

Managing Grassland Ecosystems: Teacher Notes



Elsbeth Swan ©

Activity 1

Managing grassland ecosystems – Golden Sun Moth

Objectives

After completing this activity, students will be able to:

- Identify factors contributing to the degradation of grasslands and suggest management strategies.
- Investigate how changing the physical conditions for animals impacts on their survival.

Target audience

Level 6

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 Managing grasslands computer program 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-footed 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 water ways. These structures deprive wetlands and streams of their natural flows, which affects the movements of aquatic species.
- **Altered fire regimes:** The frequency of fires 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 differently which has resulted in only small patches of grasslands remaining. Discuss how land management has changed since European settlement and how grasslands could 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 (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 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 knew; the land was cleared for developments and exotic plants and animals were introduced. Whereas Aboriginal people used to 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 could grasslands be managed? What can be done to improve grasslands?

Firstly, students need to explore what is 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 a grassland.

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 a parkland, wetland or river? 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 management strategies by completing an 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 3-16.

Activity 2: Study an endangered species – Golden Sun Moth

The aim of the second activity is to illustrate conservation in action, and shows how a range of agencies, groups and individuals are working together to conserve a threatened species. Students will study the Golden Sun Moth and discover how changes in the environment have impacted on their survival and resulted in the species becoming critically endangered. This activity shows how Action Plans and Recovery Teams help to provide an overview of the threats facing the Golden Sun Moth and the specific actions that need to be undertaken to conserve them.

Prior to studying the Golden Sun Moth, pose the following questions to the students.

What does endangered mean?

An organism that is endangered is at risk of being extinct.

Do you know of any endangered animals?

Students may talk about many plants and animals and may include non-Australian species including the Giant Panda, Red Wolf, Southern Bluefin Tuna and the Siberian Tiger.

What has caused these animals to be endangered?

There are many reasons why an animal becomes endangered. Some causes include habitat loss, pollution, competition from other organisms, over exploitation and the introduction of feral species.

List the organisations and groups that study and aim to conserve threatened organisms.

Organisations include the Department of Environment and Primary Industries (DEPI), Zoos Victoria, Parks Victoria, Mt Rothwell Biodiversity Interpretation Centre, universities, botanic gardens, local Councils, Friends groups, Landcare groups, landowners and individuals.

What is the Victorian legislation that aims to conserve threatened organisms?

The Flora and Fauna Guarantee Act 1988 provides a framework for the legal protection of Victoria's native species. The aim of the Act is to ensure that our native flora and fauna survive and flourish.

Explain to students that they will study the Golden Sun Moth. Students will open the BWVP Flora and Fauna Field Guide and find the Golden Sun Moth (*Synemon plana*) in the group Invertebrate - Insect – Moth. Students will complete questions 17-21 and investigate the habitat requirements, diet and the factors that have led the moth to becoming critically endangered. Students will go to the 'Conservation Status' tab and select the FFG Action Statement to explore what is being done to manage the species. You may like to have the Golden Sun Moth's page from the BWVP Flora and Fauna Field Guide on an overhead projector to show students where to find the information. Also, it might be useful to show students the FFG Action Statement and explain how to read it.

Conclusion

Conclude the session by engaging students in a brainstorming session about managing 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 does changing the physical conditions of grasslands impact on animals like the Golden Sun Moth?

What can be done to improve the numbers of the critically endangered Golden Sun Moth?

Students should then complete the conclusion questions in their workbook.

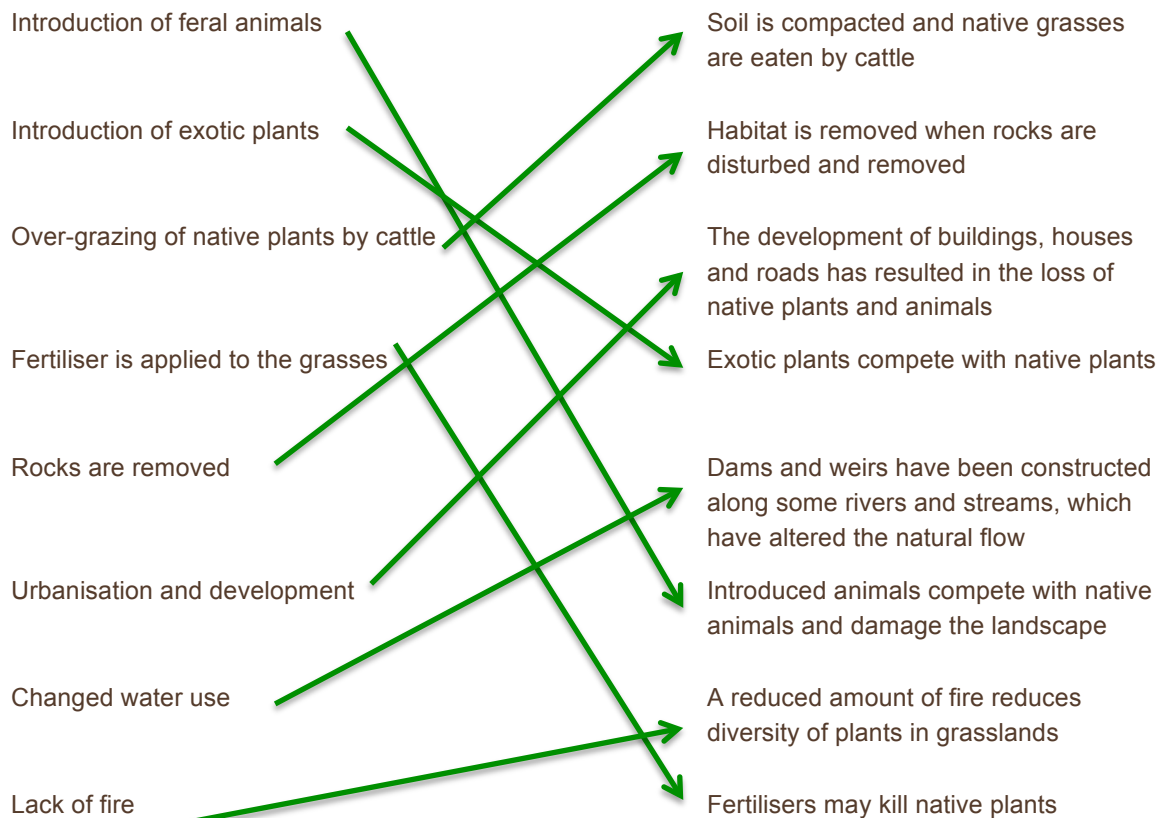
Managing grassland ecosystems

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. Grasslands are now fragmented, which means that grasslands are broken up into smaller remnants. What is the impact of fragmentation?**

When fragmentation occurs, the movement of plants and animals decreases and as a result biodiversity declines. These areas will become susceptible to reduced genetic diversity.

- 2. There were once a variety of herbivores and carnivores roaming the grasslands across the Western Volcanic Plains. Some of these animals are now extinct in the wild. Many factors have contributed to their decline in numbers and in some cases the extinction of a species. On the left is a list of threats to grasslands. Find and match the threat with the negative impact on the environment.**



3. List two ways grasslands can be managed.

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

4. Why are grassland ecosystems threatened?

Grasslands are generally found on flat land, which is suitable for settlement and agriculture.

5. How is an agricultural crop field different from a native grassland?

Agricultural crops usually contain a single plant species. In order to increase productivity, fertiliser and chemicals can be used. A native grassland is much more diverse. It has many species of plants and animals that interact with one another.

Follow the instructions and complete the BWVP Managing Grasslands online learning object. This activity simulates how to manage a degraded grassland site.

6. 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.

7. What was your overall assessment?

Student responses will vary.

8. 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 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.

9. 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, rabbits and dogs.

10. Circle the feral animals from the following list:

Foxes	Rabbits	Bandicoots	Hares
Kangaroos	Feral cats	Feral dogs	Cockatoos

11. 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.

12. 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 may be overgrown by weeds, eaten, trampled or crushed.

13. What is the best order in which to implement the 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

14. 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.

15. If land owners wanted to improve their grassland sites, would the cost of any management strategies deter them from implementing new management strategies? Explain.

The construction of a predator-proof fence is an extremely costly exercise and may not be feasible for most land owners. Fauna reintroductions and relocations are also extremely expensive, and success is not certain. The purchase of plants for revegetation and eradication of feral animals is also a costly exercise.

16. Which of the management strategies are the most accessible for land owners?

The strategic removal of weeds in a time consuming exercise however is a method most land owners could undertake.

Study an endangered animal

You will investigate an endangered animal. Open the BWVP Flora and Fauna Field Guide and find the Golden Sun Moth (Group: Invertebrate - Insect – Moth). Investigate the information found in the Field Guide and open the FFG Action Statement (click on ‘Conservation Status’ to find the link and look for clues as to why the organism is endangered). Complete the table below.

Common name	Golden Sun Moth		Scientific name	<i>Synemon plana</i>
Diet (circle answer)	Herbivore Carnivore The larvae feed on the roots of native grasses. The adult moths have no mouthparts and do not feed.	Characteristics	Medium sized day-flying moth with a wing span up to 34 cm. The upperside of the forewings of females is grey patterned; their hindwings are bright orange with black spots along the edges.	
Habitat (circle answers)	Native grasslands Grassy woodlands Open-shrub land Montane (mountainous country) Moist and dry forests Heathland			
Conservation status	DEPI Advisory List Not listed	FFG Act Listed as threatened	EPBC Act Critically endangered	
Reasons for conservation status (circle answers)	Habitat loss Introduced predators Weeds Habitat disturbance Habitat fragmentation Rubbish dumping Use of fertiliser Inappropriate planting of trees Native animal predation			
Management issues Habitat management	Protect and enhance habitat areas Weeds must be reduced Reduction in the use of fertiliser			

17. How has habitat loss caused the Golden Sun Moth to become critically endangered?

Agriculture and urbanisation have caused a loss of native vegetation. Native vegetation has been replaced with pasture plants that are not habitat for the Golden Sun Moth thereby reducing their numbers.

18. The Golden Sun Moth only lives in grasslands that contain certain types of tussock grasses. How is this a problem for the Golden Sun Moth?

The Golden Sun Moth has specific habitat requirements. This means that there is a greater chance for the population to reduce in size if the few tussock grasses are removed. There will consequently be no habitat available.

19. Is predation by introduced or native animals a threat for the Golden Sun Moth?

Predation by introduced or native animals is not the major threatening process for the Golden Sun Moth, however some introduced species may eat Golden Sun Moths.

20. What can be done to increase the population of the Golden Sun Moth?

Three things can be done to improve the habitat for the Golden Sun Moth. These are believed to increase the numbers of the moth. They are:

- i. Protect and enhance habitat areas of the tussock grasses
- ii. Removal of weeds
- iii. Reduced use of fertilisers.

Read the following passage:

A developer is requesting permission to purchase land for a new shopping centre development. The land is located on the outskirts of town in a native grassland area. The shopping centre would be constructed on land where the Golden Sun Moth population is threatened. The shopping centre will create jobs during the development stage and once in operation.

21. List the pros and cons: Should the developer be granted permission to go ahead with the project? Can you think of any alternatives or options that could be considered?

Students should list pros and cons for the argument.

Conclusion

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

To ensure the successful reintroduction of native animals to a degraded site the following must occur: weeds must be removed; a predator proof exclusion fence must be installed; an eradication of feral animals must occur; and sow indigenous seeds or plant tube stock.

- 23. Explain how adverse changes within the environment may affect organisms. Give one example referring to the Golden Sun Moth.**

Students should choose one of the threats of the Golden Sun Moth and explain the impact.