



AGRICULTURE & THE ENVIRONMENT

BIODIVERSITY



Science Grade 5: Outcomes

Conservation agriculture is a sustainable practice that responds to local climate and weather events.

Conservation agriculture practices are adapted to the requirements of plants and animals farmed.

Agricultural practices involve monitoring and responding to climate or weather.

Conservation agriculture practices include :

- *minimizing soil disturbance*
- *maintaining soil cover*
- *using water efficiently*
- *using sustainable harvesting practices*

Sustainable harvesting practices support the maintenance of stable plant or animal populations over time and include :

- *crop rotation*
- *companion planting*
- *limiting hunting and trapping*
- *considering future harvests*



Curriculum Connections



Science Grade 7: Outcomes

Unit A: Interactions and Ecosystems (Social and Environmental Emphasis)

Overview: Ecosystems develop and are maintained by natural processes and are affected by human action. To foster an understanding of ecosystems, this unit develops student awareness of ecosystem components and interactions, as well as natural cycles and processes of change. Building on this knowledge, students investigate human impacts and engage in studies that involve environmental monitoring and research. By reflecting on their findings, students become aware of the intended and unintended consequences of human activity, and recognize the need for responsible decision making and action.

Unit B: Plants for Food and Fibre (Science and Technology Emphasis)

Overview: Humans have always depended on plants as a source of food and fibre, and to meet a variety of other needs. To better meet these needs, technologies have been developed for selecting and breeding productive plant varieties and for maximizing their growth by modifying growing environments. Long-term sustainability requires an awareness of the practices humans use and an examination of the impacts of these practices on the larger environment.





BIODIVERSITY AND AGRICULTURE

What is Biodiversity?

Simply put, biodiversity is the variety of life in a particular area or habitat. Agricultural areas are packed with biodiversity!

According to Bill Freedman at Dalhousie University, biodiversity is the richness of biological variation. It is often considered to have three levels of organization: genetic variation within populations and species, numbers of species, and the variety and dynamics of ecological communities on larger scales, ie. landscapes.

This means that biodiversity not only is the number of different species (plants and animals) that are found in an area but it also refers to the difference within a species, between species and between ecosystems.

Ecosystems are a community of organisms that interact with each other in a certain area. From our entire world to a single droplet of water, you can find an ecosystem contained inside, alive and at work. A farm is an ecosystem. From large grazing animals like cattle to the microscopic bacteria that break down the organic matter in the soil, there are many types of plants and animals that can be found. This includes humans! People play a very important role, as they can change and influence biodiversity through their actions.

The key to understanding the complexity of biodiversity is knowing that what is above the ground reflects the biodiversity below the ground. The more diverse the plants and species are above ground the more diverse life is in the soil.

Why does Agriculture play such an important role in biodiversity?

Brainstorm Ideas - Group Share

Taking care of the land is a top priority for agriculture producers. Healthy working agricultural landscapes are important to stopping the decline of habitat areas like the Aspen Parkland and Northern Mixed-Grass Prairies. The biodiversity value in these habitats is high. Biodiversity and its interactions are a critical part of agriculture's productivity and sustainability. The benefits of biodiversity to a farm result in increased profits for the producer and a greater benefit for the environment.

Greater Biodiversity benefits agriculture in the following ways:

- The greater the biodiversity, the more improved pollination, which is important for crops like canola.
- Increased biodiversity in the soil as a result of reduced tillage, increases both soil fertility and nutrient cycling and storage, leading to greater crop yields and long-term soil productivity.
- With greater biodiversity there can be less damage by disease, weeds and insect pests to farms. For example, birds are capable of suppressing insect populations. Even in prairie environments, birds have been shown to effectively control grasshoppers. Adult robber flies also feed on a variety of pest species, such as grasshoppers and hornets. The larvae live in the soil and decaying organic material, where they prey on other insects and spiders.
- All livestock and crops depend upon biodiversity, and ensuring there is farm-scale biodiversity allows for benefits not even discovered yet.

According to Alberta Agriculture, farmers and ranchers across Canada are taking action to conserve biodiversity. Many producers are using agricultural practices that protect soil, water and air quality, which at the same time help to maintain biodiversity. This is an important part of stopping the decline of habitat areas like the Aspen Parkland and the Northern Mixed-Grass Prairies.

Farmers conserve biodiversity on their land in the following ways:

Principle 1. Soil is the Foundation of Healthy Ecosystems

Soil is the base of which all life is found, the amount of living organisms below ground is much larger than the living organisms above ground. Soil not only provides the foundation for which plants can grow, but it also breaks down organic matter and has the ability to cycle nutrients into forms for plants to use. We have seen a major shift in cropping practices to no-till cropping, which reduces soil disturbance and increases the biodiversity in the soil.

Principle 2. Native Areas are Biodiversity “Storehouses”

Native plant species have adapted and evolved to possess the traits that make them uniquely suited to local conditions. In these low-input systems, these plants will produce more and are more resistant to pests. According to Alberta Agriculture, conserving native areas is vital, because they have the highest levels of biodiversity. Farmers manage their grazing timing and intensity to control invasive species.

Principle 3. Timing and Intensity of Use Influence Biodiversity

Alberta Agriculture states that agricultural production systems that support the most biodiversity are those that mimic the area’s natural patterns of disturbance (e.g. fire, grazing, or flooding). Farmers can copy these patterns through their management practices, by understanding that wildlife are most sensitive during the breeding season and while raising their young, and that most native plants do best when they are rested during the spring. Allowing plants to rest, helps them rebuild roots and store enough energy to tolerate drought and disease.

Principle 4. Variety is the Spice of Life... and Diversity

Higher levels of biodiversity increase productivity and stability in production, while increasing the benefits to ecosystems through increased pollination, pest control and disease resistance. This is why farms with a variety of landscapes and plant communities experience fewer weed problems and have more production. Perennial fields with multiple types of plants are more productive than those with a single plant species.



Biodiversity Activity #1:

Species Survival



Materials

- 1 package of large, thick rubber bands
- 1 large box of paper clips
- 1 package of marbles
- 100 pennies
- 5 oz. paper cups (1 per person)
- Plastic spoons
- Clothespins
- 1 sheet, blanket or tablecloth
- 1 pad of small sticky notes
- 1 large piece of chart paper or poster board

Procedure

1. Read the background information about biodiversity.
2. In this simulation, you will be a wetland-dwelling bird species. The items (rubber bands, paper clips, marbles, pennies) on the floor represent food resources. The paper cup represents your stomach.
3. The tool you receive represents your bill or beak. Your bill or beak is uniquely designed to gather specific food needed to survive. Participants with clothespins may only eat rubber bands. Participants with spoons may eat any of the items.
4. At the signal, you will gather as many food resources as possible into your stomach. The feeding time will last 30 seconds.
5. Participants must follow these rules:
 - a. Only one food resource at a time may be picked up and only with your bill or beak.
 - b. Food must be brought to the stomach; the stomach cannot be used to help pick up food.
 - c. Only one hand can be used to pick up food resources.
 - d. Participants must return to the edge of the feeding ground for the start and end of each round.
6. Once time has been called, count the number of resources you have in your cup. For each set of five items you collected, take one sticky note (round up to the nearest five).
7. On a large sheet of chart paper, use the sticky notes to make a bar graph to record how well each species did. The x-axis should be labeled "bill or beak type" and the y-axis should be labeled "amount of food collected."
8. Each species needs 10 food resources to survive and reproduce; participants who did not collect 10 are considered dead and must sit out the remaining rounds.
9. Repeat the procedure until either one species is extinct or all food resources have been depleted.
10. Which species did the best overall?
11. Which food resource was collected the least?
12. As the rubber bands were depleted as a food resource, what happened to the clothespin-beaked bird species?
13. Reflect on these questions; your teacher may ask you to write or discuss:
 - a. What happened to the biodiversity of this wetland habitat?
 - b. What agricultural practices might negatively impact resource availability?
 - c. What agricultural practices might positively impact resource availability?

Biodiversity Activity #2:

How Diverse is Your Backyard?



Materials

- Sheet of paper
- Pencil or pen
- Optional: Digital camera to take pictures
- Optional: Magnifying glass
- An observation location, such as a backyard, park, community garden, open field, lake, stream, etc. It should be a place you like to explore and where you think you might find a diversity of organisms.

Procedure

1. Once you have picked an area to do your investigation, bring your sheet of paper and pen or pencil (and digital camera and magnifying glass, if desired) to the observation location you decided on.
2. Pick a small part of the location to investigate first. For example, it could be a pile of dead leaves, some shady rocks, a patch of lawn, old logs, dry weeds, a tree, etc. (These are all different "microhabitats.")
3. Carefully look for animals in that microhabitat. You may want to turn over rocks or logs to look for animals. On your sheet of paper, write down what type of animals you see. (For example, maybe you see a bird, earwigs, or spiders.) Do not worry if you cannot identify something right away — you can write down a description, make a drawing, or take a picture, and try to identify it later.
4. What animals do you see? What kind of microhabitat are they living in (dry, damp, has plants, rocks, etc.)?
5. Move on to another microhabitat and similarly investigate it. What animals do you see in this area? Do any of the animals look like different species of types you saw already? What is the microhabitat like, and how is it similar or different from the previous one?
6. Try to explore at least five different microhabitats at the observation location, if possible.
7. Do some animals seem to prefer certain types of microhabitats (such as damp ones or dry ones) more than other animals?



References

Adapted from the following sources:

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Educator's Guide · Agriculture and the Environment

Biodiversity Conservation Guide for Farmers and Ranchers in Alberta
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Agricultural producers care deeply about the land they live on. For many producers, caring for their land is their most important job.



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