

Learning Activity:

### **The Roles We Play**

Activity Type	/pe Role play and peer interaction		
Focus Area	Science		
Time Required	45–60 minutes		

### **Overview**

Ecosystems are networks with many moving parts. From bees and grass to soil and even humans, each member of the ecosystem plays a role in its health. As these parts work together, they not only support each other but also benefit the ecosystem as a whole by contributing to its biodiversity and strengthening the ecosystem and its ability to provide support (like food, habitat, and clean air and water). An ecosystem is strongest when the relationships between it and its moving parts are in balance. Unfortunately, as human development continues to spread, we are taking more than we are giving and tipping the balance. In this role-playing activity, participants will learn about the various components needed to maintain a healthy ecosystem, using the grasslands of the Northern Great Plains as an example. By seeing how each piece provides for and relies on these grasslands, learners will understand how losing ecosystems hurts all players.

## **Objective**

#### At the completion of the activity, students should be able to

- Understand the importance of grasslands and the benefits they provide
- Interpret the interdependent relationships between biotic and abiotic components of a grassland ecosystem
- Explain the need for an ecosystem to be balanced, with no one species taking more than it is giving or than can be replaced
- Develop ways to help grasslands and/or other local ecosystems



Bison in Badlands National Park, South Dakota. GRASSLANDS OF THE NORTHERN GREAT PLAINS LEARNING ACTIVITY | The Roles We Play | page 1 of 12



Subject and Standards

#### **Next Generation Science Standards**

- MS-ESS3-3 Earth and Human Activity
  - Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
- MS-LS2-4 Ecosystems: Interactions, Energy, and Dynamics
  - Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
- MS-ESS3-4 Earth and Human Activity
  - Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
- MS-LS2-5 Ecosystems: Interactions, Energy, and Dynamics
  - Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

### Materials Needed

- Role-playing assignments (included in this activity)
- Scissors
- Copies of The Roles We Play: Learner Handout (included in this activity)
- Copies of The Roles We Play: Learner Discussion (included in this activity, can be printed on the back of the learner handout)
- Markers
- Pencils
- Blank sticky name labels
- Grasslands of the Northern Great Plains: Educator's Resource Guide (for reference)



# Vocabulary

- Abiotic: not derived from living things
- Agriculture: the process of farming soil, producing crops, and raising livestock
- **Biodiversity:** all the different kinds of life you will find in one area, including animals, plants, fungi, bacteria, and genetic material
- **Biotic:** relating to or as a result of living things
- Climate change: a change in climate over time due to natural causes or human activity
- Ecosystem services: benefits obtained from ecosystems
- **Grassland:** a landscape that has too little rain for trees to grow in great numbers but instead has grass, grasslike plants, and shrubs that grow close to the soil
- **Habitat:** a natural environment in which plants and animals live, breed, and get their food, water, and shelter
- **Habitat loss:** the disappearance of natural environments (required for plants' and animals' survival) due to harvesting for human consumption and/or clearing to make way for agriculture, housing, roads, pipelines, and other forms of industrial development
- Interdependence: the reliance all living things have on each other in order to survive
- **Sustainable:** of, relating to, or being a method of harvesting or using a natural resource so that the resource is not depleted or permanently damaged; effective and innovative in efficiently using natural resources and ensuring their continued supply



Grasslands, South Dakota.

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GRASSLANDS of the Northern Great Plains

### **Activity Procedure**

#### **Part 1: Teacher Preparation**

• Prior to beginning the activity, print out the Role-Playing Assignments sheet and cut out each role description. You will assign each participant one role, so make sure to print multiple copies of the sheet depending on the number of participants. It is possible that there will be more than one participant with the same role.

#### **Part 2: Introduction**

- Begin by asking learners to think about who and what is part of their ecosystem. Remind learners that ecosystems include both biotic and abiotic factors. If necessary, review the vocabulary words associated with this activity, using the definitions provided.
- Create a chart on a display board with three columns: "Biotic member of the ecosystem," "What they take from the ecosystem," and "What they give back to the ecosystem." Invite participants to describe what living things exist within their ecosystem, what they rely on from the ecosystem to survive, and what they provide that keeps the ecosystem healthy and functioning. See examples below.

<b>Biotic</b> member of the ecosystem	What they <b>take from</b> the ecosystem	What they <b>give back</b> to the ecosystem
Neighbor	Habitat, air, water, food	Materials (by recycling)
Birds	Habitat, air, water, food	Plants (disperse seeds)
Trees	Water, sunlight, carbon dioxide	Oxygen, habitat, food

- Reflect on the ideas in the chart and challenge learners to identify the biotic and abiotic things mentioned. When reviewing the concept of interdependence, discuss how the living things (like wildlife and plants), in addition to relying on each other to survive, rely on support from the nonliving things, like soil and air. Each living and nonliving component plays a valuable role in keeping the ecosystem healthy and able to support biodiversity.
  - Why is it important to have the abiotic elements like soil, water, and air kept healthy, as well as the biotic elements? How do nonliving things affect living things?
  - What would happen if one member of the ecosystem, biotic or abiotic, weren't healthy enough to provide for the others?



• In this activity, learners will apply these concepts to grasslands like the Northern Great Plains. They will discover what is happening to this important ecosystem as the give-and-take relationships are becoming unbalanced. Prior to starting the activity, you can take some time to introduce learners to grasslands and the threats they are facing using the information in the *Grasslands of the Northern Great Plains: Educator's Resource Guide*.

#### Part 3: Activity

- Distribute one role-playing assignment, one The Roles We Play: Learner Handout sheet, and a blank name label to each learner. Participants will write down their role on the name label and stick the label to themselves. Allow several minutes for everyone to read over their role and memorize the information about their character. Tell learners that once the activity begins, they will represent the character that they are assigned by introducing themselves to classmates. They will describe threats they face, what they rely on, and what they contribute to the grasslands as outlined on their assignment slip.
- Have participants make their way around the room and interact with one another as their characters to learn more about the roles that are played across the grassland ecosystem and how they are affected by the destruction of grasslands. As they meet each other, they should fill out their chart, detailing what each biotic or abiotic character they meet provides, what they rely on, and what threats they are facing. Learners should speak about their character in first person, channeling the perspective of the character they are representing. Encourage learners to even try speaking as their character without reading straight from the description. Allow enough time for participants to engage with several of their peers.

#### Part 4: Discussion and Assessment

- Once everyone's charts are filled out, participants may return to their seats. First, allow learners to review their discussion question sheet individually or as table groups. Provide enough time for them to gather their thoughts and write down answers. After participants have completed their questions, have them reflect as a class on what they learned from their conversations. Discuss the answers they wrote down to the questions seen on The Roles We Play: Learner Discussion sheet:
  - What does it mean to be biotic?
  - What does it mean to be abiotic?
  - How would you describe a grassland?
  - What ecosystem services do grasslands provide?
  - Did you notice any trends (in what the roles rely on and provide, or in the threats they face)?





- What were all the threats that the different parts of the ecosystem face?
- Considering each role, do you feel the ecosystem is at a healthy balance? Why or why not?
- When a grassland ecosystem is unbalanced and weakened, who is impacted? Refer back to the start of the activity and the discussion about interdependence.
  - If one component of the ecosystem, such as pollinators, is being hurt, how could that in turn affect something like a bison?
  - Referring to all the threats that you listed, how did each of these threats damage the relationship between different components in the grassland ecosystem? Give at least one example from each threat listed.
  - Are humans impacted? If so, is it just people who live near grasslands? How might people far away be affected?
- Ecosystems like grasslands provide countless benefits and services to living things around the world. But in order to be able to provide these things, each member of the ecosystem (both living and nonliving) has to be healthy. One thing that can lead to a member becoming unhealthy is other members irresponsibly taking more from the ecosystem than they give back. What measures can be taken to improve the balance within grasslands?
- Our environment is interconnected, and the more we lose our grasslands, the more the world's other ecosystems are in danger. Ask learners how they can do their part within their own communities to restore grasslands or keep local ecosystems healthy. Suggestions can be found in the Grasslands of the Northern Great Plains: Educator's Resource Guide.



Dried earth at the Badlands National Park, South Dakota.

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of the Northern Great Plains

## Extended Learning Options

- Reach out to HHMI Tangled Bank Studios to hold a class screening of the film <u>My Garden of a</u> <u>Thousand Bees.</u>
- Use a tablet or smartphone (if available) to download the <u>WWF Together app</u>. Encourage learners to explore the Planet Earth or Monarch Butterfly segment and learn how to protect life on our planet.

GRASSLAND

- Create a pollinator garden with your class. Refer to WWF's <u>One Square Foot</u> to find out which wildflowers thrive in your area and plant a garden to support your local ecosystem.
- For another activity that focuses on grasslands, check out A Plan to Save Grasslands activity in Wild Classroom's *The Endangereds* Content Pack.
- For learners working individually, the roles do not have to be cut out and can be read all together. Alternatively, parents or guardians can also take the roles and spread them around the room for the learner to find.

# **Additional Resources**

You can use the information found at the following links to enhance your discussion with the class, or you may want to share some links directly with learners if you determine they are grade-level appropriate.

- Web feature: Exploring the Inner-workings of the Northern Great Plains—How agriculture has affected the health and wildlife of the Northern Great Plains
- Web feature: <u>Saving the Northern Great Plains</u>—How our past treatment of the grasslands reminds us why grasslands must be conserved

For more fun classroom activities with a focus on wild species and conservation, visit <u>wildclassroom.org</u>.

Educational materials developed in support of the <u>One Square Foot</u> Initiative and the PBS documentary <u>My Garden of a Thousand Bees</u> on PBS.



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### **Role-Playing Assignments**

**Plains bison** – I am a plains bison. There were once 30–60 million of my species roaming the plains, but our population declined massively as settlers spread westward across the plains of North America. We were dominant grazers in the grasslands, relying on thousands of acres of land for food and migration. We would provide shape to the landscape by eating grasses and other vegetation, which in turn supports biodiversity by helping animals like mountain plovers find nesting ground. Today, we face habitat loss from land conversion for agriculture and energy development. Luckily for us, there are several Native American nations and conservation organizations working hard to grow our numbers and bring us back to many of our old stomping grounds.

**Black-footed ferret** – I am a black-footed ferret. When our populations were healthy, we would provide prairie dog population control. Prairie dogs make up most of our diet, and we live in their burrows, so we rely on them to survive. Unfortunately, prairie dog populations have declined over the years due to human activities and non-native disease. Without prairie dogs, we don't have anything to eat. We're also losing our habitat as humans continue to plow up the grasslands for agriculture. For these reasons, my species is endangered and was once thought to have gone extinct!

**Pronghorn** – I am a pronghorn. We are the fastest mammals in North America and are able to run up to 60 mph. We provide control of grass growth and are a food source for predators such as coyotes. Year after year, our herds migrate hundreds of miles, relying on the same migration corridors. But these migrations have gotten more and more difficult. Migration pathways from the summer breeding grounds and winter grazing areas have become fragmented by roads, urbanization, and energy development. The damage to our migration routes threatens our survival and continues to threaten future generations.

**Greater sage-grouse** – I am a greater sage-grouse. We are icons of the prairie with our elaborate mating dances, and once were quite widespread across the Northern Great Plains. Today we inhabit only about half of our old range. We provide food for predators like hawks and foxes and are an indicator of a healthy ecosystem. We rely on a healthy sagebrush habitat to be able to effectively reproduce, but oil and gas development disrupts the landscape. Energy towers provide perches for predators while the loud sound the towers make disrupts our ability to call to mates. Conservation organizations are studying the impact climate change has on us, and hopefully they will help and protect our population.

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**American bumblebee** – I am an American bumblebee. Along with other pollinators, such as butterflies, beetles, wasps, and many more, we play a huge role in providing pollination for native plants that end up feeding herbivores like bison and pronghorn. We even pollinate many crops grown by humans. We rely on flowering plants for food. Unfortunately, our populations are declining across North America.

There is less suitable habitat due to urbanization, energy development, and ever-expanding agriculture. With more agriculture, you might think that we bees would have plenty of food, but in reality, most crops have short-lived growing seasons and some bee species even have completely different flower preferences.

**Monarch butterfly** – I am a monarch butterfly. We provide valuable pollination for native plants and crops grown by people. We rely on milkweed for our baby caterpillars to hatch and feed on until they become butterflies. But with increased use of herbicides with the expansion of agriculture and loss of habitat due to urbanization, milkweed has drastically decreased—about 90% of it has disappeared. This greatly threatens our ability to reproduce. Climate change also causes colder, wetter winters that threaten our ability to survive, and hotter, drier summers could push us farther north to find better habitat. By planting more native milkweed and conserving natural resources, you can help our species get some relief from these pressures.

**Wildflower** – I am a wildflower. Along with many of the other plants on the Great Plains, we are important for maintaining the health of grasslands by preventing soil runoff and filtering deep groundwater and air. We also provide food for herbivores such as bison, pronghorn, and important pollinators that we rely on to reproduce. As agriculture and human development expand, there is less and less area for us to grow and support the ecosystem. Climate change is also shifting our growing season, which changes food availability for pollinators.

**Cattle rancher** – I am a cattle rancher. Some families like mine have been ranching acres of these lands for more than 150 years to provide thousands of people with beef. Our cattle require lots of land with plenty of healthy grasses, and demand continues to grow. Having unhealthy grasslands threatens our ability to raise healthy livestock. Working with conservation and government organizations, we can help conserve grassland habitat to maintain biodiversity and keep the ecosystem healthy for future generations.

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Tribal leader – I am a tribal leader. Along with many other Native Americans, we are the original land stewards of the Northern Great Plains, and Native nations currently provide protection for about 9 million acres within the region. Much of the land is home to rich biodiversity, and many areas have seen great conservation success. We rely on the land for raising food and keeping our people healthy. Working with conservation organizations and other landowners can help us further achieve success in preserving and rehabilitating our grasslands while helping improve the lives of our communities.

**Townsperson** – I am a townsperson. While I may not live near grasslands, I rely on the Northern Great Plains for groceries like vegetables and meats, and for clean water. I also need the energy that is produced by the oil, gas, and coal that are harvested from the plains. As the human population increases, so does the demand for these resources. I help grasslands and my local ecosystem by using resources sustainably and providing food and shelter for my local pollinators by growing a pollinator garden. All the benefits I receive from the grasslands are threatened by its destruction, so it is important to protect them.

Fresh water - I am fresh water. I am essential for the existence of life here on the plains, providing water for plants and wildlife. I rely on the plains themselves to keep me clean for use by local organisms, big and small. The plants and the soil filter me as I soak deep into the earth to be stored for later use. I face several threats that end up putting the rest of the ecosystem in danger. The plowing of land for agriculture removes the plant roots and disturbs the soil that filters me. Agriculture expansion also increases the use of chemicals such as pesticides and fertilizers that can wash into local waterways and contaminate me.

Soil - I am the soil. I am a vital part of the Great Plains ecosystem because I store an enormous amount of carbon, water, and nutrients and provide a home for millions of organisms. The tiny organisms that live within me even help reduce the effects of climate change by regulating greenhouse gases. Even though I may not be living, I also face threats. As agriculture increases, the nutrients in soil get used up more quickly. Soil erosion is also something I face as more land is cleared for agriculture. I rely on healthy grasses to keep me intact, animals to control grass growth, and microorganisms to help produce nutrients so I can provide for the grassland ecosystem.

**Climate** – I am the climate. I provide seasons for growth and control the weather that produces rain for all ecosystems. I am increasingly threatened, as greenhouse gases are continuously being pumped into the atmosphere. Weather is predicted to get more irregular, with more extreme heat and cold, more rain and snow, and sudden and severe floods and droughts. I rely on healthy ecosystems to help reduce the effects of my changing. The people who manage the lands of the Great Plains will have to adapt the ways they create, evaluate, and implement their plans to use the land in order to face the challenges of a changing climate.

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## **The Roles We Play: Learner Handout**

Role	Biotic or Abiotic? (check one)	What does this role provide?	What does this role rely on?	What threatens this role?
Plains Bison	O Biotic O Abiotic			
Black-Footed Ferret	O Biotic O Abiotic			
Pronghorn	O Biotic O Abiotic			
Greater Sage-Grouse	O Biotic O Abiotic			
American Bumblebee	O Biotic O Abiotic			
Monarch Butterfly	O Biotic O Abiotic			
Wildflower	O Biotic O Abiotic			
Cattle Rancher	O Biotic O Abiotic			
Tribal Leader	O Biotic O Abiotic			
Townsperson	O Biotic O Abiotic			
Fresh Water	O Biotic O Abiotic			
Soil	O Biotic O Abiotic			
Climate	O Biotic O Abiotic			

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## **The Roles We Play: Learner Discussion**

- 1. What does it mean to be biotic? \_\_\_\_\_\_
- 2. What does it mean to be abiotic?
- 3. How would you describe a grassland? \_\_\_\_\_\_

4. What ecosystem services do grasslands provide? \_\_\_\_\_\_

5. Did you notice any trends in what the roles rely on and provide, or in the threats they face?

6. What are the threats the grasslands and their inhabitants face?

7. Considering each role, do you feel the ecosystem is at a healthy balance? Why or why not?

- 8. When a grassland ecosystem is unbalanced and weakened, who is impacted? Refer back to the start of the activity and the discussion about interdependence.
- 9. If one component of the ecosystem, such as pollinators, is being hurt, how could that in turn affect something like a bison? \_\_\_\_\_\_
- 10. Refer to all the threats that you listed in number 6. How did each of these threats damage the relationships among the different components of the grassland ecosystem? Give at least one example from each threat listed.
- 11. Are humans impacted? If so, is it just people who live near grasslands? How might people far away be affected?

12. What measures can be taken to improve the balance within grasslands? \_\_\_\_\_\_

13. What could you do within your own community to restore grasslands or keep local ecosystems healthy?

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