Lesson:
Unwelcome visitors

Summary:

This lesson looks at an issue in managing invasive species in Australia. Students 'learn by doing' through an augmented reality app – Waterweed Wipeout. This app allows students to virtually manage the water levels of Lake Mulwala, located in NSW. The lake has been invaded by *Egeria densa,* an introduced species once popular in aquariums. The weed is managed through periodic draining of the lake, exposing the plant which causes it to die back.

Lesson focus:

Introduced species harm Australia's native environment. Active management is sometimes required to reduce the impact of the invasion. In Lake Mulwala this requires raising and lowering water levels at key times to kill the weed and minimise impact on tourists, local businesses and farmers who depend on the water.

Preparation:

- **Download and print** a copy of the *Unwelcome Visitors_Worksheet_Jnr* for each student – *see* https://www.mdba.gov.au/publications/mdba-reports/waterweed-wipeout-teacher-supplement
- **Download and print:** WaterweedWipeout_App factsheet for each student (or pairs)
- **Download** *Waterweed Wipeout* (iTunes App Store or Google Play) on sufficient devices.
- **Download** the PowerPoint to accompany this lesson.
- **Prepare** to show the Atlas of Living Australia page http://bie.ala.org.au/species/http://id.biodiversity.org.au/node/apni/2900995

Prepare devices with mind-mapping tool (if available and desired) – these include Mindomo, Coggle, and Poplet (for iPads).

Equipment

Worksheets, A3 paper for mind maps (or mind-mapping software), iPads or Android devices.

Curriculum links

Science

ACSHE050	Science involves making predictions and describing patterns and relationships
ACSHE051/062	Science knowledge helps people to understand the effect of their actions
ACSIS060	Represent and communicate observations, ideas and findings using formal and informal representations (Science Inquiry skills)
ACSSU072	Living things have life cycles
ACSSU073	Living things depend on each other and the environment to survive.

HaSS

ACHASSI081	Reflect on learning to propose actions in response to an issue or challenge and consider possible effects of proposed actions

Lesson:
Unwelcome visitors

ACHASSK088	The importance of environments, including natural vegetation, to animals and people
ACHASSK090	The use and management of natural resources and waste, and the different views on how to do this sustainably.

Lesson introduction

Show slide 1 (title screen)

Ask students if they have ever been on a picnic and had unwelcome bugs come to visit (ants, wasps, mosquitos etc). Ask them if they have ever had any unwelcome plant or animal visitors at their home or garden (mice, possums, spiders, weeds etc).

Explain that today the class will be investigating some other unwelcome visitors that have made themselves a home in Australia but harmed other animals and plants.

Native species

Show slide 2

Explain that a native species is an animal or plant that is naturally found in an area. Native species often have specific features that help it survive in that area. For example, polar bears are well adapted to living in icy areas, scorpions to deserts, and whales to the sea. The features that polar bears have that help them live in the Arctic are: can survive extreme cold, thick coat, build dens, eat seals and fish, hibernate when having a baby, and white (so predators can't see them). But polar bears wouldn't do very well in hot, dry Australia!

In Australia, we have very changeable weather, with lots of droughts. Kangaroos are well adapted to their home here.

Ask 'Can you think of some reasons why?'

- their long legs help them travel long distances when they need to find water or food (they can take their joeys with them in the mother's pouch)
- they don't need to drink much water
- their soft feet don't erode soil or damage river banks
- they can breed fast when conditions are good
- colours blend in with their environment – greys in woodland, reds in desert.

Ask 'Can anyone name other native animals of Australia?'

Show slide 3 (Murray crayfish)

Explain that some native animals or plants are much fussier – they can only survive in a very small area or with certain things in their environment. This Murray crayfish (slide) lives in these cool mountain streams. They can't live in the ocean, and they don't like it when the water is dirty, salty or too hot!

Show slide 4 (Corroboree frog)

Explain: the corroboree frog lives only in the Alpine zone – in Kosciusko National Park, NSW and ACT. It eats only small bugs – particularly small black ants.

It needs wetlands (like most frogs), but this species evolved when the climate was much cooler than it is now. Its habitat (the area where it can live) has shrunk as climate has warmed, so now it's critically endangered.

Ask 'Can you think of other native animals that require specific environments?'

Show slide 5 (mind map)

Activity: Mind map (pre-testing)

1. Have a think about native animals in Australia and the things they need to live a healthy, happy life.
2. In a group (pairs or table) talk about the native animals and the things they need.
3. In the centre of your paper write **Native animals need** in a box (like on the PowerPoint).
4. For your native animal list the things you think it needs in a mind map (like the PowerPoint).
5. Each group shares one example with the class.

(This could be repeated to expand the list).

Show and discuss next slide (6)

Ask: What do we think these things might need? (Clockwise from top left):

If required, prompt:

- *Koalas: eat only certain gum trees, so specific to where those are found. Mostly along the east coast (humid areas) of Qld, NSW and Victoria. But don't need to drink much water.*
- *River red gums: need LOTS of water - need to be flooded every few years to survive*
- *Ibis: need wetlands – reeds for nests, waterbugs and frogs etc. for food*
- *Australian fur seal – salty water, fish to eat, rocks and ledges to rest on, don't like heat (live in Bass Strait and south Tasmania)*
- *Thorny devil: only eats ants and likes heat/dry (doesn't sweat/ doesn't lose water, adapted to the desert).*

Alien species

Explain that in Australia, we also have many animals and plants that are not native. These have been 'introduced' here (brought from somewhere else). They are also called alien species, because they come from another place.

Activity: Alien animals and plants

1. Show slide 7. As a class, brainstorm (and put on the board) all the alien plants and animals that we know of.

NB: correct suggestions for animals might be: horses, cows, sheep, goats, pigs, domestic dogs and cats, rabbits, foxes, cane toads, rats, mice, starlings, myna birds, black birds, fire ants, European wasps, goldfish, carp, camels, buffalo). For plants, there are thousands and students unlikely to be aware, but the worst aliens are rubber vine, a few grasses and many water weeds. Students may have heard of prickly pear, pampas grass or willows as being pests.

2. **Explain** that some alien species were brought here on purpose. Many introduced species are good for humans – we eat them and sell them; or they may be used for medicines or making clothes. But others made their home here and spread without our help. These are usually things that grow fast, breed quickly, don't have specific needs, or are stronger than our native ones that try to live in the same place.
3. **Show slide 8** and explain that students should complete the table individually (pre-testing 2) by drawing it in their workbooks or on a piece of paper (or using computerised tool).
4. **Explain** that alien species may take the homes or food of the native species. Without homes, native animals can more easily get eaten. Good examples of alien species who prey on native ones are foxes and domestic cats, which kill millions of native mice, lizards, birds, possums, etc. every year.

NB. It might be argued that rabbits can be food, or their fur used for hats or coats. This is true, but at the present time such use does not outweigh the negative effects of rabbit competition with stock or damage caused to other plants and soil. For the purposes of the learning in this lesson, an 'average' response is given.

Correct responses would be only sheep and cats are good for people; all are harmful to wildlife.

Discuss 'Why do you think alien species can be so harmful to wildlife? (Student predictions)

Show slide 9

Explain Take our shy little bilbies in their burrows for example. Imagine this many rabbits moving in so quickly. Rabbits don't just eat the same foods as native bilbies, they also take over burrows, leaving bilbies exposed to attack by foxes, cats (and also snakes and birds of prey).

Ask 'How do you think alien species come to Australia?'

Explain European settlers brought some animals they knew and were used to farming (like sheep, goats, pigs and even salmon and carp, which were put into rivers so people could fish). Some because they wanted as companions or work animals (like cats, dogs and horses). But some were introduced accidentally, i.e. rats and mice came to Australia from England with Captain Cook and the First Fleet (by boarding the ships themselves!)

Remember, some alien species are designed for invasion – they are good at hitching rides, breeding quickly and taking over; even some plants. Alien plants may spread and make it hard for native ones to reach food or light, so they get 'out competed' and die out.

Today we are going to learn about a specific alien plant, an unwelcome visitor called *Egeria densa.* First let's look at the lake it moved to.

Lake Mulwala history

Show slide 10

Explain that Lake Mulwala is located between New South Wales and Victoria. It is a man-made lake, formed in 1930. Before its creation the area had lots of sand hills and for thousands of years was home to an aboriginal group called the Pangerang Tribe. The Pangerang were part of the Yorta Yorta nation – the Yorta Yorta are still the traditional owners of the land and use the area to this day.

Now the lake is a popular place for people to come on holidays and many businesses provide services to tourists and local people. Water stored in the lake can be released into the river for use by farmers nearby, especially in summer.

Egeria densa

Show slide 11

Explain that *Egeria densa* is not native to Lake Mulwala but is now found in the lake. It was introduced into Australia from Brazil.

Show the Atlas of Living Australia page for this species (http://www.ala.org.au which shows where it has been reported. Go to species by location and enter 'Egeria densa'.

Explain that it is a typical alien invader. *Egeria* grows quickly, up to 3–4 metres in length. And it is very tough – even if it is chopped up into bits, it will keep growing, as new plants.

Ask 'How do you think it got into Lake Mulwala?' (student prediction).

Show slide 12

Explain *Egeria* was once a common plant in aquariums and it is likely that people emptied out their aquariums into the lake, not realising the harm it could do. Sometimes people who don't want their pets anymore release them into the wild. But once pets are introduced into a new environment they can do real damage to native plants and animals. Check out these goldfish released into the wild!!!

In Lake Mulwala, *Egeria* can choke out native plants which are important food sources for fish. It threatens native plants in two ways:

- by forming a thick mat on the surface of the water which prevents light that other plants need from reaching the water below
- by taking the food native plants need.

Egeria also affects people, as it tangles up boats and fishing lines.

So, the people at Lake Mulwala had a big problem: how to manage the weed and make the lake healthy again.

What do you think they could do? **Discuss** at your table and come up with some ideas.

Scientific solution

Show slide 13

Explain that scientists know that *Egeria* doesn't like being out of the water – if it dries out it dies. So they knew that if they let enough water out of the lake the weed would die.

Ask 'Do you think letting all the water out of the lake is a good idea? Who might not be happy if there is no water in the lake?'

Discuss:

- water in the lake is important for native fish
- farmers rely on the water stored in the lake to grow plants in summer when it doesn't rain
- people won't be able to do much fishing, swimming, boating or water skiing.

Explain 'The scientists had a good idea: if they just enough water out in winter (when farmers don't need it, and not as many tourists are visiting) then lots of the *Egeria* would dry out and be killed by the cold. Then when they fill the lake again only a small amount of *Egeria* survives and the native plants have enough space, light and nutrients to grow. We will never completely kill off this unwelcome visitor in this way, but it is a compromise. Using this method, the water doesn't need to be drained every year, just whenever the weed is taking over too much.'

Demonstrate app using the augmented reality marker

Explain 'This app gives you a chance to see how it works. You become the manager of the water in Lake Mulwala. You control how much is let out of the lake. Remember, it is important to make sure there is enough water in summer for everyone who uses the lake; and also important to make sure enough weed is killed.

Read the instructions on the Intro screen before you play.

Hand out the game marker (with worksheet on the reverse).

Complete worksheet on the back of the augmented reality marker

Worksheets and mind maps collected for assessment.

> *Answers: 1. Kangaroo, Emu, Koala. 2. Introduced by humans. 3. An alien plant. 4. A and C. 5. Farmers rely on the water AND tourists help local business. 6. Lowering the lake in winter. 7. Because cold/frost help kill the weed, AND because the water is needed in summer. 8. Various (because they compete with (are stronger than) native ones, because they spread easily, because they don't belong here, or because they cause problems for people etc. 9. A. true; B. False; C. True; D. False; E. True.*

Going deeper

Further information is available to explain the process of releasing and refilling Lake Mulwala. The work is done by Goulburn-Murray Water (GMW) and the Murray–Darling Basin Authority (MDBA).

Goulburn-Murray Water: http://www.g-mwater.com.au/water-resources/catchments/storages/murray/yarrawongaweir

MDBA: puts out media releases to notify of Lake Mulwala lowering (see our media centre on our website www.mdba.gov.au).

Extension/excursion

If you are situated near a water body that contains Egeria, you could visit it. Photos of the weed (and location data) can be uploaded to the Atlas of Living Australia, by creating an account.