
INTRODUCTION

The Grassland Biome is found chiefly on the high central plateau of South Africa, and the inland areas of KwaZulu-Natal and the Eastern Cape, covering 349 174km². Frost, fire and grazing ensures that trees are absent, except in a few localized habitats. Grasslands serve as a water catchment (collection of rainwater, funneling it into rivers, cleaning the water in wetlands) and carbon sequestration mechanism (storing carbon that would otherwise be released into the atmosphere). The Grassland Biome are one of South Africa's most biodiverse biomes (only second to the fynbos in terms of plant biodiversity) with 3 370 plant species of which only one in six are grasses; the rest are forbs (bulb, and herb-like wild flowers). Birds also love this biome. Of South Africa's 856 bird species, 350 occur in the Grassland Biome, of which one is the Secretarybird.

Secretarybirds need open, intact habitat, preferably grassland with less than 20% tree cover, with plenty of prey (rodents, insects, reptiles and ground birds). The presence of predators such as Secretarybirds in an area means that other animals such as rodents, arthropods and reptiles, to name a few, are present and that is proof of a healthy ecosystem. Furthermore, Secretarybirds prefer intact and healthy ecosystems and rarely stay in changed landscapes. One exception to this is in the winter rainfall region of the Western Cape where studies show Secretarybirds to occur 50% of the time in transformed (wheat) areas. This is because the Secretarybirds require low vegetation to hunt and not bushy vegetation typical of fynbos. Similarly, the small amount of irrigated and cultivated land in the Karoo, may have increased the number and abundance of prey species and therefore have made this semi-arid region more liveable for the Secretarybird.

Secretarybirds are highly mobile and will leave an area when they do not find enough food resources. Research shows that Secretarybirds spend 96% of their time outside of protected areas, so it is vital for conservationists to get buy-in from private landowners to manage their properties in a way that supports these birds in the long-term. If a landowner manages a property to support Secretarybirds, it will ensure that the area remains suitable for other bird and mammal species, including cranes, bustards, korhaans, oribi, reptiles, African Grass Owls and rare and endangered larks.

Unfortunately, only 2.8% of the Grassland Biome is formally protected and 65% is already irreversibly transformed through the planting of maize, sunflowers, sorghum and wheat. Mining, industry and urban development have also destroyed large areas of intact grasslands. Livestock over-grazing and unnatural fire regimes (burning too often at the wrong time of year) also threaten the biome. However, grazing can benefit Secretarybirds and many other species, as grazing helps to keep grass short and stops grasslands from becoming moribund. Cattle now fulfil the role that antelope played before humans settled in the grasslands.

Collisions with fences and power lines are also an issue, with smaller threats including drowning in farm dams, collisions with motor vehicles and secondary poisoning after consumption of poisoned rodents or insects. Observational studies have observed severe declines in numbers of Secretarybirds across the region (>80% in some cases) during the past 30 years.

Conservation organisations and government departments are hard at work to find strategies to halt or reverse declines in Secretarybirds. To develop more protected areas is one solution, but private landowners also need to agree to manage land in an environmentally-friendly way (e.g. correct burning and grazing regimes and bird-friendly fences) to ensure that the habitat stays intact for species like Secretarybirds. The Important Bird and Biodiversity Areas and Key Biodiversity Areas (IBA) programmes have been used to highlight the plight of Secretarybirds, with some success. For example, a number of protected areas have now been declared in the Grasslands IBA and through talks to local organisations, such as farmer's unions, the threats to Secretarybirds and how they can be mitigated, have been highlighted.

VOCABULARY

Afforestation: the process of planting large numbers of trees on land which has few or no trees on it.

Atmosphere: the envelope of gas surrounding the planet.

Biodiversity: the existence of a wide variety of plant and animal species living in their natural environment.

Biome: distinct biological communities that have formed in response to a shared climate.

Bush Encroachment: expansion of bush at the expense of other plant species, especially grasses.

Carbon Sequestration: a natural or artificial process by which carbon dioxide is removed from the atmosphere and held in solid or liquid form.

Cultivation: preparing and using land for crops.

Ecosystem: a biological community of interacting organisms and their physical environment.

Environment: the natural world, as a whole or in a particular area.

Habitat: the natural home or environment of an animal, plant, or other organism.

Habitat Transformation: change in the local environmental conditions in which a particular organism lives.

Human Disturbance: threats from human activities that alter, destroy and disturb habitats for the species living in it.

Irrigation: to supply water to land or crops to help growth.

Industry: economic activity concerned with the processing of raw materials and manufacture of goods in factories.

Moribund grass: old grassland that is stagnant and no longer productive.

Mining: the process to obtaining minerals from the soil.

Overgrazing: excessive grazing which causes damage to grassland

Secondary Poisoning: the indirect poisoning of predators when they eat poisoned prey.

Threat: a thing likely to cause damage or danger.

Urban Development: development of land for housing and industry.

Water Catchment: an area where water is collected by the natural landscape

Wetlands: saturated land consisting of marshes and swamps.

AIM AND PURPOSE OF LESSON

The aim of this lesson plan is to introduce students to the value of the Grassland Biome and how the protection of the Secretarybird will indirectly benefit this biome and the species that share it. They will learn what the threats are to the Secretarybird and what the possible solutions are to reverse the decline of the Secretarybird numbers and, in so doing, the ecosystem it occupies.

DURATION OF LESSON

60 minutes

MATERIALS NEEDED

The teacher will need:

1. Lesson Plan 2 – Secretarybirds – Flagship species of the grassland
2. A computer with internet connection to view the suggested videos. It is recommended to download the video beforehand.
3. Video 1: *Terrestrial Biomes and Ecosystems | Biology*. Only watch from minute 3:24 to minute 4:28. <https://youtu.be/4kOSXIWsUtg>
4. Answer Sheet 1 - 3 in Appendix A
5. OPTIONAL – projector and sound system to watch the video.
6. Pictures examples of the seven different biomes (Forest, Savanna, Desert, Succulent Karoo, Nama Karoo, Fynbos, Thicket, Grassland).
7. Picture of a Secretarybird

The Students will need:

1. Questionnaires 1 – 3 in Appendix B
2. Factsheet 3: *Threats to Secretarybirds*
3. Factsheet 4: *Flagship species for the grassland*.
4. Pen and paper

OBJECTIVES AND OUTPUTS:

The students will:

- Discuss what they know of grasslands and Secretarybirds with the teachers and the rest of the class.
- Watch the one short video about the Grassland Biome.
- Discuss in groups what they've learned from the videos.
- OPTIONAL: complete questionnaires.
- Report back to the teacher in their assigned groups.
- Have a class discussion about how the protection of the Secretarybird will also benefit other species sharing its environment.
- Have a better understanding why grasslands are important to the protection of Secretarybirds and other species and what the threats are to the biome.

PROCEDURE

1. Begin by showing some different biomes (Forest, Savanna, Desert, Succulent Karoo, Nama Karoo, Fynbos, Thicket, Grassland). Ask them which one is the grassland biome. Ask them to name the other biomes.
2. Ask them to name the characteristics of the Grassland Biome (it is grass dominant with bulb and herb-like plants, very few trees, it is maintained by fire, frost and grazing animals). Mention that there are 3370 plant species of which only one in six are grasses; the rest are forbs (bulb, and herb-like wild flowers).
3. Ask them to name some animals that occur in this biome (brown hyena, civet, white rhino, oribi, grass snakes, leopard, sable, cheetah, pangolin, badger, striped weasel, aardwolf, mountain zebra). The list will grow quickly – mention that over 350 bird species are found in the grassland.
4. Show the students a photo of a Secretarybird and ask them if they know what kind of bird it is.
5. Explain that the Secretarybird is a flagship species of the grassland because it prefers grassland that is intact and if it lives in an ecosystem, it indicates a healthy ecosystem as it prefers natural habitat, unchanged by humans. Intact grasslands are also beneficial to other species (like the ones the class mentioned before).
6. [Duration 15 min] Divide the students into discussion groups of 4-6 students and hand out Factsheet 3 (Threats to Secretarybirds) and Factsheet 4 (Flagship species for the grassland). Allow them 15 minutes to read through the Factsheets and discuss it amongst themselves. Ask the students to focus on the following aspects:
 - a) Why are grasslands important?
 - b) How are grasslands maintained (why doesn't it get overgrown with trees)?
 - c) What are the threats to grasslands?
 - d) What animals occur in the grassland?
 - e) Why do Secretarybirds prefer grasslands?
 - f) What type of habitat do Secretarybirds prefer?
 - g) What are the main threats to Secretarybirds?
 - h) Do they think other species are also threatened by these threats?
7. [Duration 2 min] Set up the projector / TV / computer and watch Video 1: *Terrestrial Biomes and Ecosystems / Biology*. Only watch from minute 3:24 to minute 4:28.
8. Mention to the class that the video focuses on American grasslands, but that the basic idea is the same. As they watch, ask them to focus on the following, keeping in mind what they have learned from the Factsheets:
 - a. Try to remember facts they mention in this video.
 - b. What are the major characteristics of the Grassland Biome?
 - c. What are the threats to the Grassland Biome?
9. [Duration 5 min] In their groups, allow the students 5 minutes to discuss what they have learned and remembered from the video. Ask them to write what they remembered and discussed.
10. [Duration 15 min] Students will now have 5 minutes per group to report back in their groups to the class and the teacher of what they have learned from the video and Factsheets. They can use the notes they made during group discussions to help them remember what they have learned. Use Answer Sheet 1- 3 to guide the discussion. Alternatively, hand out Questionnaire 1- 3 and give them 15 minutes to answer the questions in their groups or individually.

11. [Duration 5 min] Lastly, allow the students to go back to their seats and end the lesson with a few questions to the whole class to help them think about the future:
- a. Are grasslands important and why?
 - b. Do they think other biomes should be conserved as well and why?
 - c. Would they prefer to see a Secretarybird in the wild or in a zoo?

APPENDIX A

QUESTIONNAIRE 1: TERRESTRIAL BIOMES AND ECOSYSTEMS | BIOLOGY

1. The video mentions the climate of the American grassland. The South African Grassland Biome has similar rainfall patterns. What are they? Choose the one incorrect answer.
 - a. Winter rainfall, dry summers.
 - b. Cold winters, hot summers.
 - c. Summer rainfall, dry winters.
2. True or False?

The grasslands are usually over run by trees which makes it hard for people to farm on it.
3. What caused the Bison to nearly go extinct?

QUESTIONNAIRE 2: FACTSHEET 3: THREATS TO SECRETARYBIRDS

1. What is the regional status of Secretarybirds?
 - a. Vulnerable
 - b. Near Threatened
 - c. Least Concerned
2. What type of habitat do Secretarybirds prefer?
3. How much of their time do Secretarybirds spend outside of protected areas?
 - a. 20%
 - b. 100%
 - c. 96%
4. Name 7 threats to Secretarybirds that will also threaten the grassland?

QUESTIONNAIRE 3: FACTSHEET 4: FLAGSHIP SPECIES FOR THE GRASSLAND

1. What are the three main factors that prevent bush encroachment in a grassland?
2. What threat do all the species mentioned in the Factsheet have in common? Choose the correct answer.
 - a. Poisoning
 - b. Habitat destruction/ loss
 - c. Competition with livestock

APPENDIX B

ANSWER SHEET 1: TERRESTRIAL BIOMES AND ECOSYSTEMS | BIOLOGY

1. The video mentions the climate of the American grassland. The South African Grassland Biome has similar rainfall patterns. What are they? Choose the one incorrect answer.
 - a. Winter rainfall, dry Summers. [False]
 - b. Cold winters, hot summers. [True]
 - c. Summer rainfall, dry Winters. [True]
2. True or False?

The grasslands are usually overrun by trees which makes it hard for people to farm on it. [False, there are very few trees. The soil is very fertile and usually ideal for agriculture].
3. What caused the Bison to nearly go extinct?

Agriculture caused habitat loss and endangered the biome itself. This displaced the Bison, leaving them nowhere to go.

ANSWER SHEET 2: FACTSHEET 3: THREATS TO SECRETARYBIRDS

1. What is the regional status of Secretarybirds?
 - a. Vulnerable [True]
 - b. Threatened [False]
 - c. Least Concerned [False]
2. What type of habitat do Secretarybirds prefer?

Open habitat, preferably grassland with less than 10% tree cover.
3. How much of their time do Secretarybirds spend outside of protected areas?
 - a. 20% [False]
 - b. 100% [False]
 - c. 96% [True]
4. Name 7 threats to Secretarybirds that will also threaten the grassland?

Agriculture, urban sprawl, carbon dioxide increase, fire suppression, old fields, afforestation, bad land practices.

ANSWER SHEET 3: FACTSHEET 4: FLAGSHIP SPECIES FOR THE GRASSLAND

1. What are the three main factors that prevent bush encroachment in a grassland?

Frost, fire and grazing.

2. What threat do all the species mentioned in the Factsheet have in common? Choose the correct answer.
- a. Poisoning [False]
 - b. Habitat destruction/ loss [True]
 - c. Competition with livestock [True]