

The Nature of Science

A Field Study for Grade 7 Students

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Alberta Parks

Introduction

The Nature of Science is a full-day field study directed by park staff. The field study is designed to cover a portion of the requirements for Grade 7 Science Unit A: Interactions and Ecosystems.

Fish Creek Provincial Park is one of Canada’s largest urban provincial parks, stretching from the western edge of the city to the Bow River. The park has a strong vision within its visitor services program plan to support and foster environmental and cultural education.

Alberta Parks acknowledges 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.

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Before the Visit

PREPARATION

What to bring and what to leave behind: A few suggestions.

It is most important that you, your students and your volunteers/chaperons know and understand that your field study will be an “OUTDOOR” experience. We will have a classroom as a home base over the course of the day, but most of our time will be out in the park. With this in mind, it is important that everyone attending the field study is prepared. Weather conditions can change quickly, we will be moving throughout the park on foot over a variety of trails and off-trail areas, and working with a variety of field equipment.

What to Bring

- Extra clothing (rain gear, warm layers)
- Boots, insulated and waterproof if the weather calls for it
- Food and water for the day (there are no microwaves, coffee shops, vending machines, etc. on-site or close by)
- Cellphones (to take photos or for timing activities, but otherwise off)
- Camera, binoculars (optional)
- Pencils and clipboards

FROM THE PROGRAM OF STUDIES

Unit A: Interactions and Ecosystems

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.

Taken from the Alberta Education Program of Studies - Unit A: Interactions and Ecosystem Grade 7 Science © Alberta Learning, Alberta, Canada (2003)

Focusing Questions

How do human activities affect ecosystems? What methods can we use to observe and monitor changes in ecosystems, and assess the impacts of our actions?

Key Concepts

The following concepts are developed in this unit and may also be addressed in other units at other grade levels.

- interactions and interdependencies
- environmental monitoring
- environmental impacts
- producer, consumers, decomposers
- nutrient cycles and energy flow
- species distribution
- succession
- endangered species
- extinction
- environmental management

VOCABULARY AND DEFINITIONS

The following is a list of terms and definitions you and your students should be familiar with before your field study.

General Ecosystem Terms

- abiotic:** *The non-living components of the environment (physical and chemical), such as air and water.*
- adaptation:** *A structure or behaviour that increases an organism's chance of surviving or reproducing in a particular environment.*
- biodiversity:** *The variety of life on Earth; most commonly, the genetic variability within individual species, variety of living species; and the variety of different ecosystems.*
- biotic:** *The living components of the environment; in other words, all other organisms in the environment.*
- community:** *A group of interacting populations of two or more different species that live together in a particular environment.*
- ecology:** *The scientific study of the inter-relationships among organisms and between them.*
- ecosystem:** *A network or system of interdependent living (biotic) and non-living (abiotic) things.*
- environment:** *The complete range of external conditions, physical and biological, in which an organism lives.*
- humus:** *The decomposed (or decomposing) organic material (usually by bacteria and fungi) found in soil.*
- micro-environment:** *A small area of an environment that has different conditions (such as temperature and/or humidity) compared with the larger environment of which it is a part.*

organism: A life form.

population: A group of organisms, all of the same species, which occupies a particular area.

Measurement Terms

aspect: The directional orientation of a slope which creates differing situations of heat, light and amount of sunshine.

quadrat: A basic ecological sampling unit, ranging in size from one square metre in grasslands, to 10 square metres in forested areas. These smaller units of measure are used for making accurate estimates of the biotic and abiotic features within an ecosystem.

slope: The angle of an area of land.

transect: (1) A line used in ecological study to provide a means of measuring and representing, geographically, the distribution of organisms. Recordings are made at regular intervals. Transects are particularly useful for exploring transitions and the distribution of living and non-living things across an ecosystem. (2) A technique for estimating populations that involves running a straight line of string through the area being studied. At regular intervals along the string, every organism that touches the string, or grows directly above or below it is identified and counted.

Food Web Terms

decomposer: An organism that feeds (to gain energy and nutrients) on material that had once been alive.

deciduous: Plants whose leaves fall off annually, usually in the autumn.

coniferous: Seed-bearing plants that produce cones and bear leaves all year round.

consumer: An organism that obtains its food (to gain energy and nutrients) by eating other organisms.

fauna: All the animal species of a given area.

flora: All the plant species that make up the vegetation of a given area.

producer: An organism that is able to manufacture food from simple inorganic substances.

Land Use Terms

aesthetic features: *Sensory aspects of a landscape associated with its natural beauty and wonder.*

conservation: *The process of managing human use of the environment to ensure that heritage values are considered and such uses are sustainable.*

indicator species: *A species whose ecological requirements are well understood and where changing population numbers will indicate a particular environmental condition or set of conditions. Indicator species can also give a good indication of how other organisms may be surviving.*

land-use: *Any behaviour or activity that occurs on a parcel of land.*

protected area: *Protected areas are natural landscapes that are explicitly legislated to preserve natural heritage values. Management guidelines and monitoring programs must ensure the long term preservation of biodiversity. Environmental diversity (biodiversity) is understood to include all species of plants, animals and other organism, and the habitat, and ecological processes upon which they depend. Protected areas are internationally recognized as one of the cornerstones of biodiversity preservation.*

stewardship: *Management of the heritage of our natural spaces, species and culture in such a way that it can be passed on, intact, to future generations.*

sustainable: *Management that ensures that the present uses (human and otherwise) of an area and its resources, do not compromise the future health, availability and prospects for future generations.*

FISH CREEK PROVINCIAL PARK: Key Messages

Please review and be sure everyone understands the following information before your visit to the park.

- Our vision: Alberta's parks inspire people to discover, value, protect, and enjoy the natural world and the benefits it provides for current and future generations.
- Alberta Parks acknowledges 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.
- Alberta's parks and protected areas belong to all Albertans and contain many different natural landscapes that are home to numerous plant and animal species as well as significant cultural and historic resources. The province's network of parks and protected areas helps to ensure that Alberta's natural and cultural heritage is preserved for future generations.
- There are a wide variety of visitors and users of our parks. Everyone must respect and share the park and its facilities and resources.
- Stay on designated trails while moving through the park and participating in group activities. Staying on designated trails reduces impact to the natural habitats of the park. Please share the trail with other users.
- Feeding wildlife is prohibited. The park's ecosystems provide all the food and habitat wildlife require for their basic needs. Feeding wildlife can cause wildlife to associate humans with food. Quietly observe wildlife from a safe and comfortable distance so as not to disturb them or put them or you at risk.
- Everything in the park – living and non-living is protected. Students are welcome to share their discoveries, but must remember to leave everything as they found it. Do not remove anything natural from the park.
- Litter must be placed in garbage cans or packed out.
- Use only designated fire pits. The collecting and burning of park vegetation is not permitted. You must ensure fires are fully extinguished before leaving them.



PRE-FIELD TRIP ACTIVITIES

The following activities will help students to build initial knowledge and understandings for the field study.

Scientific Teams

The field study you are preparing for is a full-day of exploration and data collection in an outdoor, natural environment setting. It is important that your students understand what they are responsible for and what your expectations are. Be sure to review the “Key Messages” and your own expectations with them before coming to the Park.

Review the data forms that students are expected to complete while on the field study. Reflect and think about the personalities of your students. Take all of this information into account and develop the student groups that will work together on the field study.

You can have a maximum of 6 groups of students.

Review with your students the data sheets and the variety of information they are expected to collect. Students usually do better if they can try a variety of equipment and exercises in each quadrat survey; rarely will they be happy doing the same thing in each survey.

Review their responsibilities regarding:

- Care of equipment
- Respect for the Park
- Respect for their classmates, teachers, volunteers
- Importance of making careful and complete observations and recordings of data and information

Describing an Ecosystem

RESOURCE: Appendix p. 27, 28

To provide students with a list of questions or criteria they would use to help define an ecosystem when they visit it for the first time.

Instruct the students to get into their scientific teams. Circulate a variety of posters, books, or other resources showing natural habitats, landscape images from a variety of regions. Be sure each group has a different environment or ecosystem to explore and discuss.

Challenge each group to develop a list of questions that could be reduced to five questions, that when asked, would result in information that describes any ecosystem they might visit.

Ask each group to present and post the questions they developed.

Switch group resource materials. Ask them to apply the questions they developed in the first round to the second round.

Do the answers give a complete description of the ecosystem or habitat that they now have?

How could they revise their questions to improve them? Create three food webs that contain at least ten species in each web.

Describing an Ecosystem

Some possible questions to ask when exploring any ecosystem could include:

1. What are the primary abiotic features?
2. What are the primary biotic features such as:
 - What are the main producers, consumers, decomposers?
3. What unique adaptations do the plants and animals have?
4. What are the hardships and challenges organisms in this ecosystem face?
5. How does the ecosystem change over the course of the seasons?

Alberta's Natural Regions

Alberta is comprised of six distinctly different natural regions, each having several sub-regions. Classification of these regions is based on geology, landforms, soil, hydrology, climate, vegetation and wildlife. For information on the six natural regions described here, visit - <https://www.albertaparks.ca/albertaparkscalmanagement-land-use/parks-system/> and follow the links to Management & Land-use.

Grasslands Natural Region, located in the south east corner of the province is characterized as hot, dry and windy. Exposed badlands, bedrock, sandstone and large flat plains make up the geography. Wildflowers, grasses and shrubs are common plants. Wildlife includes cottontail, pronghorn and ground squirrel along with an abundance of birds. This ecosystem comprises about 12% of Alberta's environment.

Parkland Natural Region is the most densely populated natural region in Alberta, and has been farmed/ranched extensively since the late 1800s. Areas of extensive agriculture have altered it, making its boundaries difficult to define, so soil characteristics have been used to delineate the subregion, since these change more slowly than surface land cover.

The character of the natural region changes from north to south. Grasslands are the main native vegetation type in the southern part. Islands of aspen forest or patches of willow shrubland exist in moist depressions or on northerly slopes. To the north, aspen stands are more common, and closed aspen and balsam poplar stands with intermixed grasslands are typical, forming a parkland-like mosaic. This ecosystem comprises about 9% of Alberta's environment.

Rocky Mountain Natural Region lies along the Continental Divide. Here fast flowing streams and rivers dissect towering mountain ranges. Thick coniferous forests are found at lower elevations, and alpine tundra at higher elevations. Common vegetation includes Douglas fir, aspen, lodgepole pine and grassy meadows. Wildlife that live in this region include elk, bighorn sheep, deer, coyote, moose, osprey and grizzly bears. This ecosystem comprises about 6% of Alberta's environment.

Foothills Natural Region is comprised of rolling hills and ridges that run parallel to mountains. This area receives more precipitation and is cooler in the summer than other regions in the province. Its coniferous forests, populated by white spruce, black spruce, lodgepole pine and subalpine fir, are home to a wide variety of birds, black bears, grizzly bears and elk. This ecosystem comprises about 12% of Alberta's environment.

Boreal Forest Region is the largest natural region in Alberta. Vast stands of aspen, balsam poplar and white spruce are broken up by lakes and large areas of muskeg where black spruce and tamarack are the dominant tree species. These ecosystems are home to an extensive range of wildlife that include moose, hare, lynx, weasel, wetland birds, wolves, beaver, ermine, woodland caribou and an abundance of birds and insects. This ecosystem comprises about 60% of Alberta's environment.

Canadian Shield Region reaches into Alberta from the Northwest Territories on its north east border. This small region is formed of granite covered with thin soils, patchy coniferous forests, shifting sand dunes and small shallow lakes. Common wildlife include bear, beaver, muskrat, lynx, wolf, moose, bald eagle, ptarmigan and a wide variety of other birds. This ecosystem comprises about 2% of Alberta's environment.

PRE-FIELD TRIP ACTIVITIES

The following activities will help students to build initial knowledge and understandings for the field study.

What are Protected Areas?

RESOURCE: Appendix p. 29, 30

To introduce the concept that people value different things in different ways and that in order to ensure an area is “safe”, or “secure” from damage, certain precautions are required.

Teacher Instructions

1. Make copies of “What Is A Protected Area - One” and “What Is A Protected Area - Two”.

2. Circulate copies of “What Is A Protected Area - One” to each student.

3. Ask the students to think of somewhere that is very important to them. This could be their bedroom, a local natural area, a cottage, weekend cabin or particular camping destination, for example.

4. Ask the students to answer the following questions with this place in mind.

- Describe this important area without naming it.
- Why is it so important to you?
- How do you ensure it never is damaged or destroyed?
- What would you do if a friend threatened this place?
- Is this place important to other people? If so who and why?
- How do you indicate to others that this place is important to you?

5. Collect the completed sheets, number them consecutively and post the sheets on the wall, without any student’s names on the sheets.

6. Hand out copies of “What Is A Protected Area - Two”.

7. Ask the students to move around and read the posted sheets. They can ask their classmates questions that can be answered with a yes or no, in an effort to determine who wrote each posted sheet.

8. Record their guesses on the sheet entitled “What Is A Protected Area - Two” by writing the name of the person they think filled out the sheet they are reviewing, beside the sheet number on their tally sheet.

9. After a few minutes, ask each person to write their name on the “What Is A Protected Area?” sheet they made.

10. Discuss the common points that students wrote for each of the questions on the “What Is A Protected Area - One?” sheet.

Discussion should include the following points:

- What sorts of protected areas are valued by students?
- Why are these areas important?
- Why is there so much variance in what people value?
- How do you demonstrate to others that this is an area you protect?

Your Day In The Field

SCHEDULE

The following outdoor field trip activities are curriculum-connected and intended to connect learning in an experiential way to the natural world.

Program Start and End

The field study is covered in a 4 – 5 hour time frame, but can be modified to fit other schedules. A typical time frame is 9:30 a.m. to 2:00 p.m.

Groups are dropped off at the Fish Creek Environmental Learning Centre (see map in appendices). Park staff will meet and direct your group to your classroom base for the day.

What to Expect

The major portion of your field study will be doing transect/quadrat surveys in 3 habitats (grassland, aspen parkland, spruce forest) collecting information on the biotic and abiotic features of each and on flora and fauna.

Please ensure that each student has a copy of the “Data Forms” (Pages 13 - 25) and that you have students separated into working groups. You can have a maximum of six groups of students.

What to Leave Behind:

- Laptops, earbuds, games etc.
- Designer clothing – we will be doing field work, getting dirty

Field Trip at a Glance

Park and Field Study Introduction – Classroom (60 minutes)	<ul style="list-style-type: none"> • Introduction to Fish Creek and the provincial park system, park rules and behavioural expectations for the day • Review the day’s agenda including field study procedures and field equipment
Washroom/Snack Break (10-15 minutes)	
Quadrat/Transect Survey (60 – 90 minutes)	<ul style="list-style-type: none"> • The morning sees students complete the grassland study.
LUNCH BREAK (30 minutes)	
Quadrat/Transect Survey (60 – 90 minutes)	<ul style="list-style-type: none"> • The afternoon sees students complete Parkland and Boreal Forest studies.
Return to the Learning Centre for Program Wrap-up	<ul style="list-style-type: none"> • Inventory Field Equipment • Review data collected • Questions from students

Schools are responsible to pay for lost equipment or equipment broken due to misuse

FIELD TRIP ACTIVITY SUMMARY

The following outdoor field trip activities are curriculum-connected and intended to connect learning in an experiential way to the natural world.

1 Introduction

Facilitated indoors by an environmental educator



Activity Summary:

- Students are introduced to Fish Creek and the provincial park system.
- Discuss park rules and behavioural expectations for the day
- Review the day's agenda
- Review field study procedures, data to be collected, data sheets, and field equipment

2 Quadrat/Transect Surveys

Activity Summary:

- The entire class will be lead to the study area (Grassland in morning period, Aspen Parkland and Boreal Forest in afternoon period).
- The line transect is laid out and student groups set up quadrat study areas along the transect in designated spots. Student groups then work to collect and record all required field data.
- Data to collect is reviewed in the introduction and represented in the student data forms.
- Equipment use is reviewed during the introduction.

3 Wrap Up

Activity Summary:

- All equipment is inventoried to ensure all is returned in working order.
- Review data collected.
- Answer student questions.

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STUDENT DATA FORMS

www.Fish-Creek.org



Name: _____

Date: _____

Group Members: _____

ABIOTIC DATA: GRASSLAND

Sample #	1	2	3	Average
Air Temp. Two Metres Above Ground				
Air Temp. One Metre Above Ground				
Air Temp. Ground Level				
Soil Temp.				
Soil Moisture				

Wind (Slight, Moderate, Strong)	
Slope (Slight, Moderate, Steep)	
Aspect (Direction of Slope)	

BIOTIC DATA: GRASSLAND

Evidence of Animals and Insects

In the square below sketch and label all evidence of animal (bird, mammal, insect) activity in your quadrat. Include as much detail and information as possible.



BIOTIC DATA: GRASSLAND

Plants

Randomly place your grid square into your quadrat. In the grid below, do a detailed drawing of the plants found in your grid square. You may include labels or codes to identify different types of plants (G = Grass, M = Moss, F = Flower, S = Shrub).

ABIOTIC DATA: ASPEN PARKLAND

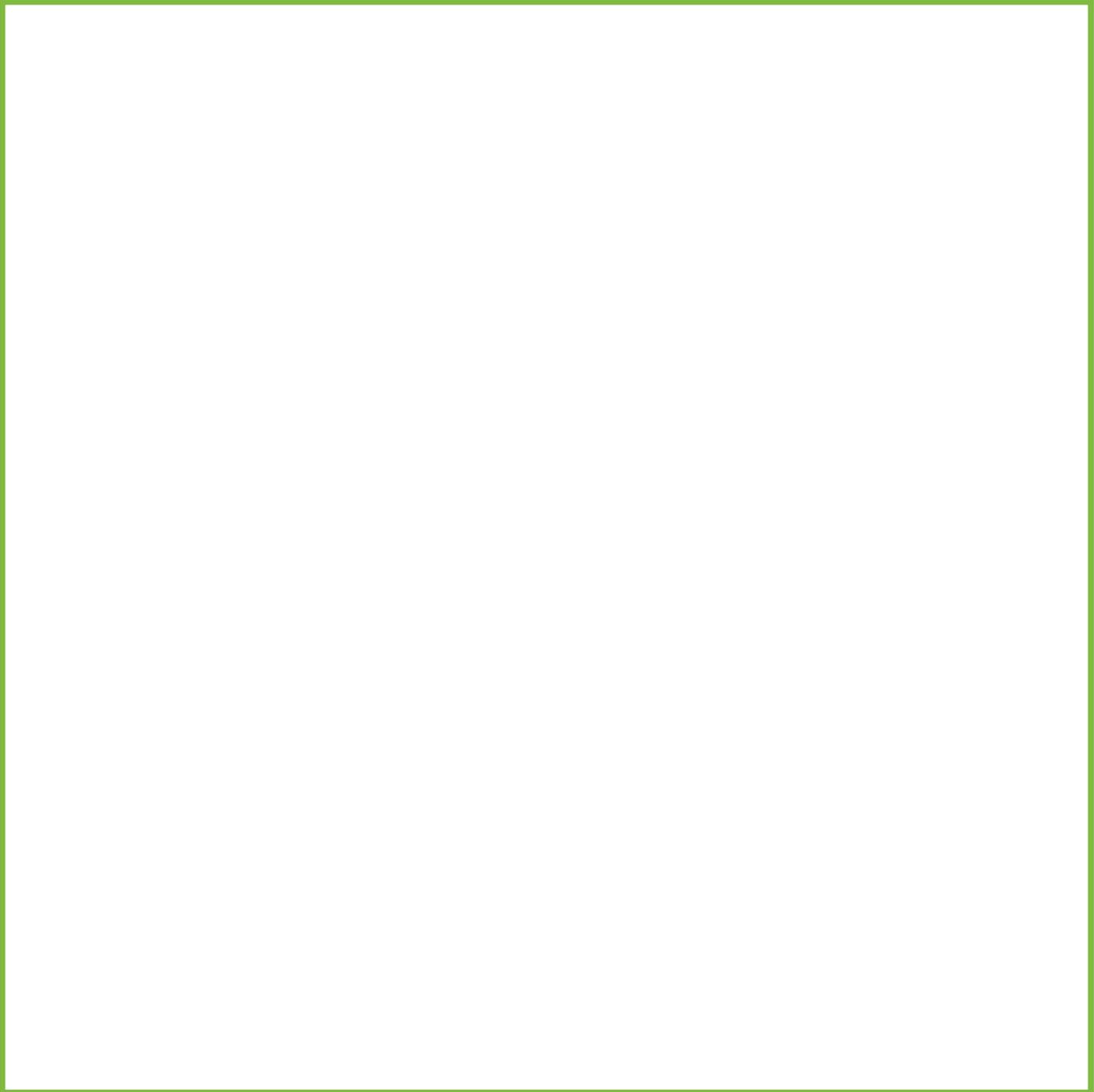
Sample #	1	2	3	Average
Air Temp. Two Metres Above Ground				
Air Temp. One Metre Above Ground				
Air Temp. Ground Level				
Soil Temp.				
Soil Moisture				

Wind (Slight, Moderate, Strong)	
Slope (Slight, Moderate, Steep)	
Aspect (Direction of Slope)	

BIOTIC DATA: ASPEN PARKLAND

Evidence of Animals and Insects

In the square below sketch and label all evidence of animal (bird, mammal, insect) activity in your quadrat. Include as much detail and information as possible.



BIOTIC DATA: ASPEN PARKLAND

Plants

Randomly place your grid square into your quadrat. In the grid below, do a detailed drawing of the plants found in your grid square. You may include labels or codes to identify different types of plants (G = Grass, M = Moss, F = Flower, S = Shrub).

ABIOTIC DATA: SPRUCE/BOREAL FOREST

Sample #	1	2	3	Average
Air Temp. Two Metres Above Ground				
Air Temp. One Metre Above Ground				
Air Temp. Ground Level				
Soil Temp.				
Soil Moisture				

Wind (Slight, Moderate, Strong)	
Slope (Slight, Moderate, Steep)	
Aspect (Direction of Slope)	

BIOTIC DATA: SPRUCE/BOREAL FOREST

Evidence of Animals and Insects

In the square below sketch and label all evidence of animal (bird, mammal, insect) activity in your quadrat. Include as much detail and information as possible.



BIOTIC DATA: SPRUCE/BOREAL FOREST

Plants

Randomly place your grid square into your quadrat. In the grid below, do a detailed drawing of the plants found in your grid square. You may include labels or codes to identify different types of plants (G = Grass, M = Moss, F = Flower, S = Shrub).

Appendix

Student Worksheet: Describing an Ecosystem Questions

Student Name: _____

Date: _____

Develop five questions that when answered would result in a detailed and accurate definition of any ecosystem you visited.

1.

2.

3.

4.

5.

Additional Questions:

1.

2.

3.

4.

5.

Student Worksheet: Describing an Ecosystem Chart

Student Name: _____

Date: _____

Ecosystem:

What are the primary abiotic features?

What are the primary biotic features?

What are the main producers?

What are the main consumers?

What are the main decomposers?

What unique adaptations do the plants and animals have?

What are the hardships and challenges organisms in this ecosystem face?

How does the ecosystem change over the course of the seasons?

Student Worksheet: What Is A Protected Area? - One

Name (don't write your name until you are asked to)

Date _____

Think of a place that is really important to you. Answer the following questions:

1. Describe the place that is really important to you without naming it.
2. Why is this place so important to you?
3. How do you ensure that this place never is damaged or destroyed?
4. What would you do if a friend threatened this place?
5. Is this place as important to everyone else as they are to you and why?
6. How do you indicate to others that this place is important to you?

Student Worksheet: What Is A Protected Area? - Two

Move around the classroom and read the posted sheets. Ask your classmates questions that can be answered with a yes or a no in an effort to determine who wrote each of the posted sheets.

1.	2.
3.	4.
5.	6.
7.	8.
9.	10.
11.	12.
13.	14.
15.	16.
17.	18.
19.	20.
21.	22.
23.	24.
25.	26.
27.	28.
29.	30.
31.	32.
33.	34.

Access Map - Fish Creek Environmental Learning Centre

13931 Woodpath Road SW, Calgary, Alberta



DIRECTIONS

From Anderson Rd SW heading west:

- Follow signs to Tsuut'ina Trail and follow exit onto Buffalo Run Blvd
- Follow Buffalo Run Blvd past the gas bar and Costco complex to 130 Ave SW
- Heading east through two traffic circles to continue onto 130 Ave SW
- Turn right onto Woodpath Rd SW and follow road straight into the park

From south of 130 Ave SW on northbound Tsuut'ina Trail:

- Take the 130 Ave SW exit and keep right at top of ramp onto eastbound 130 Ave SW
- Turn right on Woodpath Rd SW and follow road straight into the park

