

# **ECOSYSTEMS AND IMPACTS**

**An Educational Field Study for  
Biology 20 and Science 20 Students**



**Fish Creek Provincial Park**

**Telephone: (403) 297-7927**

**[www.fish-creek.org](http://www.fish-creek.org)**

**Government  
of Alberta** ■



# Contents

## **Section I – Before You Go**

1. Specific Learner Outcomes /Curriculum Connections
2. Vocabulary List
3. Park Etiquette – Key Messages to review before your field trip
4. Scientific Teams – Preparing Students to work together
5. Class Preparation Discussions for the Field Study

## **Section II – Your Field Study Day**

1. What to Bring – What to Leave Behind
2. Your Day In the Field

## **Section III – After Your Visit**

1. Web Site resources

## **Section IV – Appendices**

1. Appendix A – Maps, Access Map & Fish Creek Provincial Park
2. Appendix B – Data Forms
3. Appendix C – A Simplified Key to Common Native Trees and Shrubs

## Section I – Before You Go

### 1. Specific Learner Outcomes / Curriculum Connections

#### Curriculum Connections

The Ecosystems and Population Change field study will provide students with guided practice, in an authentic setting to support the Biology 20, Unit B: Ecosystems and Population Change as set forth by the Alberta Education.

#### Program Concepts

1. Ecosystems have distinctive biotic and abiotic factors.
2. Limiting factors can influence organism distribution and range.
3. Human activity can have both intended and unintended consequences for humans and the environment.
4. Alberta Parks helps to protect Alberta's biodiversity.

#### General Outcome 1

Students will explain that the biosphere is composed of ecosystems, each with distinctive biotic and abiotic characteristics.

#### Outcomes for Knowledge

*Students will:*

- B1.1k Define and explain the interrelationship among species, population, community and ecosystem.
- B1.2k Explain how a terrestrial and an aquatic ecosystem supports a diversity of organisms through a variety of habitats and niches.
- B1.3k Identify biotic and abiotic characteristics and explain their influence in an aquatic and a terrestrial ecosystem in a local region.
- B1.4k Explain how limiting factors influence organism distribution and range.
- B1.5k Explain the fundamental principles of taxonomy.

#### Outcomes for Science, Technology and Society

*Students will:*

- B1.1sts Explain that science and technology have both intended and unintended consequences for humans and the environment.

## **Skill Outcomes**

*Students will:*

- Bl.1s Ask questions about observed relationships and plan investigations of questions, ideas, problems and issues, and define and delimit problems to facilitate investigation by
- Hypothesizing the ecological role of biotic and abiotic factors.
- Bl.2s Conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information by
- Performing a field study to measure, quantitatively, appropriate abiotic characteristics of an ecosystem or ecosystems and to gather evidence for analysis, both quantitatively and qualitatively, of the diversity of life of the ecosystem(s) studied.

## **Analyzing and Interpreting**

*Students will:*

- Bl.3s Analyze data and apply mathematical and conceptual models to develop and assess possible solutions by
- applying classification and binomial nomenclature systems in a field study.
  - analyzing the interrelationship of biotic and abiotic characteristics that make up the ecosystem(s) studied in the field.

## **Communication and Teamwork**

*Students will:*

- Bl.4s Work as members of a team in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results by
- working cooperatively to gather and share data on field trip
  - working cooperatively to make clear and logical arguments to defend a decision on a given issue

## 2. Vocabulary and Definitions

### Vocabulary

The following vocabulary will be used throughout the field study. It's expected that students will have a working knowledge of these terms. The following resources were used to develop these definitions:

The Oxford Concise Dictionary of Ecology by Michael Allaby, Oxford University Press (1996)

The Oxford Concise Dictionary of Zoology by Michael Allaby, Oxford University Press (1996)

Dictionary of Biology by M. Thain and M. Hickman, Penguin Books (1994)

Gage Canadian Dictionary, Gage Educational Publishing Company, (1997)

### Teacher Instructions

There is a significant amount of vocabulary involved with this field study. This list, with definitions, is designed to help students sort the vocabulary into meaningful groups so that it can be used successfully for pre-visit activities, the field study day, and post-visit activities.

### 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.

### **3. Park Etiquette – Key Messages to review before your field trip**

1. 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. The province's network of parks and protected areas covers roughly 27,500 square kilometres and includes more than 500 sites. This network helps to ensure that Alberta's biodiversity is preserved for future generations.
2. 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".
3. Provincial parks exist to protect provincially significant natural, historical and cultural features. They contain a range of outdoor recreation, interpretive, and environmental education opportunities, facilities and services so that visitors can explore, learn, understand, and appreciate the natural world.
4. The Provincial Parks Act protects Alberta's parks. It is through this legislation that these landscapes have specific and important guidelines to help keep them healthy and vibrant.
5. Feeding of wildlife is not necessary and is potentially dangerous and is against Park rules. The Park's ecosystem provides all the food and habitat wildlife requires for their basic needs. Human food does not meet their nutritional requirements and can cause some species to become dependent on humans. Quietly observe all wildlife from a comfortable distance.
6. Take only pictures. Everything in the Park – living and non-living is protected to help preserve the complex living system that thrives in our provincial parks. Students are welcome to share their discoveries, but must remember to leave everything as they found it. Treat plants, insects, and trees gently to avoid unnecessary injury or damage. Please do not pick plants.
7. There are no off-leash areas in Alberta's Parks and Protected Areas. This protects the parks wildlife as well as domestic pets. Please do not bring pets on a field study. They can be distractions for students and pose a health risk for those allergic to pets. Guide Dogs and Assisted –Living Dogs are the only animals permitted in Park buildings.
8. Litter should be placed in the rubbish bins provided or in a pocket. Human litter is hazardous to Park plants and wildlife.
9. Use only designated fire pits. Open fires are a threat to public safety and Park habitats. The burning of Park vegetation is not permitted. You must bring your own firewood and water to extinguish the fire.



#### 4. Scientific Teams – Preparing Students to Work Together

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 Park Etiquette 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 on the teacher workshop 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 student groups.*

Review with your students the data sheets and try to explain 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

## 5. Class Preparation Discussions for the Field Study

### A. Scales of study in Ecosystems.

If time allows you may want to discuss the idea of scale of study.

If scientists are going to conduct a study then they need to know at what level to conduct it at.

#### Biome Level:

- Cover large geographical regions with a specific range of temperatures and precipitation and organisms that are adapted to those conditions.
- Canadian terrestrial ecosystems can be grouped into four main biomes: tundra, taiga, temperate deciduous forest and grassland .
- Global warming is an example of a mechanism of change at this scale.
- This scale is too large for us to study in this field study.

#### Landscape Level:

- At this level researchers can study areas the size of the Fish Creek valley (100 km<sup>2</sup>). At this level it's possible to see forest communities such as Aspen or White spruce within a region.
- Important factors that scientists can study are climate (average temperature, wind, sunlight etc.) and biogeography (why things tend to grow where they do).
- Changes at this scale include both natural and human disturbances such as fire, disease, floods, clear cutting.
- Maps are made using aerial photos taken from airplanes or satellites.
- This scale is too large for us to study in this field study.

#### Community Level:

- Researchers look for patterns in forest communities that are 1-10 km. They are interested in understanding how different populations (i.e. grasslands, Aspen, Spruce) interact within a community.
- At this level scientists study elevation, aspect, temp., precipitation, light, wind etc.
- Changes at this level include succession, inter and intra specific competition.
- Today we will be studying 2 different ecosystems at this scale.

If time, briefly comment on smaller scales of study:

Population Level:

- A forest population is made up of one dominant species that tends to have a similar age and distribution pattern
- At this level scientists study factors such as density, abundance and distribution.
- Changes that occur at this level include intra specific competition and natural selection.

Organism: i.e. investigate 1 aspen tree.

Cellular & Molecular: mutation, recombination, reproduction.

**B. Discuss sampling techniques** students will be engaged in as you review the data forms and equipment to be used during the field study. Emphasize the data they collect, and the methods used, will be the same for both sites. Discuss why scientists use transects and quadrat studies (systematic process to collect data which is representative of a larger area.) Discuss how groups will set up their 3m x 3m quadrat. Discuss all the tests and data students will collect. Not all students will collect the same data; however, groups will work cooperatively and share data for each study site.

**C. Data to be collected in the field,** refer to the data sheets and information below to discuss with students the information they will be collecting on the field study.

### **Abiotic Components**

Temperatures

Moisture, Light

Soil Profile

Soil pH

Slope

Aspect

## **Nitrate and Phosphate – a little more information**

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 nitrates and phosphates; two key nutrients needed for plant growth.

### **Nitrates:**

- Cells require nitrogen atoms to make proteins
- Nitrogen is also required for the synthesis of deoxyribonucleic acid (DNA)
- Nitrogen fixation occurs mainly through bacteria in soil (lightening also contributes)

### **Phosphates:**

A Key element in:

- cell membranes
- molecules that help release chemical energy
- the making of DNA
- the calcium phosphates of bones

- Park Staff will enlist one group to do the soil Nitrate and Phosphate tests
- Test results will be shared with all other working groups

## **Biotic Components**

### **Birds (using a point count)**

A point count is a count undertaken from a fixed location for a fixed time. It can be undertaken at any time of year, and is not restricted to the breeding season. Point counts are used by biologists to provide estimates on the relative abundance of each species or, if coupled with distance estimations, can yield absolute densities, too (Buckland et al. 2001). For the purposes of this ecosystem study, all students will conduct a point count and will document presence/absence (if name of species is known) and relative abundance of different species. Since it will be used only as an index, no distance band will be incorporated. *Often, a distance band of 30 m in forest communities, and 50 m in more open habitat are used in studies which can be incorporated into calculating the densities of species* (Sutherland, 2006).

## **Evidence of Animals (using a line transect)**

Line transects involve an observer moving along a pre-determined route through a study area recording the distances at which each individual/track/sign is seen. In protected areas, this study method is used to identify habitat use, as an index of activity, and to determine long term trends on the movement of wildlife through corridors and the affects of human use. You can also use transects to determine population densities.

- To investigate the presence or absence of wildlife, students will walk the entire length of the line transect, observing all signs 1 metre on either side of the transect.
- Document any wildlife sign, such as: tracks, scat, burrows, scratch marks, browsing, food caches etc.

## **Vegetation**

### Tree and Shrub Identification

- Students will document the dominant tree and shrubs in their 3m x 3m quadrat using the *tree and shrub key provided*.
- Identify and record the common and scientific name (*Genus species*).

### Ground Cover Assessment

## **Human Impacts and Observations and Ratings**

Students are to observe the Park around their quadrat and record on the Impacts Data Sheet any and all human impacts they observe

### Visual Impacts

### Auditory Impacts

### Other Human Impacts

Students will then discuss with their team whether these impacts are positive, negative or neutral, come up with arguments to justify their ratings and finally choose one impact that their group will present and discuss at the wrap-up

## **Impacts Discussion and Presentation**

Back at the amphitheatre, students work in their groups to develop and present discussions and rationalizations on one Human Impact they observed. Groups need to discuss and present on:

- Identify the impact observed
- State whether the impact has a positive, negative or neutral impact on the Park in regards *ecosystem health, the Park in general, visitor experience in the Park*
- How could the Park better manage this impact?

Students need to present their arguments to the rest of the class and answer questions regarding their views and justifications.

## Section II - Your Field Study Day

### 1. What to Bring – What to leave behind (A few suggestions)

It is most important that you, your students and your volunteers/chaperones know and understand that your field study will be an entirely “OUTDOOR” experience. We will not use a classroom or facility over the course of the day. Our home base for the day will be an outdoor amphitheatre in the Park. We will have access to washrooms at the start and end of the day, but otherwise will be in the field away from such facilities. With this in mind it is important that everyone attending the field study is prepared. Though we are in the city, everyone needs to be prepared for the day outdoors. The weather can change drastically, we will be moving through out the land base 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)
- Sturdy shoes (no sandals or flip-flops)
- Hat, sunscreen, bug repellent
- Food and water for the day (*there are no microwaves, coffee shops, vending machines, etc. on-site or close by*)
- Data sheets, pencils, clipboards
- Camera, binoculars (optional)
- Daypack
- Students in working groups (maximum of 6 groups)

#### What to Leave Behind:

- Gameboys, MP3s, PSPs, laptops, etc.
- Cell phones ( *bring them, but keep them packed away and OFF*)
- Designer clothing – we will be doing field work, getting dirty

## 2. Your Day in the Field ....

The field study day can be covered in a 4 – 5 hour timeframe, but can be modified to fit other schedules.

The major portion of your field study will be doing transect/quadrat surveys in 2 habitats (grassland, aspen parkland) collecting information on the biotic and abiotic features of each and observing, recording and discussing human impacts.

### Arrival

When doing the field study at Shannon Terrace (see map) have bus drop your group at the very last parking lot. DO NOT go to the Environmental Learning Centre. Staff will meet your group and direct you to the amphitheatre.

### **Program Outline**

- I. Set-Up & Introduction - Amphitheatre
  - Greeting
  - Alberta Parks Behaviour Guidelines (Dos and Don'ts for the day)
  - Overview of the Field Study day
- II. Historic aerial photo analysis
  - Have student groups examine series of air photos and put in order of oldest to most recent
  - Discuss how they decided upon the order
  - Discuss urban development around the Park
  - Discuss development inside Park boundaries
  - Relates to impact observations and scale/scope of studies
- III. Preparation for Field Study
  - Levels of scale to conduct studies
  - Sampling techniques
  - Explanation and review of equipment and use
  - Review Data form
- IV. Human Impacts
  - Making Observations
  - Creating questions
  - Justifications and discussions
- V. Grassland Ecosystem Investigation
- VI. Lunch ( Max 30 minutes in the field)
- VII. Aspen Parkland/Riparian Investigation
- VIII. Impacts Discussions and Presentations Activity – back at amphitheatre
- IX. Wrap-up and Equipment Inventory

## Materials Supplied by Park

- Laminated sets of aerial photos of the Fish Creek valley
- Field kits containing:
  - 10 m Measuring tape
  - Transect Line
  - Grid Squares
  - Air thermometer
  - Soil thermometer
  - Soil moisture and light metre
  - pH test strips, capped plastic vial, bottle of distilled water
  - Soil sampling tube
  - 2 metal spatulas
  - Magnifying glass
  - 4 magnifying boxes
  - soil phosphate and nitrate testing equipment (Park staff will carry this equipment, tests will be done by one working group only for entire class)
  - Clinometer
  - Compass
  - Key to Common Native Trees and Shrubs of Fish Creek Provincial Park



## Section III - After Your Visit

You have now completed your field study day. Your students have a range of data to use in examining and exploring the characteristics of ecosystems. There are a wide variety of resources that you can still explore including sources found at the websites below:

- Fish Creek Website Resources - [www.fish-creek.org](http://www.fish-creek.org)
- Alberta Learn website link to a new Alberta Natural Regions website  
[http://new.uat.learnalberta.ca/content/sszi/en/zoom\\_main.html](http://new.uat.learnalberta.ca/content/sszi/en/zoom_main.html)
- Link to Alberta Conservation Information Management System (ACIMS)  
<http://tpr.alberta.ca/parks/heritageinfocentre/naturalregions/default.aspx>
- Alberta Parks Website - <http://tpr.alberta.ca/parks/default.aspx>

## **Section IV – Appendices**

Appendix A – Maps, Access Map & Fish Creek Provincial Park

Appendix B – Data Forms

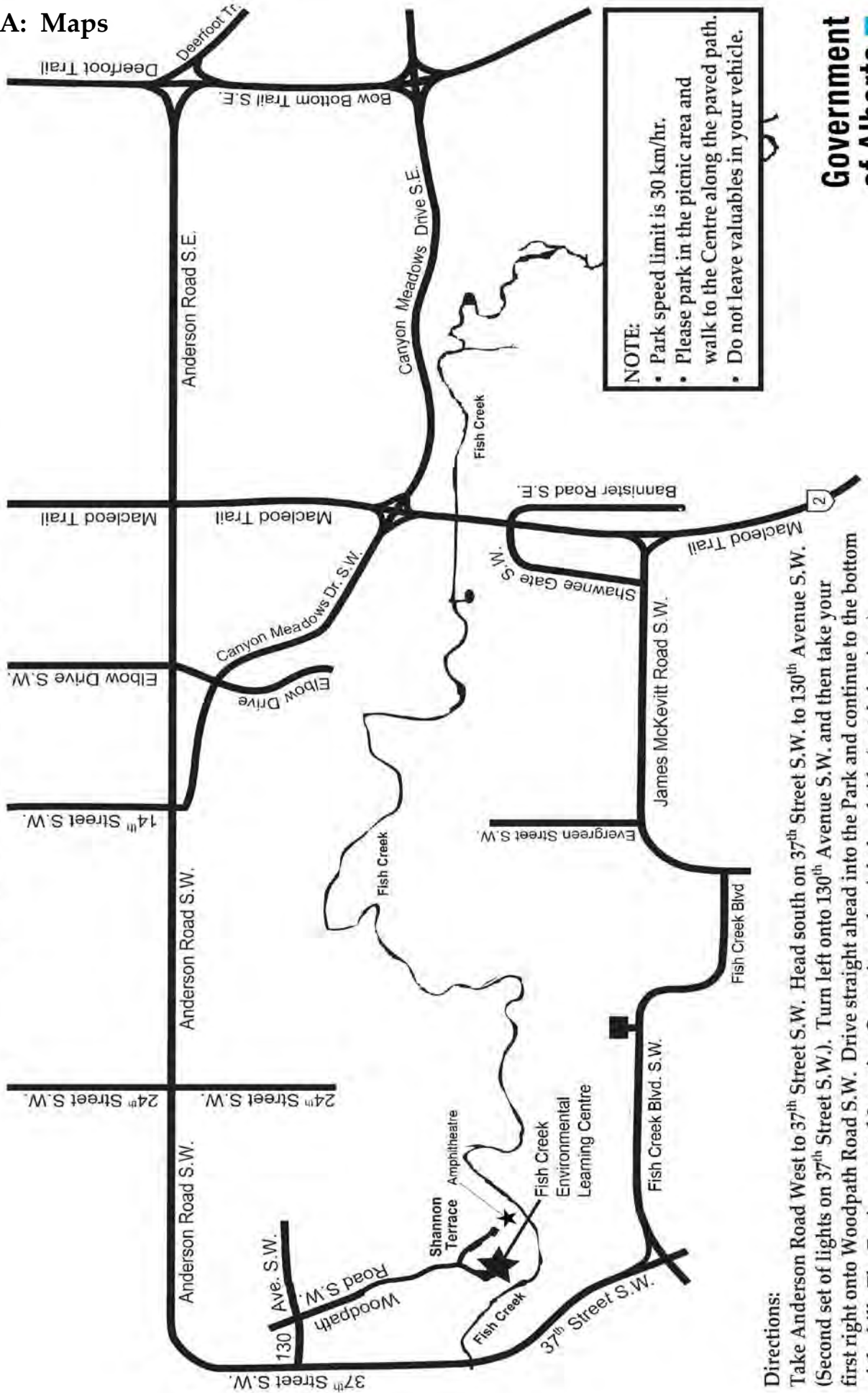
Appendix C – A Simplified Key to Common Native Trees and Shrubs

# Appendix A: Maps



## ACCESS MAP

Fish Creek Environmental Learning Centre  
 13931 Woodpath Road S.W., Calgary, Alberta T2W 5R6  
 Phone: (403) 297-7827 Fax: (403) 297-7849

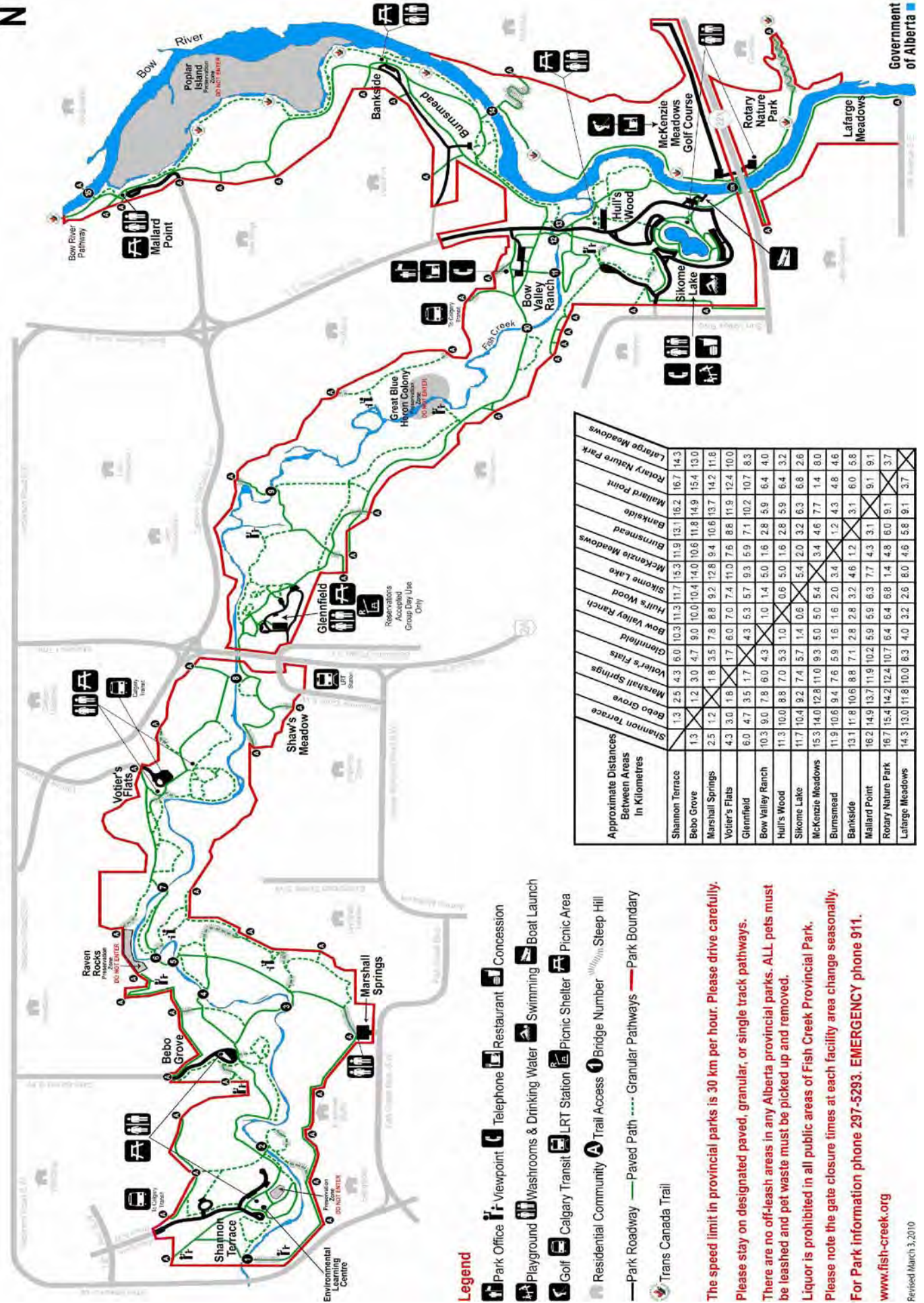


### Directions:

Take Anderson Road West to 37<sup>th</sup> Street S.W. Head south on 37<sup>th</sup> Street S.W. to 130<sup>th</sup> Avenue S.W. (Second set of lights on 37<sup>th</sup> Street S.W.). Turn left onto 130<sup>th</sup> Avenue S.W. and then take your first right onto Woodpath Road S.W. Drive straight ahead into the Park and continue to the bottom of the hill. The Environmental Learning Centre is on the right hand side (watch for signs).

**Government of Alberta**

# Fish Creek Provincial Park



## Legend

- Park Office
- Viewpoint
- Telephone
- Restaurant
- Concession
- Playground
- Washrooms & Drinking Water
- Swimming
- Boat Launch
- Golf
- Calgary Transit LRT Station
- Picnic Shelter
- Picnic Area
- Residential Community
- Trail Access
- Bridge Number
- Steep Hill
- Park Roadway
- Paved Path
- Granular Pathways
- Park Boundary
- Trans Canada Trail

The speed limit in provincial parks is 30 km per hour. Please drive carefully.

Please stay on designated paved, granular, or single track pathways.

There are no off-leash areas in any Alberta provincial parks. ALL pets must be leashed and pet waste must be picked up and removed.

Liquor is prohibited in all public areas of Fish Creek Provincial Park.

Please note the gate closure times at each facility area change seasonally.

For Park information phone 297-5293. EMERGENCY phone 911.

[www.fish-creek.org](http://www.fish-creek.org)

Revised March 3, 2010

Approximate Distances Between Areas In Kilometres	Shannon Terrace	Bebo Grove	Marshall Springs	Votter's Flats	Glennfield	Bow Valley Ranch	Hull's Wood	Sikome Lake	McKenzie Meadows	Burnsmead	Bankside	Mallard Point	Rotary Nature Park	Lafarge Meadows
Shannon Terrace	1.3	2.5	4.3	16.0	10.3	11.3	11.7	15.3	11.9	13.1	16.2	16.7	14.3	
Bebo Grove		1.3	2.0	4.7	9.0	10.0	10.4	14.0	10.6	11.8	14.9	15.4	13.0	
Marshall Springs			2.5	1.2	1.8	3.5	7.8	8.8	9.2	12.8	9.4	10.6	13.7	14.2
Votter's Flats				4.3	3.0	1.8	1.7	6.0	7.0	7.4	11.0	7.6	8.8	11.9
Glennfield					6.0	4.7	3.5	1.7	4.3	5.3	5.7	9.3	5.9	7.1
Bow Valley Ranch						10.3	9.0	7.8	6.0	4.3	1.0	1.4	5.0	1.6
Hull's Wood							11.3	10.0	8.8	7.0	5.3	1.0	0.6	5.0
Sikome Lake								11.7	10.4	9.2	7.4	5.7	1.4	0.6
McKenzie Meadows									15.3	14.0	12.8	11.0	9.3	5.0
Burnsmead										11.9	10.6	9.4	7.6	5.9
Bankside											13.1	11.8	10.6	8.8
Mallard Point												16.2	14.9	13.7
Rotary Nature Park													14.2	12.4
Lafarge Meadows														14.3

# ECOSYSTEMS AND IMPACTS

## Biology 20/Science 20 Transect and Quadrat Study

### STUDENT DATA FORM

In this field study, you will be exploring two different ecosystems; grasslands and riparian/aspen parkland. In your assigned groups, complete this data form with as much detail and accuracy as possible.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Group Members: \_\_\_\_\_  
\_\_\_\_\_

Weather Observations: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## ABIOTIC EXPLORATION

	Grassland				Riparian/Aspen Parkland			
	1	2	3	Avg.	1	2	3	Avg.
Air Temp. (°C) 1 m above the ground.								
Air Temp. (°C) at ground.								
Soil Temp. (°C)								
Soil Moisture scale 1 (dry) - 10 (wet)								
Light								
Slope (°)								
Aspect								

**Instructions:**

**Temperature:** Ensure thermometers are left for 2 minutes to accurately reflect the temperature of the area.

**Moisture and Light:** One metre will give both measurements. Take 3 readings for moisture and light within your quadrat and determine the average for each study site/ecosystem.

**Moisture** – With the probe shaft in the soil, switch to “moist” mode on the dial and wait 60 seconds before taking your reading.

**Light** – Remove probe from the soil. Place the photometer eye towards the sky. Set the switch to the “light” position and determine the position of the needle on the dial.

**Slope:** Slope, in degrees, measures the steepness of the landscape. Hold the base of the clinometre parallel with the slope being measured. Record the degree where the string falls to. This is the degree of slope for the hillside being measured.

**Aspect:** Aspect refers to the direction a slope is facing. Using a compass, stand on the uphill side of the quadrat and look down hill. Hold the compass in the palm of your hand with the ‘direction of travel arrow’ pointing down hill. Turn the compass housing until the ‘magnetic arrow’ is aligned inside the ‘compass housing arrow’. Record the direction in degrees and words that the quadrat is facing (i.e. south/180 degrees). This is taken by the measurement from the ‘direction of travel arrow’.

## Soil Profile

Soil Profile	Grassland Depth of soil layers (cm)	Riparian/Aspen Parkland Depth of soil layers (cm)
<p style="text-align: center;"><b>O Horizon</b></p> <p><b>Litter</b> Last years fallen material.</p> <p><b>Fermentation</b> Decomposing material, black and filmy in appearance that you can identify as a leaf, etc.</p> <p><b>Humus</b> Black layer of decomposing material which can not be identified as a leaf etc.</p>		
<p style="text-align: center;"><b>A Horizon</b></p> <p>Also called topsoil; it is dark brown in colour.</p>		
<p style="text-align: center;"><b>B Horizon</b></p> <p>Is often orange in colour. Is known as the mineral layer due to the leaching of materials from upper layers.</p>		
<p style="text-align: center;"><b>C Horizon</b></p> <p>Contains weathered parent rock material that is unconsolidated into soil.</p>		
<p style="text-align: center;"><b>Soil pH</b> (1 – 14)</p>		
<p style="text-align: center;"><b>Soil Nitrogen/Nitrate</b> (L – M - H)</p>		
<p style="text-align: center;"><b>Soil</b> <b>Phosphorous/Phosphate</b> (L - M - H)</p>		

### **Soil Sampling and Soil Profiles Instructions:**

Using the soil sampling tube, remove a cross section of soil from your quadrat. Use the soil samples to draw a detailed diagram of the cross section that includes:

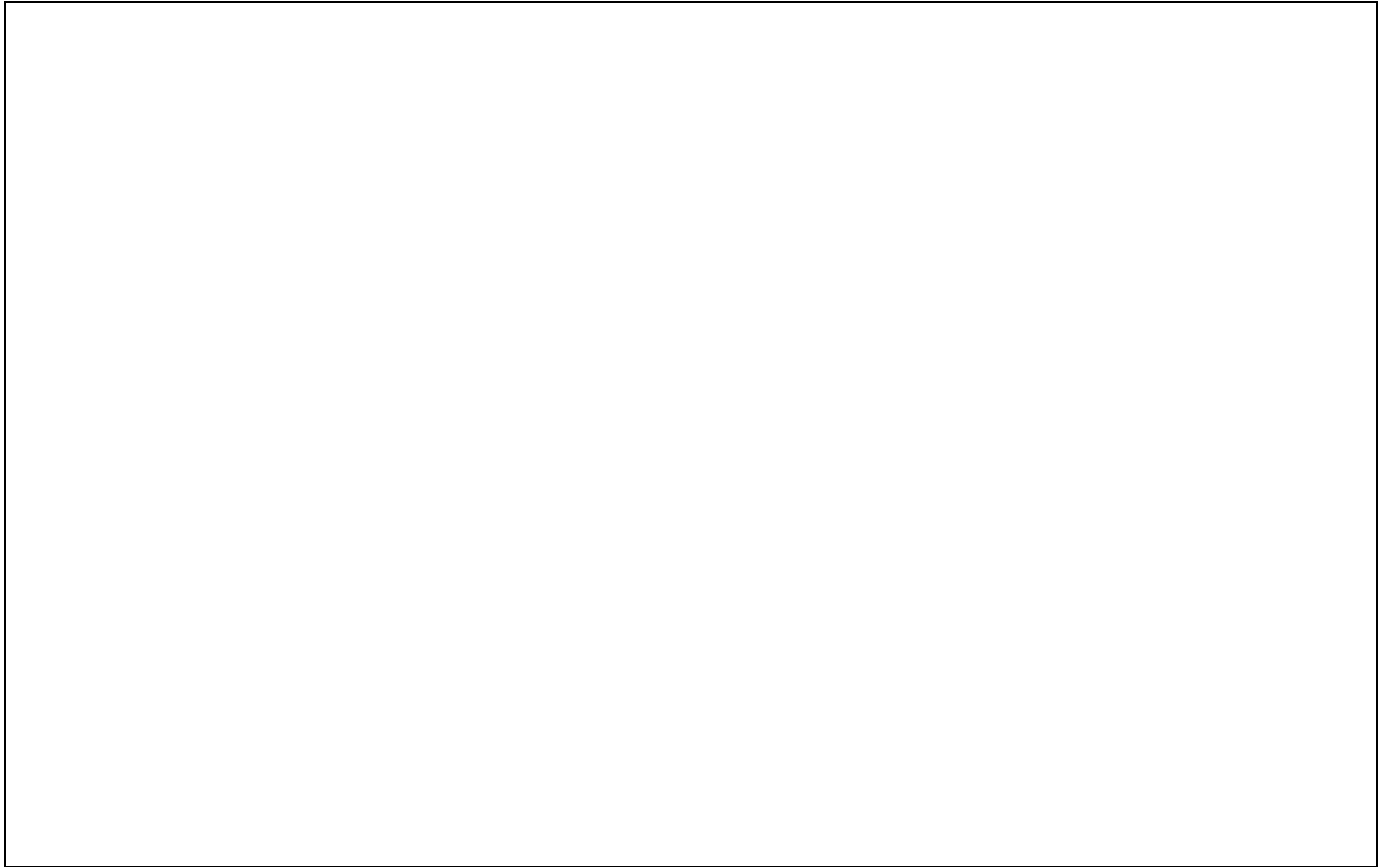
- Labelling of each layer of soil
- Measurements of the thickness of each layer (cm).
- Descriptions of the components of each layer.

**Soil pH:** After recording your soil profile sample (detailed, labelled sketch) take a small amount of soil from the sample and place in the capped plastic vial (approx.  $\frac{1}{4}$  full). Fill the vial to approximately  $\frac{3}{4}$  with distilled water from the bottle supplied and shake well. Open the vial and dip one pH test strip into the muddy mixture. Compare the test strip to the colour codes on the test strip vial to determine the pH and record (pH readings 1 – 14). Rinse the vial and cap with a small amount of the distilled water.



## BIOTIC EXPLORATION #1: *Grassland*

### Tree and Shrub Identification



Common Name	Scientific Name ( <i>Genus species</i> )	Number of Species	Symbol Used in Drawing

#### **Instructions:**

Using the square above, complete a detailed drawing of your 3m x 3m quadrat. Using the dichotomous key and other guide books provided, identify the trees and shrubs in your quadrat.

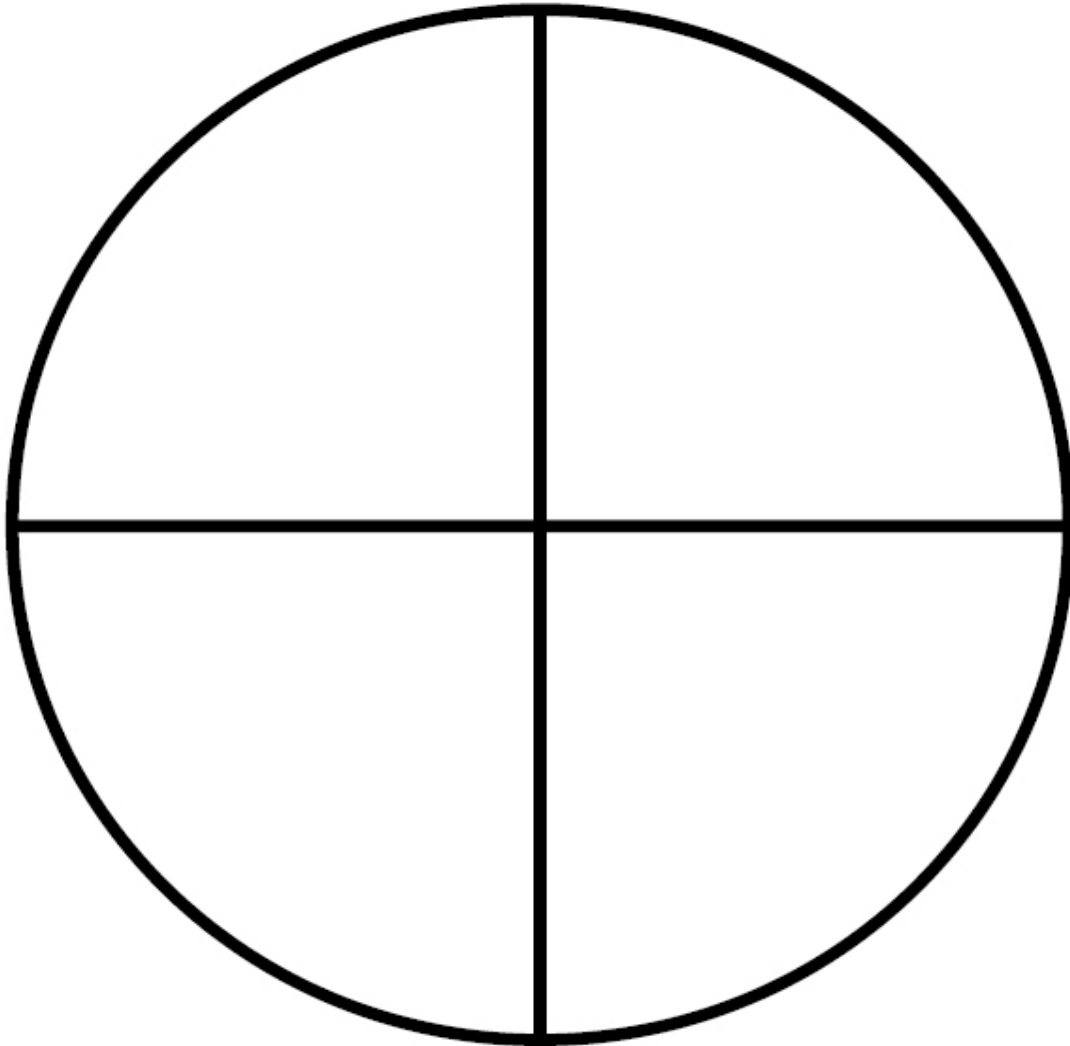
## Ground Cover Assessment #1: *Grassland*


Common Name	Percentage (%) of cover (estimation)	Symbol Used in Drawing
Moss		
Grass		
Herbs		
Woody Shrubs		

### Instructions:

Randomly place your 50 cm x 50 cm square into your quadrat. In the grid above, do a detailed drawing using symbols to represent moss, grass, herbs and woody shrubs in your 50 cm x 50 cm square. Using your estimation skills, what percentage of the area is covered with each? Can you identify any species?

**Bird Point Count #1: Grassland**



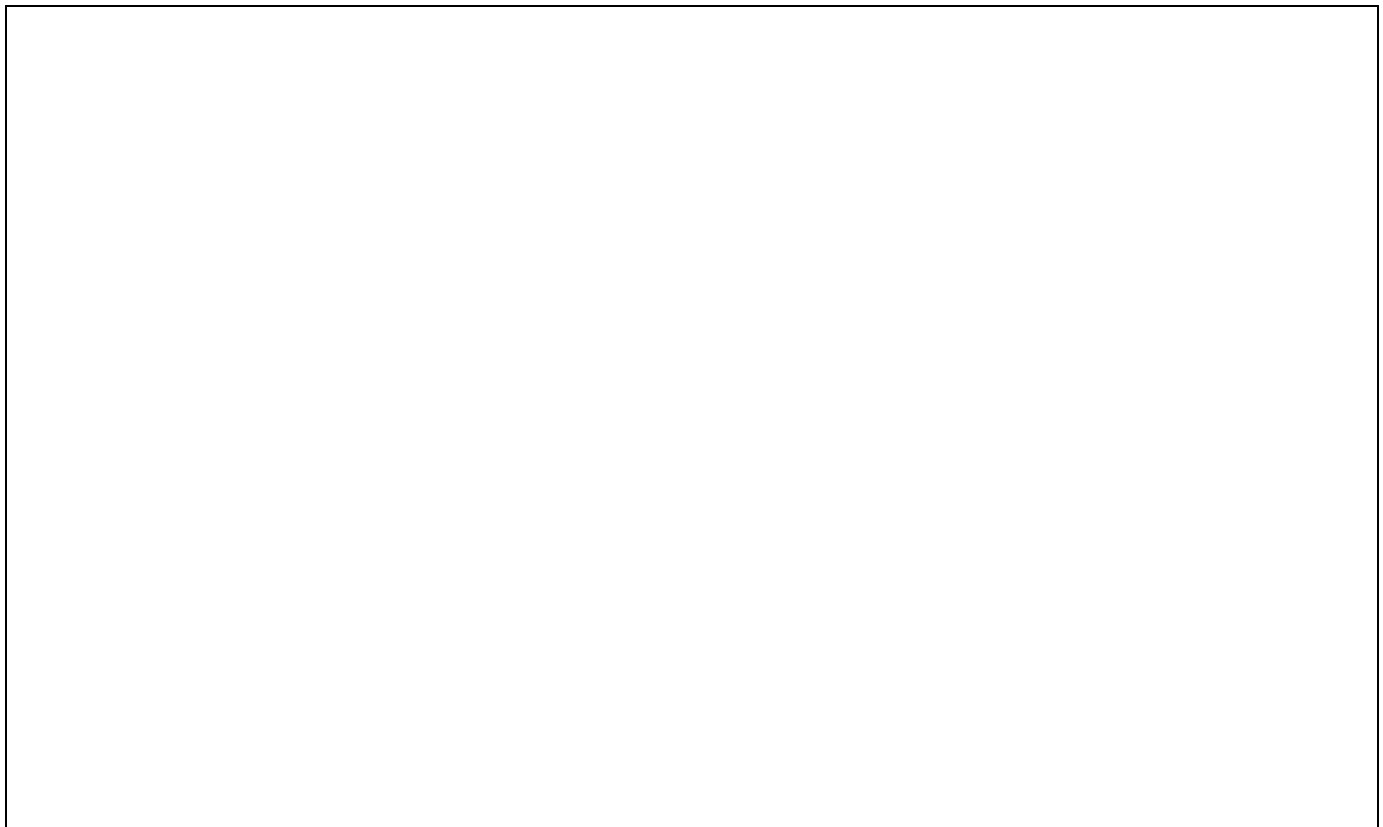
# Birds Seen \_\_\_\_\_ # Birds Heard \_\_\_\_\_ Total # of Species \_\_\_\_\_ Total # Birds \_\_\_\_\_

Can you identify any species? \_\_\_\_\_  
\_\_\_\_\_

**Instructions:** Find a place to sit comfortable and quietly. Record all birds seen or heard in the designated time period (5 or 10 minutes) on the above data sheet. Assume you are in the middle. It doesn't matter if you know the names of birds observed/heard; use symbols to identify the different species and plot them in the circle relative to your position.

## BIOTIC EXPLORATION #2: Riparian/Aspen Parkland

### Tree and Shrub Identification



Common Name	Scientific Name ( <i>Genus species</i> )	Number of Species in Quadrat	Symbol Used in Drawing

#### Instructions:

Using the square above, complete a detailed drawing of your 3m x 3m quadrat. Using the dichotomous key and other guide books provided, identify the trees and shrubs in your quadrat.

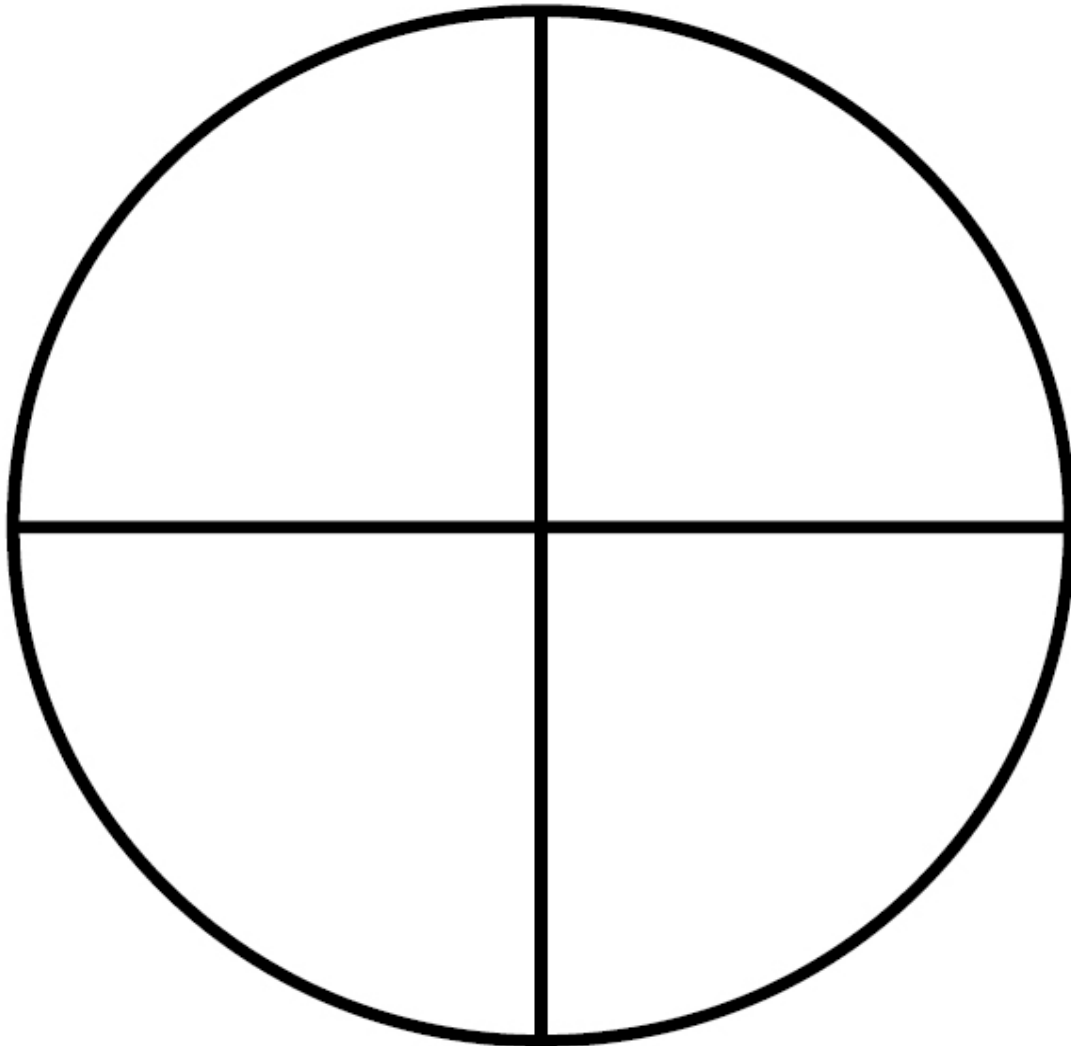
## Ground Cover Assessment #2: *Riparian/Aspen Parkland*


Common Name	Percentage (%) of cover (estimation)	Symbol Used in Drawing
Moss		
Grass		
Herbs		
Woody Shrubs		

### Instructions:

Randomly place your 50 cm x 50 cm square into your quadrat. In the grid above, do a detailed drawing using symbols to represent moss, grass, herbs and woody shrubs in your 50 cm x 50 cm square. Using your estimation skills, what percentage of the area is covered with each? Can you identify any species?

**Bird Point Count #2: Riparian/Aspen Parkland**



# Birds Seen \_\_\_\_\_ # Birds Heard \_\_\_\_\_ Total # of Species \_\_\_\_\_ Total # Birds \_\_\_\_\_

Can you identify any species? \_\_\_\_\_  
\_\_\_\_\_

**Instructions:** Find a place to sit comfortable and quietly. Record all birds seen or heard in the designated time period (5 or 10 minutes) on the above data sheet. Assume you are in the middle. It doesn't matter if you know the names of birds observed/heard; use symbols to identify the different species and plot them in the circle relative to your position.

## Line Transect

Grassland



Riparian/Aspen Parkland



**Instructions:** Line transects involve an observer moving along a pre-determined route through a study area recording the distances at which each individual/track/sign is seen. To investigate the presence or absence of wildlife, walk the entire length of the 25 m transect line, observing all signs 1 metre on either side of the transect. Document any wildlife sign, such as: tracks, scat, trails, burrows, scratch marks, browsing, food caches, etc.

## Impacts Exploration #1: Grasslands

<b>Visual Impacts</b>	Houses	Roads	Bridges	Vehicles	Power Poles	Utility Lines	Traffic Signs	Other	Totals
Number of Each									
Positive									
Negative									
Neutral									
<b>Auditory Impacts</b>	Traffic	Construction	Music	People	Dogs	Lawnmower	Equipment/Machines	Other	Totals
Number of Each									
Positive									
Negative									
Neutral									
<b>Human Impacts</b>	Developed Trails	Desire Trails	Litter	Pets	Pet Waste	Graffiti/Vandalism	Fences/signs	Other	Totals
Number of Each									
Positive									
Negative									
Neutral									

For each rating (positive, negative, neutral) discuss and justify the rating you gave....



## Impacts Exploration #2: *Riparian/Aspen Parkland*

<b>Visual Impacts</b>	Houses	Roads	Bridges	Vehicles	Power Poles	Utility Lines	Traffic Signs	Other	Totals
Number of Each									
Positive									
Negative									
Neutral									
<b>Auditory Impacts</b>	Traffic	Construction	Music	People	Dogs	Lawnmower	Equipment/Machines	Other	Totals
Number of Each									
Positive									
Negative									
Neutral									
<b>Human Impacts</b>	Developed Trails	Desire Trails	Litter	Pets	Pet Waste	Graffiti/Vandalism	Fences/signs	Other	Totals
Number of Each									
Positive									
Negative									
Neutral									

For each rating (positive, negative neutral) discuss and explain or justify the rating you gave....

## Predictions

As a group, discuss and make predictions on the most important factors you feel determine the Grassland, and Riparian/Aspen Parkland you will explore today.

---

---

---

---

## Focusing Questions

Which ecosystem studied had the greatest diversity of life? Explain your reasoning.

---

---

---

---

What was the most negative of the Human Impacts you observed and why?

---

---

---

What was the most positive of the Human Impacts you observed and why?

---

---

---

What effects could these impacts have on the ecosystems you studied today?

---

---

---

---

## Getting Critical – Interpreting the Data

After interpreting your group's data, which factor/s do you think are the most significant in determining the ecosystems you investigated?

---

---

---

---

---

How could you test your hypothesis?

---

---

---

---

---

Can you think of other factors which could be shaping the ecosystems you observed today?

---

---

---

---

