BIOLOGICAL DIVERSITY

Aquatic Ecosystems
(Module 3, Year 11)

SURF LIFE SAVING
NEW SOUTH WALES

Biological Diversity: Aquatic Ecosystems

This Depth Study focuses on Module 3 Biological Diversity content and outcomes. The Depth Study includes theoretical and practical components that achieve the 15 hours Depth Study and fieldwork requirement of the Preliminary Course.

The Depth Study focuses on aquatic contexts and is embedded with Surf Life Saving NSW education values to promote water-safety and drowning-prevention. The Depth Study aims to help students to:

- ✔ develop positive, informed values and attitudes towards biology
- ✔ recognise the importance and relevance of biology in their lives
- ✔ recognise the influence of economic, political and societal impacts on the development of scientific knowledge
- ✔ develop an appreciation of the influence of imagination and creativity in scientific research

(Reference: Biology Stage 6 Syllabus, 2017.)

The components of the Depth Study include:

- ✔ 8 theory lessons (approximately 60 minutes each)
- ✔ Surf Life Saving NSW Education Values Worksheet (3 lessons)
- ✔ Optional worksheets
- ✔ Practical handbook (inclusive of 7 hours fieldwork)
- ✔ Assessment task notification and marking criteria

The theory lessons focus on:

- ✔ Aquatic contexts
- ✔ Surf Life Saving NSW education values
- ✔ Foundational knowledge and understanding for practical components to be conducted
- ✔ Module 3 Biological Diversity content and outcomes
- ✔ Critical and creative thinking
- ✔ Intercultural understanding
- ✔ Literacy

The practical handbook focuses on:

- ✔ Working scientifically outcomes
- ✔ Aboriginal and Torres Strait Islander histories and cultures
- ✔ Sustainability
- ✔ Ethical understanding
- ✔ Information and communication technology capability
- ✔ Numeracy
- ✔ Personal and social capability
- ✔ Sampling techniques and conditional testing

The assessment task focuses on:

- ✔ Working scientifically and Module 3 Biological Diversity outcomes
- ✔ Independent or group work settings
- ✔ Autonomy of presentation and communication of the Depth Study
- ✔ Ability to satisfy the marking criteria

All components of the Depth Study coincide. The Depth Study has been designed to be:

- ✔ Self-directed for students under the guidance of their supervising Teacher
- ✔ Flexible and adaptable to suit the conditions of any inland or coastal aquatic ecosystem that is safe and suitable for fieldwork study
- ✔ Easy to follow and able to be modified as required

Note: Video resources are not included due to possible expiry of the links, however, can be incorporated by the directing Teacher at their own discretion throughout the Depth Study's progression.

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Biological Diversity: Aquatic Ecosystems

For this Depth Study Investigation to be successful, students and teachers must be able to access the theoretical resources and practical equipment listed below.

Required Theoretical Resources:

- ✔ Textbook: Nelson Net, Biology in Focus (2017, 2nd Edition)
- ✔ Computer device
- ✔ Internet access

Required Practical Equipment:

- ✔ Metal thermometer
- ✔ pH electrode
- ✔ Tensiometer
- ✔ Salinity meter
- ✔ Conductivity meter
- ✔ Surveyor tape
- ✔ Protective footwear
- ✔ Optional: screw-top container, dip-net, petri dishes, microscope, dissolved oxygen meter and sensor

Other arrangements to be conducted by the supervising Teacher prior to engagement with this Depth Study:

- ✔ Understanding of the Biology Stage 6 Syllabus (2017)
- ✔ Careful overview of the Depth Study and ability to meet its' requirements
- ✔ Determination of appropriateness and relatedness of the Depth Study to the context of the class and environment concerned
- ✔ Effective time management of the Depth Study and its implementation
- ✔ Organisation of the fieldwork excursion in its entirety (administration, timetabling, transportation, equipment preparation, etc)
- ✔ Assurance that students obtain skills to select reliable/credible resources and that students are aware of the Department of Education NSW's plagiarism policy
- ✔ Determining type of referencing students are to use
- ✔ Ensuring access to all resources required by the Depth Study
- ✔ Issuing, marking and feedback of assessment
- ✔ Providing clear instructions to students on how to conduct practical fieldwork tasks
- ✔ Professional duties and precautions

Syllabus Achievements

Knowledge and Understanding Objectives

Year 11 students:

- ✔ develop knowledge and understanding of the structure and function of organisms
- ✔ develop knowledge and understanding of the Earth's biodiversity and the effect of evolution.

Values and Attitudes

Students:

- ✔ develop positive, informed values and attitudes towards biology
- ✔ recognise the importance and relevance of biology in their lives
- ✔ recognise the influence of economic, political and societal impacts on the development of scientific knowledge
- ✔ develop an appreciation of the influence of imagination and creativity in scientific research.

Requirements for Practical Investigations

One fieldwork exercise must be completed in Year 11.

Questioning and Predicting

Developing, proposing and evaluating inquiry questions and hypotheses challenges students to identify an issue or phenomenon that can be investigated scientifically by gathering primary and/or secondary-sourced data. Students develop inquiry question(s) that require observations, experimentation and/or research to aid in constructing a reasonable and informed hypothesis. The consideration of variables is to be included in the questioning process.

Planning Investigations

Students justify the selection of equipment, resources chosen and design of an investigation. They ensure that all risks are assessed, appropriate materials and technologies are sourced, and all ethical concerns are considered.

Conducting Investigations

Students are to select appropriate equipment, employ safe work practices and ensure that risk assessments are conducted and followed. Appropriate technologies are to be used and procedures followed when disposing of waste. The selection and criteria for collecting valid and reliable data is to be methodical and, where appropriate, secondary-sourced information referenced correctly.

Processing Data and Information

Students use the most appropriate and meaningful methods and media to organise and analyse data and information sources, including digital technologies and the use of a variety of visual representations as appropriate. They process data from primary and secondary sources, including both qualitative and quantitative data and information.

Analysing Data and Information

Students identify trends, patterns and relationships; recognise error, uncertainty and limitations in data; and interpret scientific and media texts. Where appropriate, mathematical models are to be applied, to demonstrate the trends and relationships that occur in data.

Syllabus Achievements

Problem Solving

Students use critical thinking skills and creativity to demonstrate an understanding of scientific principles underlying the solutions to inquiry questions and problems posed in investigations.

Communicating

Communicating all components of the Working Scientifically processes with clarity and accuracy is essential. Students use qualitative and quantitative information gained from investigations using primary and secondary sources, including digital, visual, written and/or verbal forms of communication as appropriate. They apply appropriate scientific notations and nomenclature. They also appropriately apply and use scientific language that is suitable for specific audiences and contexts.

Investigations

An investigation is a scientific process to answer a question, explore an idea or solve a problem. Investigations include activities such as planning a course of action, collecting data, processing and analysing data, reaching a conclusion and communicating. Investigations may include the collection of primary and/or secondary-sourced data or information.

Practical investigations involve the collection of primary data. They may include:

- ✔ undertaking laboratory investigations, including fair tests and controlled experiments
- ✔ undertaking fieldwork and surveys
- ✔ constructing models.

Secondary-sourced investigations can include:

- ✔ researching by using a variety of media
- ✔ extracting and reorganising secondary-sourced information in the form of flow charts, tables, graphs, diagrams, prose, keys, spreadsheets and databases
- ✔ using models to inform understanding.

Safety

Schools have a legal obligation in relation to safety. Teachers will need to ensure that they comply with relevant legislation as well as system and school requirements in relation to safety when implementing their programs. This includes legislation and guidelines relating to Work Health and Safety, and the handling and storage of chemical and dangerous goods.

Animal Research

Schools have a legal responsibility in relation to the welfare of animals. The keeping of animals and all practical activities involving animals must comply with relevant guidelines or legislation.

Inquiry Questions

Inquiry questions are included in the course content and used to frame the syllabus content within each module. The depth of knowledge and understanding and skill development required to fully address the inquiry questions may vary. This allows for differentiation of the course content to cater for the diversity of learners.

(Reference: Biology Stage 6 Syllabus, 2017.)

Depth Study

What are Depth Studies?

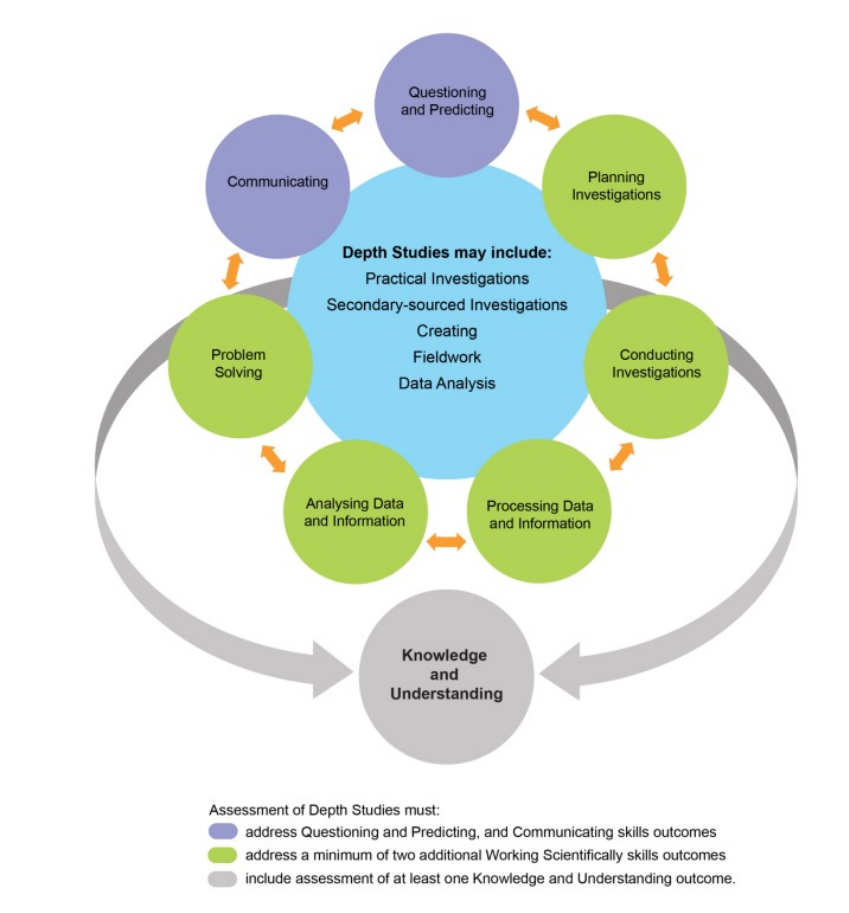
A depth study is any type of investigation/activity that a student completes individually or collaboratively that allows the further development of one or more concepts found within or inspired by the syllabus. It may be one investigation/activity or a series of investigations/activities.

Depth studies provide opportunities for students to pursue their interests in biology, acquire a depth of understanding, and take responsibility for their own learning. Depth studies promote differentiation and engagement, and support all forms of assessment, including assessment for, as and of learning. Depth studies allow for the demonstration of a range of Working Scientifically skills.

The length of time for any individual study and the pedagogies employed are not prescribed. The time for the depth studies may be allocated to a single study or spread over the year, and incorporate several studies depending on individual school and/or class requirements.

Requirements for Depth Studies

- ✔ A minimum of 15 hours of in-class time is allocated in both Year 11 and Year 12.
- ✔ At least one depth study must be included in both Year 11 and Year 12.
- ✔ The two Working Scientifically outcomes of Questioning and Predicting, and Communicating must be addressed in both Year 11 and Year 12.
- ✔ A minimum of two additional Working Scientifically skills outcomes, and further development of at least one Knowledge and Understanding outcome, are to be addressed in all depth studies.



Depth Study

Ideas for Depth Studies

Practical Investigations:

- ✔ Design and conduct experiments
- ✔ Test a claim
- ✔ Test a device

Secondary-sourced Investigations:

- ✔ Make a documentary or media report
- ✔ Conduct a literature review
- ✔ Develop an evidence-based argument
- ✔ Write a journal article
- ✔ Write an essay – historical or theoretical
- ✔ Develop an environmental management plan
- ✔ Analyse a work of fiction or film for scientific relevance
- ✔ Create a visual presentation
- ✔ Investigate emerging technologies

Creating:

- ✔ Design and invent
- ✔ Create a working model
- ✔ Create a portfolio

Fieldwork:

Fieldwork may be a starting point for a practical investigation or secondary-sourced study and could be initiated by the following stimuli:

- ✔ an excursion
- ✔ engagement with community experts

Data Analysis:

Data analysis may be incorporated into a practical investigation or secondary-sourced investigation. For example:

- ✔ construction and analysis of graphs/tables
- ✔ data analysis from a variety of sources
- ✔ research analysis, eg of longitudinal data, resource management data

Option to do the depth study individually or in a group.

(Reference: Biology Stage 6 Syllabus, 2017.)

Cross curriculum

The cross-curriculum priorities are:

- ✔ Aboriginal and Torres Strait Islander histories and cultures
- ✔ Sustainability.

The general capabilities are:

- ✔ Critical and creative thinking
- ✔ Ethical understanding
- ✔ Information and communication technology capability
- ✔ Intercultural understanding
- ✔ Literacy
- ✔ Numeracy
- ✔ Personal and social capability

(Reference: Biology Stage 6 Syllabus, 2017.)

Depth Study

Module 3: Biological Diversity (Indicative hours: 30)

Content Focus

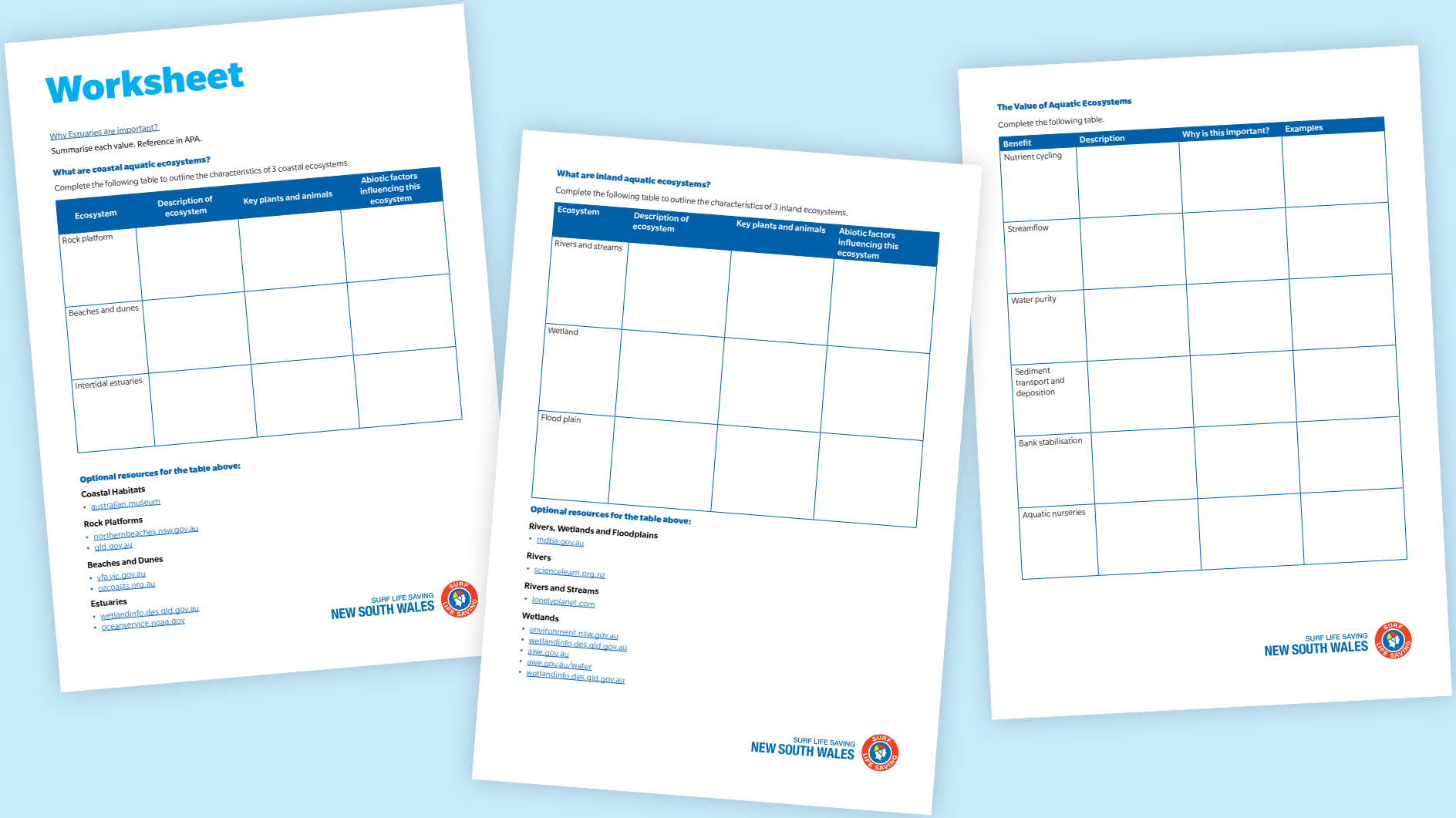
Biodiversity is important to balance the Earth's ecosystems. Biodiversity can be affected slowly or quickly over time by natural selective pressures. Human impact can also affect biodiversity over a shorter time period. In this module, students learn about the Theory of Evolution by Natural Selection and the effect of various selective pressures.

Monitoring biodiversity is key to being able to predict future change. Monitoring, including the monitoring of abiotic factors in the environment, enables ecologists to design strategies to reduce the effects of adverse biological change. Students investigate adaptations of organisms that increase the organism's ability to survive in their environment.

Working Scientifically

In this module, students focus on: designing appropriate investigations; collecting and processing data to develop questions to test hypotheses using appropriate media; communicating their understanding. Students should be provided with opportunities to engage with all Working Scientifically skills throughout the course.

(Reference: Biology Stage 6 Syllabus, 2017.)



Worksheet

Why Estuaries are important?

Summarise each value. Reference in APA.

What are coastal aquatic ecosystems?

Complete the following table to outline the characteristics of 3 coastal ecosystems.

Ecosystem	Description of ecosystem	Key plants and animals	Abiotic factors influencing this ecosystem
Rock platform			
Beaches and dunes			
Intertidal estuaries			

Optional resources for the table above:

Coastal Habitats
- australian.museum

Rock Platforms
- northernbeaches.nsw.gov.au
- qld.gov.au

Beaches and Dunes
- vfa.vic.gov.au
- ozcoasts.org.au

Estuaries
- wetlandinfo.des.qld.gov.au
- oceanservice.noaa.gov

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What are inland aquatic ecosystems?

Complete the following table to outline the characteristics of 3 inland ecosystems.

Ecosystem	Description of ecosystem	Key plants and animals	Abiotic factors influencing this ecosystem
Rivers and streams			
Wetland			
Flood plain			

Optional resources for the table above:

Rivers, Wetlands and Floodplains
- mdba.gov.au

Rivers
- sciencelearn.org.nz

Rivers and Streams
- lonelyplanet.com

Wetlands
- environment.nsw.gov.au
- wetlandinfo.des.qld.gov.au
- awe.gov.au
- awe.gov.au/water
- wetlandinfo.des.qld.gov.au

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The Value of Aquatic Ecosystems

Complete the following table.

Benefit	Description	Why is this important?	Examples
Nutrient cycling			
Streamflow			
Water purity			
Sediment transport and deposition			
Bank stabilisation			
Aquatic nurseries			

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Lesson 1 to 3 Syllabus Outcomes

The following theory component includes 8 lessons. Each lesson focuses on links to aquatic contexts. The lessons are based on the Nelson Net, Biology in Focus (2017, 2nd Edition) textbook. The time frame for each lesson is approximately 60 minutes. The Surfing Biology Module 3 online textbook resource is available as an alternative option. The Module 3 outcomes achieved by each set of lessons are outlined at the beginning of each lesson set. Any external resources used by students during the progression of the theory component are to be listed in the table at the conclusion of this document.

Surfing Biology Module 3

Effects of the Environment on Organisms

Inquiry Question:

How do environmental pressures promote a change in species diversity and abundance?

Students:

- ✔ predict the effects of selection pressures on organisms in ecosystems, including: (ACSBL026, ACSBL090)
  - biotic factors
  - abiotic factors
- ✔ investigate changes in a population of organisms due to selection pressures over time for example: (ACSBL002, ACSBL094)
  - cane toads in Australia
  - prickly pear distribution in Australia

Lesson 1 – Aquatic Ecosystems

Textbook Theory:

Ecosystems

Page 204-207 Biology in Focus

Answer questions 1, 2, 4 and 5 on page 207 (Understanding 7.1)

Preparation for your Depth Study:

1. Read through the following:
   - Depth Study Task Assessment
   - Depth Study Theory Task Questions
   - Depth Study Practical Tasks
2. Decide the form in which you would like to present your Depth Study findings. Ensure to formulate your presentation as you progress through the Depth Study Tasks.

Depth Study Task Questions:

1. 1. Choose an aquatic ecosystem for your depth study. This can be local or a site where you can access all/most the information needed.
2. State the name of the site, location, latitude and longitude, area coverage, volume, depth and surrounding land use.
3. List all known abiotic factors of your site.

Lessons

Lesson 2 – Ecology, Natural Selection and Biodiversity

Textbook Theory:

Selection Pressures in Ecosystems

Page 207-216 Biology in Focus

Answer questions 1, 2, 3, 4, 7, 8 and 10 on page 216 (Understanding 7.2a)

Depth Study Task:

1. List all known biotic factors of your site.
2. Outline the possible selection pressures of your site.
3. Is your site part of a water catchment area? If so, describe the catchment area and its relation to your site.
4. How could rainfall and temperature affect biotic and abiotic factors of your site?
5. Explain how natural selection has influenced the biodiversity of your site
6. Describe the movement of tidal flow of your site and outline the effects of tides within the ecosystem.
7. Outline how the average water temperature of your site changes throughout the year.
8. In theory, what are some animal sampling techniques that could be used to sample the species diversity and abundance of your site?

Lesson 3 – Selection Pressures and Population Trends

Textbook Theory:

Population Trends

Page 216-220 Biology in Focus

Answer questions 2 and 5 on page 220 (Understanding 7.2b)

Depth Study Task:

1. How do saline conditions affect the site?

Textbook Theory:

Changes in Population Over Time

Page 220-223 Biology in Focus

Answer questions 13, 14, 15 and 16 on page 226-227

Depth Study Task:

1. Predict the impact on species diversity of your site if there is a change in selection pressure.
2. Name the selection pressure/s, the species affected and the expected change in population.

Lesson 4 to 5 Outcomes

Adaptations

Inquiry question:

How do adaptations increase the organism's ability to survive?

Students:

- ✔ conduct practical investigations, individually or in teams, or use secondary sources to examine the adaptations of organisms that increase their ability to survive in their environment, including:
  - structural adaptations
  - physiological adaptations
  - behavioural adaptations
- ✔ investigate, through secondary sources, the observations and collection of data that were obtained by Charles Darwin to support the Theory of Evolution by Natural Selection, for example:
  - finches of the Galapagos Islands
  - Australian flora and fauna.

Lesson 4 – Adaptations and Structural/Physiological Adaptations

Textbook Theory:

Adaptations

Page 229 Biology in Focus

Answer questions 1, 2 and 3 on page 230 (Understanding 8.1)

Textbook Theory:

Structural Adaptations

Page 231 - 235 Biology in Focus

Answer questions 1, and 5 on page 235 (Understanding 8.2) and question 4 on page 250 (8 Chapter Review Questions)

Depth Study Task:

1. How do species of your site conserve water?

Textbook Theory:

Physiological Adaptations
Page 235 - 239 Biology in Focus
Answer questions 1, 2 and 3 on page 239 (Understanding 8.3)

Lesson 5 – Behavioural Adaptations and Natural Selection

Textbook Theory:

Behavioural Adaptations

Page 239 - 241 Biology in Focus

Answer question 1 on page 241 (Understanding 8.4)

Textbook Theory:

Charles Darwin, Adaptations and Natural Selection

Page 241 - 247 Biology in Focus

Answer question 5 on page 247 (Understanding 8.5)

Depth Study Task:

1. How have the species of your site adapted to the aquatic ecosystem? Ensure to address the different types of adaptations where you can (structural, behavioural, physiological).
2. Explain how these adaptations support the organism's survival. Do any of the adaptations support the organism to conserve water, reflect light or stay cool?
3. Explain how species in your site have adapted over time. Ensure to include relevant tables or graphs. Discuss the adaptation trends in this data over time.
4. Are there any ectothermic animals present in your site? If so, how do they regulate their temperature?
5. Are there animals that use social behaviour to increase their chances of survival by being a group in your site? If so, state the species and explain the social behaviour.
6. How do the needs of animals for enough water and food, keeping cool or warm, finding space to live, reproducing, and deterring predators present themselves in your study area?

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Lesson 6 to 8 Outcomes

Theory of Evolution by Natural Selection

Inquiry question:

What is the relationship between evolution and biodiversity?

Students:

- ✔ explain biological diversity in terms of the Theory of Evolution by Natural Selection by examining the changes in and diversification of life since it first appeared on the Earth (ACSBL088)
- ✔ analyse how an accumulation of microevolutionary changes can drive evolutionary changes and speciation over time, for example: (ACSBL034, ACSBL093)
  - evolution of the platypus
- ✔ explain, using examples, how Darwin and Wallace's Theory of Evolution by Natural Selection accounts for:
  - convergent evolution
  - divergent evolution
- ✔ explain how punctuated equilibrium is different from the gradual process of natural selection

Evolution – the Evidence

Inquiry question:

What is the evidence that supports the Theory of Evolution by Natural Selection?

Students:

- ✔ explain modern-day examples that demonstrate evolutionary change, for example:
  - the cane toad
  - antibiotic-resistant strains of bacteria

Lesson 6 – Evolution

Textbook Theory:

Biological Diversity and the Theory of Evolution by Natural Selection

Page 252 - 256 Biology in Focus

Answer questions 1 to 5 on page 256 (Understanding 9.1a) and question 4 on page 300 (10 Chapter Review Questions)

Depth Study Task:

1. How may global changes affect your site?
2. Conduct research about bacteria that may be found at your site and summarise your findings.

Lesson 7 – Evolution Continued

Textbook Theory:

Explaining the Origin and Diversification of Life

Page 257 - 261 Biology in Focus

Answer questions 1 to 9 on page 261 (Understanding 9.1b)

Lesson 6 to 8 Outcomes

Lesson 8 – Evolutionary Evidence

Textbook Theory:

Microevolutionary Changes and Speciation

Page 261 - 263 Biology in Focus

Answer questions 1 to 5 on page 263 (Understanding 9.2a)

Depth Study Task:

1. Have organisms of your site been dated by fossil remains? If so, provide a description, state their original environmental conditions and outline the relevance of the fossil to the modern-day organism of your site.
2. Explain how evolutionary change and its impact on genetics may have taken place at your site. Ensure to refer to relevant evolutionary evidence to the species of your site.

Textbook Theory:

Further knowledge questions:

Page 301 Biology in Focus

Answer questions 12, 15, 16, 18 and 19

Resources

List the resources used during the theory component

SLSNSW Education Values Worksheet*

Lesson 1

To do:

- ✔ Click and read through Key facts about NSW

Questions:

1. How many Australians live in NSW?
2. Where do most Australians in NSW live?
3. Outline the cultural diversity of NSW.
4. State the difference between the coast, mountains, central plains and western plains of NSW.
5. State which region of NSW your study site is located in.
6. What is the largest area of employment in NSW? In your own words, explain how this area is important to Surf Life Saving NSW.

Lesson 2

To do:

- ✔ Visit the Beach Safety Hub
- ✔ Watch the video and read through the statistics
- ✔ Look up the most recent census of your study area

Using the resources above and internet research, answer the following questions:

1. State the year the census took place in your study area.
2. Which sex are overrepresented in the drowning data? State the percentage of drownings of this sex and the year of this data.
3. State by kilometres the closest surf lifesaving service to your study area. This can be a coastal or inland service.
4. In kilometres, what is the distance between your study site and the nearest coastline?

NSW inland life saving service:

1. In terms of the sex that form majority of the drowning statistics states above, state the number of this sex and the percentage they form from the census data of your study area.
2. From the census data, state the percentage of overseas born people of your study area.

Optional Resources:

- NSW demographic: Key facts about NSW
- Nearest SLS

*Must be completed prior to beginning the practical component

SLSNSW Education Values Worksheet*

Lesson 3

To do:

✔ Click and read through the following links:

- beachsafetyhub.org.au
- A world in a rock pool

Using the website link, internet research and your own knowledge, answer the following questions:

1. Explain how your study area is used recreationally by people.
2. Are there organisms within your study area that may cause injury to people who use the site recreationally? If so, state the organism and how their potential danger to people.
3. How is the study site impacted by human activity? Explain how these events benefit or harm the study area.
4. List the resources of the study site and state whether they are renewable or non-renewable? Are there any practices currently in place to manage these resources for sustainability?
5. List all the factors that could lead to a drowning event occurring in your study area.
6. List the current preventions for drowning taking place within your study area.
7. What are some ways you could become involved around drowning prevention for your study area?

Optional resources:

- Beach safety
- Remote and rural safety
- Inland waterways
- Inland activities
- Rips
- Flooding
- About lifesavers
- SLSNSW get involved
- Royal Life Saving Educate and Participate

Practical Handbook

The following practical handbook includes theory and practical tasks for the Year 11 fieldwork component. The theory component's lessons and the practical handbook require a local aquatic ecosystem to be selected as a study site. These two components coincide to formulate a minimum of 15 hours for the Depth Study requirement. Fieldwork is estimated to be 7 hours. Information about what is required by the practical handbook is as follows.

The practical handbook coincides with the theory components of this Depth Study. The following sections of the practical handbook are to be completed prior to fieldwork taking place:

Site Details

- Protected Area Factors
- Risk Assessment
- Ethical Considerations

External Theory Components:

- Theory Component Lessons 1-3
- Surf Life Saving NSW Education Values Worksheet

The following sections of the practical handbook can be completed once fieldwork is complete:

- Further Understanding
- Reflection

External Theory Components:

- Theory Component Lessons 4-8
- Assessment Task

Materials needed for the practical handbook and fieldwork

- Internet access
- Computer device
- Metal thermometer
- pH electrode
- Tensiometer
- Salinity meter
- Conductivity meter
- Surveyor tape
- Optional: screw-top container, dip-net, petri dishes, microscope, dissolved oxygen meter and sensor
- Protective footwear
- Food
- Note pad, ruler, stationary, etc
- Field notes
- Camera
- Sunscreen, insect repellent, etc

Syllabus Outcomes Assessed

BIO11/12-1: develops and evaluates questions and hypotheses for scientific investigation

BIO11/12-2: designs and evaluates investigations in order to obtain primary and secondary data and information

BIO11/12-4: selects and processes appropriate qualitative and quantitative data and information using a range of appropriate media

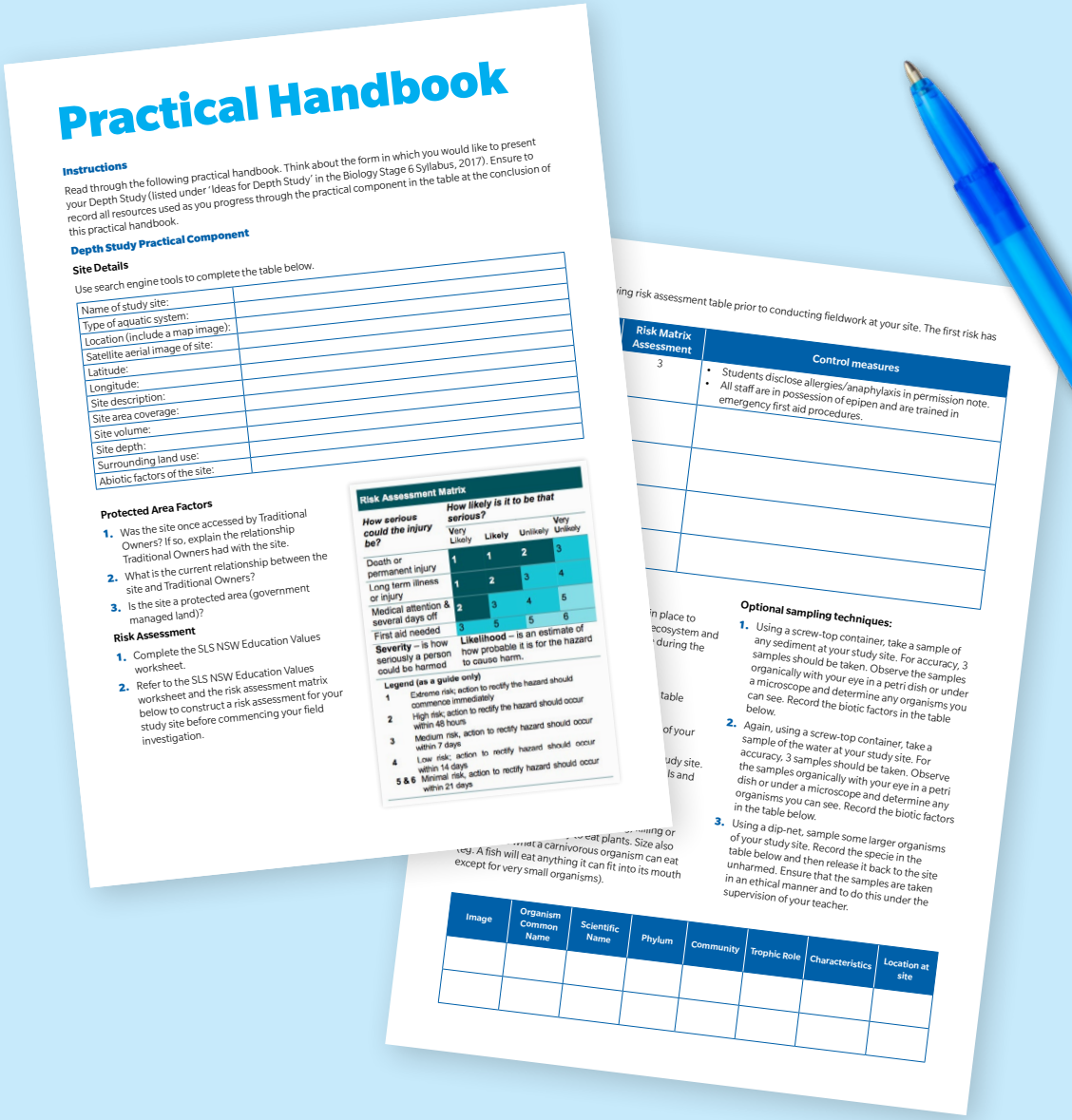
BIO11/12-7: communicates scientific understanding using suitable language and terminology for a specific audience or purpose

BIO11-10 describes biological diversity by explaining the relationships between a range of organisms in terms of specialisation for selected habitats and evolution of species

Practical Handbook

Instructions

Read through the following practical handbook. Think about the form in which you would like to present your Depth Study (listed under 'Ideas for Depth Study' in the Biology Stage 6 Syllabus, 2017). Ensure to record all resources used as you progress through the practical component in the table at the conclusion of this practical handbook.



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Assessment

Preliminary HSC Assessment Task (Module 3 Depth Study)

KLA: Science

Course: Biology

Task Title: Module 3 Biological Diversity Depth Study Investigation

Student Name:

Teacher:

Weighting:

Date issued:

Due date:

Working Scientifically Outcomes Assessed:

BIO11/12-1 Questioning and Predicting: develops and evaluates questions and hypotheses for scientific investigation

BIO11/12-2 Planning Investigations: designs and evaluates investigations in order to obtain primary and secondary data and information

BIO11/12-4 Processing Data and Information: selects and processes appropriate qualitative and quantitative data and information using a range of appropriate media

BIO11/12-7 Communicating: communicates scientific understanding using suitable language and terminology for a specific audience or purpose

Knowledge and Understanding Outcomes Assessed:

BIO11-10 Biological Diversity: describes biological diversity by explaining the relationships between a range of organisms in terms of specialisation for selected habitats and evolution of species

Task Overview

This task assesses the Module 3 Biological Diversity content and outcomes. You are required to formulate a presentation that appropriately reflects the Depth Study investigation. Prior to engaging with this assessment task, the associated theoretical lessons, Surf Life Saving NSW Education Values worksheet and practical handbook must be completed. Options for your presentation can be found under 'Ideas for Depth Study' in the Biology Stage 6 Syllabus, 2017. The Depth Study and its assignment can be conducted individually or in a group (pending approval by your supervising teacher). The theory and fieldwork practical components combine to form a total of 15 hours for the Year 11 Depth Study requirement. Ensure that your Depth Study presentation achieves the outcomes that will be assessed in the marking criteria below (see task scaffold for marking criteria summary).

Assessment

Task Scaffold

Below outlines the factors each outcome will assess within the Depth Study presentation from the marking criteria.

BIO11/12-1 Develops and evaluates questions and hypotheses for scientific investigation:

- Create an inquiry question based on an aquatic site to formulate a hypothesis that can resource primary and secondary data for further investigation

BIO11/12-2 Designs and evaluates investigations in order to obtain primary and secondary data and information:

- Complete risk assessment, listing hazards and prevention procedures
- Outline of materials used and explanation of method that is replicable
- Scientific variables accounted for
- Alternative resources and possible improvements considered

BIO11/12-4 Selects and processes appropriate qualitative and quantitative data and information using a range of appropriate media:

- Complete an appropriate presentation of relevant results
- Discussion of data, trends, patterns and relationships found in the results with relevancy, accuracy, validity and reliability assessed
- Relevant literature cited
- Suggestions for future improvements justified

BIO11/12-7 Communicates scientific understanding using suitable language and terminology for a specific audience or purpose:

- Communication piece presentation
- Conclusions
- Correct use of scientific language and notations
- Exemplary spelling and grammar
- Reference list correctly formatted (style issued by supervising teacher)

BIO11-10 Biological Diversity: describes biological diversity by explaining the relationships between a range of organisms in terms of specialisation for selected habitats and evolution of species:

- Knowledge and understanding of biological diversity
- Relevant and accurate information that presents relationships between a range of organisms
- Relevant data and justification appropriately reflects the study site
- Evolution of species is explained with supportive literature
- All the above is evident throughout the communication piece

Standards of Achievement						
Outcome	**Extensive (A/5)**	**Thorough (B/4)**	**Sound (C/3)**	**Basic (D/2)**	**Elementary (E/1)**	**Mark**
BIO11/12-1 Develops and evaluates questions and hypotheses for scientific investigation	• Insightful analysis develops and evaluates an inquiry question that is concise and complex • Clear and logical hypotheses • Inquiry question and hypotheses can be investigated scientifically, involving primary and secondary data	• Develops and evaluates an inquiry question that is concise and complex • Clear and logical hypotheses • Inquiry question and hypotheses can be investigated scientifically, involving primary and secondary data	• Explores an inquiry question that is concise and arguable • Hypotheses is predictive and a non-personalised statement • Inquiry question and hypotheses can be investigated scientifically, involving primary and secondary data	• States an inquiry question that is concise • Hypotheses is a predictive statement • Inquiry question and hypotheses can be investigated scientifically	• Identifies a concept that can be investigated scientifically	
Outcome	**Extensive (A/9-10)**	**Thorough (B/7-8)**	**Sound (C/5-7)**	**Basic (D/3-4)**	**Elementary (E/0-2)**	**Mark**
BIO11/12-2 Designs and evaluates investigations in order to obtain primary and secondary data and information	• Insightful analysis assesses and identifies a minimum of 5 hazards and prevention procedures • Critical and creative thinking selects appropriate materials and technologies for the investigation's design and planning • Justifies and evaluates a valid procedure for reliable data collection • Correctly identifies independent, dependent and all controlled variables • Acknowledges all alternative resources and possible improvements	• Assesses and identifies 4 hazards and prevention procedures • Creative thinking selects appropriate materials and technologies for the investigation's design and planning • Justifies and explains a valid procedure for reliable data collection • Correctly identifies independent, dependent and controlled variables • Acknowledges some alternative resources and possible improvements	• Assesses and identifies 3 hazards and prevention procedures • Selects appropriate materials and technologies for the investigation's design and planning • Explains a valid procedure for reliable data collection • Identifies independent, dependent and controlled variables • Acknowledges one alternative resources and possible improvement	• Identifies 2 familiar hazards and prevention procedures • Considers appropriate materials and technologies for the investigation's design and planning • Outlines a valid procedure for data collection • Considers independent dependent variables • Acknowledges one alternative resource OR possible improvement	• Identifies 1 potential hazard and/or prevention procedure • Considers appropriate materials and technologies for the investigation's design and planning • Considers a procedure for data collection	

Standards of Achievement						
Outcome	**Extensive (A/9-10)**	**Thorough (B/7-8)**	**Sound (C/5-7)**	**Basic (D/3-4)**	**Elementary (E/0-2)**	**Mark**
BIO11/12-7 Communicates scientific understanding using suitable language and terminology for a specific audience or purpose	• Successfully selects suitable forms that communicate complex ideas and information • Consistently communicates scientific understanding succinctly using correct and precise scientific terminology and notations • Uses perceptive evaluation and critical thinking to construct conclusions • Communication piece is presented in the appropriate tense with no spelling or grammar errors • Reference list formatted correctly and cites numerous reliable resources	• Selects suitable forms that communicate complex ideas and information • Correctly communicates scientific understanding using precise scientific terminology and notations • Evaluates and uses critical thinking to construct conclusions • Communication piece is presented in the appropriate tense with minimal spelling and grammar errors • Reference list formatted correctly and cites reliable resources	• Selects suitable forms that communicate ideas and information • Communicates scientific understanding using appropriate scientific terminology and notations • Uses critical thinking to construct conclusions • Communication piece is presented in the appropriate tense with some spelling and grammar errors • Reference list formatted correctly and cites suitable resources	• Selects forms that communicate relevant ideas and information • Communicates scientific understanding using some scientific terminology and notations • Uses critical thinking to construct conclusions • Evident spelling and/or grammar errors • Acknowledges references	• Identifies relevant ideas and information • Acknowledges minimal scientific terminology or notations • Constructs a relevant conclusion • Prominent spelling and/or grammar errors	
Outcome	**Extensive (A/5)**	**Thorough (B/4)**	**Sound (C/3)**	**Basic (D/2)**	**Elementary (E/1)**	**Mark**
BIO11-10 Describes biological diversity by explaining the relationships between a range of organisms in terms of specialisation for selected habitats and evolution of species	Throughout the communication piece: • Extensive knowledge and understanding of biological diversity • Provides relevant and accurate information that presents complex relationships between a range of organisms • Data and justification are relevant and appropriately reflect the selected study site • Evolution of relevant species is thoroughly explained with supporting literature	Throughout the communication piece: • Thorough knowledge and understanding of biological diversity • Provides relevant and accurate information that presents relationships between a range of organisms • Data and justification are relevant and appropriately reflect the selected study site • Evolution of relevant species is explained with supporting literature	Throughout the communication piece: • Sound knowledge and understanding of biological diversity • Provides relevant and accurate information that presents relationships between organisms • Data and justification are relevant to the selected study site • Evolution of relevant species is explained with some supporting literature	Throughout the communication piece: • Basic knowledge and understanding of biological diversity • Provides relevant information that presents relationships between organisms • Data and justification are relevant to the selected study site • Evolution of relevant species is acknowledged	Throughout the communication piece: • Elementary knowledge and understanding of biology • Acknowledges relationships between organisms • Relevancy of data to the study site is minimal • Evolution of relevant species is acknowledged	