

COTTER DAM
PROTECTING THE ENVIRONMENT
UNIT OF WORK
EARLY ADOLESCENCE – YEAR 8



UNIT DESCRIPTION

The Cotter is a significant place for the ACT as it is a primary source of drinking water. It provides an important habitat for various plants and animals including some vulnerable and endangered species. ACT residents identify with the Cotter environment as a historical and recreational space.

This unit on the Cotter environment focuses on the interdependence and interaction between plants and animals, landscape and ecology. It also explores human roles and responsibilities in ensuring the sustainability of the area.

BIG UNDERSTANDINGS

- Living things at the Cotter depend on their environment and each other for survival and
- Human activities at the Cotter affect the environment.

ATTITUDES AND VALUES

In this unit, students will have opportunities to:

- Develop a respect for living things and natural systems
- Appreciate the intrinsic value of the natural world through the use of the natural environment as an educational resource
- Develop an attitude of respect and caring for life in all its diversity.

FOCUS QUESTIONS

- Where is the Cotter and what do we know about it?
- What are the significant plants, animals and landscape features of this environment?
- How do humans impact on this environment?
- Why is sustaining the environment important, who is responsible and what can be done?
- How will you apply your knowledge and understanding to a contemporary situation?
- How would you share your understanding with the wider community?



ESSENTIAL LEARNING ACHIEVEMENTS

ELA 2 THE STUDENT UNDERSTANDS AND APPLIES THE INQUIRY PROCESS

In the early adolescence band of development, students have opportunities to:

- 2.EA.3 formulate questions, predictions or propositions suitable for investigation and clarify the inquiry focus
- 2.EA.5 determine data or information needs and devise suitable methods to collect the data or information required
- 2.EA.6 plan and conduct scientific investigations with an understanding of the requirements of fair testing (e.g. maintain the same conditions, identify the variable to be changed and the variable to be measured)
- 2.EA.7 collect and assemble relevant data or information taking steps to minimise error (e.g. systematic observation, repeated trials) and
- 2.EA.13 draw reasonable conclusions based on analysis of data and information.

ELA 19 THE STUDENT UNDERSTANDS AND APPLIES SCIENTIFIC KNOWLEDGE

In the early adolescence band of development, students have opportunities to understand and learn about:

- 19.EA.11 why some living things are better suited to their environment than others and
- 19.EA.12 food chains and webs as models of relationships within living communities.

In the early adolescence band of development, students have opportunities to learn to:

- 19.EA.15 explore, identify and model relationships (e.g. solar system, food chains and webs) to explain interrelationships and predict change.

ELA 20 THE STUDENT ACTS FOR AN ENVIRONMENTALLY SUSTAINABLE FUTURE

In the early adolescence band of development, students have opportunities to understand and learn about:

- 20.EA.1 concepts of interdependence of living things, habitat and ecosystem and
- 20.EA.2 some of the processes by which human activities change natural environments in positive and negative ways.

In the early adolescence band of development, students have opportunities to learn to:

- 20.EA.6 conduct case study investigations into local and/or national ecosystems to identify changes and predict their impacts.

ELA 21 THE STUDENT UNDERSTANDS ABOUT AUSTRALIA AND AUSTRALIANS

In the early adolescence band of development, students have opportunities to learn to:

- 21.EA.9 use geographical language, tools and conventions to interpret and create representations of Australia's physical and human geography (e.g. a variety of maps, diagrams, images and data).



FOUR C'S MODEL FOR UNIT OF WORK DEVELOPMENT

Stages of learning sequence

CONNECT

Students engage with the unit of work. They:

- establish the purpose
- identify prior knowledge and beliefs and address misconceptions and
- formulate questions for investigation.

CONTEXTUALISE

The students discover new knowledge. They:

- develop skills and learning strategies
- engage in shared learning experiences and
- utilise primary and secondary sources of information.

CONCEPTUALISE

The students develop understandings, make connections, and apply learning. They:

- analyse, synthesise and plan areas for personal, group or whole class investigation
- develop and follow a research plan and
- provide evidence for conclusions.

COMMUNICATE

Students review and share what they have discovered.

This model of Unit of Work writing has been developed by Maureen Bartle, Education Consultant.



UNIT DETAILS

BAND OF DEVELOPMENT	Early Adolescence
YEAR LEVEL	8
HOST KLA/S	Science and SOSE
DURATION	8 weeks

Stage of learning sequence

CONNECT

Focus question

- Where is the Cotter and what do we know about it?

Outcomes

Students will be able to:

- use geographical language, tools and conventions to read and interpret maps, diagrams, images and data of the Cotter region
- describe the route from their suburb to the Cotter Dam
- explain the major geographical features of the Cotter River and specially the location of the Cotter Dam and
- explain some of the connections Canberra people have to the 'The Cotter' and the vernacular use of the term.

Summative assessment tasks

Students will:

- construct a map of the geographic features of the Cotter Dam region using symbols and a key and a distance scale
- on a map of Canberra show their suburb, parliament house, the edge of the urban area, and the approximate route from their school to the Cotter Dam and
- identify some of the plants and animals found in the area and describe them in terms of their habitat, place in the ecosystem and speculate on how they may be impacted on by visitors to the Cotter recreation and leisure area.

Teaching and learning experiences

Explain the vernacular use of the term 'The Cotter' by the people of Canberra.

Show students where 'The Cotter' area is, using the different maps provided in the Resources section of the kit. Students are to locate and identify major geographical features such as rivers, mountains, valleys etc. using the worksheet provided.

Brainstorm the relevance of the Cotter region to the students. Record results before and after viewing the DVD 'Enlarging the Cotter Dam'.

Set up an individual Cotter Environment Reflection Journal. This will be an ongoing journal and will form part of the final assessment. Record reasons for the relevance of the Cotter region to them, their family, the community, the people of the past etc. (e.g. swimming at Casuarina Sands, using the camping area, etc.). Share reflections with class.

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Establish a *Media Journal*. Add to it by collecting and collating articles about contemporary issues about Canberra's water security and the Enlarged Cotter Dam project. This will be an ongoing task and will form part of the final assessment.

Students predict what they would expect to observe in terms of evidence of plant and animal life, both terrestrial and aquatic, on an excursion to 'The Cotter'. Develop an organiser for recording their observations, using appropriate categories for animals and plants and for geographic features. Develop a way of recording any built features they would expect to find. This will involve the use of symbols and a way of demonstrating distance and scale.

Plan an excursion to the Cotter Dam Discovery Trail. Use organiser for recording observations. Use photographic and video footage as additional ways of recording evidence.

Record personal impressions of the interpretative trail in individual Cotter Environment Reflection Journals.

On return from excursion develop a map/s of the area visited and method of comparing predicted observations with actual observations.

Stage of learning sequence

CONTEXTUALISE

Focus questions

- What are the significant plants, animals and landscape features of this environment?
- How do humans impact on this environment?
- Why is sustaining the environment important, who is responsible and what can be done?

Outcomes

Students will be able to:

- develop definitions for the concepts of living things; environment, habitat and ecosystem and sustainability and illustrate the definitions with examples of plants and animals found at the Cotter
- identify and classify several types of ecosystems found within the Cotter River environment and the types of fauna they support. (These may include a riparian plain, a river bed, an inflow drain, a river bank, etc)
- use the seven signs of animal life to explain why some living things are better suited to this environment than others
- develop and apply food chains and webs to model feeding relationships between species found at 'The Cotter'
- use evidence to describe some of the positive and negative impacts of human activities on the environment and
- apply scientific concepts to understand how humans can indirectly impact on a species.

Summative assessment tasks

Students will:

- apply these terms to the Cotter River environment and provide examples of biodiversity, environment, ecosystem, adaptation, habitat and sustainability
- classify and sort ecosystems into Cotter region and non-Cotter regions
- distinguish physiological adaptations and explain their benefit to a specific environment
- use information provided to create a food web for the Cotter and accurately identify key components of food webs of other species
- give reasons for classifying impacts of human activities at 'The Cotter' as positive or negative and
- conduct an experiment and be able to explain how a specific type of human behaviour can affect a particular species of animal.

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Teaching and learning experiences

Identify reliable sources of evidence for the purpose of research.

Allow time for students to explore and become familiar with the website www.actew.com.au
Students locate information on the protection and care of Xanthorrhoea grass trees and the rescue and relocation of native fish and crustaceans.

Identify several plants and animals from the Cotter River corridor. Describe the seven signs of animal life for their subjects (you may choose to use the MRS GREN - seven signs of animal life model: movement, respiration, sensitivity to the environment, growth, excretion, nutrition).

Develop a glossary relating to the Cotter River corridor which show definitions for and illustrated examples of living things (eg. species, organisms), environments, ecosystems, habitats, adaptation, sustainability, interrelationships.

Investigate a range of habitats which can be found in 'The Cotter' environment (e.g. fish homes, hollow logs etc). Students can use the Environmental Impact Statement or other research tools.

Place three or more of these habitats within an ecosystem. Use the differences between each ecosystem to look at how different species have adapted to live there (e.g. fish gills vs. snake lungs, etc.). Choose a terrestrial and an aquatic ecosystem and compare and contrast them using a Venn diagram to highlight the commonalities.

Explore the concept of adaptation by choosing an individual species from a range of animal classifications, and show one or more ways in which they have adapted to their environment. Choose three or more animals from the endangered animals list such as the Murray River Crayfish, Trout Cod, Two-spined Blackfish or Macquarie Perch and show how they are now endangered. Use the fact sheets provided on the resource disc to conduct these investigations.

Determine the factors which contribute to an organism's mortality by exploring the following concepts: top order predator, producer, consumer (first or second order). Add appropriate definitions and illustrated examples to the glossary.

Explore the relationship between predators and prey through the predator/prey activity. Students to draw a simplified food chain of the activity that includes the shrimp which the perch consumes.

Explore the concept of variables and predicting change in an environment by adding to, and eliminating component animals and plants in a food web.

Using fact sheets provided on the resource disc and the Environmental Impact Statement, investigate the impact of humans on changing the landscape during the enlargement of the Cotter Dam, e.g. removal and stock piling of top soil for later use, the building of sediment ponds, and the relocation of fish, Xanthorrhoea grass trees and fallen logs. Brainstorm initial responses and sort and classify impacts as permanent or temporary, and whether they will affect flora, fauna or both. As individuals or in groups develop an illustrated diagram to show these impacts.

Discuss and explore the survival needs of plants and animals in the Cotter environment and the impact of the enlargement of the Cotter Dam on their survival. Introduce the concept of an Environmental Impact Statement and its requirements under the *ACT Planning and Development Act 2007*, for projects of the scale of the Enlarged Cotter Dam.

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Use the Environmental Impact Statement, fact sheets or ACTEW website to conduct a study into the different sustainability programs conducted during the Enlarged Cotter Dam project. This may be undertaken by the whole class or by groups using an Expert Jigsaw strategy. Programs selected may include:

- the impact of erosion and the possibility of increased sediment
- controlling the spread of the ENH virus and its potential impact on the Macquarie Perch. Students are to identify the effects of the introduction of the virus, the modes of transmission, the role of humans in transmission and the control measures undertaken by the Enlarged Cotter Dam project and
- investigating the relationship between water temperature, depth and turbidity to understand Macquarie Perch spawning behaviour.

Brainstorm factors impacting on the Cotter Dam environs. Sort these into human (e.g. litter, virus transmission, introduction of feral species) and the environmental (e.g. landslips or bushfires). Develop posters for one of the impacts identifying and showing cause and effect on the environment. Show who has responsibility for care and management of the area (individuals, volunteer groups, government or private enterprise employees).

Stage of learning sequence

CONCEPTUALISE

Focus question

- How will you apply your knowledge and understanding to a contemporary situation?

Outcome

Students will be able to:

- identify and model the relationships between an organism and its environment and show how humans can impact on these relationships.

Summative assessment task

Students will:

- identify and describe human activities which may impact on a species and the effect the removal, depletion or increase this species will have on the environment.

Teaching and learning experiences

Conduct a case study showing the strategies being used to protect the following endangered species: the Macquarie Perch, the Trout Cod, the Two-spined Blackfish and the Murray River Crayfish.

Present project as a series of posters, PowerPoint presentation, or interactive display reflecting each stage of the investigation.

Support case study with models and additional research. Develop a series of impact projections on habitat, ecosystem and food webs if attempts to preserve the animal are not successful.

An integral part of the case study will be a detailed statement of purpose, timeline, a work flow plan, detailed statement of purpose and assessment matrix.



Stage of learning sequence

COMMUNICATE

Focus question

- How would you share your understanding with the wider community?

Outcome

Students will be able to:

- present and draw reasonable conclusions and use their research to make projections about similar research.

Summative assessment task

Students will:

- explain their research accurately and appropriately to a variety of audiences.

Teaching and learning experiences

Students will present their findings from the case study to a variety of audiences including a group of peers and to adults as either part of a Learning Journey or Exhibition. Their presentation should include:

- accurate use of scientific language and conventions
- the effects of changing population numbers of one species on the ecosystem as a whole
- detailed explanation of how human activities can impact on ecosystems or species and
- links between the management of the Cotter and the ongoing care and use of the region.



Teacher reflection and comments

What have I learnt from this Unit of Work?

What worked well?

What would I change next time?

Resources and tools

EHN virus, Macquarie Perch and the enlarged Cotter Dam work sheet

'Enlarging the Cotter Dam' DVD

Enlargement of the Cotter Reservoir and associated works Environmental Impact Statement and summary document

Classifying into living and non-living work sheet

Reading topographical maps work sheet

Sustaining the banks of the Cotter Reservoir work sheet

Topographical vegetation habitats work sheet

Venn diagram template

Water temperature, depth and fish spawning behaviour work sheet

Whose job is it? work sheet

