

Exploring Biodiversity a Field Study for Grade 9 Students

Outdoor/Indoor Activity

Curriculum: Science, Biology



The following is an outline to assist in leading your class through “Exploring Biodiversity” a field study for grade 9 science students. The study is divided into 4 sessions, covered at your pace, utilizing both your classroom and a local park or outdoor green space.

Working through all 4 sessions, students will explore:

- What is Biodiversity?
- What are the levels of biodiversity?
- Species and genetic diversity
- Field sampling techniques
- Human impacts

Materials:

- [Exploring Biodiversity – A Grade 9 Field Study video](#) This video offers explanations and examples from the field to assist you in working through the study with your students.
- [Exploring Biodiversity – Resource Package](#) Resource includes all data sheets and instructions. *Note: while developed for Fish Creek Provincial Park, this study and associated resources can be adapted to any area within Alberta.*

Session 1 – Introduction: Diversity within Your Class

Indoor Activity

Materials:

- Watch [Exploring Biodiversity – A Grade 9 Field Study video](#) from 0:00 to 01:07
- [Exploring Biodiversity – Resource Package](#), page 6

Instructions:

- This activity will see students create a series of charts to define the diverse characteristics of their class. It is a way of demonstrating characteristics of biodiversity.
- Ask your students to consider their classmates and think about things that are similar amongst them and different amongst them. You may want to start by simply asking and discussing physically observable characteristics such as:
 - Gender (be sensitive to how this is discussed)
 - Eye colour
 - Hair colour
 - Height
 - Ethnicity (be sensitive to how this is discussed)
- You can expand the discussion to include other definable characteristics:
 - Neighborhoods they live in
 - Clubs they belong to
 - Favourite music
 - Favourite school subject
 - Those with pets, cat, dog, or something more exotic
- Using any combination of characters you define, ask students to create pie charts or bar graphs to illustrate how many of their classmates fall into certain defined groups. The more combinations you ask for the more diversity may be demonstrated.

- Ask your students to identify those characteristics that are most common in the class and those that are the most unique.
- This can then lead to or support further discussing the definitions of biodiversity (diversity of species, diversity of ecosystems, genetic diversity).

Session 2 - Diversity within Species

Outdoor/Indoor Activity

Materials:

- Watch [Exploring Biodiversity – A Grade 9 Field Study video](#) from 01:07 to 03:32
- [Exploring Biodiversity – Resource Package](#), page 10
- [Simplified Key to Native Trees and Shrubs of Fish Creek Provincial Park](#)
- Various field guides to plants, trees and shrubs (check your school or local library)

Instructions:

- For this session, you will need to split your class into working groups and have an outdoor natural space to explore. You will need a large tape measure or rope for each group; 12 metres in length, marked off in 3-metre increments, 4 pegs to hold down corners of the rope or tape measure are also helpful.
- Find an area populated by a variety of trees and shrubs large enough for groups to spread out and work in.
- Instruct each group to create a 3m X 3m quadrat or square with their rope or tape measure that encompasses a number of trees and shrubs. Group quadrats should not overlap.
- Instruct students to observe and count the number of each individual tree and shrub species present in their quadrat. Students should record the number of different species and the number of individuals of each species. This will give them a sense of the diversity of species of trees and shrubs. At this point students need not know what the different species are, just be able to distinguish the differences that separate them.
- Now instruct students to select 5 individuals of the most common or numerous species they recorded. Instruct student to carefully examine these 5 individuals and record the following:
 - Similar characteristics observed in the 5 individuals
 - Unique or dissimilar characteristics observed in the 5 individuals

- Evidence of any interactions with other organisms
- To identify or put a name to the species students are observing you will need a few resources for them to utilize, but primarily an identification key for trees and shrubs. These are found in most field guides.
- To identify native trees and shrubs around Calgary, the "[Simplified Key to Native Trees and Shrubs of Fish Creek Provincial Park](#)" is a useful resource. A few other field guides to try:
 - ***Trees and Shrubs of Alberta*** by Kathleen Wilkinson
 - ***Plants of the Western Boreal Forest & Aspen Parkland*** by Johnson, Kershaw, MacKinnon and Pojar
- Once students have collected and recorded the required information, you can utilize it in a number of analysis back in the classroom.
 - Create bar graphs and pie charts to show different aspects of diversity from their observations
 - Work up diversity indices – web search Simpson Diversity Index, Shannon Diversity Index, Species Richness, Species Evenness
 - Examine and identify interactions identified. For example, "What animals or insects use the tree/shrubs?"

Learning Extension: A Dichotomous What?

A dichotomous key is a tool biologists use to identify organisms. It is based on observing physical characteristics and following a simple process of elimination. A fun and easy way to demonstrate how they work is to have students create a key to identify a classmate. Here is a classroom activity to try demonstrating how they work.

Materials:

- [Exploring Biodiversity – Resource Package](#), page 6

Instructions:

- Ask students to secretly pick an individual in the class. They will create a series of statements to describe observable, physical characteristics that will see the individual they selected put into smaller and smaller subsets of the entire class until the individual is the sole member of a final subset.
- It is important that students understand characteristics must be easily observed, well defined and ones that are relatively permanent. Examples are gender, eye colour, hair colour, height. Characteristics like height must be defined such that people understand the limits, for example, "the individual is taller than I am" or "the individual is shorter than I am".

- Ethnicity can be used, but caution must be exercised in instructing to ensure nothing can be viewed as offensive or demeaning.
- Characteristics that cannot be easily observed or defined should be avoided. Things such as “they are good at math”, “they are funny” or “smart”, are characteristics that are not easily observed and may be defined differently by different observers. Clothing can also be problematic as it changes regularly and is not very permanent.
- Students should be challenged to create a description utilizing the fewest number of defining characteristics as possible.

Example:

Group to be chosen from – Your class of 30 students. The individual to be identified is “Gerald”, a male who is tall with blue eyes.

Subset 1: the student is -

A) Male

B) Female

The student is Male (this eliminates all but, male students from further inclusion)

Subset 2: The student is -

A) Taller than me

B) Shorter than me

The student is taller so that eliminates all remaining male students that are shorter than I am.

Subset 3: The student has -

A) Blue Eyes

B) Eyes that are not blue

The student has blue eyes

The student is the only MALE – TALLER THAN ME – WITH BLUE EYES. Therefore, the student is – “Gerald”

Session 3 – More Fun in the Field – Point Counts and Line Transects

Outdoor Activity

Materials:

- Watch [Exploring Biodiversity – A Grade 9 Field Study video](#) from 03:32 to 08:42
- [Exploring Biodiversity – Resource Package](#), pages 11-17
- Access to the same greenspace or natural area used in Session 2

Bird Point Count – Modified

Instructions:

- Instruct students to spread out and find a spot to stand in silence. Give them 5 minutes (or longer) to stand, observe, and record all things bird. Birds they see and birds they hear. Utilize the circular chart from the “Exploring Biodiversity” data pages or create your own pages for students to record their observations.
- If possible, do multiple counts and try them at different times of the day. Students do not need to be able to identify individual species of birds they simply need to distinguish between different species and record observations accordingly.
- Follow-up by having students work to identify species based on their observations and using a variety of resources from printed field guides to online resources. A great resource is the [Cornell Laboratory of Ornithology](#).

Line Transects – Looking for Mammals

Instructions:

- Using the 12m, ropes or tape measures from Session 2 instruct student groups to stretch the rope/tape measure out in a straight line across the landscape. They then must walk the length of the line recording all evidence of mammal activity they find within approximately 1 m of the line.
 - Can students identify or predict the animal responsible?
 - What activity is represented from the evidence they found?

- What reasons can students give for their thinking?
- You can use the pages from the “Exploring Biodiversity” program data forms or create your own to suit.
- For both Point Count and Line Transect, you can instruct students to utilize the information collected to do a variety of analysis as in Session 2.

Session 4 – Human Impacts

Outdoor Activity

Materials:

- Watch [Exploring Biodiversity – A Grade 9 Field Study video](#) from 08:42 to 10:50
- [Exploring Biodiversity – Resource Package](#), page 18-25

Introduction:

People have a range of impacts on natural environments and therefore biodiversity. Urban landscapes do not lack biodiversity, but they certainly may have a reduced number of native and naturally occurring species than undisturbed natural environments.

As in Session 3, students will use point counts and line transects to sample an area. This time though they will be observing and recording human activity evidenced in the area.

Instructions:

- Ask students create a list of questions or inquiries around human impact on environments and biodiversity to seek information to answer. Alternatively, you may ask students to generate inquiries from the observations they record. Some possible lines for inquiry:
 - What are some of the easily observed human impacts in a park setting?
 - Are these impacts designed and built (pathways, parking lots, kiosks, picnic tables)?
 - Are these impacts simply due to human use (litter, desire trails, noise)?
 - What benefits do selected human impacts or use observed have on biodiversity of the area?
 - What negative impacts do selected human impacts or use have on biodiversity of the area?

- What was the single largest or most common activity observed?
- Access the same local natural area park, green space or area of your school grounds as in Sessions 2 and 3 to do the sampling.
- You can use the pages from the “Exploring Biodiversity” program data forms or create your own to suit.
- The “Point Count” activity in this session is to observe and record all human impacts seen and heard from locations within your defined study area.
- The “Line Transect” activity is to record all evidence of human use in the area along the transect line students lay out across locations in your study area.

Conclusion - Group Design Project

Materials:

- [Exploring Biodiversity – Resource Package](#), page 26-27

Instructions:

- After completing the above sessions students should have a higher degree of familiarity with the study area you utilized. Given the time they have spent and observations they have made ask students “If you could, how would you re-design the study area? “
- Students are to work with their group to come up with a plan for the area to redesign it to be more effective for our human uses of the space, but also more favourable for an increased and healthier biodiversity.
- The complexity of this project is up to you. You can make it as in depth or as quick and easy as you see fit to meet your needs. The idea is to have students re-visit their observations and information and to consider human use and natural biodiversity.