Managing Grassland Ecosystems: Teacher Notes

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Activity 1

Managing grassland ecosystems – Aboriginal use of fire

Objectives

After completing this activity, students will be able to:
- Identify factors contributing to the degradation of grasslands and suggest management strategies.
- Understand how scientific knowledge is used to inform community decisions regarding the use of fire.

Target audience

Level 5

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 BWVP Flora and Fauna Field Guide

- Class set of computers: access to the BWVP Managing Grassland Ecosystems learning object and the BWVP Flora and Fauna Field Guide

- Student workbook

- Pencil

Activity

Victoria was settled in 1835 and Europeans quickly exploited grasslands. Today, less then 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 the 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 differently 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 the Western Volcanic Plains grasslands, 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 extant 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 required 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 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 on the property, 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 learning object

Thirdly, students will simulate the implementation of grassland management strategies by completing the BWVP Managing Grasslands online learning object. The aim of this learning object 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 3-11.

Activity 2: Aboriginal use of fire

The aim of the second activity is to investigate how Aboriginal people used fire in 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 65,00 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.

Fossil evidence suggests that fire was a part of the Australian landscape long before the existence of humans. Natural fires were caused by lightening, occasional volcanic activity or spontaneous combustion and probably became more frequent as the continent became drier. Fires appeared with the arrival of humans over 50,000 years ago. The frequency of fires may have increased. Aboriginal people used fire for a variety of purposes such as hunting, warmth, cooking, to encourage growth of grasses and to increase

the abundance of plant foods and animals. With the arrival of Europeans the fire regime changed. Fires are now less frequent, but when they do occur they are more intense and often cause a lot of damage.

Explore how Aboriginal people used fire with your students by posing the following questions.

Why is fire important for grassland plants?

Fire is used to regenerate plants, and to remove some pest plants.

Fire releases smoke, ash and heat. How do these help plants?

Smoke – stimulates flowering and regeneration of some species

Ash – chemicals in the ash stimulate new growth

Heat – opens tightly closed fruits to release the seed or penetrates into the soil to stimulate the germination of dormant seed.

How can fire help animals?

Animals rely on plants for food, shelter and breeding requirements, therefore the use of fire affects animals too. Fire is used to change an area so that the needs of animals are met (e.g. change the area to promote the growth of different types of vegetation).

Why did Aboriginal people use fire?

Fire was commonly used to promote the regrowth of valued plants and for cleaning up vegetation, making it easier to walk through the land and safer as snakes could be avoided. Fire has also been used to flush out animals, which can then be hunted for food.

Ask students to complete questions 12-16 in their workbook.

Conclusion

Conclude the session by engaging students in a brainstorming session about how to manage 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?

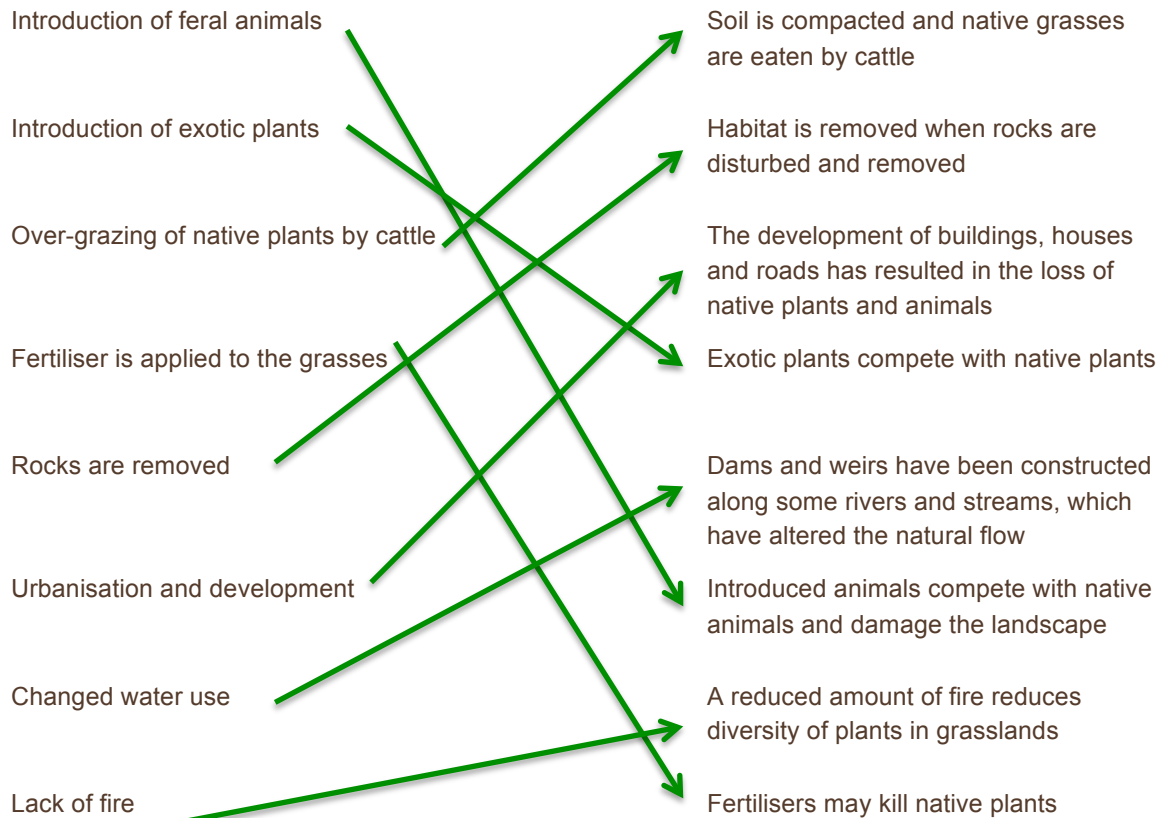What can we learn from Aboriginal people about managing grasslands?

How have Aboriginal people used fires to improve grasslands?

Students should 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.**

Threats	Negative impacts
Introduction of feral animals	Soil is compacted and native grasses are eaten by cattle
Introduction of exotic plants	Habitat is removed when rocks are disturbed and removed
Over-grazing of native plants by cattle	The development of buildings, houses and roads has resulted in the loss of native plants and animals
Fertiliser is applied to the grasses	Exotic plants compete with native plants
Rocks are removed	Dams and weirs have been constructed along some rivers and streams, which have altered the natural flow
Urbanisation and development	Introduced animals compete with native animals and damage the landscape
Changed water use	A reduced amount of fire reduces diversity of plants in grasslands
Lack of fire	Fertilisers may kill native plants

2. **List two ways grasslands can be managed.**

   i.   Student answers will vary

   ii. Student answers will vary

Follow the instructions and complete the BWVP Managing Grasslands learning object. 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, the reintroduced plants will be overgrown by weeds, eaten, trampled or crushed.

10. What is the best order in which to implement the following management strategies?

Weed management – weed removal	2
Site access – install predator-proof fence	1
Feral animal management – feral animal removal	3
Vegetation restoration – replanting	4
Fauna reintroductions – reintroduce native animals	5

11. 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 people and fire

12. Aboriginal people used fire for many reasons. List one.

Fire was commonly used to promote the regrowth of valued plants and for cleaning up vegetation, making it easier and safer to walk through the land as snakes could be avoided. Fire has also been used to flush out animals, which can then be hunted for food.

13. Many native plants benefit from fire. Use the BWVP Flora and Fauna Field Guide to investigate how the following plants benefit from fire.

Common name	Scientific name	How does fire benefit the plant?
Silver Banksia	*Banksia marginata*	High temperatures, such as bushfires, release the seed that is held in the follicles.
Common Onion Orchid	*Microtis unifolia*	Fires stimulate flowering often resulting in a massed display.
Blackwood	*Acacia melanoxylon*	Regrowth is from seed and root suckers.

14. After a fire there is a great opportunity for plant seeds to germinate and grow, as there is a greater amount of sunlight and reduced competition. Why?

Generally speaking, grasses, trees and shrubs would have been reduced in size after the fire therefore a greater amount of light hits the soil surface. There is less vegetation therefore reducing the amount of competition.

15. **How do the following animals survive a fire (look the animals up on the Ecolinc BWVP Flora and Fauna Field Guide). Do they fly away, flee, burrow?**

i.   Sulphur-crested Cockatoo: fly away

ii.   Echidna: burrow

iii.   Eastern Grey Kangaroo: flee

iv.   Grassland Earless Dragon: burrow

v.   Magpie: fly away

16. **Aboriginal people used fire to assist their hunting. How did they do this?**

Fire was used to flush out animals that could then be hunted.

Conclusion

17. **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 indigenous plants must be sown or planted.

18. **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).

19. **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.

20. **How did Aboriginal people use fire?**

Aboriginal people used fire to assist in the regrowth of plants and to clear vegetation. Fires were also used to assist with hunting.