

Managing Grassland Ecosystems: Teacher Notes



Elsbeth Swan ©

Activity 1

Managing grassland ecosystems – Aboriginal land use

Objectives

After completing this activity, students will be able to:

- Identify factors contributing to the degradation of grasslands and suggest management strategies.
- Recognise the historical development of Australian land practices.

Target audience

Level 4

Duration

Two 50-minute sessions

Materials

- Whiteboard and whiteboard markers
- Teacher's computer connected to an overhead projector, access to Google Earth, electronic images of grasslands across Victoria (Current Victorian grasslands and Pre 1750 Victorian grasslands) and the Ecolinc BWVP Flora and Fauna Field Guide
- Class set of computers: access to the BWVP Managing Grasslands online learning object, the PowerPoint 'Aboriginal grassland uses' and the BWVP Flora and Fauna Field Guide
- Student workbook
- Pencil

Activity

Victoria was settled in 1835 and Europeans quickly exploited grasslands. Today, less than one per cent of the original grasslands remain in small remnant patches. Since European settlement, grasslands have been managed in different ways, which has changed the landscape. The following is a list of threats to grasslands:

- Introduction of exotic plant species: Introduced species compete with native species and may also change the physical and chemical structure of grasslands.
- Introduction of feral pests: Many pests have been introduced, including the Red Fox and the domestic cat which prey on or compete with native fauna. This has resulted in the extinction of several species. Others like the European Rabbit and Common Hare compete with native species for food and cause damage to the landscape.
- Over-grazing by stock: The soil is compacted by hard-hoofed stock, palatable grassland species are depleted and grazing tolerant species are prolific.
- Fertiliser application: Fertilisers increase soil nutrients and can be applied to pasture species to encourage growth. Most native species compete best under low nutrient levels and are usually out-competed when fertiliser is applied.
- Rock removal and ploughing: Recent technologies are enabling farmers to access farming land that was once deemed too rocky. When the soil and rock layer is disturbed, this destroys and removes fauna habitat, disturbs soil invertebrate communities and removes most of the native vegetation.

- **Urbanisation:** The expansion of urbanisation onto rural land has resulted in the loss of native grasslands.
- **Changed water use:** Dams and weirs have been constructed along waterways. These structures deprive wetlands and streams of their natural flows, which affects the movements of aquatic species.
- **Altered fire regimes:** The frequency of fire has reduced since European settlement. Frequent use of fire by Aboriginal people maintained high diversity of species and controlled the regeneration of some woody species.

The key to managing grasslands is to identify the threats to grasslands and protect grassland sites through the development of management strategies. The following activities allow students to learn how to return a degraded grassland site to a high quality grassland, and how Aboriginal people managed grasslands in a sustainable manner.

Introduction

Begin this lesson by engaging students in a brainstorming session about the threats to grasslands and how to manage them. Explain that grasslands were once very common across western Victoria, from Melbourne to the South Australian border. Since European settlement, grasslands have been managed in different ways, which has resulted in only small patches of grasslands remaining. Discuss how land management has changed since European settlement and how grasslands can be improved. Prompt students to consider farming practices and how they have changed the landscape. Reintroduce terms such as flora, fauna and introduced animal and plants. Consider these prompts to keep the discussion lively and record the results on the board (answers have been provided).

What is flora and fauna?

Flora refers to plants and fauna refers to animals.

What does the word indigenous mean?

Indigenous means originating or occurring naturally in an area or environment.

List native plants and animals that live in grasslands.

Ground covers, herbs, grasses, shrubs and a few trees are common in grasslands. The animals that live in grasslands include reptiles such as lizards, amphibians such as frogs, mammals such as bandicoots, birds such as cockatoos and invertebrates such as spiders. For a list of plants and animals found in grasslands of the Western Volcanic Plains, look at the BWVP Flora and Fauna Field Guide.

What is an introduced species?

An introduced species is also known as exotic, non-native or non-indigenous. It is a species living outside its native distribution range.

Show students the images displaying the extent of grasslands throughout Victoria, pre European settlement (1750) and recently (2010). Ask students to explain the differences in the images.

In the 1750 image the natural temperate grassland (shaded yellow) is dominant throughout the Western Volcanic Plains. The current extent (2010) of natural temperate grasslands is virtually extinct. Only 0.1% remains.

What has caused the decline in grasslands over the last 260 years?

The First Fleet arrived in Sydney in 1788 from England. The aim was to establish the first British Colony in Australia. When British people colonised Australia they used land practices they were familiar with; the land was cleared for development and exotic plants and animals were introduced. Aboriginal people used the land in a sustainable manner, therefore the new land practices placed a strain on ecosystems. The following are a list of threats to grasslands, which have caused a decline in distribution: introduced species, introduced pests, over-grazing by stock, fertiliser application, rock removal and ploughing, urbanisation, changed water use and altered fire regimes.

Ask students to complete question 1 in their workbook.

Activity 1: Grassland management

Appropriate management strategies are needed to improve degraded grassland sites. This activity enables students to answer the following questions: How can grasslands be managed? What can be done to improve grasslands?

Firstly, students need to explore the meaning of management? Pose the question to students and write their answers on the board. Write the following grassland threats on the board and ask students to consider possible management strategies to improve a grassland site.

Grassland management involves undertaking activities that preserve and improve a grassland site. This includes activities that manage the land, plants and animals.

Introduction of exotic plants: Weed cover can be variable depending on the time of year, climate, disturbance history and site conditions, and weeds may require all year round attention. Weeds should be strategically removed prior to flowering.

Introduction of feral animals: Eradicate all feral animals.

Over-grazing by stock: Prevent trampling and excessive grazing pressure.

Fertiliser application: Promote native grasslands, which will save applying fertiliser. When fertiliser use is required, ensure it is not used in or near native grasslands.

Rock removal or ploughing: Avoid activities that result in removing rocks or disturbing the soil.

Urbanisation: Avoid activities that result in excessive soil disturbance or plant removal.

Changed water use: Avoid altering the natural flow of waterways.

Lack of fire: Get advice from your local Department of Environment and Primary Industries (DEPI) to develop an appropriate fire regime for your property. Ensure that any controlled burning is appropriately managed.

Ask students to complete question 2 in their workbook.

Secondly, students will explore their school and consider what management strategies could be implemented to improve their school landscape. Go to Google Earth (www.earth.google.com) and search for your school's location. Project this image on an overhead projector for students to examine. Pose the following questions: Can you see vegetated areas or cleared areas? Can you see bitumen or concrete? Are there any watercourses nearby? Where are there areas that provide habitat for animals such as birds, reptiles, amphibians and insects? Are there wildlife corridors that link your school to existing habitat nearby such as parklands, wetlands or rivers? How could your school area be improved e.g. replanting of native species and fencing off areas?

Managing grassland ecosystems online learning object

Thirdly, students will simulate the implementation of grassland management strategies by completing an interactive online learning object. The aim of this activity is to return a grassland site, which has become degraded yet still contains some indigenous grassland plants and possibly fauna, to a high quality grassland suitable for the reintroduction of populations of animals.

Open the BWVP Managing Grassland Ecosystems learning object and follow the instructions to complete the activity. Students will record their results and answer questions 3-10.

Activity 2: Aboriginal land use

The aim of the second activity is to investigate how Aboriginal people used grasslands.

The Australian Indigenous people are the oldest living culture in the world. Aboriginal people are believed to have occupied Australia for at least 50,000 years, however some people argue closer to 65,000 years. One of the reasons Aboriginal cultures have survived for so long is their ability to adapt and change over time. It was this amazing ability to use and read their surroundings that enabled Aboriginal people to survive for so many millennia.

The Victorian Basalt Plains grasslands were inhabited, used and managed by seven Aboriginal groups prior to European settlement. The Giraiwurrung, Dhauwurdwurrung and Djabwurrung were in the west, the Djargurdwurrung and Gulidjan around Lake Corangamite and the Wathawurrung and Woiwurrung in the eastern part of the plains.

Explore Aboriginal sustainable land practices with your students by posing the following questions.

What animal foods did Aboriginal people consume?

Animals eaten included kangaroos, possums, ducks, snakes, goannas, lobsters, shellfish, witchetty grubs, crabs, tortoises and seals.

What plant foods did Aboriginal people consume?

Plant foods eaten included wild fruit, nuts, berries, edible leaves and plant roots.

How were animals and plants not over-exploited?

Animals were not over-exploited as the young of any animal, or any female animals caring for their young were rarely killed. When collecting eggs from a bird's nest some were always left to hatch. Plants were not over-exploited as enough seeds were left so that there was always new growth.

What methods were used to capture the following animals?**Birds?**

Birds were captured using nets, placing sticky sap on branches so birds could not fly away, using seeds to attract birds, using snares, swimming underwater and grabbing swimming water birds by the legs.

Fish?

Fish were captured using nets, shell hooks, bark-string lines or spears, poisonous plants were soaked in waterholes to kill fish so that they could be collected.

Students will explore Aboriginal grassland uses by reading the PowerPoint and answering questions 11-17. Aboriginal people used plants in a variety of ways and these plants have been listed in the PowerPoint. If students wish to learn more about these plants they can explore them in the BWVP Flora and Fauna Field Guide.

Aboriginal farming

Very little plant propagation took place, though some groups did collect and scatter seeds of useful plants whilst others replanted edible yams (an underground starchy edible storage organ, available all year round).

Plains Yam Daisy (look this up in the BWVP Flora and Fauna Field Guide for a photo to show students), also known as murnong, was an important staple food. Women dug for murnong with their digging sticks, made from wattle wood, collected them in a bowl made of eucalypt bark and ate them raw or roasted in baskets in an earth oven overnight. When raw they tasted crisp and bland, so they were mostly cooked.

When cooked in this way they produce a sweet syrup, which makes them very tasty. Digging for roots was a great way of increasing plant production. The soil was turned over and aerated, root clumps were thinned out, and broken root pieces were put back into the holes to ensure propagation of further plants.

To enable students to explore the use of murnong by Aboriginal people pose the following questions.

What root vegetables do you eat?

Root vegetables students eat could include carrots, potatoes, sweet potato, swede and parsnip.

Murnong was a staple of the Aboriginal people's diet. What does a staple mean?

A staple food is eaten routinely, in large quantities, and supplies a large fraction of energy needs.

Murnong were once abundant across the Western Plains, but are now only found in small isolated locations. Why have they disappeared?

The introduction of sheep caused the decline in distribution as these hard-hoofed animals compacted the soil, which prevented their regrowth. Also, sheep were known to dig up and eat the whole tuber.

To demonstrate to students how Aboriginal women propagated murnong undertake a practical activity with a potato. To show that a plant can grow from a partial tuber it is recommended that the potato be cut into smaller sections, just like the Aboriginal women would have done.

Potato Propagation Practical

Materials

- A potato that is starting to sprout new growth from its 'eyes' – which will be cut it into smaller sections (make sure each section has at least one 'eye')
- A glass/beaker full of water
- 4 toothpicks
- Diary

Procedure

1. Cut a potato into small sections (two, three or four). Ensure that there is at least one 'eye' in each section.
2. Choose one of the sections and stick toothpicks into the potato section about two thirds up from the end that has the most sprouts. Space the toothpicks evenly around the section.

3. Place the sprouted end of the potato section into the glass/beaker. The toothpicks will rest on the rim and support the potato in the water. Make sure the 'eye' of the potato section is submerged.
4. Put the glass/beaker on a warm and sunny windowsill. Make sure the glass stays full of water.
5. After a few weeks the potato should grow roots into the glass/beaker. Soon after, the top should break open and the shoot of a new potato plant should emerge.
6. Leave the plants in the glass/beaker until it sprouts its first leaves. At this point if you wish to keep growing the plant you should transplant it to a pot with potting mix. Make sure you remove the toothpicks and transfer the plant carefully so you do not damage the roots.
7. Place the newly potted potato back on the warm and sunny windowsill. Water when the soil feels dry.

Each day ask students to make observations on the growth of the potato. Students should record their results, draw labelled drawings, and measure the length of the sprouts and roots.

Conclusion

Conclude the session by engaging students in a brainstorming session about management of grasslands. Here are some examples to keep the discussion lively.

How have grasslands been threatened?

What has caused the decline in the size of the distribution of grasslands in Victoria?

How can grasslands be managed?

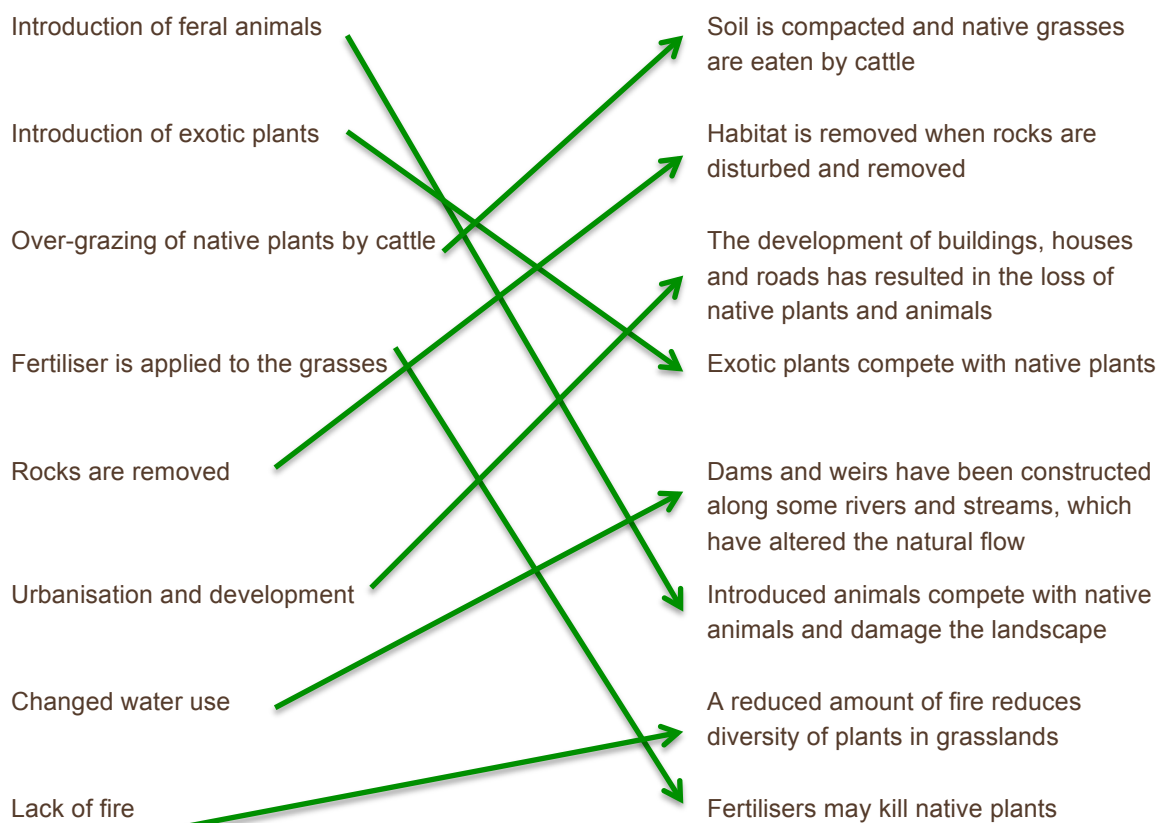
What can we learn from Aboriginal people about looking after grasslands?

Students should then complete the conclusion questions in their workbook.

Managing grassland ecosystems

Prior to European settlement grasslands extended over the Western Volcanic Plains in Victoria. Grasslands across the Western Volcanic Plains are now listed as Critically Endangered.

1. On the left is a list of threats to grasslands. Find and match the threat with the negative impact on the environment.



2. List two ways grasslands can be managed.

- i. Student answers will vary
- ii. Student answers will vary

Follow the instructions and complete the online Managing Grassland Ecosystems activity. This activity simulates how to manage a degraded grassland site.

3. Once you have completed the activity, list your suggestions for managing the site.

- i. **Weed Management:** (Best response) Strategic weed removal prior to plants flowering.
- ii. **Site Access:** (Best response) Construct a predator-proof exclusion fence, which is actively monitored and maintained.
- iii. **Feral Animal Management:** (Best response) Eradicate all feral animals including foxes, feral cats, rabbits and European Hares.
- iv. **Vegetation Restoration:** (Best response) Prepare the site and then directly sow indigenous seeds, plant tube stock or subterranean plant organs.
- v. **Fauna Reintroductions:** (Best response) Reintroduce indigenous fauna species with active monitoring.

4. What was your overall assessment?

Student responses will vary.

5. Why are weeds a problem in grasslands?

Weeds often produce a large number of seeds. This means that many new weeds can be created. Weeds also compete with native plants using soil moisture and space where native plants could otherwise grow. If there are fewer native plants there is less food and shelter for native animals.

6. Why is a predator-proof fence so effective?

A predator-proof fence is one that is specifically designed to exclude animals such as foxes, feral cats and dogs.

7. Circle the feral animals from the following list:

Foxes	Rabbits	Bandicoots	Hares
Kangaroos	Feral cats	Feral dogs	Cockatoos

8. What impact do feral animals have on grasslands?

Feral animals compete with native animals for food and shelter. They can affect which native plants grow in a grassland.

9. Why is it important to manage weeds, grazing and vehicles when reintroducing native plants?

If weeds, grazing and vehicles are not managed well at the site, the reintroduced plants will be overgrown by weeds, eaten, trampled or crushed.

10. Why is it important to reintroduce native animals last?

Before a native species is reintroduced to a site, the site needs to be safe and have suitable habitat for that species.

Aboriginal land use

Aboriginal people have lived on this land for thousands of years. You will explore how they lived here successfully for so many years. Read the information found in the PowerPoint 'Aboriginal land uses' and answer the following questions.

11. Aboriginal people sourced all their clothes, food and tools from the land. True or False.

True.

12. What were the roles of Aboriginal men, women and children?

Men hunted and women and children collected vegetables for instance leaves and tubers.

13. What was the most common food source?

Grasses.

14. Grasses were used to make flour, for binding and basket weaving. Suggest the objects that could have been carried from camp to camp in baskets?

There are no right or wrong answers. Students should think about carrying tools, equipment, utensils, etc.

15. Manna Gum (*Eucalyptus viminalis*) was used for making tools and medicines. How did Aboriginal people use the wood and bark?

Aboriginal people used the wood from the Manna Gum to make weapons and shields.

16. Golden Wattle (*Acacia pycnantha*) was used for making string from the bark. How might Aboriginal people have removed the bark without harming the tree?

Students should consider what tools were available (sharp stones, cutting implements) which could have been used to cut off some bark and not ring-bark the tree.

- 17. How would you have survived in Australia 1000 years ago? What are the basic things you would have needed?**

Students should consider the basic needs of survival, such as water, food and shelter.

Conclusion

- 18. When managing a grassland ecosystem what needs to occur to ensure the successful reintroduction of native animals to the site?**

To ensure the reintroduction of native animals to a degraded site the following must occur: weeds must be removed; a predator proof exclusion fence must be installed; eradication of feral animals must occur; and indigenous seeds or plants should be sown and planted.

- 19. What is one thing we can learn from Aboriginal people about managing grasslands?**

Student answers will vary. Responses could include: use resources in a sustainable manner – do not pick every leaf from one tree, leave some tubers for next time or only hunt the amount that can be consumed (do not waste).

- 20. Explain how Aboriginal people were able to live off the land for thousands of years without damaging the environment.**

Aboriginal people used resources in such a way that they were renewed and not exhausted. This is possible because they have an excellent knowledge of the area, including the plants and animals found there and a deep understanding of seasonal changes that affect land use.