

PARKS AND PROTECTED AREAS

Wetlands: A Field Study



This publication is part of a series of field study programs produced through the Environmental Education Program of Alberta Community Development in Kananaskis Country and Fish Creek Provincial Park. Funding for this publication has been provided by the Alberta Sport, Recreation, Parks & Wildlife Foundation in cooperation with the Friends of Kananaskis Country. The publications have been written to address the mandate of Alberta Community Development and increase students' environmental awareness, understanding, interaction, and responsibility for the natural world in which they live.

The publications are produced by environmental education staff in a close working relationship with teachers, community educators, Parks & Protected Areas staff, and program writers. Programs focus on the areas of environmental education, science, social studies, and language arts, and emphasize elements of environmental understanding, lifestyle, and citizenship.

Contributors to the development of this document:

Alberta Parks & Protected Areas

Kananaskis Country Visitor Services
Kananaskis Country Environmental Education
Fish Creek Environmental Learning Centre

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For more information on this and other Kananaskis Country Environmental Education Series Publications and Programs contact:

Environmental Education Specialist
Bow Region - Kananaskis Country
Suite 201, 800 Railway Avenue
Canmore, Alberta T1W 1P1

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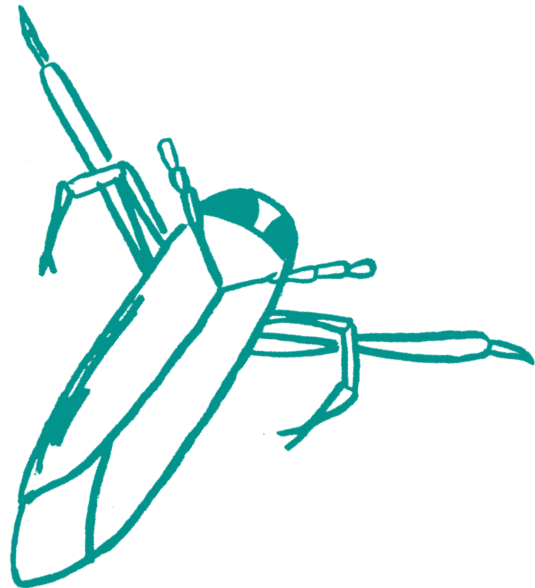
Wetlands: A Field Study
ISBN: 0-7785-1025-5 Pub. No.: I/821 (printed edition)
ISBN: 0-7785-1032-8 Pub. No.: I/821 (on-line edition)
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Web site: <http://www.gov.ab.ca>



Kananaskis Country Environmental Education Series
Wetlands: A Field Study

Table of Contents

The Big Picture	1
At A Glance	2
Curriculum Tie-Ins	3
Before You Go	4
What To Bring-Essential Equipment	4
Activities	
Draw a Definition	6
Plastic Bag Pond	8
The Microscopic World	8
Pond-In-A-Classroom	9
Checklist of Process Skills	10
Identification Skills	10
Research Assignment	10
Go!	11
Choosing An Outdoor Study Site	11
A Pond Study Lesson Plan	12
Back In The Classroom	17
Build a Web	17
Final Report	17
Taking Action	19
Selected References	20



The Big Picture

A pond study is an excellent way to teach students about the wonder of life and diversity that surrounds them. Anyone who has ever done a wetland study will remember it well. Their reflections will most likely focus on the sense of wonder they felt when they first looked closely at one of the mysterious, bizarre, and exotic creatures that inhabit a pond.

Field Studies in Protected Areas

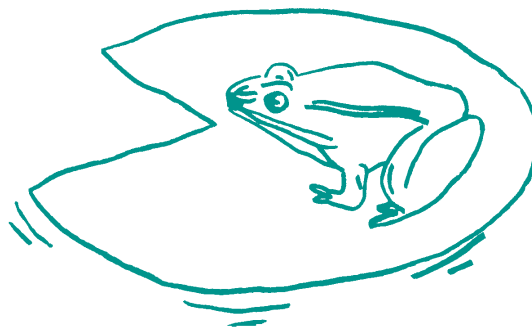
Protected areas are legislated lands that have varying degrees of protection, based upon the uniqueness of the area, its diversity, and resources. Field studies in protected areas offer a unique series of opportunities for educational experiences. These areas allow visitors to study and appreciate natural communities and systems which can be revisited time and time again as the natural processes change over time. By recognizing the value of the diversity and beauty of these precious lands, visitors can learn stewardship, and an appreciation for their continued existence. The actions and attitudes that apply to learning about protected areas also influence the decisions we make as a society about land use and preserving other lands outside protected areas.

Wetland Ecosystems: A Field Study has been developed to assist Grade 5 teachers who wish to teach Topic E of the Grade 5 Alberta Science curriculum, entitled **Wetland Ecosystems**. This booklet has been written for teachers who plan to take their class to a wetland ecosystem and conduct a field study. Pre and post activities have also been suggested for teachers who wish to extend the learning of their students to other parts/sections of the curriculum.

A natural learning progression can be accommodated through the use of this booklet. Early activities such as *Pond-in-a-Classroom* allow students to give their sense of wonder free rein, as the in-class activity allows them to become acquainted with wetland invertebrates for the first time. This leads students on to a sense of curiosity about the wetland world: how do these animals live? What do they eat? Where do they sleep? How are they able to live in their underwater world?

As understanding grows and, one by one, the **Specific Learner Expectations** of the curriculum are realized, students are introduced to the human dimension of this amazing world. They will learn how humans can

affect wetlands in positive and negative ways, and will explore how they can take action themselves to protect the health of the watery environment they have come to know.



This booklet, part of a series by the Kananaskis Country Environmental Education Program, has been developed using a model of environmental literacy developed by park's education staff, and assists learners in developing their abilities in the area of environmental literacy. Teachers interested in this model and approach can phone the Environmental Education Specialist for more information. Contact information is located at the back of this publication.

Kananaskis Country Environmental Education Series
Wetlands: A Field Study

At a Glance

Topic

Wetlands

Program Level

This booklet has been designed to be used by any Alberta elementary teacher working with Grade 5 Science, Topic E: Wetland Ecosystems.

Note: this program can be adapted to teach the Grade 2 Science curriculum Topic E, Small Crawling and Flying Creatures and some components of Division III or IV science biology.

Time Required

Field Study: 1 day

Associated activities: 2 - 4 weeks

Staff Required for Field Study

1 leader plus adult assistants.

Suggested adult:student ratio of 1:5

Best Season for Field Study

Spring and Fall: aquatic organisms will flourish in most open water conditions. As the timing of the onset and departure of winter varies greatly in Alberta, it is recommended that you visit the pond study area a few days before the field study is scheduled.

Suggested Locations

This program can be taught in any wetland area that meets the conditions described in the text: a gently sloping bottom, a non-sensitive pond margin to walk on, etc. Wetland areas can be very sensitive to human activity. A pre-visit is important to determine site sensitivity. Look at a map of your area for possible wetlands.

For suggestions on wetland study areas in Kananaskis Country, contact the Environmental Education Office in Kananaskis Country on the toll-free Government line at 310-0000, then 678-5508, for more information.



Curriculum Tie-Ins

Grade Five, Topic E: Wetland Ecosystems



Note: Two other programs (*Forest, Field, and Pond*, and *Ecology Connections*), also produced by the Kananaskis Country Environmental Education Program, offer several activities that expand on the concepts of food chains, food webs, and how energy flows through an ecosystem. Contact the Environmental Education office at 403-678-5508 for more information.

Students will be able to:

- Recognize and describe one or more examples of wetland ecosystems found in the local area; e.g., pond, slough, marsh, bog, fen.
- Understand that a wetland ecosystem involves interactions between living and non-living things, both in and around the water.
- Identify some plants and animals found at a wetland site, both in and around the water; and describe the life cycle of these plants and animals.
- Identify and describe adaptations that make certain plants and animals suited for life in a wetland.
- Identify the roles of different organisms in the food web of a pond:
 - Producers:**
green plants that make their own food, using sunlight.
 - Consumers:**
animals that eat living plants and/or animals
 - Decomposers:**
organisms such as molds, fungi, insects, and worms that reuse and recycle materials that were formerly living.
- Understand and appreciate that all animals and plants, not just the large ones, have an important role in a wetland community.
- Identify examples of each of the roles played needed in a wetland ecosystem.
- Draw a diagram of food chains and food webs, and interpret such diagrams.
- Recognize that some aquatic animals use oxygen from air while others get oxygen from the water, and identify examples and adaptations of each.
- Identify human actions that can threaten the abundance or survival of living things in wetland ecosystems; for example, adding pollutants, changing the flow of water, trapping or hunting pond wildlife.
- Identify human actions taken to preserve and enhance wetland habitats, and identify how each individual has a role to play.
- Recognize that changes in part of an environment have effects on the whole environment.



Before You Go...

What To Bring— Essential Equipment

An investigation of a wetland environment, like many areas of scientific inquiry, is best done with some tools. Fortunately, these are easy to obtain and are inexpensive; be sure to involve your students in this part of the preparation.

It is important to give students a chance to practice their skills with this equipment; the *Pond-in-a-Classroom* activity provides an opportunity for this to happen.

Observation Basins

Three to five white or light-coloured plastic basins (min. size 30 cm x 60 cm). Large clear basins can be used if a piece of white cloth is placed under them to reveal the dark bodies of the invertebrates.

Plastic Strainers

Each student will need to have their own for catching the aquatic organisms. Plastic strainers (12 cm across) make excellent collecting devices and fit well into similar sized plastic containers.

Plastic Containers

Each student will need to have his/her own. These can be empty margarine or yogurt containers, cutoff plastic bottles, ice trays, etc. They are used to transport animals from where they are caught to the observation basins. The containers should be wide enough to allow the plastic containers to sit inside so that the invertebrates can be observed swimming around.

Rubber Boots

Ask the students to bring them. At least a third of your class will need to have boots, to access the deeper parts of the wetland.

Plastic Shopping Bags

For students who have forgotten to bring waterproof footwear! Have students remove their shoes, place their feet in the bags, and put the shoe back on. The footwear may get wet, but the foot should stay dry.



Plastic Magnifiers

Without a magnifying lens, students will not have an opportunity to observe the smaller pond organisms, and will focus solely on the large ones. Obtain magnifying glasses and magnifying boxes. Avoid glass magnifiers as they can become a hazard if they shatter on the ground. One little-known fact is that you can use binoculars as a magnifying lens if you look closely through the wrong end of the binoculars!

Field Guides

To identify the invertebrates found in the observation basins, Kananaskis Country has produced an identification guide that illustrates both the larval and adult stages of some of the common aquatic species found in Alberta's wetlands. The guide also provides information on each genus, their size and location in the water column. Please contact the Kananaskis Environmental Education Program at 403-678-5508 for further information or to order copies of these guide books.



Viewing Containers

Organisms can be collected and then placed in a hand-held clear container for closer inspection. Large plastic magnifying boxes or plastic baby bottles can also be used.

Turkey Baster or Plastic Eye Dropper

This is very useful for transferring the smaller invertebrates from the observation basin into the magnifying boxes.



Optional– but recommended– Equipment

Plastic Thermometer

The temperature of the pond will vary with depth and location. Have students gather this data.

Field Microscope or Dissecting Microscope

The microscopic world of a pond is, if anything, more fascinating than the macroscopic. A high-powered microscope opens up this world to students.

A Rectangle of Old Carpet

This is useful as an outdoor seat so that students do not get wet or uncomfortable as they sit. Make one for each student, as wetland environments can be damp places to sit!

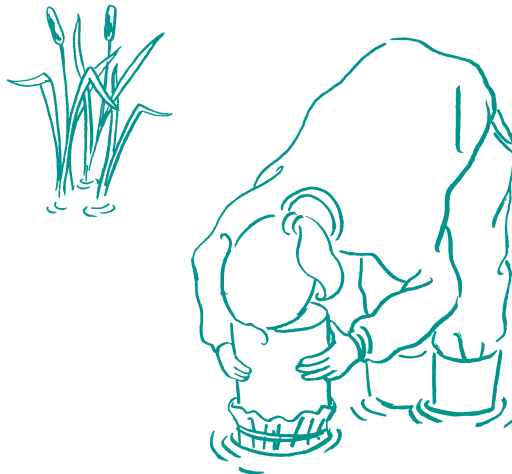
Viewing Tube

The viewing tube works like an underwater viewer enabling the students to look beneath the surface of the water and observe the pond life.



To make a viewing tube students need a large tin can or tube, a section of clear transparent plastic sheet, and waterproof tape. The can or tube will need to be at least 20 cm in diameter and 15 cm long.

Place the plastic sheet along the bottom end of the tube and wrap it up the sides about 10 cm– the piece of plastic along the bottom will be the surface that allows viewing into the bottom of the pond, much like the plastic lens on a pair of swim goggles. The tape is used to secure the sheet firmly to the pipe. Your viewing tube is now ready!



Activities

Draw A Definition

The words on the next page are used throughout this unit in the discussion of a wetland ecosystem.

Photocopy and cut out the definitions, with examples, to create game cards that will help students learn these words.

To complete the game cards write the word on the blank side of the card, and place the cut-out definition, with example, on the other side. The cards can then be used as flash cards to test for knowledge, or as a game of *Wetland Pictionary*.



You may wish to expand this game by adding some of the organisms that students will learn about in the Identification Skills section on page 10.



Game Cards

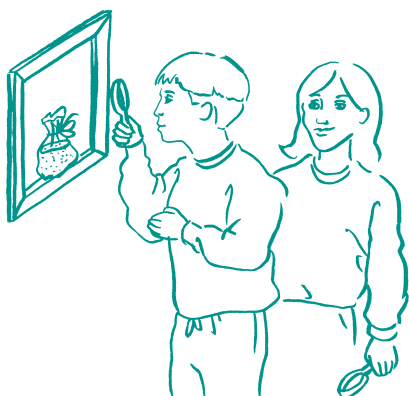
Ecosystem	A diversity of organisms that interact with each other and their non-living environments.	There are many organisms that interact and live in a pond ecosystem.
Non-Living Things	Important non-living components of an ecosystem include such things as air, water and soil.	Pond organisms rely on many important non-living things to survive; for example, air, water and soil.
Invertebrates	Animals without backbones. All insects are invertebrates.	Beetles are examples of invertebrates; although they have no backbone, they have a hard shiny case that supports their body.
Life Cycle	The changes to an organism throughout its life, including its birth and death.	The dragonfly spends part of its life cycle as a nymph, swimming around in the pond water looking for prey.
Organism	An organism is any living plant, animal or single cell lifeform.	Pond water contains organisms ranging in size from microscopic algae to huge fish.
Producer	A plant that makes its own food.	Common producers found growing in pond water include cattails, rushes and duckweed.
Consumer	Animals that eat other animals or plants for food.	Both dragonflies and moose are consumers, because they eat other things to survive.
Predator	A type of consumer that preys on other animals for food.	Frogs eat insects and pike eat other types of fish; both of these animals are predators.
Decomposer	Organisms that reuse and recycle materials that were once alive.	Molds, fungi and worms are all decomposers that help break down material that was once alive.
Food Chain	The way in which nutrients cycle and energy flows through ecosystems.	If a fish eats an insect, and is in turn eaten by an osprey, we say that they are all part of the same food chain.
Food Web	An interconnected network of food chains that show all of the feeding relationships in an ecosystem.	It's hard to predict the effect of losing all of the mosquito larvae from a pond because the pond food web is so complex.
Aquatic	Relating to water.	Fish, mosquito larvae and waterboatmen are all aquatic organisms.
Adaptation	Any change in the way an organism appears or behaves that makes it better suited to its environment.	One adaptation of mosquito larvae is the breathing tube that works like a snorkel to help it breath.



Plastic Bag Pond

This activity allows students to closely examine pond water, and will excite their curiosity and imagination about wetlands.

1. Obtain a sample of water from a nearby pond. Collect at least two or three litres.
2. In the classroom, pour about a cupful of this water into five plastic baggies, and seal the baggies with a strong adhesive tape, preferably a brand of fibre tape.
3. Using the same tape, affix the baggies to outdoor windows. The strong outdoor lighting will help illuminate any of the microorganisms in the baggies, plus help all of the living things by promoting the growth of the producers (typically algae).



4. Challenge students to find signs of life in the water. To do this, ask students to use a magnifying lens of some sort. Have students describe the organisms they find in the water. Ask the students to write a descriptive paragraph outlining the behaviour and appearance of the organism, and ask them to draw it in a large-scale diagram.
5. How long can the plastic bags be kept on the window? This all depends on the intensity of the light, the temperature, and exposure of the window. Bags placed in intense sunlight should only remain exposed for an hour - as prolonged heat will cause the animals to perish.

Bags placed in shaded windows could remain for the entire day. A thermometer placed in the bag will let students know when it is time to take them down. Have students keep a page in their science book to record their observations over time.

6. Upon completion of the study, return the organisms to their wetland environment.



Note: To increase the size of the specimen in the magnifying box, tape two lenses together, as shown below. Experiment with your lenses to see what works best.

The Microscopic World

Seen up close with the unaided eye, pond water contains many visible and fascinating things. There is another equally fascinating world contained in a single drop of pond water - but you need help to see it.



If your school has dissecting microscopes, have students view a few drops of water on a viewing tray. Some of the “larger” single celled plants and animals may be visible.

If you have a more powerful compound microscope, have students prepare slides for viewing. Commercially available staining solutions can assist with viewing these microorganisms - consult a material's supply company for more information.

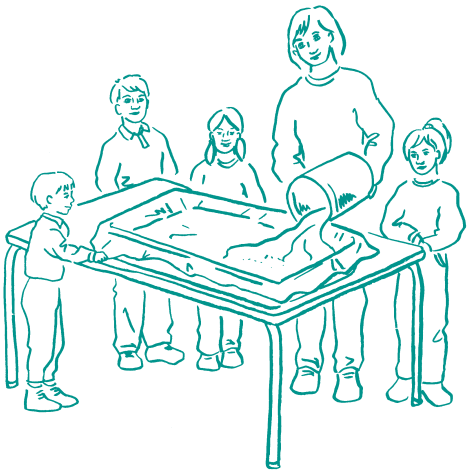


Pond-in-a-Classroom

In this activity you'll create a waterproof *pond* in your classroom and bring in actual pond plants and animals to study. Why go to the trouble? This exercise will allow students to practice many of their process and identification skills in a controlled environment, and will also introduce them to some of the organisms that they will be asked to study when they visit the pond later.

For your pond-in-the-classroom study, you'll need the following:

- long beams measuring 2 x 4 or 4 x 4 (at least 1 metre long)
- large white cloth (to go under pond)
- large waterproof plastic sheet in good condition (no holes)
- 20 litre bucket with a lid



1. In the morning before school begins, visit a local pond where you know there are abundant pond organisms. You may wish to invite a few students along with you, since your purpose is to collect as many pond organisms as you can. Transport these plants and animals to your classroom in a covered bucket with the lid securely fastened.
2. In the classroom, spread the white sheet out on a level surface. Use a large table, although part of the floor of your classroom— in a low-traffic area— is also possible.
3. Place the four beams of wood to form a rectangle or square on the cloth, and then cover the cloth and the beams with the plastic sheet, ensuring that there is adequate overlap. You may wish to tuck the loose ends of the plastic sheet over and then under the wooden beams.
4. Carefully pour the contents of the bucket into your pond, pouring gently from a position very close to the plastic sheet to minimize disturbance to the invertebrates. After 10-15 minutes any organic material from the bucket will settle and your in-class pond study can begin.
5. There are a number of activities that can occur in the classroom using the pond sample you have collected. Instruct students in how to handle the organisms, use the equipment and identification skills. If your school has microscopes, this is an excellent opportunity to study the aquatic microscopic life.
6. One important concept that you can discuss with your students is respect for life. Impress upon your students the need to keep the invertebrates immersed in water at all times to keep them healthy. Also, ask your students if the classroom environment is a normal place for these invertebrates. The answer is “no” - the lights are brighter here, and the water is slowly warming up throughout the morning as you continue to study the water sample. Because of these conditions, you may notice some mortality as time progresses.

The cloth provides students with a high-contrast background to view the organisms more readily, and is not necessary if the table top is white.

As aquatic organisms do not fair well out of their natural environment, plan the activity for only a morning time span and return the organisms to their wetland area at lunch break. More on this later.



7. If some of the animals start to seem to become less active this is your signal to model respect for life. Initiate *action* to protect the lives and health of the pond invertebrates. You will have to act fast! Place the empty bucket at one end of the pond, and have all the students assist you in carefully lifting the plastic and slowly tilting it so that the contents of the pond run back into the bucket.

These organisms need to be returned to the pond environment as soon as possible. If you cannot do it at lunch time, place the lid on the top of the bucket and leave it in a cool spot to minimize any further stress to the organisms.

Checklist Of Process Skills



Write the following list of process skills on the board, and have students check them off as they do them.

- put nose close to water to look for very small organisms
- use magnifier to see organism close up
- draw a diagram of something that lives in the pond water
- use a baster to move small organisms into plastic containers or magnifying boxes for closer observation
- measure the water temperature
- use a plastic strainer to catch something
- observe a plant or animal closely for two minutes
- identify an organism using the identification key
- write a description of how an organism moves

Identification Skills

Students will do better in an outdoor setting if they have previously been introduced to the required identification skills in the classroom. Use of a guide or key in the identification and description of a plant or invertebrate organism is a key component of a pond study.

1. Have the students select one organism to study. Ask them to observe and identify the following:
 - how it moves
 - special features (adaptations)
 - interactions with other organisms
2. After observing the organism ask students to use the guide or keys provided to identify their selection. Resist the initial temptation to tell them what the organism is. By identifying the organism students will be able to carry out future research - and become the resident expert on it.

Creating experts will pay dividends later on when the time comes to visit a real pond ecosystem - *A Pond Study Lesson Plan* describes in more detail how to use the experts.

Research Assignment

This is your opportunity to assign students to do research on some wetland animals and/or plants. Offer students the choice of selecting a type of bird, fish, plant, or one of the many invertebrates they may have observed during their *Pond In a Classroom* activity. Additional topics of interest might include emergent vegetation (i.e., plants that emerge from the water's surface) and the adjacent water-loving trees and shrubs that help to define a pond community. Ask them to produce an illustrated report on the organisms they chose.



Go!

Choosing An Outdoor Study Site



Base your selection of an outdoor study site on the following criteria:

- Does the site meet the requirements of the curriculum? The Specific Learner Expectations of Wetland Ecosystems calls for students to be able to recognize and describe one or more examples of wetland ecosystems found in a local area; e.g., pond, slough, marsh, bog, fen. Could your site be categorized as one of these?

Note: for more information on what these sites are, consult Wetlands: Webbed Feet Not Required (see Selected References for details).

- Can the site be readily accessed from the school? The ideal place is a site that is within walking distance and is a permanent wetland. If this is not possible, consider investigating areas that are within a short driving distance from the school, in order to reduce both financial and environmental costs. Consulting a street map of your area may reveal some wetlands of which you were unaware.



Visit the site just before your class visit to reassure yourself that it remains in good condition, that the water levels are appropriate for your group, and that access is not a problem. You'll be more relaxed on the field study day if you do this!

- Is the site safe? Check the bottom of the wetland - if it is a pond, does it have a steeply sloping bottom that would make this a hazardous field study site? Are there unpleasant additions to the bottom such as rusty metal objects or broken glass? If so, check around the perimeter of the pond for alternative areas.
- Is the site accessible? Look for clear areas where you can access the pond without damaging the vegetation or slopes. For example, a site with a pebbled shore makes an ideal point for access.
- Is the site suitable for teaching? The ideal setting for a pond study has an adjacent flat grassy surface where basins can be placed and where you can gather all of your students together in your outdoor classroom.
- Is this a natural pond ecosystem? There is more to a pond community than just those things that live in the water. If possible, choose a pond with emergent vegetation (plants that emerge from the water's surface) and adjacent water-loving trees and shrubs that help define a pond community.



A Pond Study Lesson Plan

The following lesson plan can be used once you have selected a site and the students are well versed on how to use the equipment and know some of the ecological concepts illustrated in an aquatic ecosystem.

Before you visit the pond, assemble the students in a comfortable spot so they can observe the wetland from a distance. As you speak, the sun needs to be at the back of your students (so their attention is not distracted by the glare); also, keep alert for birds or other wetland animals that might represent a teachable moment.

1. Welcome the students to the wetland ecosystem, and tell them that they will first be looking at the big picture– the wetland itself. Ask the students if the plants and animals in the water are part of this ecosystem; *yes*. Next, ask the students the same question about the water-loving *plants cattails, rushes, sedges, willows, alders* that surround the area - of course, these too form part of the ecosystem. Ask the students “Where does this water come from? What other ecosystems can you see from here? Do these other areas interact with the wetland ecosystem?”



2. Communicate your expectations of the students. Working in an outdoor environment means a different teaching environment; stating your expectations clearly will help the group succeed at the task.

Be sure to include the following:

- the boundaries of the study area
 - the worksheets or other writing activities that you expect the students to complete
 - rules of conduct (may include no shouting, courteous behaviour to passers-by, making way for pedestrians, etc.)
 - which areas of the pond are off limits, if any
 - how far students can wade into the water
 - the signal that will be used to draw them together (this could be a whistle, a handclap, animal noise or a raised hand)
3. Ask the students:
“Imagine if a large adult came to your home, stamped around with their muddy boots, stole all of your food, broke all of your furniture, and smashed all of your windows. How would you feel?”
Students, quite naturally, would be upset. Ask them if they expect visitors to their home to treat it with respect.



What to Bring– Essential Equipment

- 3 - 5 basins: 30 x 60 cm
- plastic strainers
- rubber boots
- plastic shopping bags
- containers that hold water
- field guides
- plastic magnifying lenses
- plastic magnifying boxes
- turkey baster/eye dropper

Optional– but recommended– Equipment

- plastic thermometer
- water scope/viewing tube
- field microscope/stereoscope
- rectangle of old carpet, one per student (this is useful as an outdoor seat so that students won't get uncomfortable as they sit). Wetland environments can be damp sitting places!



4. Inform the students:

“Right now, you are in someone else’s home. Can you name an animal or plant that might live here?”

Students may be able to come up with a variety of organisms that make this area their home, or habitat. Ask the students to suggest ways in which their behaviour will show that they are treating the wetland organisms’ home with respect and care. Check to ensure that the following points are covered.

- Do leave the flowers intact. Insects and other organisms use the nectar for food.
- Do pick up litter. Animals might eat it and become ill or get caught up in the garbage, and humans don’t like to see garbage either.
- Do leave plants in place and healthy. Not only do they have a right to live, they also act as a producer to provide food and shelter for the consumers.
- Do keep the invertebrates immersed in water. If they are held in the air (that would be like someone holding our head underwater) they will not be able to breathe.
- Do pour water containing organisms from a low height. Some of the life forms are very fragile.
- Do tread gently and carefully around the edge of the pond.

Note: If you judge that a part of the wetland is becoming over used by the visiting students, close off that portion of the study area— doing this will model an important caring ethic to the students.

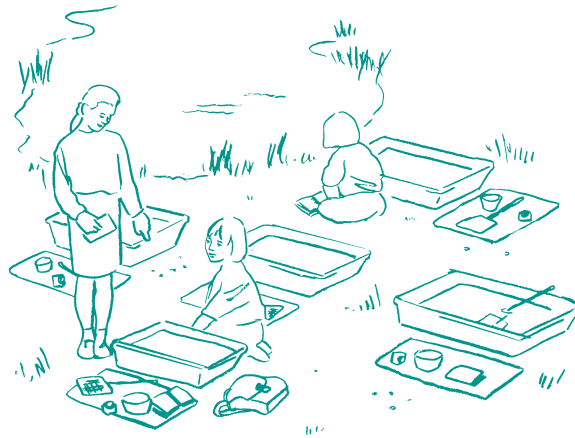


5. Review how to use the equipment.
Take the various pieces out and ask the students how they are used.



Introduce the observation basins as temporary ponds, which will serve as the ‘home away from home’ for the invertebrates that are collected. As the pond study progresses, the focus of the study will gradually turn from the pond itself to the life-filled basins. Explain the basic pond collection gear: this will consist of a plastic strainer and a small container, half-filled with water, as a temporary container for any invertebrates that the students catch, before they are placed in the observation basins.

Note: Ask the students to note from which level of the pond they collected their specimens. This allows students to appreciate that organisms have different places within the pond that they prefer to live; it will also assist students with the preparation of reports that detail the type of organism found in these areas.



Introduce how you will use the observation basins: locate three to five on level ground throughout the study area about 3 to 5 metres apart, with a white cloth underneath each one. Place the plastic strainers, plastic containers, magnifying lenses, magnifying boxes, and identification guides at each basin. Divide the students into groups and assign them to their basins.



One option to help reinforce to students how the aquatic ecosystem is divided is to label each of the containers as one part of the pond.

For example:

- Animals caught at the bottom of the pond
- Animals caught at the surface of the pond
- Animals caught at the middle of the pond
- Animals caught at the edge of the pond
- Animals caught on plants emerging from the pond

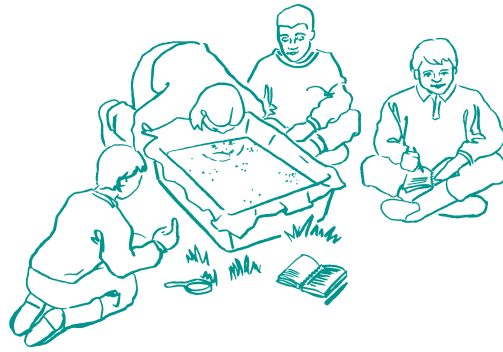
If you decide to delineate the containers in this way, encourage each group to switch every 15 minutes, and make clear that only animals found in these locations should go in the containers.

Once they have their collection equipment, they can begin to search the wetland for the invertebrates.

Plastic Strainer Note: *Some students will use strainers to only catch something they have already sighted in the water. Swishing the strainers through the pond vegetation is also an excellent way to catch some very interesting animals.*

6. Remind students to use the following process skills to help them conduct the field study:
 - observe all of the visible organisms. Remember to bend down close to the pond so that their nose is within a centimetre of the water; only then will students be able to view the very small organisms.
 - observe the way in which the life forms move. What is their means of locomotion?
 - remember that all of these animals require oxygen to survive.

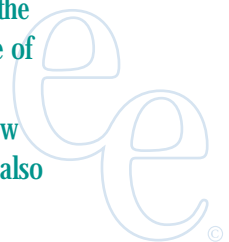
Consider how these animals breath in their aquatic environment. Do they use lungs, breathing tubes, gills or bubbles of air? Refer to the Identification key in the *Plunge In!* booklet.



7. Let the students go! A pond study is an outstanding opportunity for students to practice discovery, to *play around* in the water or at the water's edge and discover some surprising life forms in the process. Allow them to select whatever tool they wish, and allow a half-hour to pass. Remind students to transfer their captive organisms to the observation basins.
8. After the organisms have been collected, remind students of their academic expectations.
 - gather the basins together and distribute the identification guides to the groups of students. With the assistance of your student experts, begin the class discussion on what was found.

Discussions may include the following:

- Identification of the organism and determination of what it eats and by what is eaten. This can lead to the development of a food web which can be illustrated in a number of creative ways. Refer to the *Plunge In!* Identification key to determine who is predator and who is prey.
- Is it an area where there are a variety of organisms or just a few? Wetlands are generally areas of great biological diversity, unless something has impacted upon the system.
- Do the organisms found indicate whether the ecosystem is healthy or not? An abundance of different organisms usually indicates a healthier ecosystem than one with just a few organisms. The type of organisms present also indicates the overall health of the system.

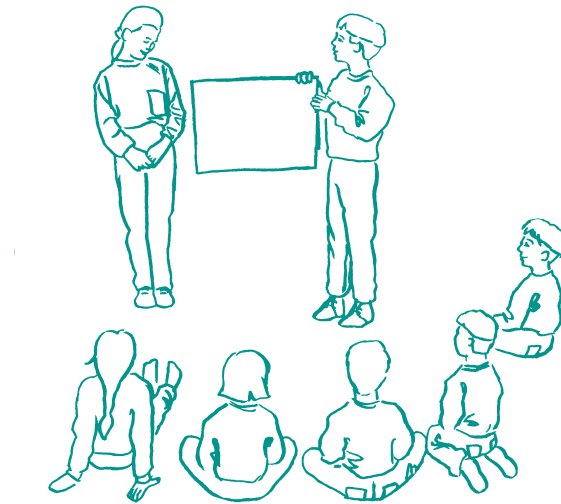


Other activities at the site could include:

- Ask the *experts* on birds, plants and invertebrates to gather into groups and prepare a presentation to the rest of the class about what they have discovered from their field study experience. These experts can also use the information that they have learned from their pre-field study research activity.



- Ask students to gather into groups and work together to draw sketches of species they have found on their field study. These sketches can be used to design a large cross-section drawing of the wetland back in the classroom. The drawing could be entitled *Sketch of a Wetland Community*. On this diagram they could show the different organisms and where they are found: e.g., the horsefly larva on the bottom of the pond, the dragonfly resting on a grass stem, and the water strider at the water's surface.



Of course, students will have to visit each of the basins in order to draw all of the animals. Tell students that they will be asked to present their drawing to the rest of the class, after completion at school.



- After the sketches are completed, give students a 10-15 minute quiet time to write a descriptive entry in their journal on: What did they learn? How do they feel about wetland areas? Are wetland areas important; why or why not? Students might include paragraphs that start with the words “I feel...”, “I see...”, “I smell...”, etc.
- As part of their reflection, have students sketch the wetland ecosystem, including all of the elements that help form the big picture of the area.

Note: you may wish to have them use the carpet seats during this activity so that they will be comfortable.



9. Before you leave the wetland site, return to the site of your opening activity where students initially looked at the wetland area. Reflect on why wetlands are important, the role they play and our connections to them. Discuss with your students whether or not this is a healthy ecosystem.

Ask the students “What things can you see that might tell you that this is an unhealthy ecosystem?” Answers may include the fact that there are visible signs of pollution. In order to best answer this question, have students scan the area, looking for signs of:



“When the well is dry
we know the worth of water.”

-Benjamin Franklin

- water pipes or other pipes that discharge into the wetland
- signs of change around these pipes, or in other areas of the pond
- other obvious signs such as rusted metal or other discarded human items
- unusual stains or slicks on the water surface
- dead or dying plants or animals
- disturbed vegetation or bare spots



10. Ask the students: “What would happen if I emptied a can of oil into the water by mistake”. Note that this action will have a profound effect on many of the organisms, as the oil will form a thin film on the surface of the water that would poison or suffocate many of the invertebrates that the students have studied. Ask the students what other negative impacts human actions can have on a pond.

11. Lastly– and most importantly– ask the students what *positive* actions people can take– and their class in particular– to maintain the health of this area. There are many actions that people can take to help preserve wetland areas. See the next section for details.



Back in the Classroom

Concluding Activities

The following activities can be used as conclusions to a wetlands study.



1. Build a Web

Present the *Sketch of a Wetland Community* pictures that were started during the field study. Have each team of students present their drawings. *Note: As an additional component to this activity, have students use brightly-coloured string to show the food web connections between the organisms.*

2. Final Report

The final report is a concluding activity that ideally includes:

- Analyses of the Area
- Estimation Of Water Quality: Is there a diversity of life in the wetland ecosystem?
- Action Plans

In this activity, students can generate a list of evaluation criteria upon which their final report will be marked. A list developed in this manner will help ensure active participation, clear expectations and a method of assessment. Knowing the evaluation criteria, students can then use a variety of approaches to demonstrate their understanding of the wetland study, as well as display their findings in a creative manner.

Instructions

On the day following the field study, have the class creatively discuss a list of criteria that they feel would reflect their working knowledge of wetlands and aquatic invertebrates (A sample list has been included on the following page). Once the evaluation criteria are completed, give the students the appropriate time to work together to complete their assignment. Marks can be awarded for the completion of each component in the evaluation criteria list.

Once the students have completed the assignments, they can turn in their poster as well as the evaluation criteria list, and the teacher can easily see if the students have met the objectives they have set for themselves by marking each of the components.



Evaluation Criteria List

Final Report

1. Present their findings in a poster format.



2. A paragraph describing the purpose of the field study, the importance of wetlands, the environmental conditions of the day, and what was found.
3. A map of the wetland, and its location.
4. Select 10 invertebrates found during the field study for display on the poster. Each invertebrate could include:
 - a drawing
 - a written description of the invertebrate
 - the location where it was found in the wetland
 - how it moved around in the water
 - label each as producer, decomposer, or consumer
5. Of the invertebrates selected, use colourful pens to illustrate their adaptations and connections to each other, by designing a food web to show interrelationships.
6. A short paragraph on the water quality related to the diversity of life found.

7. List of possible actions students might undertake to protect and preserve the health of wetland areas in their community.



"Nobody made a greater mistake than he who did nothing because he could only do a little." - Edmund Burke

8. List of organizations involved in the protection and preservation of wetlands.
9. The presentation is clear and cleanly laid out.
10. There is correct spelling throughout the poster.
11. The information is accurate.
12. The poster is creative and colourful.
13. The assignment has been completed by the due date.



Taking Action

During this unit, students will have been introduced to the ecology of an aquatic ecosystem, and will have considered a number of things that could potentially impact the ecosystem they have studied - as well as a number of human activities that could help areas like this. Although understanding is very important, the key to protecting wetlands is action. A number of organizations are involved in wetland protection and enhancement, and have much to share on what needs to be done and how to do it. By becoming involved in these organizations, as a class or individually, students can take their understanding towards meaningful and important actions for wetland protection and preservation.



Contact these groups for additional information on becoming involved in protecting Alberta's Wetlands.

Ducks Unlimited

Suite 201, 10470, 176th St., Edmonton, AB T5S 1L3
email: du_edmonton@ducks.ca

Trout Unlimited

#370, 717 - 7th Ave S.W., Box 6270, Stn. D,
Calgary, AB T2P 2C8
email: tuc@cadvision.com

Habitat 2000

Canadian Wildlife Federation
2740 Queensview Dr., P.O. Box 40027,
Ottawa, ON K2B 1A2

Alberta Conservation Association

P.O. Box 40027, Bakercentre Postal Outlet
Edmonton, AB T5J 4M9
email: info@cwf-fcf.org



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