

Science and Society

3.3 Students make predictions about the immediate impact of some applications of science on their community and environment, and consider possible pollution and public health effects.

Earth and Beyond

3.3 Students collect information that describes ways in which living things use the Earth and the sun as resources.

Life and Living

2.3 Students make links between different features of the environment and the specific needs of living things.

3.3 Students describe some interactions (including feeding relationships) between living things and between living and non-living parts of the environment.

Place and Space

2.2 Students predict possible consequences for an ecological system when an element is affected.

3 Effects of dung beetle activity on the environment: 'Woolly Thinking'

Focus

Understanding

Aims

To prompt students to:

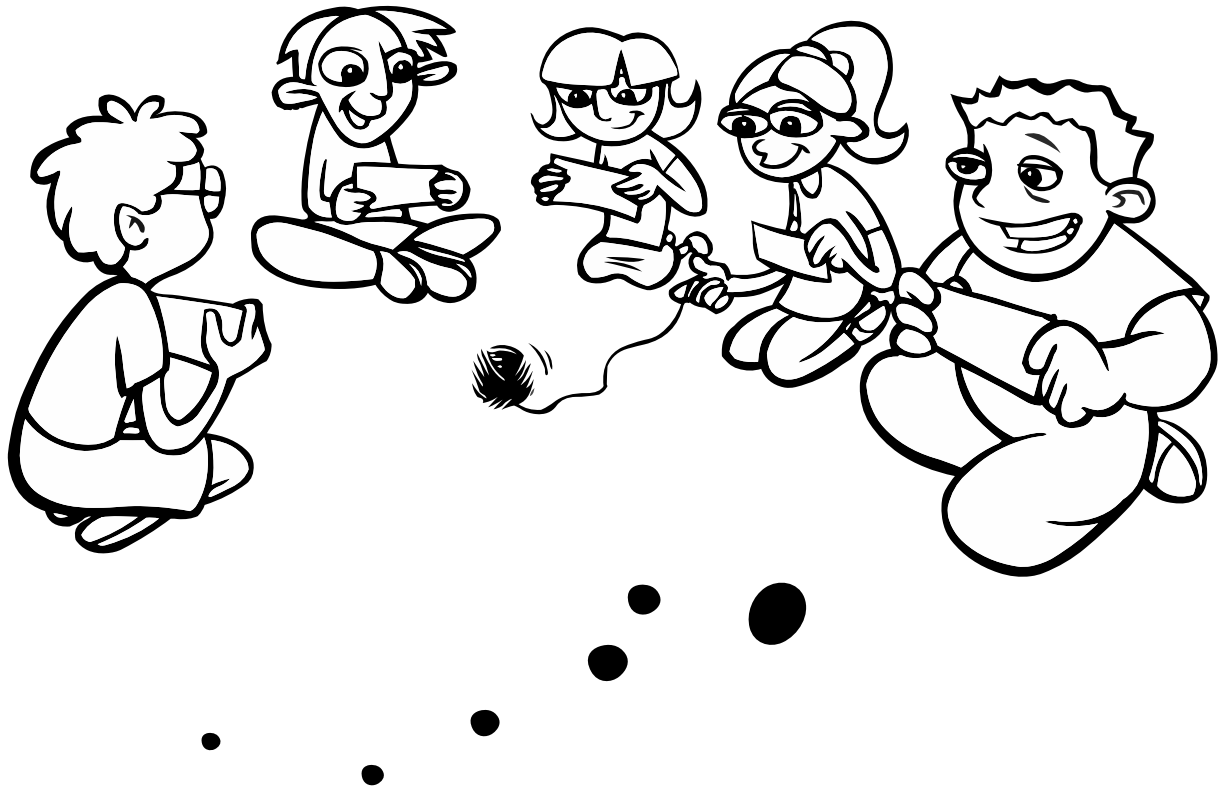
- think about the possible impacts, both good and bad, that the dung beetle may have on Australia's environment
- develop an understanding of the concepts underlying sustainable natural resource management.

Materials

- Eight balls of wool
- Labels, as follows:
 - cattle
 - fly pests
 - farmer
 - water
 - soil
 - pasture plants
 - other farm animals
 - dung beetles.
- Resource sheet 2—Operation 'Dung Beetle'

Wool yarn is required to demonstrate the links between each of the types of activity that occur on a cattle property. This activity requires an open area within which students can model the farm.





Sequence | 40 minutes

1. Make sufficient labels for each student to be allocated one. Pass them out at random and then ask all of those students whose labels are the same to join together in a group.
2. Ask students to think about how they (as described by their label) are affected by cattle dung and what links they have with the other (differently labelled) groups in the room. There are many different relationships that the students may identify with, some of which may be:
 - cattle drop dung → attracting flies → irritating people/animals → harming the farmer and other animals → reduced when beetles bury sufficient dung
 - dung beetles disperse dung → cleaner water runs off the farm → better for people and other animals → improving water quality in dams and waterways
3. Ask each group of students to stand in a different place in the room, or outside. All the 'dung beetles' will be together, but in a different place from the 'cattle'. Ask each group to demonstrate their relationships (as identified in step 2) by holding onto their ball of wool and walking to the next group in the relationship. As they get to each new group one of their group stays behind to keep hold of the wool and explain the relationship to the class.
4. Ask each group to do this until a very woolly web has been formed. When all the groups have had a turn, ask the students to remain sitting where they are to discuss the different types of relationships. (In doing so, discuss the positive effects that dung beetles have on farms.)

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4 Sampling dung beetles in your local area

Focus

Investigating

Aims

To encourage students to:

- investigate dung beetles first-hand
- make inferences from their investigations.

Materials

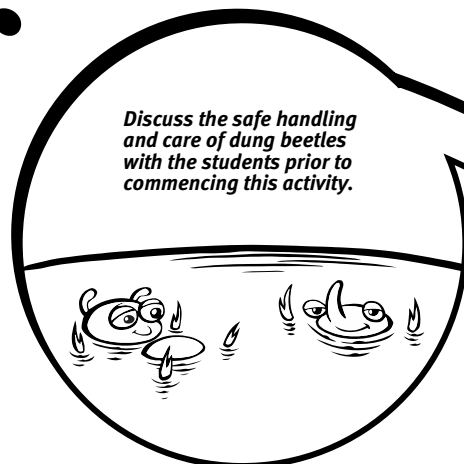
- Protective gloves (disposable rubber, vinyl or surgical gloves would be fine)
- Large open container filled with water (e.g. a 75 litre plastic rubbish bin)
- 10 litre bucket (for collecting dung and beetles before putting them in the larger container)
- Ice-cream container with lid and airholes
- Sharpened shovel
- Sieve
- Trowel
- Resource sheet 4—*Dung beetle data collection sheet*

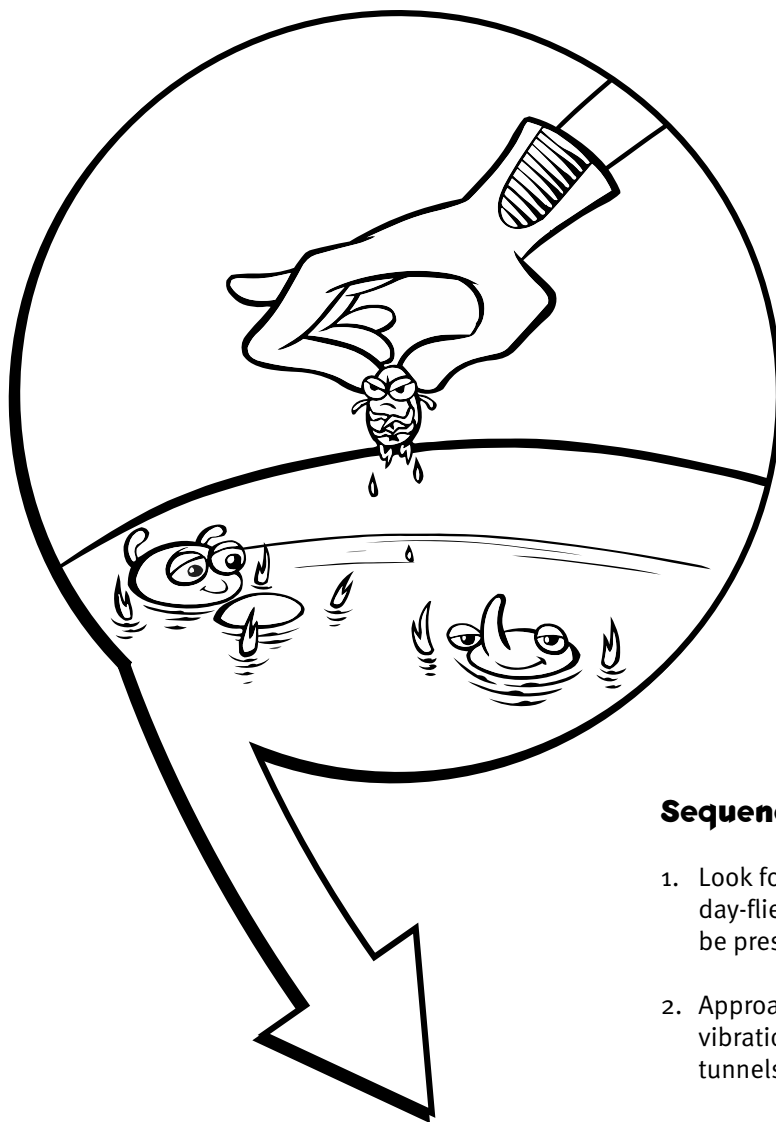
Note: Students in some regional schools will have ready access to cattle dung and, hopefully, dung beetles; whereas city schools, and regional schools that aren't located near grazing land, may need to conduct a field trip to undertake this activity. (Refer to resource sheet 3—*Queensland distribution of common introduced dung beetles*) to determine which dung beetles are common in your area.)

For more information, it may be necessary to contact:

- your local Department of Primary Industries (DPI) office
- the DPI Call Centre—ph: 13 25 23
- a local landcare group <www.landcareqld.org.au>.

Discuss the safe handling and care of dung beetles with the students prior to commencing this activity.





Ensure that gloves are worn when collecting dung and beetles, and that hands are washed after the sampling is complete.

Dung beetles can be kept in the refrigerator overnight. First, empty the water from the ice-cream container, put in a couple of sheets of damp paper towel, and replace the lid (complete with air-holes).

Sequence | Over a series of lessons

1. Look for dung pats one- to two-days-old (where day-fliers, dusk/dawn fliers and night fliers might be present).
2. Approach quietly; dung beetles are sensitive to vibrations and will quickly descend into their tunnels.
3. Scoop up the dung pat with the shovel, if possible including about 10–20 mm of topsoil, and place it in the 10 litre bucket. Repeat the process so that you have two dung pats in the bucket.
4. Transfer the dung pats to the large container and stir well with the trowel to break up the dung. The dung beetles will float to the top. (Don't worry—they are good swimmers and won't drown.) Skim them off with a sieve. Stir again and skim again, continuing until there are no more beetles. You can collect more dung pats and repeat the procedure if you like—just keep a note of how many you sample. You may need to wash the beetles a few times, using a hose and the 10 litre bucket. (You can keep beetles in an ice-cream container half-filled with water while you sort through them. This will stop them from flying away.)
5. Pick out at least one specimen of each type of beetle. Release the remainder back into the paddock, or hold them overnight for use in activity 5.

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Students must be instructed not to harm the beetles in any way as they should be returned to a nearby paddock after the identification is done.

Remind students that not all the beetles they find will be on the identification sheet as some may be native dung beetles or among the seven less common introduced species.

5 Identification of common introduced dung beetles

Focus

Investigating

Aims

To encourage students to:

- identify the introduced dung beetles in their area
- compare their result with the details recorded on resource sheet 3—*Queensland distribution of common introduced dung beetles*.

Materials

- Resource sheet 4—*Dung beetle data collection sheet*
- Resource sheet 5—*Common dung beetles in Queensland: colour identification sheet*
- Table lamp
- Magnifying glass(es)
- Trays (for sorting beetles)
- Disposable gloves
- Ruler

Ensure that students wear gloves and wash their hands after completing any stages involving the handling of dung.

Sequence | 60 minutes

1. Students should complete resource sheet 4—*Dung beetle data collection sheet*.
2. Divide the dung beetle sample among the class.
3. With reference to resource sheet 5—*Common dung beetles in Queensland: colour identification sheet*, ask students to examine the size, shape and colour of the beetles to distinguish between different types and determine the species.
4. With reference to resource sheet 4—*Dung beetle data collection sheet*, ask the students to tick off the beetles they think they have found and write down any comments that they would like to make about the beetles. They can then compare the number of introduced species they have found with those on resource sheet 3—*Queensland distribution of common introduced dung beetles*—to see whether they have collected all of the common species known to be present in their region.
5. Once the students are sure they have correctly identified their dung beetles they can move on to the next class activity—making a dung beetle farm. Students then will be able to observe dung beetle activity and interactions.



Life and Living

- 3.1 Students draw conclusions about the relationship between features of living things and the environments in which they live.
- 3.3 Students present information which illustrates stages in different types of life cycle (including metamorphosis) of familiar living things.
- 4.2 Students identify and analyse similarities and differences in the ways that different living things reproduce.
- 5.3 Students evaluate the consequences of interactions between the living and non-living parts of environments.

If your container is deeper (front to back) than that specified, cut a piece of glass or polystyrene to form the back so that the chamber has the correct depth, or build a container out of glass or Perspex. A suitable chamber can be made from two sheets of glass (30 cm x 45 cm) held apart at the edges of three sides by 1.5 cm x 1.5 cm wood strips cut to the required lengths. Use small woodworking clamps to hold the chamber together. A lid can be made from gauze or fly wire.

Dung can be kept in a container in a refrigerator for a few days so that more can be added if needed. Use a fridge that isn't used for food storage, (e.g. one that your school uses for science experiments).

*This arrangement is not suitable for ball-rollers (*Sisyphus*).*

Plasterer's loam or brickie's loam also is suitable.

If this activity is conducted after activities 4 and 5 students can use the beetles already collected. Before starting, students should be advised on the ethics of keeping dung beetles. They should be encouraged to think about the needs of the beetles (food, light, temperature—no sun), and who will be responsible for caring for them. (Perhaps a roster could be drawn up.)

6 Making a dung beetle farm

(Source: Adapted from *Bioscan*, 1995)

Focus

Investigating

Aim

To allow students who may not have access to a cattle property the opportunity to observe the tunnelling behaviour of dung beetles.

Materials

- An aquarium or a large plastic ant farm (available from pet shops), measuring about 30 cm high and 45 cm long, with the back and front about 1.5 cm apart.
- Fresh dung.
- Dung beetles (already collected for activities 4 and 5):
 - 6–8 *Onitis* (= 3–4 pairs of males and females)
 - or 8–10 *Onthophagus gazella* (4–5 pairs)
 - or 10–12 *Euoniticellus intermedius* (5–6 pairs).Fewer beetles should still give a result. Species can be mixed in lower numbers (e.g. two pairs of *Onitis* plus 3 pairs of *O. gazella*; or four pairs of *E. intermedius*).
- Moist sand, packed firmly into the farm.

Sequence | Over a week or more to ensure that some dung beetle activity can be observed

1. Assemble the farm frame.
2. Place the sand/loam in the chamber, leaving room for the dung on top. Firmly pack the sand to a depth of 200–225 mm.
3. Add dung to the sand, leaving 5 cm of space at either side of the mass.
4. Add the beetles and replace the lid on the farm to stop them escaping.
5. The beetles must be fed when the dung dries out or is depleted by beetle activity.
6. Students should take daily observations of the dung beetles' activities, for example:
 - How many beetles are present?
 - How many different species are present?
 - What are the beetles doing?
 - Why do you think they are behaving that way?
 - What other behaviours have you observed (e.g. resting, hiding, feeding, mating, nesting, fighting)?
 - What conclusions can be drawn from these behaviours?
 - How many dung (brood) balls can you see?