Marine Science and Marine and Aquatic Practices

Resources and links

For Year 11 and 12

Learning area: Marine

GBRMPA Science Teaching Units

These units are aligned with the National Science Curriculum. The content descriptors for these units are from the Australian National Curriculum. Following the inquiry based 5Es approach to teaching science, the units are based on the Australian Curriculum Assessment and Reporting Authority (ACARA) expectations of a minimum time per week assigned to science lessons for students in each graft level. The overall units or the individual lessons could be extended or shortened to cater for individual classes as deemed necessary by the class teacher. The Units include a resource section with a guide to making judgements and links to the QSA Literacy Indicators.

The science teaching units cover a range of Reef related topics from Year 1-10. Of Interest to high school science teachers are:

* Year 7 - Wetlands
* Year 8 - Coral Bleaching
* Year 9 - Ecosystems
* Year 10 - Climate Change

The Year 11 and 12 Investigation Tasks may be used as either extended experimental investigations or extended research tasks to support the needs of students in science based units of work. Find all of these at [www.gbrmpa.gov.au](http://www.gbrmpa.gov.au)

Great Barrier Reef Outlook Report 2014

<http://www.gbrmpa.gov.au/managing-the-reef/great-barrier-reef-outlook-report>

This Report is undertaken every five years and examines the Great Barrier Reef’s health, pressures (threats) and likely future. The Outlook Report describes trends for a variety of assessment criteria examining reef health and management effectiveness*. (Compliments Marine science Senior Syllabus CS2 and CS3)*

The report is structured around nine assessments, each with its own chapter. Trends since 2009 are presented for each assessment and trends into the future are identified. See the “Outlook in Brief” for an overview of the nine assessments (chapters) and the questions they answer.

**Note:** The assessment criteria used in the Outlook Report 2014 are the same as those used in the Outlook Report 2009. This allows for comparisons to be made between the assessment grades assigned for the 2009 and the trends identified for 2014.

**Chapters and sections of interest to Marine Science Teachers**

Note: Assessment summaries for each chapter describe trends for each factor, species or issue considered in the chapter.

**Chapter 2**

Assessment of Biodiversity – What are the current state and trends?

* Considers conditions and trends of habitats to support species: Islands; Mainland Beaches and Coastlines; Mangrove forests; Sea Grass meadows; Coral reefs; Lagoon floor; Shoals; Halimeda banks; Continental slope; Open waters.
* Considers trends of populations of species and groups of species: Mangroves; Seagrasses; Macro Algae; Benthic micro algae; Corals; Other Invertebrates; Plankton and microbes; Bony Fish; Sharks and Rays; Sea snakes; Marine turtles; Estuarine crocodiles; Seabirds; Shore Birds; Whales; Dolphins; Dugongs.

**Chapter 3**

Assessment of Ecosystem Health - What are the current state and trends?

* Considers conditions and trends of: physical processes; chemical processes; ecological processes; terrestrial habitats that support the Great Barrier Reef; outbreaks of disease, introduced species and pest species.

**Chapter 5**

Assessment of commercial and non-commercial use - What are the current state and trends?

* Considers: Commercial Marine Tourism; Defence activities; Fishing; Ports; Recreation (not including fishing); Research and educational activities; shipping; traditional use of marine resources.

**Chapter 7**

Assessment of existing protection and management – How have management activities made a difference?

* Assessment of existing protection and management measures.
  + Managing direct use: Commercial Marine Tourism; Defence Activities; Fishing; Ports; Recreation (not including fishing); research activities; Shipping; traditional use of marine resources.
  + Managing External factors: Climate Change; Coastal development; Land Based Runoff.
* Assessment of management approaches.

**Chapter 8**

Assessment of ecosystem and heritage resilience – How well can the Great Barrier Reef resist and recover from disturbance?

* Case Studies of recovery in the ecosystem: Coral reef habitats; lagoon floor habitats; Black teat fish; Coral trout; Loggerhead turtles; Urban Coast Dugongs; Humpback whales.

**Chapter 9**

Assessment of risks to Region’s values – What are the remaining risks to the Great Barrier Reef?

* Identifying and assessing the threats. Assessing the risk.
* Of interest –
* Table 9.3 – Summary of threats arising from factors influencing the regions values, and associated scale and risk level.
* Table 9.4 – Trends since 2009 for threats to regions ecosystems
* Table 9.5 – Management effectiveness, impacts and risk associated with Factors influencing the regions values.

**Chapter 10**

Assessment of the long-term outlook for the Region’s values – What does this mean for the Great Barrier Reef’s future?

* Knowledge for management (information needs)
* Likely future trends
* Current and future initiatives (management and protection)

**Great Barrier Reef Strategic Assessment -** <http://www.gbrmpa.gov.au/managing-the-reef/strategic-assessment> *Compliments Marine Science Senior Syllabus CS3*

Reef 2050 Long Term Sustainability Plan

High level strategy underpinned by identified actions for the long term protection and conservation the Great Barrier Reef World Heritage area and its values. *Compliments Marine Science Senior Syllabus CS1 and CS2*

The Australian and Queensland governments’ [*Reef 2050 Long-Term Sustainability Plan*](http://www.environment.gov.au/reef-2050-long-term-sustainability-plan) provides an overarching strategy for managing the Great Barrier Reef . It coordinates actions and guides adaptive management to 2050. It addresses the findings of the Great Barrier Reef Marine Park Authority’s [Outlook Report 2014](http://www.gbrmpa.gov.au/managing-the-reef/great-barrier-reef-outlook-report) and builds on the comprehensive [strategic environmental assessment](http://www.gbrmpa.gov.au/managing-the-reef/strategic-assessment)

<http://www.environment.gov.au/system/files/resources/d98b3e53-146b-4b9c-a84a-2a22454b9a83/files/reef-2050-long-term-sustainability-plan.pdf>

**Chapters and sections of interest to Marine Science teachers**

**Chapter 3**

**Management**

**Addressing Key risks to the Reef** - overview of their status, current actions and priorities for the future.

3.1 – Climate Change – Long-term, System wide

3.2 – Land Based Runoff – Immediate, System wide

3.3 – Coastal land use change – Immediate, Local/Regional

3.4 – Direct use (includes, Fisheries; Marine Debris and Shipping) - Immediate, Local/Regional

**Chapter 4**

**Actions for the future**. Each of the following have their:

* Threats identified
* Foundational Programs addressing these are identified
* Specific actions to address the threats are identified
* Targets (2020), Outcomes (2035) and Objectives (2050) are described

4.5 – **Ecosystem Health**

4.6 – **Biodiversity**

4.7 – **Heritage**

4.8 – **Water Quality**

4.9 – **Community Benefits**

4.10 – **Economic Benefits**

Managing the Great Barrier Reef – Video <https://www.youtube.com/watch?v=PZlTQFWLdBo&feature=youtu.be>

Eye on the Reef program

Eye on the Reef is a powerful monitoring program that enables anyone who visits the Great Barrier Reef to contribute to its long-term protection. *Compliments Marine science Senior Syllabus CS3.3 and CS3.4*

The Eye on the Reef program brings together four assessment and monitoring programs that collect valuable information about reef health, marine animals and incidents. <http://www.gbrmpa.gov.au/visit-the-reef/eye-on-the-reef>

**Of interest:**

**Rapid Monitoring Survey** <http://www.gbrmpa.gov.au/visit-the-reef/eye-on-the-reef/the-rapid-monitoring-survey>

The Eye on the Reef Rapid Monitoring program is about using simple science to introduce Reef users to the main threats that are affecting the Great Barrier Reef. The program is aimed at people with little to moderate reef experience who can either snorkel confidently or dive.  It enables them to record what they see on the Reef and report that data to the Great Barrier Reef Marine Park Authority.

The strength of the Rapid Monitoring program is that it can be used to monitor the same site regularly to get an idea of changes to that site over time, or used at infrequently visited sites to get a basic snapshot of reef health.

Participants who may get value from the program include school groups: Use the survey as an introduction to reef biology, and then [submit](http://www.gbrmpa.gov.au/eye-on-the-reef) and view the data via the Eye on the Reef database. Eye on the Reef is linked to areas of study in the [Queensland Education Marine Science Senior Syllabus](http://www.qsa.qld.edu.au/20319.html)

**Note:**

* Schools will only have access to the data they have collected. Privacy laws mean Eye on the Reef is unable to provide access to other data sets.

Online Training**:** The Eye on the Reef — Rapid Monitoring online training program has four training modules, which include knowledge, reviews and short assessments (quizzes). Each module takes up to 30 minutes to complete.

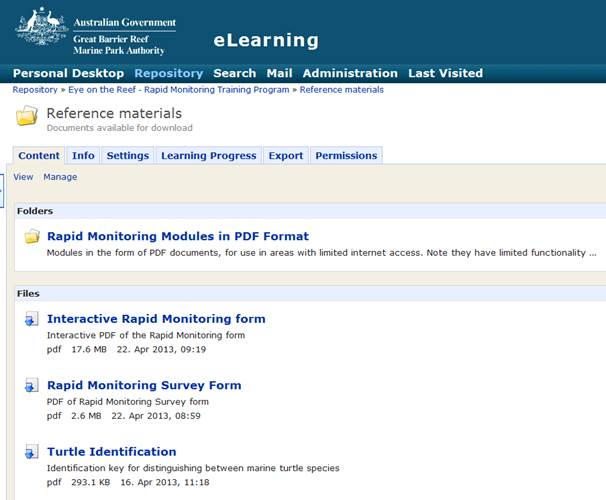
**Note:**

* Teachers are able to download training modules as interactive PDF’s for use by students.
* Quizzes are available as PDF’s, on request to Eye on the Reef.
* Teachers are able to participate in annual in-water training days with tourism and Marine Parks staff participating in the program.

**Engaging with the Eye on the Reef program, Rapid Monitoring:**

1. To join the Eye on the Reef — Rapid Monitoring, email [eyeonthereef@gbrmpa.gov.au](mailto:eyeonthereef@gbrmpa.gov.au) and request that you are registered in the program. Please include
   1. your name
   2. your schools name
   3. brief description of your marine science program and how you may apply Rapid Monitoring in this program
2. You will receive a reply with a request to complete a consent and permission declaration
   1. Please complete and return this document to [eyeonthereef@gbrmpa.gov.au](mailto:eyeonthereef@gbrmpa.gov.au) .
3. You will then be issued a username and password that will provide you with access to the [Eye on the Reef online training system](http://ilias.gbrmpa.gov.au/ilias/login.php?target=&client_id=GBRMPA&auth_stat=) and provide you with the capacity to enter and review your data in [data management and reporting](http://www.gbrmpa.gov.au/eye-on-the-reef/f?p=150:LOGIN:1081607942427401) system.
4. Please take the time to complete the online training modules to build your reef biology knowledge and monitoring skills.
   1. Please consider participating in one of the in-water Eye on the Reef training days where you will have the opportunity to be mentored by Eye on the Reef experts to sharpen your knowledge and skills. The training days are usually held in March/April and October/November each year.
5. Download the Interactive PDF’s of the online training modules for use in the classroom.
   1. The Rapid Monitoring Modules in PDF Format and other useful training and monitoring resources including the monitoring data form are available for anyone who has access to the Rapid Monitoring online training to download for themselves– under the ‘Reference Materials’ section (See below).

b. Screenshot:



1. Plan for the delivery of Eye on the Reef in your school Marine Science program.
   1. Support students to develop reef biology knowledge and monitoring skills by using the interactive training PDF’s.
   2. Plan for a field trip to conduct the monitoring. Many tourism operators are involved in the Eye on the Reef program and some may be able to offer assistance to you to support the monitoring activities in the field.
2. Input data
   1. Please input a single data sheet into the *Eye on the Reef* [data management and reporting](http://www.gbrmpa.gov.au/eye-on-the-reef/f?p=150:LOGIN:1081607942427401)system*.* If you complete data sheets at more than one unique site (e.g. North side of reef and South side of reef; Reef Flat and Reef slope; Reef A and Reef B) input a data sheet from each site. Please ensure that data inputted is accurate and representative of the site.
   2. Over time, your Eye on the Reef data set will grow and students can use this data set to compare trends for the various monitoring parameters recorded.
   3. Schools have the option of using all of the data they collect to create their own database such that the data from a full class set of data sheets can be studied e.g. students are assigned specific areas at a site that they are to monitor (for example: distances from a tourist pontoon or mooring; reef locations Flat, Slope; North side South side) and comparison between these locations can be made within the class data set.

Accessing Data/ Data for comparative studies

**Australian Institute of Marine Science “Long Term Monitoring Program”** *Compliments Marine science Senior Syllabus CS3.3 and CS3.4*

For over 20 years AIMS has been surveying the health of 47 mid-shore and off-shore reefs across the Great Barrier Reef region. The Long-term Monitoring Program represents the longest continuous record of change in reef communities over such a large geographic area <http://www.aims.gov.au/docs/research/monitoring/reef/reef-monitoring.html>

The **Long Term Monitoring Status Report No. 8** is an enormous resource. It is a complete review of all data collected by the program through 2006-7 and contains trend information, graphical representations of trends and discussion of trends reef by reef, sector by sector and reef wide for a wide diversity of Reef health, biological and ecological indicators. <http://www.aims.gov.au/documents/30301/05734196-b5f0-4d49-8900-6ea1ffa6835f>

The other option when seeking data for individual reefs or reef regions is to go to <http://www.aims.gov.au/docs/research/monitoring/reef/latest-surveys.html> where you can access Reef Monitoring survey reports undertaken since 1993 and the data summaries that they have produced for each specific reef that is part of this program. From here you have a range of options with respect to the individual surveys you can review. They will all provide you with options and data at the individual reef scale. Take some time to explore the diversity of links to reports found on this page. For example if we select “latest surveys” from this page <http://www.aims.gov.au/docs/research/monitoring/reef/latest-surveys.html#Latest surveys>

And then from the 2014/15 survey period select - “Report on the Cairns and Townsville sectors of the Great Barrier Reef” <http://www.aims.gov.au/reef-monitoring/cairns-and-townsville-sectors-2015> - here you can read summaries of the report findings for the region studied. Scrolling down this page you can access Data summaries and graphical depictions of data for individual reefs targeted during these surveys by selecting a reef that interests you e.g. Green Island <http://data.aims.gov.au/reefpage2/reefpage.jsp?fullReefID=16049S>

From the Green Island data summary on this page you are able to access a discussion of data trends and a graphical representation of this data for:

* Crown of Thorns Starfish - <http://data.aims.gov.au/reefpage2/rpdetail.jsp?fullReefID=16049S&sampleType=MANTA>
* Tends in cover of benthic organisms including corals and algae <http://data.aims.gov.au/reefpage2/rpdetail.jsp?fullReefID=16049S&sampleType=VPOINT>
* Trends in Fish abundances <http://data.aims.gov.au/reefpage2/rpdetail.jsp?fullReefID=16049S&sampleType=FISH>

From the Green Island Data summary page it is also possible to view graphical depictions of trends in coral cover at different locations within the Green Island reef. Click on Back, Flank 1, Front, Flank 2

Managing the Great Barrier Reef Marine Park

**How the Reef is Managed** an overview of management priorities and management tools *Compliments Marine science Senior Syllabus CS1 and CS2* <http://www.gbrmpa.gov.au/managing-the-reef/how-the-reefs-managed>

**Reef Advisory Committees and Local Marine Advisory Committees**

*Compliments Marine science Senior Syllabus CS2.1and CS 2.3* <http://www.gbrmpa.gov.au/our-partners/reef-advisory-committee>and <http://www.gbrmpa.gov.au/our-partners/local-marine-advisory-committees>

**Great Barrier Reef Marine Park Zoning Plan 2003:**

The principle tool for managing multiple uses and protecting biodiversity within the Great Barrier Reef Marine Park. *Compliments Marine science Senior Syllabus CS2.3* <http://www.gbrmpa.gov.au/zoning-permits-and-plans/zoning>

**Of Interest:**

* About zoning <http://www.gbrmpa.gov.au/zoning-permits-and-plans/zoning/about-zoning>
* Zoning Maps <http://www.gbrmpa.gov.au/zoning-permits-and-plans/zoning/zoning-maps>
* Interpreting zoning (what activities can be undertaken in each zone) <http://www.gbrmpa.gov.au/zoning-permits-and-plans/zoning/zoning-guide-to-using-the-marine-park/interpreting-zones>
* Maps showing the extent to which each of the, 30 Reef Bioregions and 40 non Reef Bioregions, are protected by zoning.
  + Reef Bioregions <http://www.gbrmpa.gov.au/__data/assets/pdf_file/0012/17301/reef-bioregions-in-the-gbrmp-and-gbrwh.pdf>
  + Non Reef Bioregions <http://www.gbrmpa.gov.au/__data/assets/pdf_file/0011/17300/nonreef-bioregions-in-the-gbrmp-and-gbrwh.pdf>

A study of zoning and its effectiveness as a management tool should include a review of the **Representative Areas Program** which provided the foundational knowledge of the location and diversity of habitats and bioregions within the Great Barrier Reef Marine Park such that the **Zoning Plan 2003** could be sure to protect representative examples of all different habitat types while minimising the impacts to the existing users of the Marine Park. <http://www.gbrmpa.gov.au/zoning-permits-and-plans/rap>

**Environmental Assessment and Management**

*Compliments Marine science Senior Syllabus CS1.5* <http://www.gbrmpa.gov.au/zoning-permits-and-plans/environmental-assessment-management>

Policies, Position Statements and Guidelines

Details on specific issues that have the potential to impact the Great Barrier Reef Marine Park. *Compliments Marine science Senior Syllabus CS 1.3 - CS1.5* <http://www.gbrmpa.gov.au/zoning-permits-and-plans/legislation-regulations-and-policies/policies-and-position-statements>

**Policies**

*Our policies give effect to the Agency's responsibilities, functions and powers outlined in the* [*Great Barrier Reef Marine Park Act 1975*](http://www.comlaw.gov.au/Series/C2004A01395)*. A policy will only be developed where there is an identified need that has been approved by the Marine Park Authority (Board), or if urgent - the Chairman.*

**Of Interest:**

* Policy on **Structures** e.g Tourism Pontoons - *Compliments Marine science Senior Syllabus CS1.5* <http://www.gbrmpa.gov.au/__data/assets/pdf_file/0003/16968/Structures-Policy-reviewed-2010.pdf>
* Policy on **Managing Tourism** Permissions – *Compliments Marine science Senior Syllabus CS1.3* *and CS1.5* <http://www.gbrmpa.gov.au/__data/assets/pdf_file/0020/3845/gbrmpa_ManagingTourismPermissionsPolicy_2003.pdf>
  + **On-Board Tourism Operators Handbook** is a guide for tourism operation in the Great Barrier Reef Marine Park. This guide may suit a student investigation involving the planning of a Tourism Operation (e.g. Vessel based or Pontoon based) in the Great Barrier Reef Marine Park. This guide does not consider Island based Resort developments as these are managed by Queensland Government agencies. <http://onboard.gbrmpa.gov.au/>
  + **Tourism Partners** <http://www.gbrmpa.gov.au/our-partners/tourism-industry>

**Position statements**

Position statements outline the Agency's position on issues where the Marine Park Authority (Board) has a strong interest, but does not have legislative powers for example; emerging risks from shipping. A position statement will only be developed where there is an identified need that has been approved by the Board, or if urgent - the Chairman.

**Of Interest:** **Aquaculture in the Marine Park** - *Compliments Marine science Senior Syllabus CS1.4* <http://www.gbrmpa.gov.au/__data/assets/pdf_file/0020/3890/gbrmpa_AquaculturePositionStatement_2002.pdf>

**Guidelines**

*Guidelines generally support the Agency's policies or position statements and outline the Agency process on certain issues. Guidelines may also be the required terminology under certain circumstances. Any guidelines developed by the Agency will clearly state whether they are 'for guidance' or 'strict rules to be adhered to'*.

**Of Interest:**

**Artificial reefs**- *Compliments Marine science Senior Syllabus CS1.5* <http://www.gbrmpa.gov.au/zoning-permits-and-plans/legislation-regulations-and-policies/policies-and-position-statements>

Other Useful Links

**Facts about the Reef** <http://www.gbrmpa.gov.au/about-the-reef>

Includes links to information about following including links to management information:

* How the Reef is Managed
* Biodiversity
* Animals
* Heritage
* Managing Multiple Uses

**Great Barrier Reef Coastal Ecosystems**

*Compliments Marine science Senior Syllabus CS2.5* <http://www.gbrmpa.gov.au/about-the-reef/great-barrier-reef-coastal-ecosystems>

**Threats to the Reef**

*Compliments Marine science Senior Syllabus CS1 and CS3* <http://www.gbrmpa.gov.au/managing-the-reef/threats-to-the-reef>

**Responsible Reef Practices**

Advice on how to reduce impacts associated with a range of activities likely to occur in the Great Barrier Reef Marine Park. *Compliments Marine science Senior Syllabus CS1.1* <http://www.gbrmpa.gov.au/visit-the-reef/responsible-reef-practices>

**Traditional Owner Connections to Sea Country**

*Compliments Marine science Senior Syllabus CS1.1* <http://www.gbrmpa.gov.au/our-partners/traditional-owners>

**Explore the Great Barrier Reef Marine Park with Google Earth** <http://www.gbrmpa.gov.au/resources-and-publications/spatial-data-information-services/explore-the-gbrmp-with-google-maps>

* + Additional spatial data layers are available either by request or by visiting the Great Barrier Reef Marine Park Authority (GBRMPA).
  + See what is available here <http://www.gbrmpa.gov.au/resources-and-publications/spatial-data-information-services/spatial-data-information>

**Reef Tube – GBRMPA YouTube channel**

<http://www.gbrmpa.gov.au/resources-and-publications/spatial-data-information-services/spatial-data-information>

**Reef HQ Aquarium** <http://www.reefhq.com.au/>

**E- Atlas – Australian Tropical Land and Seas**

<http://eatlas.org.au/home> - The [eAtlas](http://eatlas.org.au/) is a website and [mapping system](http://maps.eatlas.org.au/) for presenting environmental research data in an accessible form that promotes greater use of this information. It is also a data management system for preserving and encouraging reuse of this data. From the site, users can discover what research is being done in a given region or on a given topic then learn more about this research and its outcomes. The data behind the research can be investigated through an interactive mapping system and, where possible, the data itself can be downloaded. The eAtlas also contains a wide range of reference datasets that complement its research content.

**Of Interest:** *Compliments Marine science Senior Syllabus CS3.2, CS3.3 and CS3.4*

* + **Reef Rescue Marine Monitoring Program** – research and reports on Great Barrier Reef Water Quality including data on trends
    - **Program Overview -** <http://eatlas.org.au/rrmmp>
    - **Research and project reports** - <http://eatlas.org.au/rrmmp/gbr-aims-inshore-water-quality>
  + **38 NERP Tropical Ecosystems Hub projects –** Links to overviews and reports of all 38 projects. This research covers a wide range of topics some of which include: seagrass, coral reefs, turtles, dugongs, seabirds, bathymetry, fish abundance, Crown Of Thorns Starfish, rainforest revegetation, wet tropics species distributions, etc. <http://eatlas.org.au/rrmmp/gbr-aims-inshore-water-quality>

**Australian Institute of Marine Science** <http://www.aims.gov.au/>

Explore the AIMS data catalogue <http://www.aims.gov.au/docs/data/data.html>

**Queensland Fisheries – Department of Agriculture and Fisheries**

*Compliments Marine science Senior Syllabus CS1 and CS 2* <https://www.daf.qld.gov.au/fisheries>

**Queensland Department of National Parks, Sport and Racing**

*Compliments Marine science Senior Syllabus CS1 and CS2* <http://www.nprsr.qld.gov.au/>

**Managing Queensland Marine Parks** <http://www.nprsr.qld.gov.au/marine-parks/> and <http://www.nprsr.qld.gov.au/managing/index.html>

For information about the management of Great Barrier Reef Islands and commercial activities <http://www.nprsr.qld.gov.au/parks/index.php> and <http://www.nprsr.qld.gov.au/tourism/index.html> and <http://www.nprsr.qld.gov.au/managing/commercial-activities/index.html>