

Stage 6

Earth and Environmental Science

AUSMAP *citizen science in action*



Module 4 Human Impacts



Stage 6 Earth and Environmental Science

Module 4: Human Impacts

The Australian Microplastic Assessment Project AUSMAP has partnered with NSW Department of Education Environmental and Zoo Education Centres to support the implementation of the AUSMAP citizen science investigation for secondary students.

The AUSMAP scientific investigation enables teachers to model guided inquiry to address each of the S6 Earth and Environmental Science Working Scientifically outcomes and inquiry questions for Module 4: Human impacts. This creates a brilliant opportunity for a depth study!

The content includes secondary data and observations that have motivated scientists to ask questions about human impacts upon water, specifically the causes and effects of microplastics and macroplastics. Interpretation of the secondary data supports students' collection of accurate quantitative and qualitative primary data for analysis, creative and critical application of knowledge through problem solving and subsequent communication.

Click on headings to view and/or download each Working Scientifically file.

Pt 1 Questioning and Predicting

An investigation of secondary evidence about water management and in particular the issue of microplastics in aquatic environments. This background research will be used to develop and evaluate questions and hypotheses for scientific investigation.


Formative Assessment

Complete the online multiple choice quiz to revise secondary sourced information in Part 1 Questioning and Predicting. Recounting what is known prior to planning an investigation is an important part of working scientifically.

To access the quiz click on formative assessment above or the sample question below.

Stage 6 Earth and Environmental Science
Module 4: Human Impacts - Water Management

MICROPLASTICS
How can water be managed for use by humans and ecosystems?



Part 1: Questioning and Predicting

An investigation of secondary evidence about water management and in particular the issue of microplastics in aquatic environments. This background research will be used to develop and evaluate questions and hypotheses for scientific investigation.

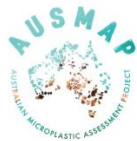
NAME: _____

Environmental and Zoo Education Centres NSW

Quiz Questions

Select the most correct answers to recall background information from Part 1: Questioning and Predicting.

1. Research published in 2014 estimated that at least 5.25 trillion plastic particles weighing 268,940 tons are currently floating in the world's oceans, equivalent to 0.1% of world annual plastic production is determined by: *
- 1 point



MICROPLASTICS

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Part 2: Planning an Investigation

An investigation of secondary evidence about water management, in particular the issue of microplastics in aquatic environments provides background research to inform processes for the collection of primary data to test questions and hypotheses.

NAME: _____

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Pt 2 Planning Investigations

Collection of primary data through fieldwork requires thorough planning of methods and equipment to be used. Variables are to be identified as independent, dependent and controlled to ensure a valid procedure that will allow for the reliable collection of data.

[Dr Scott Wilson demonstrates AUSMAP methodology.](#)

[AUSMAP micro plastic identification guide](#)

Pt 3 Conducting Investigations

Fieldwork enables collection of primary data, both qualitative and quantitative. Using appropriate equipment, employing safe work practices and ensuring risk assessments are conducted and followed.

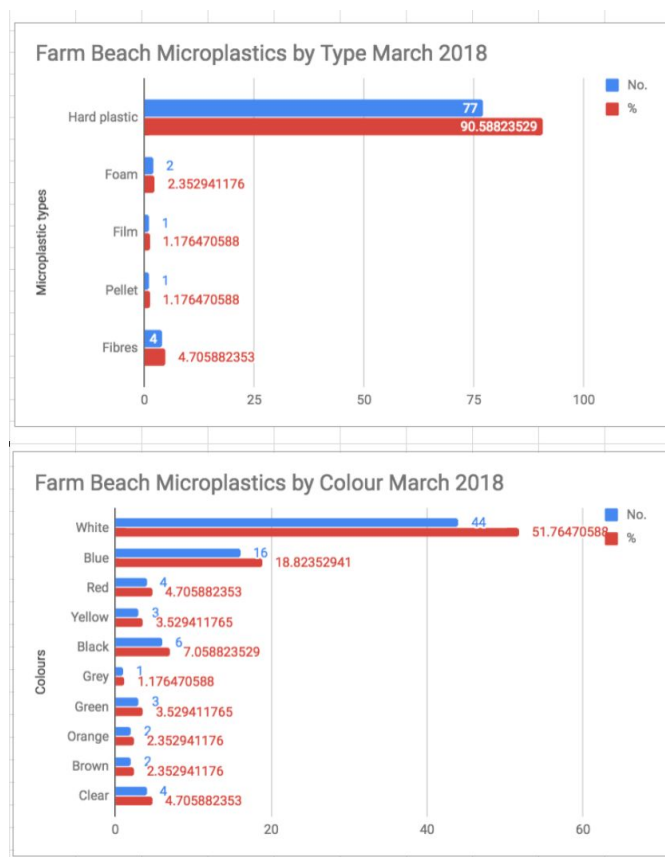
MICROPLASTICS

Australian Microplastics Assessment Project - AUSMAP



Name: _____





Pt 4 Processing Data and Information

Selecting and processing qualitative and quantitative data requires different digital technologies and media to organise and analyse data and information sources.

Pt 5 Analysing Data and Information

Data analysis clarifies trends, patterns and relationships determined through a valid, accurate and reliable process.

Stage 6 Earth and Environmental Science

Module 4: Human Impacts - Water Management

MICROPLASTICS

How can water be managed for use by humans and ecosystems?



Part 5: Analysing data and Information

Data obtained from the microplastics sampling is analysed to clarify trends, patterns and relationships determined through a valid, accurate and reliable process. This data will be uploaded to the AUSMAP database to contribute to the nation-wide citizen science project designed to obtain widespread, accurate and reliable data on the presence of microplastic particles on Australian shorelines.



MICROPLASTICS

How can water be managed for use by humans and ecosystems?



Part 6: Problem Solving

Students use critical thinking skills and creativity to demonstrate an understanding of working scientifically using the AUSMAP methodology. Students use their primary data and secondary sources including mathematical modelling to construct and justify conclusions about the sources and solutions to managing water resources to reduce microplastics from entering the ocean.

Pt 6 Problem Solving

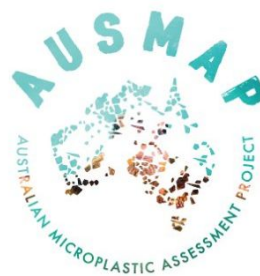
Students use critical thinking skills and creativity to demonstrate an understanding of working scientifically using the AUSMAP methodology. Students use their primary data and secondary sources including mathematical modelling to construct and justify conclusions about the sources and solutions to managing water resources to reduce microplastics from entering the ocean.

Pt 7 Communicating

Communication of all components of the working scientifically processes with clarity and accuracy is an imperative of scientific investigation. Scientists use a variety of forms to communicate their work, including digital, visual written and/or verbal.

Other ideas for communicating include: students writing a letter to the local mayor; write a letter to the editor of the local paper; work in groups to prepare a mini documentary; prepare a Powerpoint presentation, use Prezi, podcast, iMovie

CONTENTS



Questioning & Predicting

- 1.1 Background Information (include relevant scientific concept/s)
- 1.2 Inquiry Questions
- 1.3 Hypotheses
- 1.4 Background information including scientific media and texts.

.01

Planning

- 2.1 Risks and ethical issues
- 2.2 Study site/s
- 2.3 Methods and materials
- 2.4 Variables and controls

.02



Conducting AUSMAP research

- 3.1 Risk assessment and working ethically
- 3.2 Reliable & valid qualitative data
- 3.3 Reliable & accurate quantitative data

.03

EES11-1 develops and evaluates questions and hypotheses for scientific investigation	<ul style="list-style-type: none"> inquiry question and hypothesis cannot be tested scientifically variables are limited, incomplete and/or do not address the hypothesis 	<ul style="list-style-type: none"> developing ability in creating and evaluating inquiry questions and hypotheses that can be tested scientifically. capacity to identify variables as part of the questioning process 	<ul style="list-style-type: none"> displays competency in developing and evaluating inquiry questions and hypotheses that can be tested scientifically. well developed capacity to identify variables as part of the questioning process 	<ul style="list-style-type: none"> displays exceptional skills in developing and evaluating inquiry questions and hypotheses that can be tested scientifically. highly developed capacity to identify variables as part of the questioning process
Maximum marks 5	Marks 1	Marks 2	Marks 3	Marks 4-5
EES11-2 designs and evaluates investigations in order to obtain primary and secondary data and information	<ul style="list-style-type: none"> limited skills in designing and planning an investigation incomplete expression of variables as dependent, independent and controlled 	<ul style="list-style-type: none"> developing skills in designing and planning an investigation to obtain accurate and reliable data, evaluating risks and ethical issues developing capacity in describing variables as dependent, independent and controlled to ensure a valid procedure in obtaining primary data 	<ul style="list-style-type: none"> well developed skills in designing and planning an investigation to obtain accurate and reliable data, evaluating risks and ethical issues thought about and expressed in a sensible way describing variables as dependent, independent and controlled to ensure a valid procedure in obtaining primary data 	<ul style="list-style-type: none"> highly developed skills in designing and planning an investigation to obtain accurate and reliable data, evaluating risks and ethical issues outstanding capacity in identifying variables as dependent, independent and controlled to ensure a valid procedure in obtaining primary data
Maximum marks 5	Marks 1	Marks 2	Marks 3	Marks 4-5
EES11-3 conducts investigations to collect valid and reliable primary and secondary data and information	<ul style="list-style-type: none"> limited application to fieldwork and mostly ensures safe practices working toward developing skills in collecting reliable and valid data 	<ul style="list-style-type: none"> acceptable application to fieldwork and mostly ensures safe practices demonstrates skills in collecting reliable and valid data 	<ul style="list-style-type: none"> consistent application to fieldwork and always ensuring safe practices demonstrates well developed skills in collecting reliable and valid data using appropriate technology when required to make accurate observations 	<ul style="list-style-type: none"> outstanding application to fieldwork and always ensuring safe practices demonstrates highly developed skills in collecting reliable and valid data using appropriate technology when required to make accurate observations
Maximum marks 5	Marks 1	Marks 2	Marks 3	Marks 4-5

Sample formal assessment. Depth Study: Human Impacts Upon Hydrological Processes: Microplastic Pollution

Sample Unit – Earth and Environmental Science - Year 11

Sample for implementation from Year 11 from 2018

Module 4: Human Impacts	Duration	10 hours including a 5 hour Depth Study
Content Focus <p>Humans use the Earth's resources to maintain life and provide infrastructure. However, natural resources are not infinite. Renewable resources such as water, soil, plants and animals can be managed sustainably using scientific knowledge. Incomplete information or failure to consider the impact of resources use may cause environmental damage.</p> <p>Scientific knowledge enables efficient use of resources and also the rehabilitation of damaged ecosystems. Healthy ecosystems provide renewable resources, purify air and water, regulate climate and provide cultural services.</p>		
Module Focus <p>Working Scientifically In this module, students focus on developing questions and hypotheses when planning and conducting investigations about human impacts on the Earth. Students should be provided with opportunities to engage with all Working Scientifically skills throughout the course.</p>		
Outcomes A student: <ul style="list-style-type: none"> conducts investigations to collect valid and reliable primary and secondary data and information EES11/12-3 selects and processes appropriate qualitative and quantitative data and information using a range of appropriate media EES11/12-4 analyses and evaluates primary and secondary data and information EES11/12-5 describes human impact on the Earth in relation to hydrological processes, geological processes and biological changes 		
Resources <ul style="list-style-type: none"> 		Formal assessment <p>Field study: Students engage in a field study of their local catchment with a focus on the effect microplastics on waterways.</p> <p>Depth Study for assessment Students choose one area of interest from the field study that interests them and develop an inquiry question. They must include a practical investigation and research in their investigation. Students report their findings in 5 minute oral presentation.</p>
Inquiry questions 1.		

Sample Unit - Earth and Environmental Science - Year 11. Module 4: Human Impacts