A SEASONAL BALANCE (Part II)

GRADE Grade 4

PART 2 of 3

TOPICS Plants, growth, change, interactions, seasons, citizen science

CURRICULAR CONNECTIONS

Grade 4 Science

Topic E – Plant Growth and Changes

1. Describe the importance of plants to humans and their importance to the natural environment
3. Describe common plants, and classify them on the basis of their characteristics and uses
4. Recognize that plant requirements for growth; i.e., air, light, energy, water, nutrients and space; vary from plant to plant and that other conditions; e.g., temperature and humidity; may also be important to the growth of particular plants
6. Recognize that a variety of plant communities can be found within the local area and that differences in plant communities are related to variations in the amount of light, water and other conditions
11. Describe ways that seeds are distributed; e.g. by wind, by animals; and recognize seed adaptations for different methods of distribution

OVERVIEW

Students will continue their investigation of the relationships between plants, animals and people by looking at the ways in which different cues from the environment determine when changes will occur. By relating key seasonal environmental events to their own lives, they will gain a greater appreciation and understanding of the delicate balance that exists between different species.

OBJECTIVES

- Students will be able to provide examples of cues that plants and animals receive from changing seasons
- Students will be able to provide specific examples of animal-plant interactions
- Students will understand how climate change can disrupt animal-plant interactions

KEY TERMS

- **Climate** – the average measurements of temperature, wind, humidity, snow and rain in a place over the course of many years
- **Deciduous** – trees and shrubs that shed their leaves every year, usually in the autumn
- **Phenology** – the study of yearly cycles of animals and plants
- **Pollinator** – an animal that allows plants to make fruit or seeds
- **Prediction** – a statement about what might happen in the future

GUIDING QUESTIONS

- What are the cues that indicate to plants when it is time to undergo certain changes?
- How are climate and weather different from one another?
- What are some of the ways that changing climate could disrupt relationships between plants and animals?

BACKGROUND ESSAY

How do we know that the seasons are changing? How do we change our behaviours to adapt to different seasons? We might use a clock or a calendar to determine when it is time to do certain things. Perhaps we know what season it is based on events that come around every year, such as returning to school after summer vacation or celebrating an important holiday with our families. But what would happen if we had no calendars?

Plants and animals rely on cues from the environment to know when to undergo changes. The study of the yearly cycles that plants and animals go through is known as **phenology**. The changes that plants and animals go through each year have nothing to do with the calendar that guides many humans' activities. In the spring, leaf buds and flowers develop and bloom. In the fall, **deciduous** trees like aspen poplars lose their leaves.

Plants and animals respond to natural cues to know when to it is time to change, grow or move. These cues include length of day and the movement of other animals. They are also closely linked to the **climate** of where they grow. Climate is the average measurements of temperature, wind, humidity, snow and rain in a place over the course of years. Climate is similar to weather, except that it happens over a long, long time rather than what is happening outside your window at one exact moment in time.

In Part I, we learned about the important interactions between plants and animals that are key to their survival. Phenology is very important when we think about how and when animals meet their needs. For example, when grizzly bears emerge from their dens in the spring they travel to the valley bottoms where the snow has melted and the first flowers like dandelions are flowering. As the snow melts at higher elevations in early summer they might travel back uphill in pursuit of Whitebark pine nuts, until the buffaloberries ripen in late summer and the bears return to the valley bottoms.

Another important relationship to consider is between flowers and **pollinators**. Pollinators are animals that allow plants to make seeds and fruits. They do this by moving pollen from one part of the flower of a plant to another part of the same plant or a different one. Often the time that a flower is blooming is very short, so it is very important that pollinators can find them during these short windows so that plants can produce seeds and more plants. Over many, many years, animals and plants have perfected these relationships.

For many thousands of years, people have broken up the year into seasons based on distinct weather patterns, amount of daylight, or food gathering activities. Our ancestors survived by making observations about their natural environment and learning when to hunt, plant, or gather certain types of food.

DURATION 20-30 minutes

MATERIALS

- Ball of yarn
- Food web cards

ACTIVITY – PHENOLOGY CALENDAR

Students create a month by month calendar of phenological events in order to reinforce the idea that they likely already have a good baseline understanding of phenology even though the term is likely to be new to them.

1. Place 6 or 12 sheets of chart paper around the room. Label each sheet with a month of the year. For smaller groups, you may choose to label each sheet with two consecutive months (e.g. January/February, etc.). Some younger students may need to complete this activity using seasons instead of months.

2. Divide students into groups based on their birthday months. *As an added challenge, you can first ask students to arrange themselves in a line based on their birthdays* ***without talking****. This activity can further emphasize that nature is organized based on different cues,*

whereas humans are accustomed to using talking to organize themselves.

3. Ask students to fill in the calendar with different things that happen outdoors in the natural world during their birth month (or season). Ask them to think about plant, animal and human relationships with nature as well as the changes in weather and temperature during their month. Start by discussing the changes that are happening in the environment outside right now. *Depending on the level of reading/writing comprehension of the group, students can also draw their responses. Alternatively, an adult can write their ideas down.*

4. Some things that students might consider: animal migration, allergies, berry seasons, leaf colour change, annual festivals that celebrate the seasons, hunting or sports seasons. Students may find it easier to relate to things that happen in their own lives during different seasons that are not necessarily directly related to the environment (e.g. starting school, Christmas holidays). During the discussion you can help the students to relate these events back to environmental changes. Do any of the events relate to one another? For example does the arrival of a migratory bird overlap with the appearance of a certain type of berry?

5. Ask students to present their ideas to the class. Was their any overlap between months? How do events change from year to year? How do differences in where people have lived effect their understanding of yearly events? Explain to students that phenology is represented by the events that the students have added to the calendar.

6. *Extension: Create a classroom phenology-birthday book. Each student can contribute a page with an essay, poetry, images, etc. about a phenology fact corresponding to their birthday. Students could also create a phenology wheel, described how the changes, activities or cycles that one plant or animal species undergoes through the year.*

This activity has been adapted from "Phenology Calendar Activity" from the University of Maine – Signs of the Seasons: A New England Phenology Program. View the original lesson plan at extension.umaine.edu/signs-of-the-seasons/resources-for-educators/phenology-calendar-activity/.

BACKGROUND ESSAY

Scientists make **predictions** about the timing of seasonal changes to predict how climate and the environment might change in the future. We have already learned that plant and animal growth and changes are closely linked to climate and that there are delicate relationships that exist between life forms. Currently the climate of the Earth is

changing much more quickly than it has in the past. This has led to warmer-than-average temperatures as well as changes to the amount of snow and rain that some places receive. One of the consequences of a changing climate is changes in flower and plant blooming times.

When the weather changes suddenly, humans can adapt by wearing warmer clothing or putting winter tires on our cars. However for plants and animals, it takes time for creatures to adapt to changes. Imagine for example that due to snow melting earlier, a plant that depends on a certain insect pollinator grows flowers a week earlier than it has in previous years. It takes time for insects to develop from egg to larvae to adult, and therefore they might not be able to fly from flower to flower to transport pollen. The delicate balance between insect and flower has been disrupted and it may take a long time to establish a new balance.

LOCAL RESEARCH

Researchers Greg McDermid, David Laskin & Scott Nielson from the University of Calgary investigated how warming temperatures might affect the diet of Alberta's grizzly bears. Their research found that by the end of the 21st century, buffaloberries are expected to ripen nearly three weeks earlier in Alberta's Rocky Mountains. This would widen the gap between the availability of this important food source and hibernation.

Read more at theconversation.com/alberta-grizzly-bears-will-feel-the-effects-of-climate-change-113001

Another example is the connection between grizzly bears and buffaloberries. Buffaloberries are the major source of food for grizzly bears in the Canadian Rockies. During late summer, bears can eat up to 200,000 berries in a single day. Research predicts that in the coming decades these berries will ripen earlier than they have historically. This means that bears will have less time to forage for this important food source before hibernation. This could lead bears to look for food elsewhere and potentially bring them into contact with humans.

All food chains begin with plants. Anything that affects a plants' ability to reproduce can impact the other parts of the food chain and food web. Changing conditions can have a significant impact on how we live our lives and the interactions that we have with the natural environment.

Scientists around the world are using data about the timing of key seasonal events like flowering, fruiting and pollination to predict how climate and ecosystems might change in the future. Monitoring plants can provide valuable information about how the climate is changing and is among some of the oldest scientific data on record. Farmers have used phenological observations to determine when to plant and harvest crops and nature lovers use them to predict when the best time for viewing wildflowers will be.

DURATION >1 semester

MATERIALS

Materials for the Classroom Phenology will vary based upon the type and depth of investigation undertaken by classes

ACTIVITY – CLASSROOM PHENOLOGY

Citizen science is a great way for students to learn about phenology and local ecosystems while also contributing valuable information about phenology and climate change.

Plants undergo dramatic changes throughout the school year. This activity lends itself to a semester- or year-long activity, during which students take ongoing measurements to understand how weather and

plants change throughout the year and how those changes are linked to one another.

NatureWatch & Alberta PlantWatch

The PlantWatch program empowers citizen scientists to record flowering times for selected plant species. The information that citizen scientists record is shared with researchers who are trying to understand how ecological changes may be affecting our environment. Participating in the Plantwatch program is a great way for students to learn about the terrific diversity of plants in their backyard while also helping scientists to better understand the effects of climate change in Canada.

Begin by creating a NatureWatch profile and acquainting yourself and your class with the species that are included. Get outside with your class and try to find as many of the plants on the list as possible. You may want to install semi-permanent markers (e.g. metal stakes with flagging tape) so that you can visit the same plants year after year. Within your account you will be able to submit your class observations for a list of species and specify whether you observed a first bloom, leafing out or mid-bloom event.

The Alberta PlantWatch website has many terrific classroom resources for teachers interested in getting involved. Get started at www.naturewatch.ca/plantwatch/ and www.plantwatch.naturealberta.ca.

Nature's Notebook

Nature's Notebook is a project of the USA National Phenology Network. While the data observations are specific to the United States, they have numerous associated activities that can be adapted to Canada and the Bow Valley. Their user friendly website allows you to select activities based on audience type, activity type and length, and keyword search.

For more information, visit www.usanpn.org/nn/educate/activites.

REFERENCES

Budburst. (n.d.). *About Phenology.* Chicago Botanic Garden. budburst.org/phenology-defined