Biology 20 & Science 20
NMHS Virtual Biological Field Study

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Acknowledgements

We acknowledge that Fish Creek Provincial Park is part of the traditional territory of Treaty 7 region in Southern Alberta, which includes the Blackfoot Confederacy (comprising Siksika, Piikani and Kainai First Nations), the Tsuut'ina First Nation, and the Stoney Nakoda First Nation. The City of Calgary is also home to Metis Nation of Alberta, Region III.

This field study assignment is based on the "Ecosystems & Impacts in Fish Creek Provincial Park Terrestrial Field Study Guide" from the Alberta Parks Fish Creek Environmental Learning Centre.

Thank-you to Roland Kirzinger for donating his time, equipment, and expertise to make this virtual learning experience a reality.

Introduction

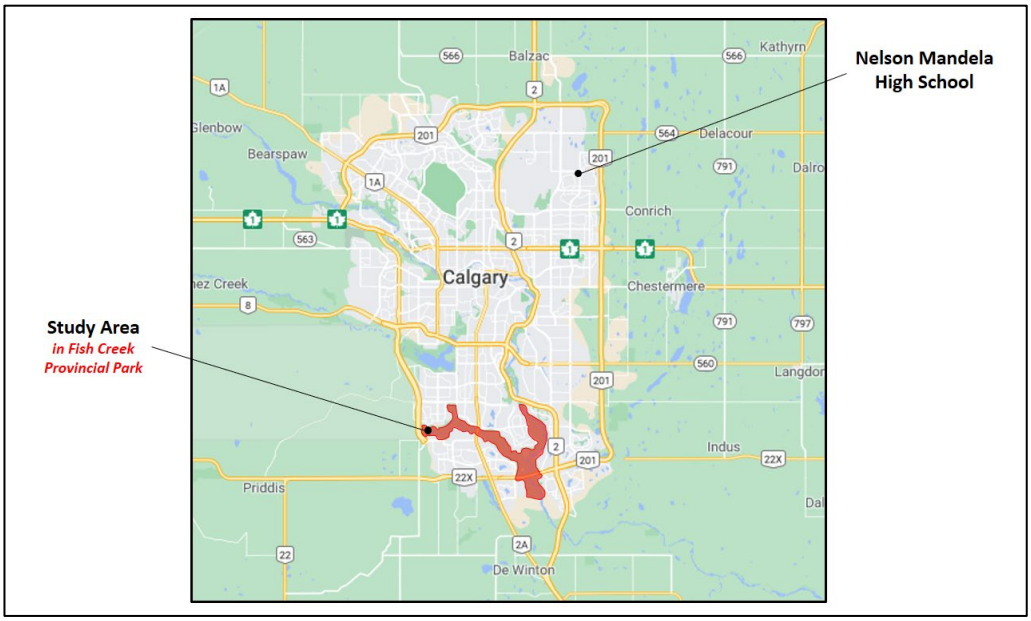
The purpose of this virtual field study is for students to experience what it is like to perform a field study to measure and quantify appropriate abiotic and biotic characteristics of an aspen parkland and grassland ecosystem. In the video, students will observe the gathering of both quantitative and qualitative evidence of the diversity of life in the ecosystems studied. After observing the data, students will analyze the results to compare and contrast the two ecosystems and extrapolate data for a third ecosystem, boreal forest. Students can then explore the impacts of human activities and invasive species in the area.

Study Location: Fish Creek Provincial Park

Fish Creek Provincial Park is located in Calgary, Alberta, Canada. It is the second-largest urban park in Canada, stretching 19 km from east to west. It is bordered by the city of Calgary on the north, east, and southern edges, and by the Tsuu T'ina Nation on the western edge.

The Fish Creek valley was designated as a provincial park in 1975. Prior to this the area was historically significant as a trading post, farming, and cattle ranching area.

These days the park is a popular area for hiking, biking, picnicking, swimming, fishing, and observing wildlife.



More information on the history of the park can be found on the Alberta Parks: Fish Creek Provincial Park: History page.

Guiding Questions

1) What are the major biotic and abiotic characteristics that distinguish grassland and aspen parkland ecosystems?
2) What data would you need to collect in a field study to determine the major abiotic characteristics and diversity of organisms in an ecosystem?
3) In what ways do humans apply their knowledge of ecosystems to assess and limit the impact of human activities?

Introduction & Overview of Field Study Equipment

Watch the "NMHS Virtual Biological Field Study" video from 0:00 to 5:44 and answer the following question(s).

Identify and briefly describe/explain five pieces of equipment that will be used in the field study.

i.

ii.

iii.

iv.

v.

Observations: Aspen Parkland Ecosystem

Watch the "NMHS Virtual Biological Field Study" video from 5:46 to 22:48. Complete the observations below as you watch, pausing and/or rewinding the video as necessary. Images are also available in the resource package.

Human Impacts in Aspen Parkland

As you watch the video, record evidence of human impacts you see and/or hear, such as houses, roads, bridges, vehicles, power poles, utility lines, cell phone towers, traffic, construction, music, people, dogs, lawn-mowers, equipment/machines, trails, litter, pets, pet waste, graffiti/vandalism, fences, signs, etc.

Table 1: Abiotic Factors in Aspen Parkland

Soil Moisture *[1(dry) – 4(wet)]*	**Soil Temperature** *(^oC)*	**pH** *(1-14)*	**Potassium** *(L-M-H)*	**Phosphorous** *(L-M-H)*

Figure 1: Soil Profile in Aspen Parkland

Soil Profile	Labelled Sketch of Soil Layers
O Horizon • litter or humus • decomposing organic material, leaves, grasses, etc. **A Horizon** • topsoil • usually dark brown to black in colour **B Horizon** • mineral layers • often light brown to bronze or orange in colour **C Horizon** • contains weathered parent rock material not consolidated into soil	

Figure 2: Plants and Ground Cover in Aspen Parkland

Watch the "NMHS Virtual Biological Field Study" video from 22:49 to 25:19. Complete the observations and questions below as you watch, pausing and/or rewinding the video as necessary. Images are also available in the resource package.

Refer to the image(s) of the grid square in the video/appendix. <u>Choose 1 image</u> to use for your observation drawing.

- *Make a detailed drawing of the plants found in the grid square.*
- *Label different types of plants with the following codes: G = grass, M = moss, F = flower, S = shrub*

Table 2: Biotic Factors in Aspen Parkland

- *Using your grid square diagram, calculate the percentage of each type of plant. Each complete square is 4% of the total area (100%)*
- *Record any plant species that are specifically mentioned in the video*
- *Use the provided close-up images and dichotomous key to identify **two** specific plant species found in the ecosystem*
- *Pay close attention to the video and make note of evidence of animals and insects that are discussed*

Plants	Evidence of Animals & Insects

Observations: Grassland Ecosystem

Watch "NMHS Virtual Biological Field Study" from 33:49 to 47:16. Complete the observations below as you watch, pausing and/or rewinding the video as necessary. Images are also available in the resource package.

Human Impacts in the Grassland Ecosystem

As you watch the video, record evidence of human impacts you see and/or hear, such as houses, roads, bridges, vehicles, power poles, utility lines, cell phone towers, traffic, construction, music, people, dogs, lawn-mowers, equipment/machines, trails, litter, pets, pet waste, graffiti/vandalism, fences, signs, etc.

Table 3: Abiotic Factors in Grassland

Soil Moisture *[1(dry) – 4(wet)]*	**Soil Temperature** *(^oC)*	**pH** *(1-14)*	**Potassium** *(L-M-H)*	**Phosphorous** *(L-M-H)*

Figure 3: Soil Profile in Grassland

Soil Profile	Labelled Sketch of Soil Layers
O Horizon • litter or humus • decomposing organic material, leaves, grasses, etc. **A Horizon** • topsoil • usually dark brown to black in colour **B Horizon** • mineral layers • often light brown to bronze or orange in colour **C Horizon** • contains weathered parent rock material not consolidated into soil	

Table 4: Biotic Factors in Grassland

- *Record any plant species that are specifically mentioned in the video*
- *Pay close attention to the video and make note of evidence of animals and insects that are discussed*

Plants	Evidence of Animals & Insects

Analyzing & Interpreting Soil Chemistry Data

In a natural setting, plants grow without the benefit of artificial fertilizers. The continuous recycling of nutrients between decomposing matter and growing plants, and the species of plants growing in the soil, ensures the soil remains productive. In this investigation you will determine the relative amounts of dissolved potassium and phosphorus; two key nutrients needed for plant growth.

4) Why are potassium and phosphorous important for plant growth?

5) How do potassium and phosphorous get into the soil?

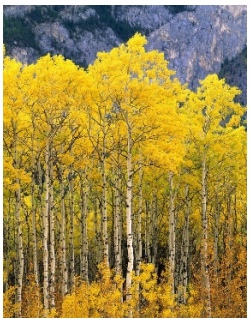
6) Thinking about the purpose of this field study (comparing aspen parkland and grassland ecosystems), create a testable question that might be answered through the tests conducted in the video.

7) What might causes soil to have an alkaline (basic) pH?

8) What might cause soil to have an acidic pH?

9) Fill in the columns for aspen parkland and grassland using the data you recorded. Make a prediction about the soil chemistry for a boreal forest.

Table 5: Summarizing and Predicting Abiotic Factors in Fish Creek Ecosystems

	Aspen Parkland	**Grassland**	**Boreal Forest***
			
Soil Moisture *[1(dry) – 4(wet)]*			
Soil Temperature *(^oC)*			
pH *(1-14)*			
Potassium (L-M-H)			
Phosphorous (L-M-H)			

10) Provide reasoning for your predictions about the boreal forest.

Ecological Succession in Fish Creek Park

If necessary, re-watch the section from 30:43 to 33:49 of the "NMHS Virtual Biological Field Study" video. Complete the observations and questions below as you watch, pausing and/or rewinding the video as necessary.

11) Use the table to summarize the process of ecological succession occurring in Fish Creek Provincial Park. Include sketches and a brief description.

Table 6: Summarizing Ecological Succession in Fish Creek Provincial Park

Grasses			
			
Description:	**Description:**	**Description:**	**Description:**

12) Fish Creek Provincial Park was once a working ranch and farm. Based on the information from the video, is this an example of primary or secondary succession? Explain.

Invasive Species in Fish Creek Park

If necessary, re-watch the sections from 28:17 to 30:41 and 41:30 to 44:03 of the "NMHS Virtual Biological Field Study" video. Complete the observations and questions below as you watch, pausing and/or rewinding the video as necessary.

An ***invasive species*** *is an organism (plant, animal, insect, etc.) that is introduced into a habitat where they are not normally found. In many cases invasive species will out-compete native species for resources to the point where the native species cannot survive.*

13) Fill in the table with the invasive species that were discussed in the video for each ecosystem.

Table 7: Invasive Species in Fish Creek Park Ecosystems

Invasive Species in Fish Creek Aspen Parkland	Invasive Species in Fish Creek Grassland

14) Why does the grassland ecosystem in Fish Creek Provincial Park contain such a large number of invasive species?

15) Identify/describe at least **three** possible ways that an invasive species might be introduced into an area.

16) Use your research skills to learn about two more invasive species (not mentioned in the video) that are affecting ecosystems in Alberta. Fill in the table with your information. *Don't forget to reference your sources!*

Table 8: Investigating Invasive Species & Impacts in Alberta

Invasive Species	Impact on Local Ecosystem

Slope & Aspect

Watch the "NMHS Virtual Biological Field Study" video from 44:09 to 47:15. After watching, complete the questions below.

> ***Slope** refers to the angle, or grade, of an upwards or downwards incline. Slope is usually measured as an angle. **Aspect** is the compass direction (N, S, E, or W) that a slope faces.*
>
> *Combined with elevation, both of these measurements play a significant role in determining the composition of an ecosystem.*

17) **a)** How might abiotic conditions on a north-facing slope be different than abiotic conditions on a south-facing slope?

b) Based on your previous answer, what type(s) of plants would you expect to find growing on north-facing and south-facing slopes in Fish Creek Provincial Park?

18) The vegetation growing on Slope A in the photograph is a boreal forest.

Based on your understanding of slope and aspect, discuss why the vegetation growing on Slope A in the photograph is significantly different than the vegetation growing on Slope B

Critical Thinking

19) After examining the data gathered and discussed in the virtual field study, what abiotic factor(s) determine the climax community established as a result of ecological succession in Fish Creek Provincial Park. **Explain** your thinking.