Australian Government
Great Barrier Reef Marine Park Authority

Reef Guardian School

Overview

The Reef Authority's Eye on the Reef Rapid Monitoring delivers an age-appropriate reef activity that aligns with the P-12 Australian curriculum (Table 1). Rapid Monitoring is linked to the Australian Curriculum V9.0 to the subjects of Science, Humanities and Social Sciences (HASS) /Geography, Mathematics, English and Senior QLD Marine Science, Biology, Science in Practice, Earth Science & Aquatic Practices. Rapid Monitoring is also a citizen science data collation activity that actively contributes to lifelong skills, monitoring, and Marine Park management needs over time. Students/ guests require preliminary information to be able to complete the Rapid Monitoring survey independently, in pairs or as a guided group at the Reef.

Alignment of the Australian curriculum V9.0 to Rapid Monitoring across the learning areas and year levels is listed in Table 2. This table will be very handy should you wish to develop and deliver Rapid Monitoring as an educational product to accommodate school groups. Simply choose your Australian Curriculum outcomes, subject and year level from Table 2 and grab a copy of the Rapid Monitoring Flip Book or Rapid Monitoring Classroom Power Point. The Flip Book has been designed to be used by tourism operators or teachers to present preliminary information on the way out to the Reef. This combined with in water surveys and data entry provides an extremely strong alignment to the Australian Curriculum as found in Table 2.

Please note, Rapid Monitoring consists of three surveys but has been scaffolded for younger students into the Be A Marine Biologist For A Day (BAMBFAD) program. Students tend to find the BAMBFAD name engaging and we use the name to differentiate students completing only the first of three surveys found in Rapid Monitoring.

Rapid Monitoring student scaffolding that meets age-appropriate learning needs and content:

- Prep to grade 4 typically complete the timed swim indicator survey with focus on only a single indicator species (BAMBFAD)
- Grade 4-8 focus on identifying and counting all eleven indicator species during the timed swim indicator survey (BAMBFAD)
- Grade 8 to 10 can complete the timed swim indicator survey and 360 benthic survey
- Grade 10 and over can complete timed swim indicator survey, 360 benthic survey and coral impact survey

To receive a free copy of the Rapid Monitoring Flip book (hard copy water proof), Rapid Monitoring and/or BAMBFAD slates, please return email (reefguardians@gbrmpa.gov.au) with your request and shipping details.

Table 1: Overview of Rapid Monitoring Teaching and Learning Modules

Section	Age/ Grade	Information	Links
Pre-Learning (online or at school).	Age-Open	Rapid Monitoring methodology, surveys and information. Snorkel practice (pool).	Rapid Monitoring training course (16 years +) Rapid Monitoring Flip Book V9.0 Prep-Grade 3 Power point, activity book. answers, assessment BAMBFAD Grade 4 Power point, activity book, answers, assessment- Grade 5 Power point, activity book, answers, assessment- Grade 6 Power point, activity book, answers, assessment Grade 7 Power point, activity book, answers, assessment- Grade 8 Power point, activity book, answers, assessment- Grade 9 Power point, activity book, answers, assessment- Grade 10 Power point, activity book, answers, assessment Grade 11 & 12 Power point, activity book, answers assessment 1, assessment 2, assessment 3.
RAPID 1- **Site and survey** (boat).	Age-9+ Grade 4+	Site and observer details, environmental conditions.	Rapid Monitoring Flip Book V9.0 Rapid Module1and Quiz RM1 Primary Pre and Post Snorkel Brief Middle Pre and Post Snorkel Brief Senior Pre and Post Snorkel Brief
RAPID 2- **Timed swim** (snorkel or glass bottom boat)	Age-9+ Grade 4+	Identify and count 11 key reef indicator species within 10 minutes.	Foundation- Grade 4+, ages 5-10 BAMBFAD Single Slate. Grade 4- 9, ages 10-15 -BAMBFAD 11 Indicator Slate. Grade 10+, ages 15+ Rapid Monitoring Slate. Rapid Monitoring Flip Book V9.0 Rapid Module 2 and Quiz RM2
RAPID 3- **Benthic 360^0** (snorkel)	Age-15+ Grade 10+	Estimating % cover of the benthos (substrate types) of a representative reef site area.	Rapid Monitoring Flip Book V9.0 Rapid Module 3 and Quiz RM3 Senior Pre and Post Benthic Snorkel Brief.
RAPID 4- **Coral impact** (snorkel)	Age- 16+ Grade 11+	Includes; bleaching, predation, disease, competition, damage and rubbish.	Rapid Monitoring Flip Book V9.0 Coral impact Flip Book Rapid Module 4 and QuizRM4 RM Final Exam Answer Sheet
Data entry (Tourism operator facilitated or classroom)	Age-9+ Grade 4+	Collating and submitting data into Eye on the Reef.	Rapid Monitoring data entry Eye on the Reef Registration and data entry guide. Prep to Grade 3 Power point Grade 4 Power point- Grade 5 Power point- Grade 6 Power point Grade 7 Power point- Grade 8 Power point- Grade 9 Power point- Grade 10 Power point Grade 11 & 12 Power point
Post survey (Tourism operator or classroom).	Age- Open	Discussion, reflecting on findings, Reef health, survey methods, and observations	Reef Health Evaluation.

Table 2 Curriculum Links – ACARA V9.0

The tables below maps how the Australian Curriculum (ACARA V9) algins with Rapid Monitoring across all year levels: Foundation to Year 10- Science, Humanities and Social Sciences (HASS) /Geography, Mathematics, English and Senior Marine Science, Science in Practice, Biology, Earth Science & Aquatic Practices.

Kindergarten (Be A Marine Biologist For A Day- BAMBFAD)

Subject	ACARA code	ACARA Standard	Activities to achieve the standard.
Science	SU AC9SFU01	Observe external features of plants and animals and describe ways they can be grouped based on these features.	Focus on indicator species and discuss their external features and how they can be grouped.
Science	SHE AC9SFH01	Explore the ways people make and use observations and questions to learn about the natural world.	How can counting and observing indicator species be used to learn about reefs?
Science	SI AC9SFI04	Compare observations with predictions with guidance.	Ask students to predict the numbers of indicator species they will see and compare with actual results.
HASS	AC9HSFK03	The features of familiar places they belong to, why some places are special and how places can be looked after.	Discuss with students their direct or indirect association with the Reef.
Math	AC9MFN02	Recognise and name the number of objects within a collection up to 5 using subitising.	Make cards with numbers 1-5 displayed using subitised spp.
Math	AC9MFN03	Quantify and compare collections to at least 20 using counting and explain or demonstrate reasoning.	Count and compare butterfly fish with grazing herbivores.
Math	AC9MFN05	Represent practical situations involving addition, subtraction and quantification with physical and virtual materials and use counting or subitising strategies.	Select one indicator species and count how many are seen in a reef scape image or video transect.
Math	AC9MFST01	Collect, sort and compare data represented by objects and images in response to given investigative questions that relate to familiar situations.	Have various examples of indicator species and ask students to put them into categories e.g. sea cucumbers, butterfly fish, grazing herbivores, cods and groupers and coral trout.
English	AC9EFLA05	Recognise that sentences are key units for expressing ideas.	Make a summary statement where students can add in their data.
English	AC9EFLA07	Explore the contribution of images and words to meaning in stories and informative texts.	Discuss a labelled diagram and how it helps to assist in identification.
English	AC9EFLA09	Identify punctuation as a feature of written text different from letters; recognise that capital letters are used for names, and that capital letters also signal the beginning of sentences while punctuation marks signal the end.	Practice use of capital letters of chosen indicator spp.
English	AC9EFLE01	Share ideas about stories, poems and images in literature, reflecting on experiences that are similar or different to their own by engaging with texts by First Nations Australian, and wide-ranging Australian and world authors and illustrators.	Compare the images of First Nation representation of indicator species. Eg turtle.
English	AC9EFLY06	Create and participate in shared editing of short written texts to record and report ideas and events using some learnt vocabulary, basic sentence boundary punctuation and spelling some consonant–vowel–consonant words correctly.	Create a sentence and cut it up for students to glue and create a sentence or fill in a missing word.

Grade 1 (BAMBFAD)

Subject	ACARA code	ACARA Standard	Activities to achieve the standard.
Science	AC9S1U01	Identify the basic needs of plants and animals, including air, water, food or shelter, and describe how the places they live meet those needs.	Discuss reef creatures' needs of water, sunlight and currents.
Science	AC9S1H01	Describe how people use science in their daily lives, including using patterns to make scientific predictions.	Discuss how counting reef species can be used to make predictions.
Science	AC9S1I05	Compare observations with predictions and others' observations, consider if investigations are fair and identify further questions with guidance.	Discuss why each person may have a different result.
Science	AC9S1I06	Write and create texts to communicate observations, findings and ideas, using everyday scientific vocabulary.	Use a glossary to help create texts or explore scientific names of indicator species.
HASS	AC9HS1K04	How places change and how they can be cared for by different groups including First Nations Australians.	Discuss how the Reef changed over time and how we can look after it.
Math	AC9M1ST01	Acquire and record data for categorical variables in various ways including using digital tools, objects, images, drawings, lists, tally marks and symbols.	Use the slate to tally images or visual footage.
English	AC9E1LA09	Recognise the vocabulary of learning area topics.	Glossary

Grade 2 (BAMBFAD)

Subject	ACARA code	ACARA Standard	Activities to achieve the standard.
Science	AC9S2I04	Sort and order data and information and represent patterns, including with provided tables and visual or physical models.	Rapid monitoring data can represented in different forms- could use photos of indicator species to make column graph.
Science	AC9S2I05	Compare observations with predictions and others' observations, consider if investigations are fair and identify further questions with guidance.	Compare and discuss why Rapid results vary.
HASS	AC9HS2K01	A local individual, group, place or building and the reasons for their importance, including social, cultural or spiritual significance.	Discuss the importance of reefs and world heritage values.
HASS	AC9HS2K03	How places can be spatially represented in geographical divisions from local to regional to state/territory, and how people and places are interconnected across those scales.	Draw ways each biome across Australia is connected to the reef.
HASS	AC9HS2S01	Develop questions about objects, people, places and events in the past and present.	Students develop a question they would like to answer about the Reef.
HASS	AC9HS2S05	Draw conclusions and make proposals.	Draw conclusions on the Rapid monitoring results. Propose how we can all help the Reef.
HASS	AC9HS2S06	Develop narratives and share observations, using sources, and subject-specific terms.	Write a story about a chosen indicator species.
Math	AC9M2ST01	Acquire data for categorical variables through surveys, observation, experiment and using digital tools; sort data into relevant categories and display data using lists and tables.	Conduct a component of Rapid monitoring and slates (online or in water).
English	AC9E2LA08	Understand that images add to or multiply the meanings of a text.	Labeled diagrams of an indicator species.

Grade 3 (BAMBFAD)

Subject	ACARA code	ACARA Standard	Activities to achieve the standard.
Science	AC9S3H01	Examine how people use data to develop scientific explanations.	Discuss the data results.
Science	AC9S3H02	Consider how people use scientific explanations to meet a need or solve a problem.	Rapid data can be used to monitor the GBR that is 2300km long.
Science	AC9S3I01	Pose questions to explore observed patterns and relationships and make predictions based on observations.	Design a question based on information given about indicator species e.g. are butterfly fish always found in pairs?
Science	AC9S3I04	Construct and use representations, including tables, simple column graphs and visual or physical models, to organise data and information, show simple relationships and identify patterns.	Organise data using Rapid monitoring slate.
Science	AC9S3I05	Compare findings with those of others, consider if investigations were fair, identify questions for further investigation and draw conclusions.	Discuss Rapid monitoring method findings and discuss why results may be different or impacted.
HASS	AC9HS3S04	Analyse information and data and identify perspectives.	Analyse food chain perspectives- what if the indicator species was gone altogether?
Math	AC9M3ST03	Conduct guided statistical investigations involving the collection, representation and interpretation of data for categorical and discrete numerical variables with respect to questions of interest.	Rapid monitoring slate.
English	AC9E3LY02	Use interaction skills to contribute to conversations and discussions to share information and ideas.	Group discussion and presentations of findings.
English	AC9E3LY07	Plan, create, rehearse and deliver short oral and/or multimodal presentations to inform, express opinions or tell stories, using a clear structure, details to elaborate ideas, topic-specific and precise vocabulary, visual features, and appropriate tone, pace, pitch and volume.	Retell the Rapid task. Or tell a story about new knowledge about a chosen indicator species.

Grade 4 (BAMBFAD)

Subject	ACARA code	ACARA Standard	Activities to achieve the standard.
Science	AC9S4U01	Explain the roles and interactions of consumers, producers and decomposers within a habitat and how food chains represent feeding relationships.	Using indicator species to represent feeding relationships.
Science	AC9S4U02	Identify sources of water and describe key processes in the water cycle, including movement of water through the sky, landscape and ocean; precipitation; evaporation; and condensation.	Discuss the water cycle and how it is linked to the reef.
Science	AC9S4H01	Examine how people use data to develop scientific explanations.	Discuss how this data can be used to help management of Marine Park.
Science	AC9S4H02	Consider how people use scientific explanations to meet a need or solve a problem.	Discuss how data regarding Crown of thorns starfish (COTS) can mitigate the impacts of a breakout.

Science	AC9S4I01	Pose questions to explore observed patterns and relationships and make predictions based on observations.	Pose questions about a chosen indicator species.
Science	AC9S4I04	Construct and use representations, including tables, simple column graphs and visual or physical models, to organise data and information, show simple relationships and identify patterns.	Rapid monitoring data slates. Data can also be turned into graphs at school.
Math	AC9M4M02	Recognise ways of measuring and approximating the perimeter and area of shapes and enclosed spaces, using appropriate formal and informal units.	Recognise that a 10-minute timed swim can cover a different area dependent on speed and current direction.
Math	AC9M4ST03	Conduct statistical investigations, collect data through survey responses and other methods; record and display data using digital tools; interpret the data and communicate the results.	Rapid monitoring data entry.
HASS	AC9HS4K05	The importance of environments, including natural vegetation and water sources, to people and animals in Australia and on another continent.	Discuss the importance of the Great Barrier Reef.
English	AC9E4LA02	Identify the subjective language of opinion and feeling, and the objective language of factual reporting.	Write a fact report on the data and compare it to a written summary of your opinion on the reef.

Grade 5 (BAMBFAD)

Subject	ACARA code	ACARA Standard	Activities to achieve the standard.
Science	AC9S5U01	Examine how particular structural features and behaviours of living things enable their survival in specific habitats.	Chosen an indicator species to examine how structural and behavioral features enhance survival.
Science	AC9S5H02	Investigate how scientific knowledge is used by individuals and communities to identify problems, consider responses and make decisions.	Describe how Rapid data is used for Marine Park management.
Science	AC9S5I05	Compare methods and findings with those of others, recognise possible sources of error, pose questions for further investigation and select evidence to draw reasoned conclusions.	Discuss the variation in survey results. Discuss possible sources of error and ways to improve next time.
Science	AC9S5I06	Write and create texts to communicate ideas and findings for specific purposes and audiences, including selection of language features, using digital tools as appropriate.	Present or recap information learnt on an indicator species.
HASS	AC9HS5S02	Locate, collect and organise information and data from primary and secondary sources in a range of formats.	Rapid monitoring slates or combining BAMBFAD data.
HASS	AC9HS5S03	Evaluate information and data in a range of formats to identify and describe patterns and trends, or to infer relationships.	Use abundance to describe pattern and trends to infer ecological relationships of indicator species.
HASS	AC9HS5S04	Evaluate primary and secondary sources to determine origin, purpose and perspectives.	Evaluate data compared to previous year or in a different Marnie Park zone or type of reef.
HASS	AC9HS5S05	Develop evidence-based conclusions.	Use data to describe evidence based on ecological health of the Reef.
HASS	AC9HS5S06	Propose actions or responses to an issue or challenge that consider possible effects of actions.	Talk about green zones and possible effects to the reef.
HASS	AC9HS5S07	Present descriptions and explanations, drawing ideas, findings and viewpoints from sources, and using relevant terms and conventions.	After engaging with tourism operators, present a description of the health of the reef surveyed.

HASS	AC9HS5K05	The management of Australian environments, including managing severe weather events such as bushfires, floods, droughts or cyclones, and their consequences.	Explore extreme weather events and Reef impacts.
Math	AC9M5ST03	Plan and conduct statistical investigations by posing questions or identifying a problem and collecting relevant data; choose appropriate displays and interpret the data; communicate findings within the context of the investigation.	Could compare the number of indicator species at two different reefs and communicate findings. Data entry.
English	AC9E5LY06	Plan, create, edit and publish written and multimodal texts whose purposes may be imaginative, informative and persuasive, developing ideas using visual features, text structure appropriate to the topic and purpose, text connectives, expanded noun groups, specialist and technical vocabulary, and punctuation including dialogue punctuation.	Using the glossary write a summary text on findings from completing Rapid or BAMBFAD data.
English	AC9E5LY07	Plan, create, rehearse and deliver spoken and multimodal presentations that include relevant, elaborated ideas, sequencing ideas and using complex sentences, specialist and technical vocabulary, pitch, tone, pace, volume, and visual and digital features.	Choose an indicator species and make a power point of all the relevant information required for next year's class to complete BAMBFAD or Rapid monitoring.

Grade 6 (BAMBFAD)

Subject	ACARA code	ACARA Standard	Activities to achieve the standard.
Science	AC9S6U01	Investigate the physical conditions of a habitat and analyse how the growth and survival of living things is affected by changing physical conditions.	Analyse how salinity, rainfall, sunlight and/or temperature affect coral growth and survival.
Science	AC9S6H02	Investigate how scientific knowledge is used by individuals and communities to identify problems, consider responses and make decisions.	Investigate how people use knowledge about the reef to take action to protect it.
Science	AC9S6I05	Compare methods and findings with those of others, recognise possible sources of error, pose questions for further investigation and select evidence to draw reasoned conclusions.	Compare data collated between students, discuss errors and how to improve data collation next time.
Science	AC9S6I06	Write and create texts to communicate ideas and findings for specific purposes and audiences, including selection of language features, using digital tools as appropriate.	Write a summary report on the Rapid monitoring process, why, what, who, when, where and how.
HASS	AC9HS6S02	Locate, collect and organise information and data from primary and secondary sources in a range of formats.	Rapid monitoring primary and online data collation.
HASS	AC9HS6S03	Evaluate information and data in a range of formats to identify and describe patterns and trends, or to infer relationships.	Infer relationship between the number of herbivorous fish and algae coverage.
HASS	AC9HS6S04	Evaluate primary and secondary sources to determine origin, purpose and perspectives.	Compare photo or video footage to primary in-water results.
HASS	AC9HS6S05	Develop evidence-based conclusions.	Use the data to make inferences on the health of a reef.
HASS	AC9HS6S06	Propose actions or responses to an issue or challenge that consider possible effects.	Propose actions that can be taken to help protect the indicator species.
HASS	AC9HS6S07	Present descriptions and explanations, drawing ideas, findings and viewpoints from sources, and using relevant terms and conventions.	Describe why a chosen species should or should not be classed as an indicator species.

English	AC9E6LA07	Identify and explain how images, figures, tables, diagrams, maps and graphs contribute to meaning.	Explain how images and diagrams assist with identification training. Explain how zoning maps assist in explaining a reef and its location.
English	AC9E6LY05	Use comprehension strategies such as visualising, predicting, connecting, summarising, monitoring and questioning to build literal and inferred meaning, and to connect and compare content from a variety of sources.	From the flip book and various resources learn how to identify reef indicator species in books, photos and in real life.
English	AC9E6LY09	Use knowledge of known words, word origins including some Latin and Greek roots, base words, prefixes, suffixes, letter patterns and spelling generalisations to spell new words including technical words.	Find scientific names of reef indicator species and understand how to spell and write them.

Grade 7

Subject	ACARA code	ACARA Standard	Activities to achieve the standard.
Science	AC9S7U01	Investigate the role of classification in ordering and organising the diversity of life on Earth and use and develop classification tools including dichotomous keys.	Investigate how each of the indicator species are classified.
Science	AC9S7U02	Use models, including food webs, to represent matter and energy flow in ecosystems and predict the impact of changing abiotic and biotic factors on populations.	Create food webs of the reef and indicator species and predict the impact of changing biotic and abiotic factors.
Science	AC9S7U03	Model cyclic changes in the relative positions of the Earth, sun and moon and explain how these cycles cause eclipses and influence predictable phenomena on Earth, including seasons and tides.	Explain how the movement of the tide and moon affects coral reefs and spawning events.
Science	AC9S7H03	Examine how proposed scientific responses to contemporary issues may impact on society and explore ethical, environmental, social and economic considerations.	Investigate, if green zones are better for maintaining ecosystem function might interact with competing viewpoints, values and interests for marine areas.
Science	AC9S7I02	Plan and conduct reproducible investigations to answer questions and test hypotheses, including identifying variables and assumptions and, as appropriate, recognising and managing risks, considering ethical issues and recognising key considerations regarding heritage sites and artefacts on Country/Place.	Plan and conduct Rapid monitoring to test if data can be used for management. Identify variables, risks, and the Marine Park.
Science	AC9S7I04	Select and construct appropriate representations, including tables, graphs, models and mathematical relationships, to organise and process data and information.	Can turn the tallied results into bar graphs.
Science	AC9S7I06	Analyse, methods, conclusions and claims for assumptions, possible sources of error, conflicting evidence and unanswered questions.	After Rapid Monitoring, analyse the method, conclusion, assumptions and possible sources of error.
Science	AC9S7I08	Write and create texts to communicate ideas, findings and arguments for specific purposes and audiences, including selection of appropriate language and text features, using digital tools as appropriate.	Write a report of the Rapid monitoring data collation.
HASS	AC9HG7S01	Develop questions for a geographical inquiry related to a phenomenon or challenge.	How to monitor and manage the Reef that is as big as Italy.
HASS	AC9HG7S02	Collect, organise and represent data and information from primary research methods, including fieldwork and secondary research materials, using geospatial technologies and digital tools as appropriate.	Rapid Monitoring data.

Math	AC9M7ST01	acquire data sets for discrete and continuous numerical variables and calculate the range, median, mean and mode; make and justify decisions about which measures of central tendency provide useful insights into the nature of the distribution of data	Combine all Rapid results across the class and calculate the range, mean and mode of each category.
English	AC9E7LA05	Understand how complex and compound-complex sentences can be used to elaborate, extend and explain ideas.	Explain the results and how they can infer the health of the reef.
English	AC9E7LY07	Plan, create, rehearse and deliver presentations for purposes and audiences in ways that may be imaginative, reflective, informative, persuasive and/or analytical, by selecting text structures, language features, literary devices and visual features, and using features of voice including volume, tone, pitch and pace.	Present facts and ideas about how to identify an indicator species.

Grade 8

Subject	ACARA code	ACARA Standard	Activities to achieve the standard.
Science	AC9S8H04	Explore the role of science communication in informing individual viewpoints and community policies and regulations.	Explore science communication used within the GBRMP.
Science	AC9S8I02	Plan and conduct reproducible investigations to answer questions and test hypotheses, including identifying variables and assumptions and, as appropriate, recognising and managing risks, considering ethical issues and recognising key considerations regarding heritage sites and artefacts on Country/Place	Plan Rapid monitoring investigation.
Science	AC9S8I06	Analyse methods, conclusions and claims for assumptions, possible sources of error, conflicting evidence and unanswered questions.	Rapid monitoring analyses of method, errors and conclusions.
Science	AC9S8I08	Write and create texts to communicate ideas, findings and arguments for specific purposes and audiences, including selection of appropriate language and text features, using digital tools as appropriate.	Complete a report after Rapid monitoring.
HASS	AC9HG8K02	The location and distribution of Australia's distinctive landscapes and significant landforms.	Explore the location of the Great Barrier Reef.
HASS	AC9HG8S01	Develop questions for a geographical inquiry related to a phenomenon or challenge.	Develop questions of how the Reef can be monitored and managed.
HASS	AC9HG8S02	Collect, organise and represent data and information from primary research methods, including fieldwork and secondary research materials, using geospatial technologies and digital tools as appropriate.	Rapid monitoring data.
HASS	AC9HG8S03	Interpret and analyse geographical data and information to identify similarities and differences, explain patterns and trends and infer relationships.	Identify similarities and differences in Rapid monitoring data and infer ecological function or health of the reef.
HASS	AC9HG8S04	Draw conclusions based on the analysis of the data and information.	Draw conclusions on the health of the reef based on Rapid monitoring data.
HASS	AC9HG8S05	Identify a strategy for action in relation to environmental, economic, social or other factors, and explain potential impacts.	From Rapid monitoring identify a strategy for action that would increase the environmental or economic factors and explain any impacts.
Math	AC9M8ST02	Analyse and report on the distribution of data from primary and secondary sources using random and non-random sampling techniques to select and study samples.	Use random sampling of Rapid timed swim compared to transect lines in particular areas.

Math	AC9M8ST04	Plan and conduct statistical investigations involving samples of a population; use ethical and fair methods to make inferences about the population and report findings, acknowledging uncertainty.	Collate data of indicator species populations using Rapid monitoring. Make inferences on about the population and acknowledge uncertainty.
English	AC9E8LY06	Plan, create, edit and publish written and multimodal texts, organising and expanding ideas, and selecting text structures, language features, literary devices and visual features for purposes and audiences in ways that may be imaginative, reflective, informative, persuasive and/or analytical.	Explain Rapid monitoring and results.

Grade 9

Subject	ACARA code	ACARA Standard	Activities to achieve the standard.
Science	AC9S9U03	Represent the carbon cycle and examine how key processes including combustion, photosynthesis and respiration rely on interactions between Earth's spheres (the geosphere, biosphere, hydrosphere and atmosphere).	Represent the Carbon cycle that includes marine and aquatic biomes e.g. reef, mangroves, ocean.
Science	AC9S9I02	Plan and conduct valid, reproducible investigations to answer questions and test hypotheses, including identifying and controlling for possible sources of error and, as appropriate, developing and following risk assessments, considering ethical issues, and addressing key considerations regarding heritage sites and artefacts on Country/Place.	Plan and conduct Rapid monitoring.
Science	AC9S9I04	Select and construct appropriate representations, including tables, graphs, models and mathematical relationships, to organise and process data and information.	Organise and process data and information gained from Rapid monitoring.
Science	AC9S9I07	Construct arguments based on analysis of a variety of evidence to support conclusions or evaluate claims and consider any ethical issues and cultural protocols associated with accessing, using or citing secondary data or information.	Construct an argument about reef health using a variety of secondary data or information.
Science	AC9S9I08	Write and create texts to communicate ideas, findings and arguments effectively for identified purposes and audiences, including selection of appropriate content, language and text features, using digital tools as appropriate.	Communicate findings of Rapid monitoring.
HASS	AC9HG9K01	The distribution and characteristics of biomes as regions with distinctive climates, soils, vegetation and productivity.	Look at the distribution of reefs and mangroves worldwide.
HASS	AC9HG9K06	The effects on places of people's travel, recreational, cultural or leisure choices, and the strategies for managing the impacts on these places.	Investigate the effects of travel, recreational, cultural or leisure activities and strategies for managing impact on the Reef.
HASS	AC9HG9S01	Develop a range of questions for a geographical inquiry related to a phenomenon or challenge.	Develop questions regarding climate change, COTS or coral spawning.
HASS	AC9HG9S02	Collect, represent and compare data and information from primary research methods, including fieldwork and secondary research materials, using geospatial technologies and digital tools as appropriate.	Rapid monitoring data.
HASS	AC9HG9S03	Evaluate geographical data and information to make generalisations and predictions, explain patterns and trends and infer relationships.	Rapid monitoring data.
HASS	AC9HG9S06	Create descriptions, explanations and responses, using geographical knowledge and geographical tools as appropriate, and concepts and terms that incorporate and acknowledge research findings.	Describe Rapid monitoring site that acknowledges research findings.

Math	AC9M9ST02	Analyse how different sampling methods can affect the results of surveys and how choice of representation can be used to support a particular point of view.	Compare the timed swim to the 360 benthic survey to transects and quadrants.
Math	AC9M9ST05	Plan and conduct statistical investigations involving the collection and analysis of different kinds of data; report findings and discuss the strength of evidence to support any conclusions.	Rapid monitoring data.
English	AC9E9LY04	Analyse the organisation of ideas in paragraphs and extended texts and evaluate its impact on meaning.	Can look at the Outlook report or MMP snapshots
English	AC9E9LY06	Plan, create, edit and publish written and multimodal texts, organising, expanding and developing ideas, and selecting text structures, language features, literary devices and multimodal features for purposes and audiences in ways that may be imaginative, reflective, informative, persuasive, analytical and/or critical.	Informative written text on indicator species and Rapid monitoring.
English	AC9E9LY07	Plan, create, rehearse and deliver spoken and multimodal presentations for purpose and audience, using language features, literary devices and features of voice such as volume, tone, pitch and pace, and organising, expanding and developing ideas in ways that may be imaginative, reflective, informative, persuasive, analytical and/or critical.	Informative presentation on indicator species and Rapid monitoring.

Grade 10

Subject	ACARA code	ACARA Standard	Activities to achieve the standard.
Science	AC9S10U02	Use the theory of evolution by natural selection to explain past and present diversity and analyse the scientific evidence supporting the theory.	Use theory of evolution to explain past and present reef diversity.
Science	AC9S10U04	Use models of energy flow between the geosphere, biosphere, hydrosphere and atmosphere to explain patterns of global climate change.	Explain climate change and biosphere and hydrosphere.
Science	AC9S10I06	Assess the validity and reproducibility of methods and evaluate the validity of conclusions and claims, including by identifying assumptions, conflicting evidence and areas of uncertainty.	Assess the validity of Rapid monitoring and Benthic 360 survey.
Science	AC9S10I08	Write and create texts to communicate ideas, findings and arguments effectively for identified purposes and audiences, including selection of appropriate content, language and text features, using digital tools as appropriate.	Create texts to communicate findings of Rapid and Benthic surveys.
HASS	AC9HG10K01	The human-induced changes that challenge the sustainability of places and environments.	Explore human induced changes that challenge the sustainability of the reef.
HASS	AC9HG10K03	First Nations Australians' approaches to custodial responsibility and environmental management in different regions of Australia.	Explore how TUMRA groups use Rapid monitoring.
HASS	AC9HG10K04	Causes and effects of a change in an identified environment at a local, national or global scale, and strategies to manage sustainability.	Climate change and impact on reef.
HASS	AC9HG10S02	Collect, represent and compare data and information from primary research methods, including fieldwork and secondary research materials, using geospatial technologies and digital tools as appropriate.	Rapid monitoring data.
HASS	AC9HG10S03	Evaluate geographical data and information to make generalisations and predictions, explain patterns and trends and infer relationships.	Explain patterns and trends between Indicator and Benthic survey results and what it may infer regarding reef health.

HASS	AC9HG10S04	Evaluate Data and Information to justify conclusions.	Evaluate Indicator and Benthic data to justify conclusions.
Math	AC9M10M04	Identify the impact of measurement errors on the accuracy of results in practical contexts.	Identify the impact of measurement errors on the accuracy of results in Rapid and Benthic monitoring.
English	AC9E10LY06	Plan, create, edit and publish written and multimodal texts, organising, expanding and developing ideas through experimenting with text structures, language features, literary devices and multimodal features for specific purposes and audiences in ways that may be imaginative, reflective, informative, persuasive, analytical and/or critical.	Plan, create, edit and publish written and multimodal texts reporting on the method and findings of Indicator and Benthic monitoring.

Year 11 and 12 Aquatic Practices

AQP	AQP Syllabus	Students explore the rich biodiversity that exists in aquatic ecosystems, including the biotic and abiotic components that create this diversity.	Discuss biotic and abiotic factors of the reef/ site.
AQP	AQP Syllabus	They explain the processes that form, degrade and restore ecosystems and the wide variety of ecological relationships they each contain.	Coral impact section- damage
AQP	AQP Syllabus	Students build skills in identifying species, measuring water quality, conducting risk assessments and identifying threats to ecosystems.	Identification of reef indicator species, benthic categories and coral impacts- could conduct water quality or turbidity tests. Discuss algae and flood plumes.
AQP	AQP Syllabus	They gain an appreciation and awareness of the cultural significance of waterways to Aboriginal peoples, Torres Strait Islander peoples and Australian communities.	Discuss the cultural significance of mangroves and reef to Aboriginal, Torres Straight Islanders and Australian communities.
AQP	AQP Syllabus	Students develop their understanding of conservation and management techniques for aquatic ecosystems.	Discuss the management and conservation of the Marine Park (zoning, programs)
AQP	AQP Syllabus	They evaluate the effectiveness of current management of aquatic ecosystems and consider ways this could be improved.	Evaluate the effectiveness of current Marine Park management and improvement.
AQP	AQP Syllabus	investigate a question that − is related to aquatic ecosystems − has scope to be refined further. Document the investigation process and conclusion, including − selecting a methodology or sources − collecting information − analysing information − drawing a conclusion based on the analysis of information − making recommendations for future investigations.	Complete Rapid and benthic survey (coral impact section if relevant) enter Rapid monitoring data. Write report. Question ‘’Is the Reef in good health?” ‘’Does reef health differ between zones”?
AQP	AQP Syllabus	complete a project − that is related to a scenario about aquatic ecosystems − with an outcome of either a physical product or the performance of a skill. Document the process used to complete the project, including – analysing and interpreting the given scenario – describing the relevant concepts and procedures – selecting a procedure to follow – executing skills and processes to deliver an outcome – evaluating the outcome – making recommendations for future projects.	Complete snorkeling performance and enter Rapid monitoring data.

Marine Science Unit 2 is Year 11 and Unit 3 is Year12

SU	MS Syllabus UNIT 2	Describe the three main types of diversity, i.e. genetics, species and ecosystem.	Could discuss coral genetic and species diversity and inner and outer reef ecosystem diversity.
SU	MS Syllabus UNIT 2	Explain the three unique characteristics of marine biodiversity, i.e. wide dispersal at sea, the need for structural complexity, critical nursery habitats.	Could discuss life cycle of many marine organisms spending various parts of their life out at sea, in mangroves, on reefs. Connectivity and importance to conserve each biome.
SU	MS Syllabus UNIT 2	Identify the variety of ecosystems (e.g. estuaries, coastal lakes, saltmarshes, mangroves, seagrass, rocky shores, temperate reefs, coral reefs, lagoons, shelf and deep water) that constitute Australia's marine biomes.	Discuss how many biomes a student has encountered travelling from home to the outer reef. Discuss importance of connectivity and conservation of each biome.
SU	MS Syllabus UNIT 2	Describe the implications of connectivity to marine ecosystems, e.g. estuaries, mangroves, seagrass beds.	Implications for life cycles, food, shelter, habitat, adaptation, threats and pollution.
SU	MS Syllabus UNIT 2	Identify factors that lead to a loss of diversity, e.g. natural hazard, loss/fragmentation of habitat, pollution, exploitation, introduction of new species, disease.	Identify reef threats- cyclones, plumes, COTS, overfishing, algae, water quality, marine debris, climate change.
SU	MS Syllabus UNIT 2	Calculate the biodiversity of a marine ecosystem using Simpson's diversity index (SDI), $SDI = 1 - (\sum n(n-1) N(N-1))$ where N = total number of organisms of all species and n = number of organisms of one species.	SDI could be conducted after Rapid monitoring. Or a different count study on butterfly fish or grazing herbivores.
SU	MS Syllabus UNIT 2	Describe the concepts of ecosystem resilience, disturbance and recovery.	Could focus on coral resilience after floods or bleaching and recovery. Resilience and recovery can be influenced by human daily actions and long-term projects.
SU	MS Syllabus UNIT 2	Identify biotic components of marine ecosystems, i.e. trophic levels, food chains, food webs, interactions and population dynamics.	Identify the various tropic levels, food chains/ webs and interactions of the indicator species and benthic categories of Rapid monitoring. Population dynamics can be discussed in terms of number of grazing herbivores and macroalgae.
SU	MS Syllabus UNIT 2	Classify biotic interactions based on the following terms - symbiosis (i.e. parasitism, mutualism, commensalism and amensalism) - competition (i.e. intraspecific and interspecific) - predation.	Unpack the Anemone fish mutualism, groupers, cod and sharks, COTS and *Drupella* as predation, sea cucumbers and pearlfish commensalism, chemical warfare amensalism, growth of coral and algae competition, parasites to corals such as flatworms and sea spiders. Zooxanthellae and coral symbiosis.
SU	MS Syllabus UNIT 2	Identify and describe marine species, using field guides and identification keys.	Rapid indicator species and macro algae.
SU	MS Syllabus UNIT 2	Identify organisms in trophic levels in a food web based on the following terms - producers - primary consumers - secondary consumers - tertiary consumers - decomposers.	Indicator species and benthic categories can be identified in tropic levels regarding the role and ecological function to reef.

SU	MS Syllabus UNIT 2	Describe the concept of population dynamics using the terms population size, density, abundance, distribution (i.e. clumped, uniform, random), carrying capacity, niche, K-strategists and r-strategists, keystone species.	These terms can be used when explaining the data collated from Rapid and Benthic monitoring.
SU	MS Syllabus UNIT 2	Describe abiotic components of marine ecosystems: light availability, depth, stratification, temperature, currents (water and wind), tides, sediment type and nutrient availability.	In the first section of Rapid monitoring method it asks participants to take these factors into consideration and record. Discuss the importance of these factors when summarizing data results.
SU	MS Syllabus UNIT 2	Explain how marine ecosystems are influenced and limited by abiotic factors differently than terrestrial ecosystems due to the different physical and chemical properties of water, e.g. light availability, buoyancy, pressure, temperature, viscosity, sound, salinity and sediment loading.	Could compare and contrast the Reef to the rainforest and also reef to dry tropics.
SU	MS Syllabus UNIT 2	Explain the concepts of limiting factors and tolerance limits and their importance in population distributions.	Discuss the limiting factors and tolerance limits of the benthic categories.
SU	MS Syllabus UNIT 2	Interpret field data from a local ecosystem.	Enter in Rapid Monitoring data and interpret findings from the Rapid monitoring survey conducted.
SU	MS Syllabus UNIT 2	Classify different groups of animals using structural characteristics.	Grazing herbivores and butterfly fish can be classified based on structural adaptations.
SU	MS Syllabus UNIT 2	Classify adaptations as anatomical (structural), physiological (functional) or behavioural.	Classify the adaptations of reef indicator species as structural, physiological or behavioural.
SU	MS Syllabus UNIT 2	Describe the role of adaptation in enhancing an organism's survival in a specific marine environment.	How has adaptation enhanced the survival of grazing herbivores (or any chosen indicator species) on the reef.
SI	MS Syllabus UNIT 2	Investigate a local ecosystem to determine factors of population dynamics (e.g. density or distribution) and assess abiotic components, including - estimating populations, e.g. survey count, quadrats, species density, percentage coverage, indirect or direct observation, catch and release - using field guides to identify to a genus level - using a range of field equipment to measure biotic factors related to marine environments - conducting in-field mapping of food webs via gut analysis to determine food sources - identifying physical structures of a specific marine organism (this could be virtual, practical or as a demonstration).	Rapid and Benthic monitoring- Rapid monitoring survey.
SI	MS Syllabus UNIT 2	Assess the limitations of a chosen field technique, e.g. quadrat, transect.	Assess, compare and contrast the limitations of the timed swim survey method to the 360 benthic method.
SI	MS Syllabus UNIT 2	Apply the terms ecosystem resilience, disturbance and recovery as indicators of 'health' of marine environments to a chosen case study.	Apply the listed terms to the findings from the Rapid monitoring method.
SI	MS Syllabus UNIT 2	Classify the arguments for preserving species and habitats as ecological, economic, social, aesthetic or ethical.	GBR World heritage values classify preserving biodiversity into these categories as well as Marine Park zoning -multiuse science for management information.
SI	MS Syllabus UNIT 2	Describe the direct and indirect values of marine ecosystems of Australia.	GBR World heritage values
SI	MS Syllabus UNIT 2	Describe the role of stakeholders in the use and management of marine ecosystems.	Management of GBR- TUMRA - Field Management- zoning, compliance, permits,

			COTS, Eye on the Reef App, reporting and monitoring programs.
SI	MS Syllabus UNIT 2	Discuss the specific value systems that identified stakeholders use, i.e. ecocentric, technocentric and anthropogenic.	List stakeholders use and identify the value system for each.
SI	MS Syllabus UNIT 2	Identify issues affecting selected marine ecosystem, including erosion, eutrophication, overharvesting, runoff, sedimentation, urbanisation.	Identify the issues on the Reef from overharvesting, overfishing, flood and algae plumes and urbanisation.
SI	MS Syllabus UNIT 2	Describe criteria used to inform decisions regarding the design of Marine Protected Areas.	Discuss Marine Park zoning and investigate how it was completed.
SI	MS Syllabus UNIT 2	Compare the strategies and techniques used for marine environmental planning and management with reference to a specific case study.	Could case study Rapid monitoring method or COTS program.
SI	MS Syllabus UNIT 2	Interpret data related to the marine environmental planning and management process.	Rapid monitoring data and Outlook report.
SHE	MS Syllabus UNIT 2	Evaluate the success of a regional zoning plan or plan management, based on the social, economic and cultural context on which it was considered.	Consider the success of green zones based on social, economic and cultural context on which it was considered to protect and preserve biodiversity and abundance.
SHE	MS Syllabus UNIT 2	Appreciate that effective marine ecosystem management is informed by the development of complex models requiring a broad range of scientific knowledge in gathering data, identifying indicators and ensuring measurement is valid and reliable.	Appreciate that citizen science Rapid monitoring data adds value to the management of the reef.
SHE	MS Syllabus UNIT 2	Recognise that in areas where marine management decisions reflect scientific, social, cultural and ethical considerations, Aboriginal knowledge and practices and Torres Strait Islander knowledge and practices related to sea country are often used to complement conservation practices.	TUMRA Indigenous ranger-use of Rapid monitoring.
SU	MS Syllabus UNIT 3	Describe the different types of reef structure, e.g. fringing, platform, ribbon, atolls, coral cays.	Rapid monitoring site section.
SU	MS Syllabus UNIT 3	Describe the zonation within a reef cross-section, e.g. reef slope, reef crest/rim, lagoon/back reef.	Rapid monitoring.
SU	MS Syllabus UNIT 3	Explain that the habitat complexity (including species diversity, rugosity and percentage coral cover) established by corals influences the diversity of other species.	Could investigate species diversity of butterflyfish with coral diversity. Or investigate macroalgae coverage and grazing herbivore diversity.
SU	MS Syllabus UNIT 3	Describe how fish, particularly herbivore populations, benefit from coral reefs.	Discuss how grazing herbivores reduce macroalgae to promote future coral settlement and growth.
SU	MS Syllabus UNIT 3	Identify the relationship between water quality and some of the factors that affect coral cover, e.g. crown-of-thorns	Water quality of flood plumes and nutrients can smother and kill corals and potential increase survival conditions for macroalgae and COTS.
SU	MS Syllabus UNIT 3	Assess the diversity of a reef system, e.g. using line intercept transects, quadrats, fish counts using underwater video survey techniques, benthic surveys, invertebrate counts and rugosity measurements.	Choose a Rapid monitoring indicator species e.g. Butterfly fish or Grazing herbivore, investigate the diversity and complete a species diversity count.
SU	MS Syllabus UNIT 3	Explain the concept of coral bleaching in terms of Shelford's law of tolerance.	Coral impact section of Rapid monitoring can be elaborated linking to Shelford's law of tolerance.

SU	MS Syllabus UNIT 3	Discuss the ecological effects of a bleaching event on other reef organisms, e.g. fish.	Food and shelter loss. Anemones can bleach and fish can lose its home.
SU	MS Syllabus UNIT 3	Describe the conditions necessary for recovery from bleaching events.	Sea surface temperature returns to below threshold due to cloud cover, seasons, upwelling, currents, reduction of carbon outputs.
SU	MS Syllabus UNIT 3	Compare the responses to bleaching events between two regions, recognising that coral cover increases on resilient reefs once pressures are reduced or removed.	Could compare the northern versus the southern Reef using Outlook report or Snapshots. Could compare Rapid monitoring data. over consecutive years, before and after temperature increases. Collaborate with another school to compare regions.
SU	MS Syllabus UNIT 3	Discuss how resilience of coral reefs is improved by minimising other impacts including coastal run-off (nitrogen inputs), and habitat destruction and fishing.	Coastal run off can be investigated via MMP, Summer Snapshot reports. Rapid Monitoring- grazing herbivores increased numbers in green zones and associated reduction of macroalgae promoting coral health and growth.
SU	MS Syllabus UNIT 3	Examine how decisions made on reef management and conservation are based on scientific knowledge, which relies on clear communication of findings, peer review and reproducibility.	Outlook report
SU	MS Syllabus UNIT 3	Explain the criteria (i.e. site selection, networking and connectivity, replication, spacing, size and coverage) used to design protected marine areas.	Marine Park Zoning.
SU	MS Syllabus UNIT 3	Identify management strategies used to support marine ecosystem health, e.g. managing threats, zoning, permits, plans, longitudinal monitoring.	Reef Authority Zoning Reef Authority Permits Reef Authority COTS program Marine Park management Reef Authority Restoration
SU	MS Syllabus UNIT 3	Interpret data to determine the success of a protected marine area.	Scientific journals, Green Zone Infographic and Outlook report.

Biology Year 12 (Unit 3) Biodiversity and the interconnectedness of life

SU	Unit 3 Biology	Describe and explain: the biodiversity within ecosystems	Describe genetic, species and reef ecosystem diversity. Interpret data to classify and name ecosystems using Specht's classification system and the Holdridge life zone classification scheme. Outer reef- coastal reef- mangroves- sea grass- rivers. Look at biodiversity of species found on different reef zones/ areas. Describe how reef composition and health may influence biodiversity.
SU	Unit 3 Biology	Describe and explain: a range of biotic and abiotic components and the interactions between abiotic and biotic components of ecosystems	Describe how the distribution and abundance of species in a reef ecosystem are influenced by -

			biotic factors — food availability, competition for resources, predation, disease - abiotic factors — space, shelter, availability of water, nutrients, environmental conditions. Outlook report. Contact local Indigenous Sea Country Ranger group to explore how First Nations peoples' knowledges of environmental change and interactions between abiotic and biotic elements of ecosystems inform land management practices.
SU	Unit 3 Biology	Describe and explain: species interactions	Explain the following species interactions: predation, competition, mutualism, commensalism and parasitism.
SU	Unit 3 Biology	Describe and explain: adaptations of organisms to their environment	Compare the reproductive strategies and growth curves of K- and r- strategists.
SU	Unit 3 Biology	Describe and explain: principles of population dynamics	Use the Lincoln index ($N = M \times n\ m$) to estimate the size of a population.
SU	Unit 3 Biology	Describe and explain: how classification systems are used to identify organisms and aid scientific communication	Identify the major taxa of Rapid Monitoring in the Linnaean system of biological classification and explain how it is used to classify and name species.
SU	Unit 3 Biology	Students understand the structure of ecosystems (reef)	Explain that ecosystems are composed of varied habitats, including microhabitats, which may impact the distribution of species (e.g. uniform, random or clumped), and therefore the validity and reliability of different sampling methods/techniques including Rapid Monitoring.
SU	Unit 3 Biology	Processes involved in the movement of energy and matter in ecosystems	Explain the transfer and transformation of energy as it flows through the biotic components of an ecosystem, including the - conversion of light into chemical energy - production of biomass and its interactions with components of the carbon cycle - loss of energy as heat. Analyse food chains, energy flow diagrams and ecological pyramids to determine - efficiencies of energy and biomass transfer - gross and net productivity - loss of energy through radiation, reflection and absorption. Describe the transfer and transformation of matter (water, carbon, nitrogen) as it cycles through ecosystems.
SU	Unit 3 Biology	How environmental factors limit populations is essential to appreciate the dynamics, diversity and underlying unity of these systems.	Interpret data from an experiment investigating how abiotic factors affect the distribution, abundance and/or biodiversity of species in an

			ecosystem. Outlook report on flood plumes (light and smothering), sea surface temperature, water quality Outlook report.
SU	Unit 3 Biology	Students investigate the interactions within and between species	Describe the biological species concept and identify its limitations.
SU	Unit 3 Biology	Students investigate how measurements of abiotic factors, population numbers, species diversity and descriptions of interactions between species can form the basis for spatial and temporal comparisons between ecosystems.	Rapid monitoring- Determine the diversity of species using measures such as species richness, evenness (relative species abundance), percentage cover, percentage frequency and Simpson's diversity index, SDI = $1-(\sum n(n-1)\ N(N-1)$).
SU	Unit 3 Biology	Students examine and analyse data collected from fieldwork to understand the interconnectedness of organisms, the physical environment and the impact of human activity.	Describe how Rapid Monitoring sampling can be used to investigate the species diversity of a given area, considering the most appropriate – sampling method: random, systematic, stratified – sampling technique: quadrats, line transect, belt-transect, capture-recapture – strategies to minimise bias: size and number of samples, random-number generators, counting criteria, calibrating equipment and noting associated precision – measure/s of diversity.
SI	Unit 3 Biology	Students use the process of stratified sampling to - identify different habitats within an ecosystem - investigate changes to abiotic factors in different strata - investigate changes to community composition in different strata, e.g. layers of an ecosystem - infer species interactions within and between strata - classify an ecosystem	Interpret ecological data to compare ecosystems across spatial and temporal scales. e.g, Sea grass, mangroves, beach, inner reef and outer reef.
SI	Unit 3 Biology	Students investigate - how abiotic factors affect the distribution and/or abundance of species in an ecosystem - changes in species composition along an environmental gradient - how environmental factors affect the global distribution of ecosystems - how the process of classifying ecosystems allows for effective ecosystem management.	Investigate - species interactions, e.g. by looking for correlation in abundance data - the competitive exclusion principle, e.g. by studying vertical zonation on a tree - factors affecting carrying capacity - the effectiveness of single-species conservation in maintaining complex ecosystem dynamics - how the fossil record and sedimentary rock characteristics provide evidence of past ecosystems.
SI	Unit 3 Biology	Compare species diversity in two spatially variant ecosystems of the same classification.	Explain how overexploitation, habitat destruction, monocultures and pollution affect community structure and ecosystem functioning. Explain how the carrying capacity of an ecosystem can be impacted by changes to biotic and abiotic factors, including climatic events.

Earth and Environmental Unit 4 (Year 12) The Changing Earth- the cause and impact of earth hazards

SI	Unit 4	Students investigate historical data and case studies about major weather systems to infer their impacts on Earth processes and interactions. This could include the effects of - cyclones on habitat destruction e.g. reef communities - flood events on inner and outer reef ecosystems.	Reef Geohub Reef Knowledge System Outlook Report 2024 | Reef Authority
SI	Unit 4	Students appreciate that changes in surface and ocean temperature will lead to changes in the distribution of some species of plants and animals, with flow-on effects for ecosystems.	Reef Geohub Reef Knowledge System Outlook Report 2024 | Reef Authority

Science in Practice Year 11 and 12

‘’Rapid monitoring’’- Assessment B1: Applied investigation or Assessment B2: Practical Project.

Execute Plan	Unit B Ecology	Describe types of ecosystems and the influence, interaction and relationship between abiotic and biotic factors	Rapid Monitoring- Plan (risk assess) and contribution to a citizen science project. Investigation e.g. How does water quality effect the reef, How do a/biotic factors influence the health of a reef?
Execute	Unit B Ecology	Describe feeding relationships, e.g. consumers, herbivores, omnivores, carnivores, parasites	Completion of food chains and food webs
Execute	Unit B Ecology	Describe endangered species, e.g. the cause and impact of extinction, referring to Australian fauna and flora examples and considering the Aboriginal perspectives and Torres Strait Islander perspectives of impact	identification and classification of common local organisms
Evaluate	Unit B Ecology	Describe adaptations, e.g. mechanisms and cause of animals and plant adaptation; reasons some species adapt and others become extinct	Coral adaptations to climate change. Adaptations of 11 indicator species.
Evaluate	Unit B Ecology	Describe examples of monitoring strategies and physical, chemical and biological indicators	measurement of materials and variables, e.g. pH; light penetration (Secchi discs and turbidity tubes); bio-surveys; biological oxygen demand (BOD); toxins and pollution monitoring; flow rates; salinity. Water quality monitoring data from different sites, interconnected biomes, and/or sources and potential benefits for the reef community, environment and economy.
Execute	Unit B Ecology	Describe flow of matter, energy and water through a system	Mountain to Reef interconnectedness of biomes. Or could only focus on the reef.