TEACHER BOOKLET

ENVIRONMENTAL IMPACT ASSESSEMENT

Year 12	**BIOLOGY**
Name	

Students will work in small groups to conduct an environmental impact assessment for the area surrounding the Daintree Rainforest Observatory

Students will:

- ☐ develop a plan to measure key factors required for an EIA
- ☐ collect data
- ☐ make inferences and conclusions
- ☐ present your findings.

Introduction

Students will need to compile a preliminary Environmental Impact Assessment on the potential impact of building an eco-friendly resort at the Daintree Rainforest Observatory site. Students will need to design and carry out a series of procedures to assess the impact, and write a report to explain their findings and recommendations.

The task will consist of several parts:

A **Land Use Survey:** Using topographic maps and directories, students should prepare a land use map, comparing present and past land uses within the Daintree catchment

B **Generate Hypotheses and Method of Study:**

Students will need to generate a set of hypotheses that link changes in the Daintree ecosystem to ecology and land use. Develop suitable methods (using information provided and limitations) to test these hypotheses.

C **Field Study:**

Students will conduct field studies to collect data from the Daintree Rainforest Observatory site.

D **Report:**

Students will present their findings in a report to the Happy Holidays Company and The Wet Tropics Management Authority, outlining the real and potential problems caused by development. It is to include;

- hypotheses
- method (rewritten after doing the study)
- results (including clear diagrams, graphs and/or tables)
- discussion (verbalise the trends, relate back to the hypotheses, explain and link to natural and/or human causes, discuss overall changes to ecology of creek, and further studies that could be done)
- conclusion and recommendations

Reference to other studies that have been done on the Daintree would be appropriate (properly referenced). Students should include a thorough evaluation of the overall ecological quality of the Daintree, including an outline of possible causes of reduced ecological value.

The concluding section of the report should be a list of recommendations (with justification) regarding future management of the Daintree Rainforest Observatory ecosystem. Particularly noting any controls which should be placed on developments.

DAINTREE RESEARCH OBSERVATORY - JCU

For this assessment students will be investigating how humans might impact the delicate Daintree rainforest ecosystems. Students will be collect data at the Daintree Research Observatory, which is run by James Cook University.

Location

The Daintree Rainforest Observatory is located at 40 m elevation in lowland tropical rainforest at Cape Tribulation, 140 kilometres north of Cairns in Queensland Australia (16º 06' 14.8" S, 145º 26' 58.0" E). The site is adjacent to the Daintree National Park. The Daintree rainforest has the highest biodiversity anywhere in Australia and has a unique Gondwanan flora.

In 1988 the rainforests among which the crane is situated were declared the Wet Tropics World Heritage Area. This is one of the few areas in the world where the reef meets the rainforest and the only place where two World Heritage Areas sit side by side. The site is flanked to the west by coastal ranges rising to more than 1400m and by the Coral Sea to the east.

Climate

Annual average rainfall is approximately 3500mm and is strongly seasonal with 70% falling during the wet season which runs from December to April. Summers are often hot and humid with the mean daily temperature in January around 28°C. However, temperatures up to 36°C are not unusual during the summer months. Winters are mild and dry with the mean daily temperature in July around 22°C.

Northern Australia is subject to tropical cyclones in the wet season and their occurrence is unpredictable. The impact of these severe tropical storm systems are regarded as a natural phenomenon and a key evolutionary factor in shaping the ecology of Queensland's tropical lowland rainforests.

History

The area in which this site is located was selectively logged in the late 1950's and early 1960's. There are however standing specimens of Toona ciliata (Red Cedar) in the area, which suggests that this logging was probably not intensive.

Extreme disturbance due to storm damage (tropical cyclones) is common in the area on a cycle of approximately 50 years. On the 11th of February 1999, tropical cyclone Rona (category 3) passed over the Cape Tribulation area causing widespread major damage. Wind gusts of up to 170 km/hr, local flooding and storm surges of up to 1.4m were recorded in the area. The canopy crane site was severely damaged, as approximately 10% of the trees were felled and 50% of the trees suffered complete crown loss on the research plot. The past 10 years has shown profound recovery of the forest.

http://www.jcu.edu.au/canopycrane/about/JCUPRD_046915.html

Australian Curriculum – Senior Biology

Science Understanding	**Describing Biodiversity** • Biodiversity includes the diversity of species and ecosystems; measures of biodiversity rely on classification and are used to make comparisons across spatial and temporal scales (ACSBL015) • Ecosystems are diverse, composed of varied habitats and can be described in terms of their component species, species interactions and the abiotic factors that make up the environment (ACSBL019) • In addition to biotic factors, abiotic factors including climate and substrate can be used to describe and classify environments (ACSBL021) **Ecosystem Dynamics** • Keystone species play a critical role in maintaining the structure of the community; the impact of a reduction in numbers or the disappearance of keystone species on an ecosystem is greater than would be expected based on their relative abundance or total biomass (ACSBL024) • Ecosystems have carrying capacities that limit the number of organisms (within populations) they support, and can be impacted by changes to abiotic and biotic factors, including climatic events (ACSBL025) • Human activities (for example, over-exploitation, habitat destruction, monocultures, pollution) can reduce biodiversity and can impact on the magnitude, duration and speed of ecosystem change (ACSBL028) • Models of ecosystem interactions (for example, food webs, successional models) can be used to predict the impact of change and are based on interpretation of and extrapolation from sample data (for example, data derived from ecosystem surveying techniques); the reliability of the model is determined by the representativeness of the sampling (ACSBL029)
Science Inquiry Skills	• Identify, research and construct questions for investigation; propose hypotheses; and predict possible outcomes (ACSBL001) • Design investigations, including the procedure/s to be followed, the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics, including animal ethics (ACSBL002) • Conduct investigations, including using ecosystem surveying techniques, safely, competently and methodically for the collection of valid and reliable data (ACSBL003)

	• Represent data in meaningful and useful ways; organise and analyse data to identify trends, patterns and relationships; qualitatively describe sources of measurement error, and uncertainty and limitations in data; and select, synthesise and use evidence to make and justify conclusions (ACSBL004) • Interpret a range of scientific and media texts, and evaluate processes, claims and conclusions by considering the quality of available evidence; and use reasoning to construct scientific arguments (ACSBL005) • Select, construct and use appropriate representations, including classification keys, food webs and biomass pyramids, to communicate conceptual understanding, solve problems and make predictions (ACSBL006) • Communicate to specific audiences and for specific purposes using appropriate language, nomenclature, genres and modes, including scientific reports (ACSBL007)
Science as a Human Endeavour	• Science is a global enterprise that relies on clear communication, international conventions, peer review and reproducibility (ACSBL008) • The use of scientific knowledge is influenced by social, economic, cultural and ethical considerations (ACSBL011) • Scientific knowledge can enable scientists to offer valid explanations and make reliable predictions (ACSBL013) • Scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability (ACSBL014)

Learning Sequence

It is envisaged that this assessment task will form the final assessment for the Australian Curriculum **Unit 1: Biodiversity and the interconnectedness of life**. In accordance with the Australian Curriculum it is expected that students will have a satisfactory knowledge of *Describing biodiversity and Ecosystem dynamics.*

Listed here are suggested **additional learning experiences** for students before attempting this assessment.

- Use qualitative and quantitative first-hand and second-hand data, and evaluate the contribution of the data sources. Construct arguments and draw conclusions supported by scientific evidence.
- Graph primary and secondary data to investigate the relationship between variables.
- Interpolate and extrapolate from graphical data to approximate values.
- Revise the experiment design concepts of:
  - scientific method
  - variables (independent and dependent)
  - formulating questions and hypotheses
  - controlling variables
  - conduct safety audits
  - fair tests
  - importance of repeating the experiment
  - designing appropriate tables.
- Discuss the reliability of information obtained by research.
- Locate and record details of sources for reference lists.
- Revise report writing skills.
- Revise research skills including the use of reputable resources
- Revise ICT skills:
  - using learning objects
  - locating and organising data in scientific research
  - compiling and organising data using spreadsheets.

Teacher Resources

Wet Tropics Management Authority

- http://www.wettropics.gov.au/home

A relevant online unit is available from the ASTA website, Science Web Australia:

- http://scienceweb.asta.edu.au/years-9-10/unit1/overview/yr910-unit1-overview.html

Steps of the Scientific Method

- http://www.sciencebuddies.org/science-fair-projects/project_scientific_method.shtml

Measuring Biodiversity – from Berkely.edu

- http://gk12calbio.berkeley.edu/lessons/less_measbiodiv.html

EIS – What is Environmental Assessment?

- http://www.environment.gov.au/protection/environment-assessments

Techniques for measuring stand height

- http://www.epa.nsw.gov.au/resources/pnf/standheight07392.pdf

Understanding Soil pH

- http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/167187/soil-ph.pdf

Measuring Soil Quality

- http://wwf.panda.org/about_our_earth/teacher_resources/project_ideas/soil_quality/

CRITERIA SHEET: Senior Biology - Daintree Environmental Impact Study - AUSTRALIAN CURRICULUM

	A	B	C	D	E
UNDERSTANDING BIOLOGY	**The student communicates their understanding by:**				
	Making links between related ideas to reveal meaningful interrelationships between physical and biological factors (including biodiversity) in ecosystems. Evaluates potential impacts to ecosystems by using accurate models, and identifying key aspects of ecosystem dynamics including keystone species, and carrying capacity	Explains how patterns and trends in the physical factors affect interrelationships between them and the biological factors. Identifies potential impacts to ecosystems by using accurate models, and identifying key aspects of ecosystem dynamics including keystone species, and carrying capacity	Describing ideas of how patterns and trends in the physical factors affect the interrelationships between them and the biological factors. Identifies potential impacts to ecosystems	Stating ideas and using terminology to recall the data collected. Identifies some relevant impacts to ecosystems	States terminology and ideas relevant to concepts.
INVESTIGATING BIOLOGY	**The student communicates investigative processes by:**				
	Formulating researchable questions by considering a wide range of physical and biological factors. Designing, modifying and implementing investigations to present a logical, efficient method which enables the focus questions to be comprehensively researched. Collecting and organizing data into accurate diagrams, tables and graphs to identify trends and interrelationships. Interpreting and critically analyzing results with links to theoretical concepts to draw conclusions relating to the questions(s) Evaluating the design of the investigation and reflecting on the adequacy of the data collected and proposing refinements.	Formulating researchable questions by considering a range of physical and biological factors. Selecting, modifying and implementing investigations to present a method which enables the focus questions to be effectively researched. Collecting and organizing data into diagrams, tables and graphs (with minor errors) to identify trends. Interpreting results and drawing conclusions relating to the questions(s) Evaluating the design of the investigation and the adequacy of the data collected.	Identifying researchable questions by considering a range of physical factors. Selecting and implementing investigations to present a method which enables the focus question to be answered. Collecting and organizing data using diagrams, tables or graphs. Discussing results and drawing conclusions.	Following instructions to collect and organize data. Evidence of a suitable method Collects data, some of which links to the focus question. Uses tables or graphs	Following instructions to collect and organize data. Collects data

SCIENCE AS A HUMAN ENDEAVOUR	Uses scientific knowledge to develop and evaluate projected economic, social and environmental impacts and to design action for sustainability	Uses scientific knowledge to discuss projected economic, social and environmental impacts	Uses some scientific knowledge to describe projected economic, social and environmental impacts	Describe some projected economic, social and environmental impacts	

Teacher Comments

UB	IB	SHE