5.1 A very successful attempt to manage a problem in an ecosystem

Lesson outcomes

At the end of this activity students will be able to:

- discuss the role of the dung beetle in an ecosystem and explain why beetles were imported to Australia to fulfil this role.

Equipment list

The CLASS will require:

- internet access.

Each GROUP will require:

- *Student Guide*

Each STUDENT will require:

- ***Notebook.***

Teacher content information

The importation of dung beetles to Australia is considered a success because they have helped to eradicate a problem in Australian ecosystems without becoming an environmental problem themselves. This is in stark contrast to the cane toad, in which the original problem was not solved but the toads themselves have become an enormous ecological problem.

Lesson plan

Step 1: To raise awareness of the need to manage dung disposal, ask students to imagine walking across a cow paddock which has held 50 cows for a day. Imagine the mess and smell. Some students may mention the flies buzzing around the cow pats. The number of flies around a cow pat is mentioned at the beginning of the article the students are asked to read.

Step 2: Direct students to the digital resource, instructing them to view the dung beetle at work before they read the article about their introduction to Australia.

Step 3: As students work, encourage them to discuss possible answers to the questions but record their own. Promote discussion where necessary with questions such as those below.

- Why do you think native Australian beetles can process kangaroo dung, but not cattle dung?
- What do the animals producing the dung eat?
- What is the name given to organisms in a food web that return nutrients to the soil for reuse by plants?
- What are some examples of these that you remember from earlier work?
- What went wrong with the introduction of cane toads? Has this happened with the introduction of dung beetles?

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5.2 Can changes in ecosystems caused by human activities create problems for the survival of some species?

Lesson outcomes

At the end of this activity students will be able to:

- discuss the changes that may be caused in adjacent ecosystems as a result of farm run off and suggest how these problems could be managed.

Key vocabulary

Surface runoff, turbidity, algal bloom, eutrophication, crown-of-thorns starfish.

Equipment list

The CLASS will require:

- internet access.

Each GROUP will require:

- *Student Guide*

Each STUDENT will require:

- ***Notebook.***

Teacher content information

Eutrophication is the aquatic ecosystem's response to the addition of natural or artificial nutrients (phosphates and nitrogen compounds). This can lead to an increase in phytoplankton in a water body (algal bloom) which can deplete the oxygen in the water, leading to death of aquatic animals. See the set of steps in this process at http://www.bbc.co.uk/schools/gcsebitesize/science/edexcel/problems_in_environment/pollutionrev4.shtml

Sediment loads in surface runoff from agricultural lands can be reduced by:-

- Setting stocking rates that maintain vegetation cover and diversity
- Managing stock access to riparian (riverbank) and wetland areas
- Reducing tillage of soils and retention of crop residues (stubble)
- Use of contour embankments to reduce surface runoff and soil loss.

For more information go to the Reef Water Quality Protection Plan http://www.reefplan.qld.gov.au/about/scientific-consensus-statement/agricultural-management-practices/

Lesson plan

Step 1: Ensure that students read the *Student Guide*, watch the videos and access the *Find out more* section before they tackle the ***Notebook*** questions.

Step 2: Once students have completed the ***Notebook*** questions ask them to form small groups and discuss their answers to the questions.

Step 3: Ask one or two groups to share their answers to 'Can you think of ways we can prevent nutrients and sediments from running into rivers?' Encourage others to comment or contribute.

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5.3 Should we allow development in national parks?

Lesson outcomes

At the end of this activity students will be able to:

- consider differing points of view about a specific exploitation of resources in a national park
- develop an argument supporting a point of view that is balanced and evidence-based, use relevant science knowledge and appropriate scientific language

Equipment list

The CLASS will require:

- internet access.

Each GROUP will require:

- *Student Guide*

Each STUDENT will require:

- **Activity sheet 5.3 Assessment rubric** (in *Teachers Guide*)
- ***Notebook***

Things to consider

In this **summative assessment** task students consider differing points of view about a specific exploitation of resources in a national park. They decide on their view and develop a supporting argument. They use their knowledge of ecosystems and demonstrate their ability to use scientific language and appropriate scientific concepts to support the argument.

Lesson plan

Step 1: Discuss the knowledge, investigation and analysis skills students have developed during this unit. Refer to the three points of good arguments on page 46 of the *Student Guide* as a scaffold for students when constructing reports.

Step 2: Explain stimulus materials will help students focus on their topic.

Step 3: Discuss the suggested rubric in **Activity sheet 5.3 Assessment rubric** to agree on a version detailing all the aspects of the task to be assessed in students' reports.

Step 4: Ask students to consult you before beginning their report, so you can ensure they have a clearly focused topic and an effective plan for finding relevant information.

Step 5: Collect and assess reports.

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5.4 Sample test

A sample **summative test** and a **marking scheme** have been developed and are available to teachers from *Science by Doing* at sbd@science.org.au. Both are editable versions, so you can adapt them to your students' needs. You may choose to use this in addition to the assessment task outlined in **Activity 5.3**.

Note - *Science by Doing* provides sample assessment items and whilst every effort has been made, the security of these items cannot be guaranteed. *Science by Doing* encourages teachers to modify the items to suit individual teaching programs.

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This resource was revised in 2017 by Jef Byrne and Dr Jim Woolnough.

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