

Pollinator Habitats

LESSON PLAN

GRADE AND STRAND: Grade 9, Academic – Biology: Sustainable Ecosystems OR
Grade 9, Applied – Biology: Sustainable Ecosystems and Human Activity

LESSON(S) TOPIC THEME AND CRITICAL INQUIRY: Pollinator Habitats

DURATION: 150 minutes (2 periods)

CURRICULUM EXPECTATIONS

GRADE 9, ACADEMIC - BIOLOGY: SUSTAINABLE ECOSYSTEMS

Overall Expectations

- B2.** Investigate factors related to human activity that affect terrestrial and aquatic ecosystems, and explain how they affect the sustainability of these ecosystems.
- B3.** Demonstrate an understanding of the dynamic nature of ecosystems, particularly in terms of ecological balance and the impact of human activity on the sustainability of terrestrial and aquatic ecosystems.

Specific Expectations

- B2.1** Use appropriate terminology related to sustainable ecosystems, including, but not limited to: bioaccumulation, biosphere, diversity, ecosystem, equilibrium, sustainability, sustainable use, protection, and watershed.
- B2.5** Analyze the effects of human activity on the populations of terrestrial and aquatic ecosystems by interpreting data and generating graphs.
- B3.1** Compare and contrast biotic and abiotic characteristics of sustainable and unsustainable terrestrial and aquatic ecosystems.
- B3.3** Describe the limiting factors of ecosystems, and explain how these factors affect the carrying capacity of an ecosystem.
- B3.5** Identify various factors related to human activity that have an impact on ecosystems, and explain how these factors affect the equilibrium and survival of ecosystems.



GRADE 9, APPLIED - BIOLOGY: SUSTAINABLE ECOSYSTEMS AND HUMAN ACTIVITY

Overall Expectations

- B2.** Investigate factors related to human activity that affect terrestrial or aquatic ecosystems, and describe the consequences that these factors have for the sustainability of these ecosystems.
- B3.** Demonstrate an understanding of characteristics of terrestrial and aquatic ecosystems, the interdependence within and between ecosystems, and the impact humans have on the sustainability of these ecosystems.

Specific Expectations

- B2.1** Use appropriate terminology related to sustainable ecosystems and human activity, including, but not limited to: biodiversity, biotic, ecosystem, equilibrium, species diversity, sustainability, and watershed.
- B2.2** Investigate the characteristics and interactions of biotic and abiotic components of a terrestrial or aquatic ecosystem, and describe the importance of these components in a sustainable ecosystem.
- B2.5** Analyze the effects of factors related to human activity on terrestrial or aquatic ecosystems by interpreting data and generating graphs.
- B3.4** Identify the major limiting factors of ecosystems, and explain how these factors are related to the carrying capacity of an ecosystem.
- B3.5** Identify factors related to human activity that have an impact on ecosystems, and explain how these factors affect the equilibrium and survival of populations in terrestrial and aquatic ecosystems.



LEARNING GOALS

- » Define and identify pollinators.
- » Identify abiotic and biotic components of ecosystems that support pollinators.
- » Understand how pollinators contribute to sustainable ecosystems.

LESSON PART 1: MINDS ON/GETTING STARTED

(20-25 MIN)

ACTIVITY 1: THINK-PAIR-SHARE (SMALL GROUPS/WHOLE CLASS)

- Display a picture of a variety of pollinators (e.g., hummingbird, bumble bee, monarch butterfly, bat, beetle, wasp) with the caption: What do these organisms have in common?
- Have students Think-Pair-Share the answer to the question for 1 minute
- Debrief Think-Pair-Share activity as a class to ensure that all students understand that the organisms in the picture are pollinators.
- Share learning goals to help students monitor learning throughout lesson:
 1. Define and identify pollinators.
 2. Identify abiotic and biotic components of ecosystems that support pollinators.
 3. Understand how pollinators contribute to sustainable ecosystems.

ACTIVITY 2: KWL CHART (SMALL GROUPS/WHOLE CLASS)

- In groups of 3-4, have students complete the “What We **Know**” and “What We **Wonder**” sections of a KWL chart about pollinators.

Sample KWL Chart - Topic: Pollinators

WHAT WE KNOW	WHAT WE WONDER	WHAT WE LEARNED

- After 5 minutes, regroup to debrief KWL charts as a whole class.
- Consolidate each groups’, “What We **Know**” and “What We **Wonder**” sections into a class KWL chart
- Clarify any misconceptions during the debrief.
- Review definition of pollinators and why they are important.
 - » *Sample definition: A pollinator is any animal that transports pollen from the male parts (anther) of one plant to the female parts (stigma) or another plant*
- Tell students: Today, we will be exploring our local community to identify local pollinators and investigate the ecosystem conditions necessary for their survival.
- Our focus will be on butterflies and bumble bees - two of the most common pollinators in Canada.

LESSON PART 2: WORKING ON IT

(60-75 MIN)

ACTIVITY 1: WHY DO WE NEED POLLINATORS?

(INDIVIDUAL/SMALL GROUPS/WHOLE CLASS)

- Individually, students will read **Benefits and Values, Threats and Consequences** by the Canadian Wildlife Federation or EcoSpark's Protecting Our Pollinators article
- After reading the article, in groups of 3-4, students will discuss the following questions:
 - » What are some ecosystem services pollinators provide?
 - » How do these services contribute to sustainable ecosystems?
 - » What are some threats pollinators face?
- Debrief the questions as a whole class

ACTIVITY 2: WHAT ECOSYSTEM CONDITIONS SUPPORT POLLINATORS?

(SMALL GROUPS)

- Tell Students:
 - » Butterflies and bumble bees are the most well-known pollinators. They are also difficult for researchers to monitor.
 - » Researchers depend on citizen scientists to help them monitor butterflies and bumble bees.
 - » What do you think a citizen scientist is? (e.g., a citizen of the world engaged in homegrown inquiry to solve problems.)
 - » Today we are going to become citizen scientists to monitor bumble bees and butterflies in our local ecosystems.
 - » Through our investigation, we will find out which of our local ecosystems are best suited for pollinators.
- Visit 2 - 3 different ecosystems within your school yard or local community (e.g., meadow, garden, park, field, woodland, etc. - refer to *EcoSpark's School Watch Guide* for tips on safety and site assessment.)
- While visiting each site, students will record the biotic and abiotic factors along with any other important observations using the *Pollinator Ecosystem Assessment Data Sheet*.

MATERIALS:

- [Benefits and Values, Threats and Consequences](#)
- Computer & projector

MATERIALS:

- *Pollinator Ecosystem Assessment Data Sheet*
- *Data Submission Guide: e-Butterfly & Bumble Bee Watch*
- *EcoSpark School Watch Guide*
- Personal Devices (e.g., cell phone, tablet)
- Clipboards
- Pencils

- For each site, have students use their personal devices to take pictures of any pollinators (butterflies or bumble bees) they see and contribute their data to e-Butterfly or Bumble Bee Watch, depending on whether their sighting is of a butterfly or bumble bee.
- Provide students with the *Data Submission Guide: e-Butterfly & Bumble Bee Watch* for step-by-step instructions on submitting data.
- All pollinators should also be recorded in the “Pollinators” section of the *Pollinator Ecosystem Assessment Data Sheet*.
- If pollinators are found feeding, instruct students to note the flower the pollinator is feeding on in both their *Pollinator Ecosystem Assessment Data Sheet* and in their e-Butterfly/Bumble Bee Watch submission.



LESSON PART 3: CONSOLIDATION AND DEBRIEF

(30 MIN)

WRAP UP (SMALL GROUPS/WHOLE CLASS)

- Ask students to reflect on the following questions within their groups:
 - » Based on the data you collected, which of the sampling sites do you think was the best suited for pollinators?
 - » Were there any biotic components of each site that were suitable/unsuitable for pollinators?
 - » Were there any abiotic components of each site that were suitable/unsuitable for pollinators?
 - » Were there any human activities that may have contributed to the different levels of pollinators found in each habitat?
 - » What are some actions we can take to make our local community more inviting to pollinators?
 - » What are some human activities that might be preventing pollinators from visiting our community?
 - » What kind of ecosystem conditions could we create to attract pollinators to our community?
 - » How can we raise community awareness about the importance of pollinators?
- Debrief the questions as a whole class.
- As a class complete the “What We **Learned**” section of the class KWL chart to consolidate learning.

MATERIALS:

- Computer & projector
- KWL Chart

ADDITIONAL CONSIDERATIONS

EXTENSION ACTIVITIES

- Statistically analyze data between sites by calculating biodiversity index of plants, pollinators and other biota from each sampling site.
- Have students research a local pollinator at risk to create a PSA poster containing the pollinator's key features, ideal ecosystem conditions, preferred flower(s), and actions to help protect the species.
- Compare student data to local data on e-Butterfly and Bumble Bee Watch contributed by other citizen scientists.
- Compare data over time to see changes in pollinator abundance and distribution - hypothesize and investigate reasons for variations.
- Have students read the article [What's the bee-g deal with community science?](#) on the York University website and review the process of contributing citizen science data to the Bumble Bee Watch project.

ADAPTING TO DIFFERENT GRADE LEVELS

Senior Level

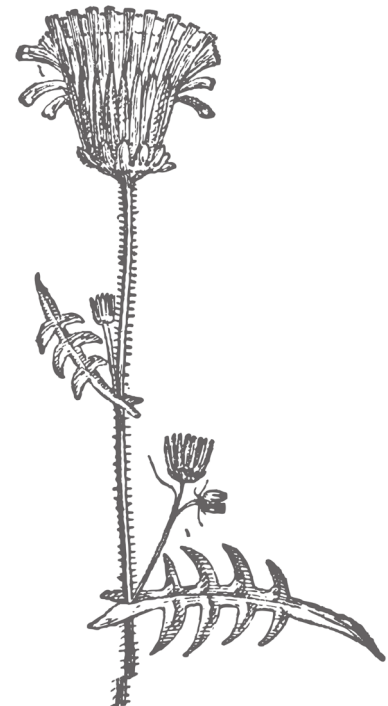
- Have students conduct additional research, individually or in small groups for *Working On It - Activity 1: Why Do We Need Pollinators?*
- Research the effects of neonicotinoids on bumble bee populations.
- Identify floral hosts of pollinators.
- Research and create a poster on the life history/biology/ecology of a butterfly species found in the local community, answering the following questions:
 - » What are some important ways that the caterpillars and adults differ?
 - » Why is it important for the caterpillar and the adult to live in different places and eat different things?
- Determine the conservation status of the pollinator species found in the local community
 - » If at risk, why? Does the species have characteristics that make it more likely to be at risk compared to other types of pollinators?

Junior Level

- Research the role pollinators play in food chains and food webs:
 - » Model a food chain/food web that includes a pollinator by creating a diagram or poster.
 - » What would happen if we didn't have pollinators?
- Have students highlight unfamiliar terms when reading the articles in *Working On It - Activity 1: Why Do We Need Pollinators?* and review highlighted vocabulary as a class.
- Have students create graphs of pollinator data collected in the local community.

REFERENCES

- Bumble Bee Watch. (n.d.). www.bumblebeewatch.org
- Canadian Wildlife Federation. (n.d.). *Benefits and values, threats and consequences*. cwf-fcf.org/en/resources/for-educators/resource-sheets/benefits-and-values-threats.html
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- EcoSpark. 2018. *School watch guide: Green spaces as learning spaces*. www.ecospark.ca/teaching-materials
- Ontario Ministry of Education. (2008). *The Ontario curriculum, grades 9 and 10: Science*. www.edu.gov.on.ca/eng/curriculum/secondary/science.html
- York University. (2020, May 13). *What's the bee-g deal with community science?* yfile.news.yorku.ca/2020/05/13/whats-the-bee-g-deal-with-community-science/?http://yfile.news.yorku.ca/?utm_source=YFile_Email&utm_medium=Email&utm_content=Current-News&utm_campaign=yfile



SCHOOL WATCH LESSON PLAN

School Watch introduces students, grades 6 to 12, to the world of citizen science through customized curriculum-linked classroom and on-site activities.

EcoSpark's School Watch program provides the lesson plans and tools - such as butterfly nets, binoculars, and tree measuring tools - to deliver citizen science projects suitable for most school grounds. EcoSpark staff lead facilitated two-hour outdoor sessions with students, on or near the school grounds, to bring curriculum based concepts to life. In addition to providing the necessary equipment we supply data sheets and other project materials such as identification keys.

EcoSpark believes strongly in the benefits of outdoor education but also recognizes that during the Covid-19 crisis not all education will take place in traditional school learning environments. In addition to our in-person programs we have modified remote learning options available with flexible scheduling and delivery variations based on board, school and teacher needs and requirements.

For more information or questions, please contact:
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