for work in government and the private sector in positions such as environmental officer, environmental consultant, environmental health project officer, environmental management officer, environmental scientist.

For more information visit: https://www.griffith.edu.au/

Griffith UNIVERSITY
Centre for Coastal Management

COASTED

Proudly supported by
CITY OF GOLDCOAST.

# TEACHER PACK:
# COASTAL ECOLOGY

## LESSON PLANS, ACTIVITIES AND RESOURCES FOR PREP TO YEAR 12