Burns Bog Classroom Program

Teacher Resource Manual

Grade 7




Curriculum developed and designed by Jennifer Stonehouse (BA, BEd, MSc)

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Cover photos by Jennifer Stonehouse, Sarah Howie, Angela Danyluk, and Marcel LaBreche

Introduction

The Burns Bog Teacher Resource Package has been designed specifically for the British Columbia grade 7 Science curriculum. It is important to note that the lesson plans included in this Teacher Resource Package focus on Science and the environment but are cross-curricular and teachers can modify and adapt many of the lesson plans to fit any intermediate classroom. The Burns Bog Teacher Resource Package includes 14 lesson plans (complete with blackline masters) and four additional games and activities that can be used in your classroom to teach your students about Burns Bog through a student-centred and hands-on focus.

The focus of the unit is based on the Burns Bog website (**www.burnsbog.ca**) but also takes students outside of the classroom into the Delta Nature Reserve (a part of Burns Bog). Hands-on learning beyond the walls of the classroom is the primary goal throughout this unit. Science process skills are also a key component throughout this unit specifically highlighting observation skills and engaging in observation activities in the Delta Nature Reserve.

Grade 7 Science Curriculum

Science Process Skills
Students will be able to:
- Test a hypothesis by planning and conducting an experiment that controls for two or more variables
- Create models that help to explain scientific concepts and hypotheses

Life Science: Ecosystems
Students will be able to:
- Analyse the roles of organisms as part of interconnected food webs, populations, communities and ecosystems
- Assess survival needs and interactions between organisms and the environment
- Assess the requirements for sustaining healthy local ecosystems
- Evaluate human impacts on local ecosystems

Physical Science: Chemistry
Students will be able to:
- Conduct investigations into properties of matter
- Measure substances and solutions according to pH, solubility and concentration

Earth & Space Science: Earth's Crust
Students will be able to:
- Explain how the Earth's surface changes over time

The curriculum connections support Grades 4-7 in the following areas:

Subject	Grade 4	Grade 5	Grade 6	Grade 7
Science	Process Skills: Observations Life Science: Habitats and Communities	Process Skills: Observations Earth and Space Science: Renewable and Non-Renewable Resources	Process Skills: Observations Life Science: Diversity of Life	Process Skills: Observations Life Science: Ecosystems
Language Arts	Writing and reading activities Incorporating technology and media presentations	Writing and reading activities Incorporating technology and media presentations	Writing and reading activities Incorporating technology and media presentations	Writing and reading activities Incorporating technology and media presentations
Math	Measurement: Perimeter, area and capacity	Measurement: Perimeter, area and capacity	Measurement: Perimeter, area and capacity	Measurement: Perimeter, area and capacity
Social Studies	Skills and Processes of Social Studies : Mapping, graphing, critical thinking, etc.	Skills and Processes of Social Studies : Mapping, graphing, critical thinking, etc.	Skills and Processes of Social Studies : Mapping, graphing, critical thinking, etc.	Skills and Processes of Social Studies : Mapping, graphing, critical thinking, etc.
Art	2-D and 3-D Image development and visual representation	2-D and 3-D Image development and visual representation	2-D and 3-D Image development and visual representation	2-D and 3-D Image development and visual representation
Drama	Role Playing	Role Playing	Role Playing	Role Playing
Heath and Career Education	Careers	Careers	Careers	Careers

The Corporation of Delta will provide you with the following resources for the Burns Bog Teacher Resource Package. This is limited to Delta schools only.

- Access to a Sphagnum moss sample that can be signed out through the Corporation of Delta by sending an email to: **burnsbog@corp.delta.bc.ca**
- Have your students participate in a conservation project by participating in an invasive species pull. This can be organized through the Corporation of Delta by sending an email to: **CAE@corp.delta.bc.ca**

Suggested Teacher Tips:

- The lesson plans have been listed in a numeral order from 1 to 14; however, they do not need to be delivered in this order.
- A Delta Nature Reserve Trail Map has been included and four areas have been identified and linked to the individual lesson plans to give teachers the best area in the Delta Nature Reserve for the lesson plan to take place.
- Stay on the boardwalks when visiting the Delta Nature Reserve to avoid trampling plants, especially Sphagnum moss. However, it is okay to head off the boardwalks in the Open Forest area of the Delta Nature Reserve to explore.
- Bring a garbage bag with you to help the environment by picking up litter along the way while you are in the Delta Nature Reserve.
- A pair of binoculars can also be a great resource to take with you into the Delta Nature Reserve to observe birds and nature.

Enjoy the unit and have fun learning about Burns Bog and the Delta Nature Reserve. Remember that it is important to respect the bog etiquette: take nothing but pictures, leave nothing but footprints.

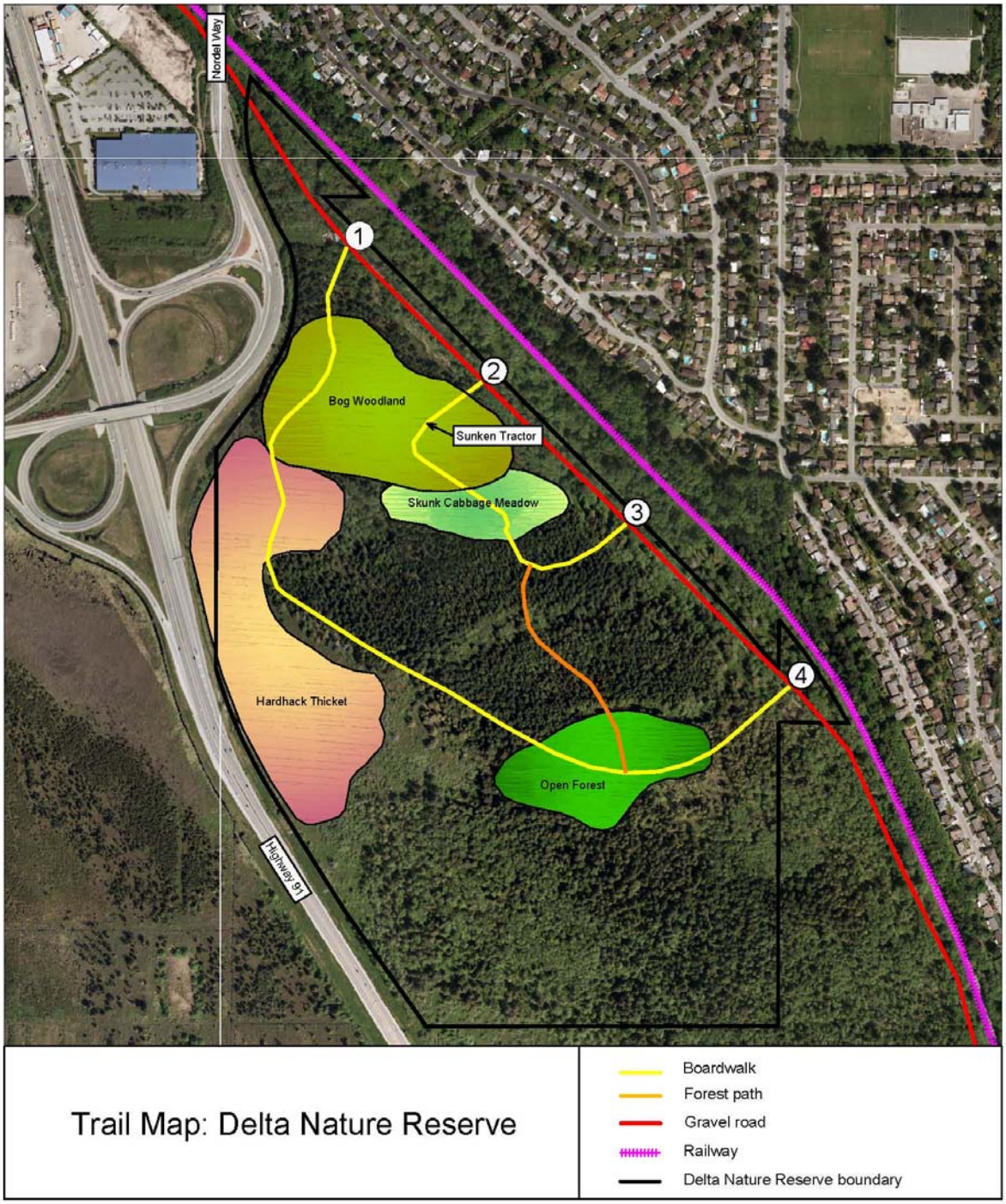
How to get to the Delta Nature Reserve:

- The Delta Nature Reserve is located in the northeastern corner of Burns Bog. It is located north of 72 Avenue and east of Highway 91.
- A gravel access road runs along the eastern edge of the park and can be accessed by foot.
- If you are traveling to the Delta Nature Reserve by car, you can part at the Planet Ice parking lot.
- Heading north on Highway 91: take the River Road exit and turn right on Nordel Court and drive to the end of the road.

Acknowledgements:

The Corporation of Delta would like to thank Jen Stonehouse for developing this curriculum package. Assistance from Jill Deuling, a Park Interpretation Specialist with Metro Vancouver Regional Parks, is also greatly appreciated.

Trail Map of the Delta Nature Reserve:



Activity 1: Burns Bog Scavenger Hunt

Purpose: Students will learn about the ecosystem of Burns Bog and understand how Burns Bog represents a wetland ecosystem. Students will explore the Delta Nature Reserve.

Subject: Science, Art and Math

Suggested Time: Three classes (includes a visit to the Delta Nature Reserve)

Materials:

- Whiteboard/Chalkboard
- Scrap paper or Science journal and pencil
- Wetlands and Burns Bog (blackline master)
- The Size of Burns Bog (blackline master)
- Eye Spy Activity Cards (blackline master) (this page should be cut up into 12 different cards)
- Eye Spy Activity Journaling (blackline master)
- Blank Eye Spy Activity Cards (blackline master)
- School digital camera (student digital cameras or cell phone cameras – optional)
- Construction paper to create image display

Background:

It is difficult to form one universal definition of wetland as each wetland ecosystem is unique. Wetlands are defined in Canada as "land that has the water table at, near, or above the land surface". The soil is saturated with water for at least part of the year. Wetlands are places where you will find water-loving plants and animals; these life forms have adapted to a wet environment. There are five types of wetlands in the Canadian classification system: bog, fen, swamp, marsh, and shallow open water. Burns Bog is a wetland ecosystem and, more specifically, a raised bog.

A bog is a *peatland*, which is a special kind of wetland where at least 30 cm of dead plant matter (peat) has piled up because of the very wet conditions. The peatland creates an environment where decomposition is extremely slow. Raised bogs get their name because the peat has accumulated, creating a raised ground surface. The only water entering the bog comes from precipitation because the bog is isolated and above the groundwater table of surrounding lands. Bogs are therefore low in nutrients. Fens and swamps can also be peatlands, but they are still connected to the mineral-rich groundwater so they receive more minerals and nutrients than bogs. On the Pacific Coast of British Columbia, there are five different kinds of bogs:

- basin bogs
- shore bogs and floating bogs
- slope bogs (also called blanket bogs)
- flat bogs
- domed bogs (also called raised bogs)

Procedure:

Suggested First Class

1. Have each student make a prediction about the definition of a wetland ecosystem. Share these predictions and discuss what a wetland ecosystem is. Use the background information to teach the definition of a wetland ecosystem. Use the blackline master "Wetlands and Burns Bog" to help discuss wetlands and make connections to Burns Bog.

2. Ask the students if they have heard of Burns Bog. Ask the students if they have visited Burns Bog. Inform the students that Burns Bog is an example of a wetland ecosystem. Use the blackline master "The Size of Burns Bog" to help teach the exact location and size of Burns Bog.

3. Use a KWL chart to brainstorm in a large group discussion about what they *know*, *wonder* and *want to learn* about Burns Bog. Use this to guide your students through the unit about Burns Bog.

Suggested Second Class

4. Visit the Delta Nature Reserve with your class and head to the Open Forest area for this lesson plan. See the Trail Map of the Delta Nature Reserve if required.

5. Divide the students into small groups of 3 to 4 students.

6. Pass out one "Eye Spy Activity Card" to each group and pass out one "Eye Spy Activity Journaling" page to each student so the students can record their findings (blackline masters are included). Students will find items that match the criteria on the "Eye Spy Activity Cards". Discuss with your class that nothing should be removed or harmed in Burns Bog. The students will record, sketch and/or takes pictures of the "things" in Burns Bog that match the criteria on the "Eye Spy Activity Cards".

7. Give the students 10-15 minutes to complete this activity. Once the students have found objects that match the criteria and they have completed recording their findings, have the students share their findings as a whole group. The students could trade "Eye Spy Activity Cards" and repeat the activity if time permits.

8. Instruct the students to make their own "Eye Spy Activity Card" using the blackline master "Blank Eye Spy Activity Cards". These new Eye Spy Cards could be used before you leave or on any future visit to the Delta Nature Reserve.

9. Before the students leave the Delta Nature Reserve, have each student take one picture of something that they observed while in Burns Bog that interests/inspires them or they just thought it was cool. Use a school digital camera or student cell phones.

10. Return to the classroom. Print the images or have the students bring in a print of their image if they brought their own camera or used their cell phone camera. These images should be ready to go before the third lesson is continued.

Suggested Third Class

11. Discuss the student experiences of being in the Delta Nature Reserve. Review the KWL chart the class created earlier. Is there anything else they want to add to the KWL chart? Is there anything they can answer?

12. Examine the images that the students took pictures of while visiting the Delta Nature Reserve. Hold up each picture or take a walk around the classroom to look at the different images the class captured on their visit to the Delta Nature Reserve. Give each student their image and have each student reflect about the picture.

    - Describe the image
    - Where was it found/located?
    - Why does it interest/inspire you or why is it cool?
    - What do you know about it?
    - What do you want to know about it?

13. Create a display based on the image and reflections. If there is time, have the students research their questions. Display images and science reflections and questions.

Extensions:

1) Using a map of the Lower Mainland area, have the students try to locate and plot other bogs in the area such as:

- Richmond Nature Park
- Camosun Bog (hint: this bog is in Pacific Spirit Regional Park in Vancouver)
- Douglas Island Bog (hint: this bog is an island in the Fraser River near Surrey Bend Bog)
- Surrey Bend Bog (hint: this bog is adjacent to Barnston Island)
- Langley Bog (hint: this bog is in Derby Reach Regional Park)
- Blaney Bog (hint: this bog is in Maple Ridge near 232 Street)

2) Research the five different kinds of bogs on the Pacific Coast of British Columbia:

- basin bogs
- shore bogs and floating bogs
- slope bogs (also called blanket bogs)
- flat bogs
- domed bogs (also called raised bogs)

3) Using a map of Canada, have the students locate and plot Burns Bog in British Columbia and Mer Bleue Bog in Ontario. Compare and contrast the two bog ecosystems (example: location, size, plants and animals in the bog, recreation use, the kind of bog, etc.).

Technology Component:

Use Google Earth to locate Burns Bog and other bogs that the students have located and plotted on maps.

Wetlands and Burns Bog

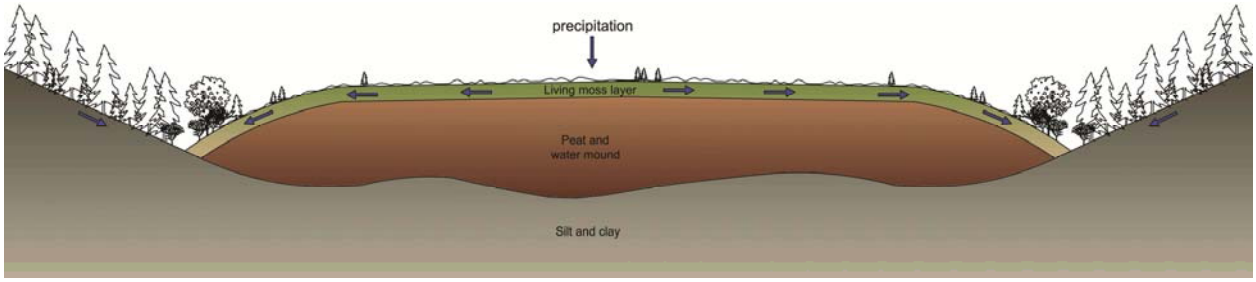
What is a wetland? Make a prediction.

_____
_____
_____
_____

Characteristics of a wetland include the following:

- _____
- _____
- _____
- _____
- _____

Burns Bog is a _____ ecosystem. It is an example of a _____. A bog is a special kind of wetland that is called a _____.



Profile of a raised bog

Characteristics of a raised bog include the following:

- _____
- _____
- _____
- _____
- _____
- _____

Answer Key: Wetlands and Burns Bog

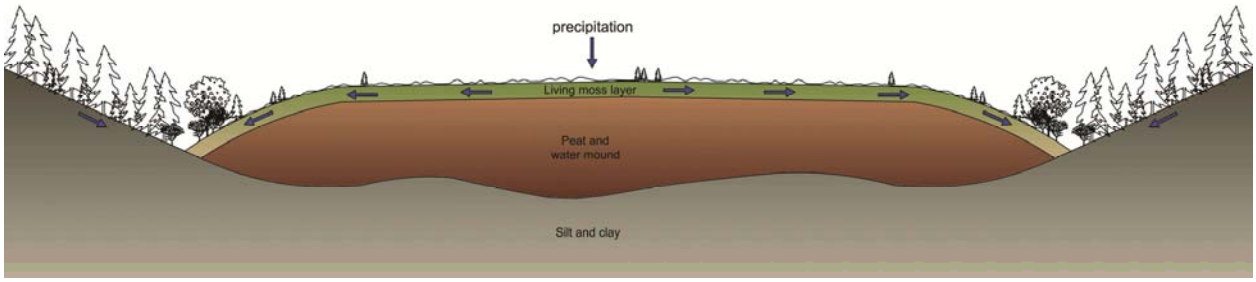
What is a wetland? Make a prediction.

Answers will vary

Characteristics of a wetland include the following:

- No universal definition. Each wetland is unique.
- Canada defines wetland as "land that has the water table at, near or above land surface".
- Water loving plants and animals which have adapted to wet environments.
- Soil is saturated with water.
- Five wetland examples in Canada: bog, fen, swamp, marsh and shallow open water

Burns Bog is a _____wetland_____ ecosystem. It is an example of a ___raised bog_____. A bog is a special kind of wetland that is called a ___peatland_____.



Profile of a raised bog

Characteristics of a raised bog include the following:

- Raised ground. At least 30 cm of plant matter (peat) piled up due to wet conditions.
- Decomposition is extremely slow.
- The only water entering the bog is precipitation because the bog is isolated from the groundwater.
- Low in nutrients.
- Wet
- Acidic

The Size of Burns Bog

Burns Bog covers approximately 3,000 hectares and is located in Delta between the south arm of the Fraser River and Boundary Bay. It is one of the largest undeveloped urban landmasses in North America. Burns Bog is globally unique because of its chemistry, shape, plants and animals and large size.

At 3,000 hectares, Burns Bog is eight times bigger than Vancouver's Stanley Park! Compare the two "bird's eye view" satellite pictures below to see just how big Burns Bog really is.

Burns Bog (Delta, BC)

Stanley Park (Vancouver, BC)

Find another comparison to Burns Bog. Select something unique to compare the size of Burns Bog to something else located in the Lower Mainland. What did you pick? Compare the size of Burns Bog to the place you chose.

_____

_____

Eye Spy Activity Cards

Instructions: Cut into 12 cards and hand out one card to each group.

Eye spy something that… • is living • is small • is a species	Eye spy something that… • smells (good or bad) • represents sunlight • is valuable to animals
Eye spy something that… • is non-living • is growing • is unique	Eye spy something that… • represents water • is part of a cycle • is valuable to plants
Eye spy something that… • you want to learn more about • will be there the next time you visit Burns Bog • is organisms interacting	Eye spy something that… • is valuable to people • is new to you • was left behind by a human (please remove it if it is something to be removed)
Eye spy something that… • is a habitat • is connected to a wetland • represents air	Eye spy something that… • is beautiful • you didn't see at first • represents a pattern
Eye spy something that… • is changing • is food for something else • is shelter	Eye spy something that… • won't be there the next time you visit Burns Bog • represents the season • is camouflaged
Eye spy something that… • is decomposing • is an ecosystem within an ecosystem • is cool	Eye spy something that… • is part of the ecosystem • is part of nature • is man-made

Eye Spy Activity Journaling

Eye Spy Something that…..

- _____

Notes:	Sketch:

- _____

Notes:	Sketch:

- _____

Notes:	Sketch:

Blank Eye Spy Activity Cards

Instructions: Make several copies, cut each page into 12 cards, and hand out one card to each student.

Eye spy something that…	Eye spy something that…
Eye spy something that…	Eye spy something that…
Eye spy something that…	Eye spy something that…
Eye spy something that…	Eye spy something that…
Eye spy something that…	Eye spy something that…
Eye spy something that…	Eye spy something that…

Activity 2: What's In Burns Bog?

Purpose: Students will learn about the living and non-living environment in Burns Bog, and will use their senses to explore the Delta Nature Reserve and to locate the interactions including food chains and webs within this ecosystem.

Subject: Science, Language Arts and Art

Suggested Time: Three classes (includes a visit to the Delta Nature Reserve)

Materials:

- Whiteboard/Chalkboard
- Animals in Burns Bog (blackline master)
- Scrap paper or Science journal and pencil
- Plant and Animal Name Tag List (blackline master)
- Name tags with plant and animal names (complete before you go into the Delta Nature Reserve)
- Food Chain/Web Role Play Activity (blackline master)
- String or yarn
- Clue Cards (blackline master)
- Computers or information books to research animals
- Colours (felts, pencil crayons etc)
- Rare and Endangered Species in Burns Bog (blackline master)

Background:

Burns Bog has both living and non-living parts within its ecosystem that link and interact. The living parts include a variety of plants and animals. The different plants or animals found in an ecosystem are called species. All the members of one species within an ecosystem are called a population. A group of two or more populations of different species that live within an ecosystem form a community. The non-living parts of an ecosystem provide many of the things that the plants and animals need to survive. Burns Bog is an example of biodiversity due to the high diversity of plant and animal life. It offers a variety of habitats within the ecosystem. Burns Bog is also a rare type of habitat in the Lower Mainland, so it increases regional biodiversity.

Biotic Parts

Burns Bog supports a variety of biotic parts including animals and plants within the ecosystem. Many vertebrates such as birds, mammals, amphibians and reptiles, as well as many species of invertebrates such as insects, can be found in Burns Bog. Many animals make the bog their home. Burns Bog is also a good place to rest, as the bog is on the Pacific Flyway and many birds will use it as a stop-over on their migration route. The Burns Bog ecosystem also supports many food chains and food webs. The most important plant in Burns Bog is Sphagnum moss. Sphagnum moss helps form the bog's ecosystem and creates a healthy raised bog system.

Abiotic Parts

The non-living parts of Burns Bog are important for the living parts. The sunlight, water, soil, precipitation, physical environment and temperature are important for plant and animal survival. The living parts interact with the non-living parts of Burns Bog. The network of interactions among the living and non-living parts of Burns Bog make up this ecosystem.

Definitions:

- Food Chain – a pathway of how food energy is passed from one organism to another.
- Food Web – Several interconnected food chains.

Procedure:

Suggested First Class

1. In a large group discussion, brainstorm and record using a T-chart, the living parts (biotic) and non-living parts (abiotic) of the Burns Bog ecosystem.

2. Examine the blackline master "Animals in Burns Bog" to find five examples of animals that live in Burns Bog. Teach about the three different types of consumers: herbivores (eat plants), carnivores (eat other animals) and omnivores (eat both plants and animals). It is important to note that plants are producers and make their own food through a process called photosynthesis. Discuss other animals that live in Burns Bog. Use student knowledge or visit the Burns Bog website (**www.burnsbog.ca**) to find other examples.

3. Using the five examples of animals that are found in Burns Bog, have the students make connections and link interactions between the living and non-living parts within Burns Bog.

   For example, interactions between:
   (a) living parts - predator/prey relationships
   (b) non-living parts - sunlight and temperature or water levels
   (c) living and non-living parts – plants need sun and soil (non-living parts provide things that living things need to survive)

4. Discuss the terms located in the background information: species, population and community. Have the students give examples of how these terms connect with the living environment of Burns Bog.

Suggested Second Class

5. Visit the Delta Nature Reserve with your class and head to the Open Forest area for this lesson plan. See the Trail Map of the Delta Nature Reserve if required.

6. Have the students find a spot to sit down and make silent observations using their senses for five minutes. Ask students to record observations in their Science journal. What do you see? What do you hear? What do you smell? What do you feel? Come together as a large group and share a few findings from the senses observation activity.

7. Next, have the students complete an observation activity using the letters of the alphabet. Have them write down the letters A-Z in their Science journal. Instruct students to leave space to record one word or phrase that starts with each letter that is connected to Burns Bog. Give the students 10 minutes for the A-Z observations activity. Then, as a large group, start at one end of the group and move through the group starting with the first letter of the alphabet. Have each student share something that is connected to Burns Bog that starts with each letter of the alphabet.

   Example of A-Z observation:
   - A – animals
   - B – bog
   - C – crane

8. Pass out name tags with plant and animal names on them. Prepare name tags using the blackline master "Plant and Animal Name Tag List" prior to your visit.

9. Using the background information, define the difference between a food chain and a food web. Can anyone identify a food chain based on the name tags they see? Use the blackline master "Food Chain/Web Role Play Activity" to complete the activity. Use string/yarn to create the chains/web.

10. Return to the classroom.

Suggested Third Class

11. Have the students select an animal or plant that is found in Burns Bog and design a Clue Card. The Clue Card will include a picture of this animal or plant (on the front) as well as 5 clues (on the back) that provide information about this living organism. The clues should start with general information and become more specific as you list the clues about this living organism. Students can design their own Clue Card or use the Clue Card blackline master provided.

12. Share the completed Clue Cards with the class. Can students figure out the living organisms being presented?

13. Make connections to the living organisms presented by the class. Are there any food chains/food webs that were presented with the Clue Cards? Create a display on a classroom bulletin board using the Clue Card pictures and string/yarn to create food chains and food webs that are present.

Extension:

Use the blackline master “Rare and Endangered Species” to find a list of animals that are flagged by the Ministry of Environment as “red-listed” and “blue-listed”. Research the difference between a red-listed and blue-listed species. Research one species from the list and discuss how it depends on Burns Bog to survive.

Technology Component:

Research the term “invasive species”. What does this term mean? One type of invasive species found in Burns Bog is Himalayan Blackberry. Research this plant species. What does it look like? Sketch it and learn about this invasive species. Predict how you think it arrived in Burns Bog.

Animals in Burns Bog

Animals	Pictures	Characteristics
Greater Sandhill Cranes		• The wing span is over two metres and they can fly for many hours with little flapping. • Burns Bog is on the Pacific Flyway migration route. • Cranes are omnivores that feed on insects, voles, shrews, frogs, berries and grains
Black-tailed Deer		• You will find many deer on foot trials and roads, but they will get out of the way fast if humans are around by jumping into the bushes or leaping over ditches. • Deer are herbivores that feed on producers such as grass and other plants.
Insects (Damselfly)		• Estimated 4000 species of insects live in the bog. • Common insects include: flies, bees, wasps, ants and spiders • Eat differently depending on the species. They can be herbivores, detrivores or carnivores.
Eagles (babies in a nest)		• Eagles build nests and hunt from tall trees. • Roost in the winter. • Carnivores that feed on fish from the Fraser River or Boundary Bay, and on birds, ducks, small mammals, snakes and turtles.
Black Bear		• 5-10 bears living in the bog. • Great at hiding. • Territory and lack of connections to other bear populations keep numbers low • Omnivores that feed on plants and animals

Photo Credits: Marcel LaBreche

Plant and Animal Name Tag List

Each student must have a name tag.

Note: You can add additional names if you need more parts for the role play.

1. Sun
2. Plants
3. Greater Sandhill Crane
4. Insects
5. Voles
6. Shrews
7. Frogs
8. Berries
9. Grains
10. Deer
11. Grass
12. Dragonflies
13. Mosquitoes
14. Bear
15. Nuts
16. Eagles
17. Fish
18. Birds
19. Ducks
20. Small mammals
21. Snakes
22. Turtles
23. Salmon
24. Rabbits
25. Tree bark
26. Clover
27. Fox
28. Flies
29. Bees
30. Wasps
31. Ants

Food Chains/Web Role Play Activity

During your visit in the Delta Nature Reserve you will discuss the difference between food chains and food webs. There are many food chains and food webs that are present in Burns Bog. Each organism in the food chain plays an important role. In the role play below, you will be examining several different food chains that make up a food web.

Example Food Chains:

Greater Sandhill Crane (Omnivores) – insects, voles, shrews, frogs, berries, grains

Deer (Herbivores) – grass

Dragonfly (Carnivores) – insects, mosquitoes

Eagles (Carnivores) – fish, birds, ducks, small mammals, snakes, turtles

Bear (Omnivores) – plants, berries, insects (ants, wasps, bees), deer, small mammals

Salmon (Carnivores) – dragonflies, fish

Rabbit (Herbivores) – grass, tree bark, clover

Fox (Carnivores) – rabbits, rodents

Role Play:

Follow the guided imagery below or prompt with questions for the next in the chain. For example, "This animal is an omnivore and eats the following things". Have the students who are playing that food source put up their hands as you read the food it eats. The string/yarn may be passed to various plants and animals more than once as the food chains interconnect to form a food web.

Start with the Sun. Give the Sun the string/yarn. The Sun gives energy to all living organisms and is necessary for plants to carry out the process of photosynthesis. The person that is playing the part of the sun will pass the string/yarn to the person playing the role of the plants and then anyone playing the role of specific plant parts (berries, grains, grass nuts, tree bark and clover). Have the students who are playing the part of plants put up their hands. Each plant can pass the string/yarn to the next plant.

Next, the person with the string/yarn will pass it to the Greater Sandhill Crane. Discuss that this animal is an omnivore and eats insects (have the students pass to the insect person as well as the specific insects listed in the group), voles, shrews, frogs, berries and grains. Have the students who are playing these food sources put up their hands and the students will continue to pass the string/yarn to the various roles.

Next, the person with the string/yarn will pass it to the deer. Discuss that this animal is a herbivore and eats grass. The string/yarn will continue to pass to the plants and grass roles.

Next, the person with the string/yarn will pass it to the dragonfly. Discuss that this animal is a carnivore and eats insects such as mosquitoes.

Next, the person with the string/yarn will pass it to the eagle. Discuss that this animal is a carnivore and eats fish, birds, ducks, small mammals, snakes and turtles. Have the students who are playing these food sources put up their hands and the students will continue to pass the string/yarn to the various roles.

Next, the person with the string/yarn will pass it to the bear. Discuss that this animal is an omnivore and eats plants, berries, insects (ants, wasps, bees), deer and small mammals. Have the students who are playing these food sources put up their hands and the students will continue to pass the string/yarn to the various roles.

Next, the person with the string/yarn will pass it to the salmon. Discuss that this animal is a carnivore and eats insects (dragonflies) and fish. Have the students who are playing these food sources put up their hands and the students will continue to pass the string/yarn to the various roles.

Next, the person with the string/yarn will pass it to the rabbit. Discuss that this animal is an herbivore and eats plants, grass, tree bark, and clover. Have the students who are playing these food sources put up their hands and the students will continue to pass the string/yarn to the various roles.

Next, the person with the string/yarn will pass it to the fox. Discuss that this animal is a carnivore and eats rabbits and rodents. Have the students who are playing these food sources put up their hands and the students will continue to pass the string/yarn to the various roles.

Discussion after the Role Play:

Discuss the connections from the various food chains and in the food web. Have the "plant" student drop the piece of string/yarn they are holding on to. Does it impact the food chains/food web? Have all the specific plants drop the piece of string/yarn they are holding on to. Discuss if one organism disappears it impacts the ecosystem of Burns Bog. All living organisms are important in the food chains and food webs. If one species disappears, it does impact the other species within the ecosystem.

Clue Card Template

Front	Back
	1. _____ _____ 2. _____ _____ 3. _____ _____ 4. _____ _____ 5. _____ _____

Rare and Endangered Species in Burns Bog

Common Name (bird)	Latin Name	Provincial Listing
Peregrine Falcon	*Falco peregrinus anatum* *Falco peregrinus pealei*	red-listed
Purple Martin	*Progne subis*	red-listed
American Bittern	*Botaurus lentiginosus*	blue-listed
Great Blue Heron	*Ardea Herodias*	blue-listed
Green Heron	*Butorides virescens*	blue-listed
Trumpeter Swan	*Cygnus buccinators*	blue-listed
Greater Sandhill Crane	Grus canadensis tabida	blue-listed
Short-billed Dowitcher	*Limnodromus griseus*	blue-listed
Caspian Tern	*Sterna caspia*	blue-listed
California Gull	*Larus californicus*	blue-listed
Barn Owl	*Tyto alba*	blue-listed
Short-eared Owl	*Asio flammeus*	blue-listed
Hutton's Vireo	*Vireo huttoni*	blue-listed

Common Name (mammal)	Latin Name	Provincial Listing
Southern Red-backed Vole	*Clethrionomys gapperi occidentalis*	red-listed
Pacific Water Shrew	*Sorex bendirii*	red-listed
Trowbridge's Shrew	*Sorex trowbridgii*	blue-listed

Common Name (amphibian/reptile)	Latin Name	Provincial Listing
Red-legged Frog	*Rana aurora*	red-listed
Painted Turtle	*Chrysemys picta*	blue-listed

Source: http://www.burnsbog.ca/flora_fauna.html

Activity 3: Burns Bog Creature

Purpose: Students will learn what living things need to survive, about habitats that exist within Burns Bog, and how animals adapt to a bog ecosystem.

Subject: Science, Social Studies and Art

Suggested Time: Three classes (includes a visit to the Delta Nature Reserve)

Materials:

- Whiteboard/Chalkboard
- Scrap paper or Science journal and pencil
- Burns Bog Habitats (blackline master)
- Chart paper
- Felts/pencil crayons

Background:

Living things must have their basic needs met in order to survive. Burns Bog provides a lot of these basic needs. Many living things make their home in Burns Bog because conditions are right for survival.

Living things need the following in order to survive:

- *Sunlight*: Sunlight provides heat to living organisms in Burns Bog. It also is used in the process of photosynthesis to produce food for plants.
- *Food*: Animals eat plants or other animals found in Burns Bog to get their food. Plants produce their own food using sunlight.
- *Air*: Plants in Burns Bog release oxygen into the ecosystem and take in the carbon dioxide from the ecosystem. Plants use the carbon dioxide to help make their food. Animals use the oxygen from the air.
- *Water*: Living organisms are mostly water. Water has important functions in the bodies of living things. Living organisms receive water from the foods that they eat as well as water from within the ecosystem.
- *Shelter*: All living things need shelter. Some living things find natural shelter in the ecosystem. Other living things build shelter from materials in the ecosystem.

A habitat is the physical space where a species lives. Living organisms will only live in a habitat where their survival needs are met.

Procedure:

Suggested First Class

1. Ask the students what they need to survive. Individually, have the students think about what they need to survive and write down five things in their Science journal. Have the students share their five items with a partner. Then, discuss their thoughts on survival needs as a group.

2. Discuss what living things need to survive: sunlight, food, air, water and shelter. Burns Bog is a great habitat for animals because many different living things can meet their basic needs in this ecosystem.

3. Brainstorm some of the habitats that exist within Burns Bog. Where do animals and plants live in Burns Bog? Record this list on the board. Use the blackline master "Burns Bog Habitats" to make connections between different habitats and the animals that live in Burns Bog.

4. Continue using the "Burns Bog Habitats" blackline master and examine the adaptations that these animals have that help them survive in the various habitats present in Burns Bog. Brainstorm some of the adaptations that living things have in order to survive in this habitat. For example, birds have wings to help them fly, ducks have webbed feet to help them swim, beavers have large teeth that help them cut tree branches to build their dams, etc.

Suggested Second Class

5. Visit the Delta Nature Reserve with your class and head to the Open Forest or Skunk Cabbage Meadow areas for this lesson plan. See the Trail Map of the Delta Nature Reserve if required.

6. Divide the class into small groups of 3 or 4 students.

7. Have each group find a specific habitat or specific area of Burns Bog to sketch. The sketch could either be looking straight at it or a bird's eye view. Give each group a large piece of chart paper to sketch out the habitat/area. Use a legend to incorporate different aspects of your sketch – plants, animals, water, soil, evidence of human impact, etc.

8. Think about the plants and animals that live in this specific habitat of Burns Bog. Do you see animals? Do hear animals? Do you see any evidence of animals? Incorporate the animals and plants that live in this habitat into your sketch. Incorporate human impact into your sketch, if it is present.

9. Return to the classroom.

Suggested Third Class

10. Have the students discuss within their groups how the animals and plants in their chosen habitat meet their basic survival needs. Is there evidence of human impact in the area that you examined? If so, discuss how humans could impact this area of Burns Bog.

11. Give each group another piece of chart paper and have each group create a creature using the different adaptations of animals that live in the area of Burns Bog that each group mapped. For example, your new creature could have wings like a bird, webbed feet like a duck, the body of a deer, large teeth like a beaver, etc. This is a new creature that does not exist. Think about how this newly discovered species meets its basic needs. Groups should give their creature a common and scientific name.

12. Each group will present their habitat and new creature. The groups will discuss how the creature meets its basic needs in Burns Bog.

Extension:

Make a 3-D model/diorama of the area of Burns Bog that you mapped.

Or, make a 3-D model of your new Burns Bog creature using recycled materials.

Technology Component:

Create a PowerPoint presentation that describes the different adaptations of your new creature that lives in Burns Bog.

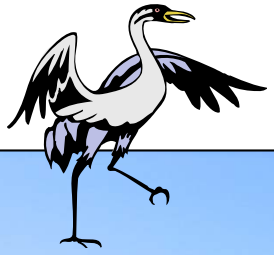
Burns Bog Habitats

Why does a crane or a sundew plant need a healthy bog? Animals and plants that live in the bog need healthy habitats to survive. A habitat provides everything that the animal or plant needs to survive, like food, water, shelter, and space. Burns Bog has many different habitats.

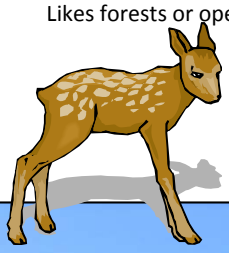
Connect the animals with the Burns Bog habitat that fits best.

Weasel
Lives in open or forested areas near water

Sandhill Crane
Nests in the bog ponds



White-tailed Deer
Likes forests or open bog



Frog
Lives in and around ponds

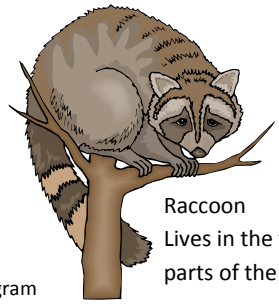
Beaver
Builds dams in bog ponds

Ducks and Geese
Use the bog ponds for shelter during winter storms and migration

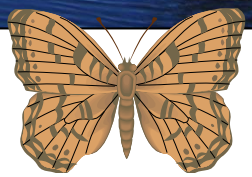
Damselfly
Lays eggs in ponds

Bald Eagle
Makes nests in pine trees at the bog edge

Chipmunk
Feeds on wild berries and seeds in forested areas



Raccoon
Lives in the forested parts of the bog



Moths and Butterflies
Lay eggs on bog plants

Activity 4: Fires in Burns Bog

Purpose: Students will learn about the history of fires in Burns Bog and how humans can impact Burns Bog.

Subject: Science and Math

Suggested Time: Two classes

Materials:

- Whiteboard/Chalkboard
- Laptop/projector/internet access or computer lab access
- Scrap paper or Science journal and pencil
- Articles on Burns Bog Fires: Corporation of Delta and CBC News (blackline masters)
- Graph paper

Background:

If a bog has dried out and the conditions are right then fires can start. However, an ignition source needs to be present. An ignition source can be human-caused or due to natural causes such as lightning. Once a bog fire has started, it can be very difficult to stop. Burns Bog is a raised peat bog and when peat catches on fire, the fire can travel underground and smolder for many months. It can be very difficult for fire fighters to access or put out the fire if it is underground.

Recent history of fires in Burns Bog:

- 1996: Fire in bog (80 hectares burned)
- 1998: Several small fires break out in the bog, but are extinguished quickly
- 2005: Large fire in the bog (205 hectares burned)
- 2007: Small fire in the bog (1.7 hectares burned)

Procedure:

Suggested First Class

1. Remind the students that Burns Bog is a wetland and the ground is saturated with water. Ask the students whether or not they think a bog could catch on fire. Have the students make a prediction and record the yes/no poll on the board. Inform the students that if the surface conditions are dry, and the water table is low, then a fire can start.

2. Discuss the history of fires in Burns Bog. Refer to the background information. Ask the students if anyone remembers the fires in Burns Bog. If they do, what do they remember?

3. Use a laptop, projector and wireless internet or set up time in the computer lab to visit the Burns Bog website and view the photogallery of the 2005 and 2007 bog fires with your students. **http://www.burnsbog.ca/photogallery.html**

4. Discuss the impacts of a bog fire to the ecosystem. Is the environment healthy? Discuss the positive and negative roles that humans play on the local ecosystem if there is a bog fire.

   Examples:
   Negative – Is the fire caused by humans? How could humans cause a fire in the bog?
   Positive – Fire fighters and teams work together to put out the fire.

5. Use the blackline masters of the two Burns Bog Fire Articles by The Corporation of Delta and CBC News to read about the fires in Burns Bog in 2005 and 2007. Have the students compare and contrast the two articles using a Venn diagram in their Science journals. What information presented is the same, and what is unique to each fire? Discuss the findings as a class.

Suggested Second Class

6. Using the background information, compare the sizes of the areas that burned in the four listed fires. Have the students graph the areas that burned during the three measured fires in a graph of their choice. For example, students could do a bar graph, a pie graph, or plot this information.

7. What is a hectare? Have the students put this information into something that makes sense to them. Find another comparison to fire size that puts this information into the perspective of the real world. For example, one of the articles compared the size of the fire to a football field. Select something unique to compare the size of fires in Burns Bog.

8. Share these comparisons with the class.

Extension:

Visit the Delta Nature Reserve, which is a small section (40 hectares) of Burns Bog. Look around this area. What would happen if there was a fire in the Delta Nature Reserve? Discuss the implications to the ecosystem if a fire started in this area of Burns Bog.

Technology Component:

Research other fires that have started in other areas of the Province of British Columbia. How are most fires started - by humans or by natural causes such as lightning?

Burns Bog Fire

The Corporation of Delta

September 13, 2005

The Corporation of Delta continues to battle the fire in Burns Bog today. The firefight is being conducted by Delta Fire Crews, the Provincial Fire Service and the Greater Vancouver Regional District.

Firefighting efforts have been centred on a burn area of approximately 200 hectares (500 acres) in size in the southeast corner of the Bog.

In addition to aerial tankers and helicopter support, ground crews have been deployed to control the Burns Bog fire. Low winds have generally been present which has aided fire control efforts.

The fire is located well into the Bog. Currently there is no immediate risk to homes or properties, no evacuation orders have been issued and the fire crews are in the process of containing the fire. Approximately eighty percent of the perimeter has been controlled.

Burns Bog includes a large wetland area and The Corporation of Delta strives to maintain high water levels around the perimeter of the Bog to support that ecosystem. Despite the significant amount of water present, the peat readily facilitates the movement of the fire.

Smoke from the fire has been reported throughout the Greater Vancouver area. The Fraser Health Authority has posted a link to information about Forest Fire Smoke on their website at www.fraserhealth.ca.

The section of 104th Street north of Highway 10 along with 64th Avenue west of Highway 91 has been closed to the general public.

Media briefings will continue to be provided via an onsite media centre on 104th Street until further notice. The next update is at 3:00 p.m.

Further updates will be posted as required.

Source: http://www.corp.delta.bc.ca/EN/main/municipal/6231/archives/16853.html

Burns Bog Fire

CBC NEWS

Burns Bog fire under control

CBC News May 2007

Delta firefighters returned to Burns Bog at first light Wednesday to battle the remains of a fire that has burned about a hectare of the ecologically sensitive area of Greater Vancouver.

The smoke from the Burns Bog fire could be seen across the Lower Mainland on Tuesday. (CBC)

More than three dozen firefighters battled the ground fire for hours into Tuesday evening, finally pulling out of the peat bog at dusk because of safety concerns over the soft soil conditions.

"These guys are awesome. They did a stellar job. These guys worked their butts off, " said Delta fire Chief Dan Copeland of his crews.

On Tuesday, the firefighters hiked about a kilometre into the bog, dragging their hoses with them. They were aided by a helicopter that dumped thousands of litres of water on the flames.

Officials said the fire was under control, but it would take another day or two to extinguish it.

Delta firefighters had to drag their hoses a kilometre into the bog. (CBC)

Copeland said it was reduced to a smouldering ground fire, and sprinklers were set up overnight to prevent it from spreading.

The fire at one time was the size of two football fields, but it was only a fraction of the size of a blaze in 2005 that burned about 10 per cent of the bog.

That fire created a huge pall of smoke across Greater Vancouver and the Fraser Valley, triggering a health advisory for people with breathing problems.

George Harvie, Delta's chief administrative officer, said officials weren't taking any chances with the latest fire.

"We'd rather have more resources at the beginning than [risk] second guessing ourselves later on."

The cause of the fire is not known, but officials believe they know where it started.

Burns Bog is the largest green belt in Greater Vancouver, covering about 4,000 hectares in suburban Delta. It is the largest such peat bog in North America.

Article reproduced with permission from the Canadian Broadcasting Corporation (CBC).
Source: http://www.cbc.ca/news/canada/british-columbia/story/2007/05/30/bc-bog-fire.html

Activity 5: Burns Bog in 2060

Purpose: Students will learn about the uses of Burns Bog throughout history and envision what Burns Bog might look like in 2060.

Subject: Science and Math

Suggested Time: Three classes

Materials:

- Whiteboard/Chalkboard
- Scrap paper or Science journal and pencil
- Name tags for the various stakeholder roles
- Stakeholders of Burns Bog (blackline master)
- Case Notes (blackline master)
- Access to the computer lab
- Poster paper
- Burns Bog in 2060 (blackline master)

Background:

Burns Bog has an interesting history that includes: farming and ranching, peat mining, and cultural and traditional uses by First Nations groups. Parts of Burns Bog have been developed for agricultural and industrial use, a highway goes through the eastern side of Burns Bog, and a landfill is found in the southwestern corner. In 2004, the government bought Burns Bog and protected it as a natural area.

Pioneering – Burns Bog was named after Dominic Burns who purchased the Delta Bog in 1905 to ranch cattle and sheep. The bog was purchased for $26,000 in 1905 which would have been equivalent to $650,000 today. Burns Bog was used for ranching cattle and sheep in the early 1900s and steps were taken to improve the bog for farming, such as ditches. A bog can be a dangerous place for domestic animals as there are poisonous plants as well as sink holes and quicksand-like peat.

Peat Mining – Peat has been used as a fuel source for hundreds of years. The top layer of peat is not a valuable fuel source. It is the deeper peat that is better for burning. In the process of harvesting the deeper peat, the peatland habitats can be lost and may take hundreds of years to regenerate. From the 1940-1980's, there was extensive peat mining in Burns Bog. During this time, two peat plants and a railway were constructed in the bog. To improve conditions for peat mining in the bog, several roads, ditches, and 16 kilometres of train track were constructed to help with the harvesting. Peat is commonly used in gardening as a soil amendment, but more sustainable alternatives include garden or leaf compost, wood chips, or manure.

First Nations Groups – Burns Bog was used by First Nations people (Tsawwassen, Semiahmoo, Sto:lo, Katzie and Musqueam) for thousands of years. The bog was an important food source for First Nations people, from the berries found in the bog to hunting the animals that lived in the bog. Many plants in the bog were used as medicines and had healing powers. Conservation of Burns Bog is also important to First Nations people in terms of the cultural, archaeological, traditional and current uses.

Procedure:

Suggested First Class

1. Discuss with the class how Burns Bog has been used in the past.

   Examples:
   - Pioneering – farming and ranching
   - Peat Mining – mining peat for fuel and gardening
   - First Nations groups – cultural and traditional uses

2. Discuss how Burns Bog is used today and how the uses are different from each other.

   Examples:
   - Government and Conservation Groups – Working to conserve, restore, sustain and protect Burns Bog, and provide a healthy ecosystem and habitats to rare and endangered species.
   - Urban/Industrial Groups – The Vancouver Landfill, and development at the edges of Burns Bog such as highways and industrial areas.
   - Scientists conducting research projects. Research projects listed below are currently underway in Burns Bog:
     1. Water level monitoring (The Corporation of Delta)
     2. Weather station (Environment Canada)
     3. Vegetation monitoring (Metro Vancouver)
     4. Studies on insects and snails/slugs (Ministry of Environment)
     5. Sandhill Crane monitoring (Ministry of Transportation)
   - Recreational – People visiting the Delta Nature Reserve to enjoy the trails and nature.

3. Inform the students that the government purchased Burns Bog in 2004 and set up a management planning team to help make decisions to conserve and protect the bog. Four students will play the roles of the four purchasing agencies (The Corporation of Delta, Metro Vancouver, the Province of British Columbia, and Environment Canada). The rest of the class will be divided into the past and present stakeholders of the bog. It is the year 2060 and the Burns Bog management planning team is asking for input on the future planning of Burns Bog.

4. Divide the students into their stakeholder roles or let the students choose their stakeholder roles. Pass out name tags to identify students in their role.

5. Pass out the "Stakeholder Cards and Case Notes" blackline masters. Each group represents a team of experts for the various stakeholders. Allow the students to read the information cards and research their stakeholder role. Students can start their research using the Burns Bog website: **www.burnsbog.ca**.

Suggested Second Class

6. Students will need to prepare a case to convince the management planning team about their particular stakeholder. Give each stakeholder group the following instructions:

    - Construct a poster about your stakeholder group. Explain on the poster how your group wishes to use Burns Bog.
    - You will be supporting the case for your stakeholder. Your group must prepare information for the management planning team on how they should proceed with the future of Burns Bog in the best interest of your particular stakeholder.

7. Add finishing touches to the group presentations. Tell the students to ensure that they can defend the position of their stakeholder group to the management planning team. How would your stakeholder group like to use Burns Bog? Why is this use in the best interest of Burns Bog?

Suggested Third Class

8. Stakeholders will each present their case on the future of Burns Bog to the management planning team.

9. The management planning team will ask questions of the various stakeholders and make a decision about the future of Burns Bog.

10. Use the blackline master "Burns Bog in 2060" to have each student draw how they envision Burns Bog in 2060.

Extension:

Write letters to the The Corporation of Delta to explain why Burns Bog is a unique ecosystem, and share each student's vision for Burns Bog in 2060.

Technology Component:

Research the peat mining industry. Learn about the different methods that were used to extract peat from Burns Bog. Compare and contrast the vacuum method with the hydropeat method. Research can be done on the Burns Bog website: **www.burnsbog.ca**.

Burns Bog Stakeholders

Photo Credit: Delta Museum and Archives

Ranchers

Burns Bog was named after Dominic Burns who purchased the Delta Bog in 1905 to ranch cattle and sheep. The bog was purchased for $26,000 in 1905, which would have been equivalent to $650,000 today. Burns Bog was used for ranching cattle and sheep in the early 1900s and steps were taken to improve the bog for farming, such as ditches. A bog can be a dangerous place for animals as there are poisonous plants as well as sink holes and quicksand-like peat.

Photo Credit: Delta Museum and Archives

Peat Miners

Peat has been used as a fuel source for hundreds of years. The top layer of peat is not a valuable fuel source. It is the deeper peat that is better for burning. In the process of harvesting the deeper peat, the peatland habitats can be lost and may take hundreds of years to regenerate. From the 1940-1980's, there was extensive peat mining in Burns Bog. During this time, two peat plants and a railway were constructed in the bog. To improve conditions for peat mining in the bog, several roads, ditches, and 16 kilometres of train track were constructed to help with the harvesting. Peat is commonly used in gardening as a soil amendment, but more sustainable alternatives include garden or leaf compost, wood chips, or manure.

Photo Credit: Jennifer Stonehouse

First Nations Groups

Burns Bog was used by First Nations people (Tsawwassen, Semiahmoo, Sto:lo, Katzie and Musqueam) for thousands of years. The bog was an important food source for First Nations people, from the berries found in the bog to hunting the animals that lived in the bog. Many plants in the bog were used as medicines and had healing powers. Conservation of Burns Bog is also important to First Nations people in terms of the cultural, archaeological, traditional and current uses.

Photo Credit: Jennifer Stonehouse

Government and Conservation Groups

Several groups are working together to conserve and protect Burns Bog. These groups are working hard to promote a healthy ecosystem and habitats for rare and endangered species. This includes educating people about the importance of Burns Bog, protecting the sensitive ecosystem from trampling and fires, and studying the bog to understand it better.

Photo Credit: Jennifer Stonehouse

Urban/Industrial Development Groups

The Vancouver Landfill is the southwestern corner of Burns Bog. The landfill has existed since 1966 and is not an ideal place for a landfill as it is a wet and boggy site. Highway 91 was built through Burns Bog for the Alex Fraser Bridge. The Tilbury industrial lands are at the north edge of the bog, and farmlands have been built at the southern edge of the bog.

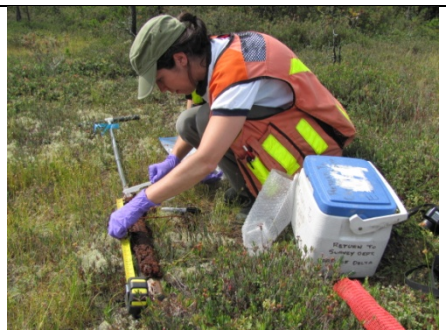


Photo Credit: Sarah Howie

Scientists

Scientists are conducting research projects in Burns Bog. The following research projects are underway in Burns Bog:

1. Water level monitoring (The Corporation of Delta)
2. Weather station (Environment Canada)
3. Vegetation monitoring (Metro Vancouver)
4. Studies on insects and snails/slugs (Ministry of Environment)
5. Sandhill Crane monitoring (Ministry of Transportation)

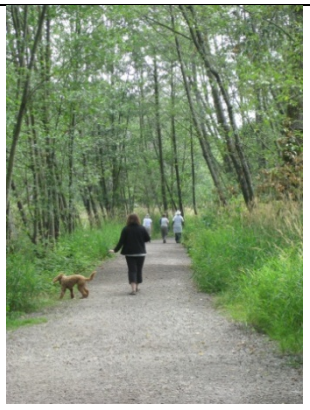


Photo Credit: Jennifer Stonehouse

Recreational Users

Most of Burns Bog has been set aside as an ecological reserve, but one area in the northeastern corner is open for public use and enjoyment: the Delta Nature Reserve. People can stroll along boardwalks which pass through various landscapes such as forests, meadows and bog areas. There are also many kinds of wildlife that can be viewed throughout the Delta Nature Reserve.

Stakeholder Case Notes

It is the year 2060, and the Burns Bog management planning team is asking for input on the future planning of Burns Bog. Your group represents a team of experts for this stakeholder. You will need to prepare a case to convince the management planning team to support your stakeholder's point of view. Read the information card that gives you background information on your stakeholder group. Then, start your research using the Burns Bog website: **http://www.burnsbog.ca/acquisition.html**, and continue to explore the website to learn more about the history of Burns Bog. Your assignment is to:

- Construct a poster about your stakeholder group and explain how your group would like to use Burns Bog in the future.
- Support the case for your stakeholder and prepare information for the management planning team on how they should proceed with the future of Burns Bog in the best interest of this particular stakeholder.
- Defend your position.

Stakeholder Group:

_____

Notes

Supporting This Stakeholder

Imagine the Future

What Will Burns Bog Look Like in 2060?

Burns Bog has a long history of use, dating way back to the last century. A farmer tried using the bog as a ranch for a short time. Later on, people harvested the peat from the bog to sell. In 2004, the government bought the bog and now it is protected as a natural area. What do you think Burns Bog will look like in 50 years? Draw your ideas on the last image!

1900 –
Ranching

1950 –
Peat Harvesting

2060 –
Draw the future that you imagine for Burns Bog

Activity 6: Hidden Treasures

Purpose: Students will learn about the properties of sink holes and quicksand-like peat in Burns Bog, the preservation that can happen in the bog, and the legends of First Nations people. Students will visit the Delta Nature Reserve to identify the hidden treasure!

Subject: Science and Social Studies

Suggested Time: Three classes (includes a visit to the Delta Nature Reserve)

Materials:

- Whiteboard/Chalkboard
- Scrap paper or Science journal and pencil
- 2L clear plastic pop bottles (cut off the top)
- Soil (from the garden or forest)
- Clear mixing bowl or pan
- Cornstarch
- Water
- Plastic toy and metal toy
- Laptop (with internet)
- Projector
- Speakers (optional – you can use the laptop speakers instead)
- DragonFly TV Assignment (blackline master)
- Picture of the Hidden Treasure in Burns Bog (blackline master)
- Hidden Treasure (blackline master)
- Clear Rubbermaid bin for decomposition experiment
- Items to decompose (5-6). Examples: paper towel, banana peel, fabric, plastic, etc.
- Gloves
- Decomposition Experiment (blackline master)
- School digital camera (student digital cameras or student cell phones with cameras - optional)

Background:

Bogs can be very wet areas and, as a result, very dangerous terrain for animals due to the sink holes and quicksand-like peat. Bogs are formed of Sphagnum moss which breaks down into peat over time. The peat is building up on top of itself and is not very stable. The peat is loosely packed, saturated with water, and has poor drainage. Due to the wet conditions, decomposition is very slow. The peat builds up its own water table and is not able not support anything too heavy because the bog surface is floating on decomposed matter full of water. If animals find themselves in sink holes or quicksand-like peat, they struggle with their four legs and are not able to pull themselves out. In 2009, a young deer was stuck up to its neck in quicksand-like peat and had to be rescued from a ditch in Burns Bog. This is an example of a happy ending because humans were able to help this animal. Not all animals are as lucky, because there are some spots where they could sink quickly and not have help.

There are legends from First Nations groups about an underground channel that flowed from the Strait of Georgia into Burns Bog. It was believed that sea monsters were responsible for dragging people or animals into the quicksand-like peat. There are also stories about people being lost at sea and then turning up in the middle of Burns Bog. It is possible that underground waterways could have once connected Burns Bog to the ocean or the Fraser River.

Metro Vancouver park operator saving a young deer that was stuck in a Burns Bog ditch

Procedure:

Suggested First Class

1. Review and brainstorm what the students know about the conditions of soil and peat in the bog.
    - Peat is saturated with water because the Sphagnum moss acts as a sponge
    - Low in nutrients
    - Receives water only through precipitation
    - Decay happens slowly (items can be preserved) due to the lack of oxygen
    - Acidic conditions

2. Fill a 2L plastic pop bottle 1/3 with soil (garden or forest soil). Next, slowly add water (precipitation) to see how the soil becomes saturated with water.

3. Discuss with the students that the terrain in the bog can have similar properties to quicksand. At times, sink holes or quicksand-like peat can be present. Inform the students that animals can become trapped in the sink holes and quicksand-like peat. Share the story about the deer that had to be rescued in 2009. Sinkholes are one reason why boardwalks have been built to ensure visitor safety in the bog.

4. Demonstrate how quicksand-like peat works using Oobleck. Show the students how quicksand-like peat works when a plastic and a metal toy are placed on top of the Oobleck. Watch what happens. Do they sink? What rate do they sink at? Can you get them out? Compare and contrast the

differences between the plastic and the metal toy in the quicksand-like peat. They will slowly sink into the Oobleck and demonstrate what could happen to animals in the bog that become trapped in sink holes and quicksand-like peat.

How do you make Oobleck?

Materials: cornstarch, water, bowl and mixing spoon.

Directions: In a clear mixing bowl or pan add 1.5-2 cups of cornstarch and 1 cup or water. Stir the mixture until the cornstarch has dissolved.
The Oobleck represents quicksand. Touch the Oobleck with an open palm of your hand; this represents a solid and your hand will stay on the surface. Touch the Oobleck with one finger; this represents a liquid and your finger will slowly sink into the mixture.

Note: When you are completing your Chemistry unit, this is a great activity for the students to think about the properties of Oobleck. Is Oobleck more like a solid or a liquid? It has properties of both!

5. Using a laptop (connected to the internet) and projector watch the DragonFly TV video about Bogs. To access this video clip visit: **http://www.burnsbog.ca/videos.html**
    - Click on the DragonFly TV link to watch the video.
    - Optional: you can hook up speakers to your laptop for better sound.

6. Inform the students that they will be doing a short assignment on the video clip, so they will need to pay careful attention to the clip and may want to take notes as they watch. Students can use their Science journal or use the blackline master "DragonFly TV Notes" to take notes.

7. Watch the DragonFly TV clip (approx. 10 minutes)

8. Next, use the blackline master "DragonFly TV Assignment" to have the students answer the questions regarding the video clip. Discuss the answers as a class.

Suggested Second Class

9. Ask the class if anyone is aware of the item that sank in Burns Bog. There is evidence of this item that can be viewed on the trail. If you know what it is, don't say anything to anyone!

    - *Optional*: You can show a picture to your class and have them make a prediction about the hidden treasure before you go to see the hidden treasure. Use the blackline master "Picture of the Hidden Treasure" to show your students.

10. Visit the Delta Nature Reserve with your class and head to the Bog Woodland area for this lesson plan. See the Trail Map of the Delta Nature Reserve if required. The sunken tractor is indicated on the map.

11. Find the hidden treasure. Use the blackline master “Hidden Treasure” to complete the observation activities. What do you think it is? Make a prediction about the hidden treasure and have the students record their observations about the area around the sunken treasure in their Science journal.

    Note: The hidden treasure is a tractor. This tractor was stolen during a construction project at Scottsdale Mall in the early 1990’s. The person who took it decided to enjoy driving it in the bog, but the tractor sank into the quicksand-like area of the bog. You can see the top part of the tractor from the trail in the Bog Woodland area. Each year the tractor sinks a little more. Fuel that was left inside has been leaking slowly into the bog. On a wet day it has been observed that it smells like gas and sometimes bubbles can be seen on the surface.

12. Return to the classroom.

Suggested Third Class

13. Discuss with the students how the bog preserves things due to Sphagnum moss, acidic conditions, and lack of oxygen and bacteria. Have the students set up an experiment to test decomposition under “normal conditions”. Fill a clear Rubbermaid bin with soil (garden or forest soil) and bury 5-6 items to test the rate of decomposition. The items can be voted upon by the class and one experiment will be completed to test decomposition rates. *Note*: Decomposition for items with skin, hair, wool and leather would take longer in bog conditions. You will not be burying items in the bog to demonstrate this.

14. Have the students make predictions and record the rate of decomposition of the items being tested. Use the blackline master, “Decomposition Experiment” to complete this activity. Record and take pictures or sketch the results and findings each week.

15. When the experiment has been completed, have the students make a prediction about the rate of decomposition of these items in bog-like conditions. Also, have the students graph the rate of decomposition under “normal conditions”.

Extension:

Have the students take a picture of an area in Burns Bog or use the sketch they did in the Hidden Treasure observation activity to create a legend based on the First Nations beliefs about the quicksand-like peat. Create a First Nations legend using the idea about an underground channel that flowed from the Strait of Georgia into Burns Bog. The students will write a legend about a sea monster that was responsible for dragging animals into quicksand-like peat in Burns Bog, or about someone that was lost at sea but turned up in Burns Bog. Or, try something completely different and have the students write about the night the tractor arrived in Burns Bog. Add illustrations to the legends.

Technology Component:

Give the students the GPS coordinates of the hidden treasure. The students will need to locate the hidden treasure based on the GPS coordinates using a GPS device or a smart phone with a GPS application. Once in the correct area, they will need to find evidence of the hidden treasure. The students will need to identify the hidden treasure as the sunken tractor. The GPS coordinates for the hidden treasure are:

- Latitude: 49.14491 N
- Longitude: 122.93099 W

Optional Suggestion: You could have students find the hidden treasure in this lesson by using the GPS coordinates from a GPS device or a smart phone with a GPS application.

DragonFly TV Notes

DragonFly TV Assignment

Over thousands of year, Sphagnum moss turns into _____.

Why do anthropologists love bogs? What did they discover?

Why can bogs preserve things? Fill in the information below.

- Sphagnum moss acts as a _____ and soaks up lots of _____.
- Moss holds _____as much water as soil.
- There is no _____ due to dead plants.
- Bog water is _____.

During the girls' visit to the museum exhibit, what four items were found to preserve the best in the bog?

What items did the girls bury in the bog?

In which three locations did the girls bury the items?

What items changed the most in all three locations?

What item didn't change in all three locations? Why?

What item had the most surprising changes?

What items stayed the same in all three locations?

DragonFly TV Assignment Answers

Over thousands of year, Sphagnum moss turns into ___peat moss___.

Why do anthropologists love bogs? What did they discover?

Bogs preserve things from the past; bog mummies.

Why can bogs preserve things? Fill in the information below.

- Sphagnum moss acts as a __sponge___ and soaks up lots of _____water_____.
- Moss holds ___twice___as much water as soil.
- There is no ___oxygen____ due to dead plants.
- Bog water is ___acidic___.

During the girls' visit to the museum exhibit, what four items were found to preserve the best in the bog?

Skin, hair, wool and leather clothing

What items did the girls bury in the bog?

Meat, apple, leather, butter, linen, bone and wool

In which three locations did the girls bury the items?

Ground, bog and water

What items changed the most in all three locations?

Meat and apple

What item didn't change in all three locations? Why?

Leather, because it is like skin and preserves very well

What item had the most surprising changes?

Butter

What items stayed the same in all three locations?

Linen, bone, wool and butter

Picture of the Hidden Treasure

Photo Credit: Jennifer Stonehouse

Hidden Treasure

What do you think the hidden treasure is?

_____

Draw the hidden treasure. Include the surroundings in the Bog Woodland.

What is the hidden treasure? Explain how it got there.

_____
_____
_____

Use your senses to make some observations. Fill out the table below.

See	Hear	Smell	Touch

The hidden treasure entered the bog in the early 1990's and is slowly sinking. Make a prediction to describe when you think the hidden treasure will be completely submerged in the bog.

_____

Decomposition Experiment

Items	Predictions of Normal Decomposition Rate	Week 1 Observations	Week 2 Observations	Week 3 Observations	Week 4 Observations	Week 5 Observations	Week 6 Observations	Predictions of Bog Decomposition Rate

Activity 7: Water Everywhere!

Purpose: Students will learn how Sphagnum moss soaks up water and about the acidic water conditions in the bog. Students will visit the bog to set up a rain gauge experiment and then monitor the precipitation levels in different areas of the bog.

Subject: Science

Suggested Time: Three classes (includes multiple visits to the Delta Nature Reserve to monitor the rain gauge, but this can be done during other lesson plans)

Materials:

- Whiteboard/Chalkboard
- Science journal and pencil
- Sphagnum Moss (blackline master)
- Sponges (the kitchen kind – all groups should have the same kind of sponge)
- Plates for each group
- Balance scale or spring scale
- Measuring cup
- Water
- Building materials (recycled materials and things you have available at school)
- Sponge Lab (blackline master)
- Rain Gauge – Materials and instructions on how to make a rain gauge are included in this lesson
- Rain Gauge Data Collection (blackline master)
- Do Not Remove Note (blackline master)
- Jars to collect a water sample from the bog
- Cabbage Juice (cabbage and water)
- Microscope
- Slides or a container that can be put under the microscope to examine the water
- Acidity of Bog Water (blackline master)
- Graph Paper
- Total Precipitation Data in Burns Bog (blackline master)

Background:

A bog is a peatland, which is a special kind of wetland. There must be at least 30 cm of peat (dead plant matter that has piled up) in order for a place to be a peatland. A raised bog has peat piled high above the ground surface and is above the local groundwater table. The bog is isolated from groundwater supplies and relies on precipitation in the form of rain, snow, hail and fog as the only method of water entering the bog. Precipitation is low in nutrients, so as a result, bogs are low in nutrients as well.

Burns Bog is a raised bog because the peat has piled up so high that the ground surface is raised. At the edge of a raised bog there is a transition zone called the lagg zone. The lagg zone is where the bog meets the mineral-rich waters. The chemistry of the lagg zone is a mixture between the low pH, low-nutrient

water of the bog and the high-nutrient water and soil outside the bog. The lagg area surrounding Burns Bog is now mostly agricultural and industrial areas, but some of the lagg zone still remains.

Procedure:

Suggested First Class

1. Use the blackline master "Sphagnum Moss" to show the class a picture of Sphagnum moss and learn about this plant. Teach the class that the Sphagnum moss is an important plant in Burns Bog. It acts as a sponge and soaks up the water. The bog receives water only from precipitation so the Sphagnum moss has adapted to store large quantities of water. Sphagnum moss can collect up to 30 times its weight in water. It absorbs the water and in the past was used in diapers and bandages during the war. It is also a natural antibiotic so it helps prevent bacteria growth in the water. Bog water is acidic.

> *Note:*
>
> Sphagnum moss cannot be collected from the Delta Nature Reserve, but a sample can be signed out for your class to examine through the Corporation of Delta. If you are interested in signing out a sample of the Sphagnum moss send an email to: **burnsbog@corp.delta.bc.ca**

2. Divide the class into small groups.

3. Give each group two sponges to keep moist for 24 hours. One sponge will represent the Sphagnum moss and the other sponge will represent the control group. The students will need to design a way to keep their sponge moist as if it is Sphagnum moss living in a bog. Use the blackline master "Sponge Lab" to complete this lab.

4. Discuss the forms of precipitation that the bog receives: rain, snow, hail and fog. What is the most common form of precipitation that Burns Bog receives? Inform the students that they will be making rain gauges to record the amount of precipitation that Burns Bog receives over a period of time. The students will work in small groups again to construct at least five rain gauges. Four will be placed in different areas of the Delta Nature Reserve and one at the school to compare the different amounts of precipitation in Burns Bog and at the school. Use the blackline master "Rain Gauge Instructions" to build the rain gauge and "Rainfall Data Sheet" to record your data.

   Note: Please ensure you label the rain gauge with a note stating that it is for a school project and will be removed when the experiment is done. There is a sample note provided where you can fill in your school's name. Use the blackline master "Do Not Remove Note" to label the rain gauges.

Suggested Second Class

5. Visit the Delta Nature Reserve with your class and head to the Bog Woodland area first for this lesson plan. You will be seeing if you can find Sphagnum moss in this area. Later in the lesson you will be travelling to all areas of the Delta Nature Reserve to distribute the rain gauges. As you travel to the different areas you will want to collect a water sample in either (or both) the Hardhack Meadow or the Skunk Cabbage Meadow areas. See the Trail Map of the Delta Nature Reserve if required.

6. Have the students see if they can locate Sphagnum moss in its natural ecosystem. The students should sketch the Sphagnum moss in its natural setting in their Science journal.

7. Take a walk with your class throughout all the areas of the Delta Nature Reserve and have each group select a place for the rain gauge in the four different areas. Each group will be responsible for monitoring their rain gauge and recording the results during future visits to the Delta Nature Reserve. Each group will need to share the results with the class after tracking the precipitation levels during the time period.

   Rain Gauges should be placed in different areas of the Delta Nature Reserve. See the Trail Map of the Delta Nature Reserve. The groups can select the spot. If you have more than four rain gauges to place in the Delta Nature Reserve, allow the other groups to select a good location.
   - Bog Woodland
   - Skunk Cabbage Meadow
   - Hardhack Meadow
   - Open Forest
   - Other locations -optional

8. Each group should collect water samples from the Delta Nature Reserve. The best place to collect water samples is in the Hardhack Meadow and the Skunk Cabbage Meadow areas. Students should stay on the boardwalks when they are collecting the water samples. Note: This could be challenging since the bog does act like a sponge and absorbs most rainwater. In the winter, there is often standing water which can be reached from the boardwalk.

9. Return to the classroom.

Suggested Third Class

10. What do you notice about the water sample you collected? Discuss the difference between groundwater and rainwater. It is most likely that the students will be collecting rainwater or muddy groundwater. This allows for great discussion as you carry on with this lesson. Use a microscope and slide to examine the water sample collected at the Delta Nature Reserve. Have the students sketch a picture of the image under the microscope and record the observations in their Science journal.

11. Discuss with the class that the bog has wet, acidic conditions. Explain what acids are and how acids are measured using the pH scale. Bog water is not highly acidic and will not cause harm to the students.

    Acids are compounds that form solutions that can be sour-tasting, react with metals and cause serious burns on the skin.
    pH is a scale that measures the acidity of a substance using a number scale from 0 (most acidic) to 14 (least acidic).

12. Use the background information to teach the students about the lagg zone of Burns Bog and how it relates to pH levels. Ensure the students understand the lagg zone is the edge or the perimeter of a raised bog. The Delta Nature Reserve is part of the perimeter of Burns Bog.

13. Examine the acidity of four different solutions:
    - tap water – neutral
    - bog water – acidic
    - salt water (water and table salt) – basic
    - lemon water (water and lemon juice) – acidic

    Use cabbage juice as an indicator. When cabbage juice reacts with an acid, it turns the solution red in colour. When cabbage juice reacts with a base, it turns the solution blue/green in colour. Use the blackline master "Acidity of Bog Water" to compare the acidity of the solutions. Does the indicator work for the bog water? Discuss why or why not. Was the sample groundwater or rainwater? Was it muddy? The bog water can be quite muddy, so the indicator may have little effect on your sample. Complete the activity, as science does not always work the way we think it will work.

    How do you make Cabbage Juice?

    Materials: purple cabbage, water, stove and a pot.

    Directions: On medium heat, place purple cabbage in a pot ½ full of water. Allow the water and cabbage mixture to come to a boil. Remove the cabbage leaves and pour the purple solution into a container. Keep the cabbage juice in the fridge to last longer.

    Note: When you are completing your Chemistry unit, cabbage juice can be used as an indicator to test acids and bases in a hands-on science lab.

14. Review the three important components of water in the bog: (1) Sphagnum moss absorbs water, (2) precipitation is the only water that the bog receives and provides nutrients, and (3) bog water has acidic properties.

Extension:

Does your school have a rain garden? If not, locate a school in Delta that has a rain garden and compare and contrast the rainfall levels in other locations in Delta. Remember, you also had a rain gauge at your school to compare rainfall levels between the Delta Nature Reserve and your school. You could also examine rainfall levels at a local park instead of a rain garden. Do precipitation levels in the Delta Nature Reserve differ from precipitation levels at your school and in Rain Gardens? Discuss and graph the results.

Rain Gardens can currently be found at:

- Cougar Canyon Elementary
- Chalmers Elementary
- Annieville Elementary
- Heath Elementary
- Richardson Elementary
- Gibson Elementary

Or, examine data from the weather station in Burns Bog. The students can work individually or be divided into small groups to graph total precipitation for the month of January from 2007 to 2011. Compare and contrast trends in precipitation. Compare them to data from your rain gauge and the month you set up your rain gauge.

Technology Component:

Start a student blog on Burns Bog! Have the students work individually or in small groups to record interesting observations from their time spent in the Delta Nature Reserve, post pictures and track the precipitation amounts in the different areas of the bog where the rain gauges were placed!

Sphagnum Moss

There are 53 different species of moss in Burns Bog. The 12 Sphagnum moss species found in Burns Bog are the bog engineers. Sphagnum grows on top of a peat bog and the peat is the decaying plant matter underneath. Bogs are dependent on precipitation as their main source of nutrients. Sphagnum moss needs to be able to retain water well. It has adapted to be able to hold large quantities of water and air in its cells and can hold up to 30 times its dry weight. In wet conditions the moss will float to ensure it can complete the process of photosynthesis. The peat moss decays slowly due to low levels of oxygen and bacteria. Peat moss also favours acidic conditions. It should be noted the Sphagnum moss is a rare plant in the Delta Nature Reserve (this park is a small part of Burns Bog). It is important to be aware of Sphagnum moss while you are in the Delta Nature Reserve and ensure that you stay on the path and be very careful in areas with Sphagnum moss.

Photo Credits: Angela Danyluk

Sponge Lab

Sphagnum moss absorbs water because it acts just like a sponge. The bog only receives water through precipitation, so Sphagnum moss has adapted to store large quantities of water. Your task is to use a sponge to represent Sphagnum moss and to design a way for a sponge to absorb and retain moisture representing bog-like conditions for 24 hours.

You will receive two sponges (one sponge will represent the control and the other will be the Sphagnum moss with adaptations to store water) and a plate for your sponges to live on for 24 hours.

Discuss with your group a plan to keep the "Sphagnum sponge" wet during the 24 hour period. You will design and implement your adaptations for the "Sphagnum sponge" to store water with the materials that your teacher has available for you to use. Below, sketch the sponge before and after. List and label the materials that your group used to create the adaptations.

Weigh and record the mass of the dry sponges: _____

Give the two sponges enough water so they are saturated but not leaking water. Use a measuring cup so you can ensure you give both sponges the same amount of water. Each sponge received _____ of water.

Weigh and record the mass of the wet sponges: _____

Make predictions about what will happen:_____

Create a plan and select materials to use that will keep one sponge wet over the 24 hour period while the other sponge must endure the air-drying conditions.

Materials Used:_____

Before (the control)	After (the adaptations)

Wait for 24 hours. Note any interesting observations in your Science journal.

Weigh and record the mass of the two sponges after the 24 hour period.

Control: _____ "Sphagnum moss": _____

Make inferences about the results. Discuss the various results of the different groups.

Rain Gauge Instructions

What is a rain gauge?

A rain gauge is an instrument used to gather and measure the amount of liquid precipitation. Precipitation is usually measured in millimetres (mm), but can also be measured in centimetres (cm).

Rain gauges should be placed in an open area where nothing will block the rainfall, such as trees or buildings, from entering the rain gauge. Many rain gauges are checked by a person and the data is recorded manually.

How do you make a rain gauge?

You can use a graduated cylinder and upside-down funnel as your rain gauge, or make your own rain gauge using simple materials. Environment Canada has instructions listed on their website (http://www.on.ec.gc.ca/skywatchers/exGamesAct/equipment_rain_e.html) on how to make a simple rain gauge. These instructions are listed below.

Materials Needed: plastic 2 L pop bottle, ruler at least 15 cm in length, scissors, stones or gravel, tape, water and coffee filter (optional)

Rain Gauge Instructions:

1. Cut the pop bottle about 10 cm from the top. Save the top part.
2. Fill the bottom of the bottle with stones or gravel until the little bumps are filled and the gravel or stones reach the smooth sides of the pop bottle. This will make the rain gauge more stable.
3. Tape the ruler to the pop bottle so that the zero mark is above the stones or gravel.
4. Poor water into the pop bottle until the water is level with the zero mark on the ruler.
5. Take the top part of the pop bottle that you saved. Turn it upside down and put it into your pop bottle like a funnel.
6. Place the rain gauges in the four different areas of the Delta Nature Reserve and place one somewhere at your school.
7. When it has rained, take a reading using the ruler. Poor out extra water and ensure your water level line is at the zero mark on the ruler.

Points to remember: If the rain gauge is out in the sun, check the rain gauge to ensure that the water level is at the zero mark on the ruler. Water will evaporate if the rain gauge is out in the sun for long periods.

Optional coffee filter: You can place the coffee filter in the funnel at the top of your rain gauge. The rainfall will filter through the coffee filter and students can then collect particles that fall into the rain gauge. Students can look at the particles collected under a microscope.

Rainfall Collection Data Sheet

Location of Rain Gauge: _____

Month of _____

Date	Rainfall Collected (including units)	General observations: (particles collected in the rain gauge and observations of the bog)

DO NOT REMOVE

Our class at

_____

has built this rain gauge and we are currently monitoring and measuring the precipitation levels in the Delta Nature Reserve.

Please do not touch our experiment!

Thank You

Acidity of Bog Water

What is an acid?

Acidic solutions contain the following properties:

- _____
- _____
- _____

Complete the chart below:

Solutions Tested	Observations	Observations After Cabbage Juice has been Added	Sketch the colour	Identify Acidity of the solution (acid/neutral/ base)
Tap Water				
Bog Water				
Salt Water				
Lemon Water				

Use the colours of the solutions from the results of your experiment to rank the solutions from most acidic to most basic.

Total Precipitation Data in Burns Bog

Weather Station in Burns Bog - *Photo Credits: The Corporation of Delta*

Total Precipitation Data for the Month of January from 2007 to 2011 (Measured in mm)

Date (day/month)	2007	2008	2009	2010	2011
1/1	23.15	0.00	12.60	15.20	0.10
2/1	22.15	2.40	0.00	7.00	0.16
3/1	10.22	1.40	2.60	0.20	0.20
4/1	9.43	4.20	4.44	17.40	0.60
5/1	5.99	0.22	24.20	0.80	30.60
6/1	1.77	0.66	27.60	0.10	22.80
7/1	16.23	3.60	18.40	0.40	9.80
8/1	2.19	7.80	5.20	16.40	0.00
9/1	2.61	4.40	2.60	0.80	0.00
10/1	5.91	17.20	42.53	4.20	0.00
11/1	0.02	0.00	2.60	27.80	0.00
12/1	0.07	0.00	0.87	2.80	20.20
13/1	0.12	0.00	0.02	6.20	8.60
14/1	0.18	0.00	0.06	26.00	9.00
15/1	0.23	0.00	0.10	13.60	10.20
16/1	0.28	0.00	0.14	0.00	10.20
17/1	0.33	0.00	0.18	9.20	0.15
18/1	0.39	0.09	0.08	0.60	4.40
19/1	6.11	0.09	0.08	0.02	0.20
20/1	0.19	0.02	0.16	0.06	17.40
21/1	3.54	0.04	0.06	0.10	23.40
22/1	29.98	0.07	0.00	0.14	0.17
23/1	12.62	0.10	0.00	0.18	2.20
24/1	0.02	0.13	0.00	3.00	33.20
25/1	0.1	0.16	0.00	1.80	1.20
26/1	0.17	0.19	0.00	0.01	0.29
27/1	0.32	0.29	4.80	0.08	0.00
28/1	0.17	0.00	0.09	0.15	6.40
29/1	0.07	0.80	0.32	1.80	6.40
30/1	0.18	4.60	0.00	6.40	0.00
31/1	0.03	1.60	0.00	1.60	0.00

Activity 8: Insect Mania

Purpose: Students will learn about the insects that live in Burns Bog and how insects are important to this ecosystem.

Subject: Science and Art

Suggested Time: Three classes (includes a visit to the Delta Nature Reserve)

Materials:

- Whiteboard/Chalkboard
- Science journal and pencil
- Old magazines that can be cut up (with pictures of insects)
- Insects (blackline master)
- Clear plastic containers with lids (Deli containers work well)
- Wide straws (or plastic tubing)
- Elastics
- Gauze
- Clay
- Rice
- Insect Lab (blackline master)
- School digital camera (student digital cameras or cell phones with cameras - optional)
- Building materials (recycled materials and things you have available at school)

Background:

Burns Bog is home to many different species of insects. It is a great place for insects to make their habitat. The scientists who conducted a study in 1999 found over 400 species of insects living in Burns Bog. This finding allowed the scientists to estimate that there are actually about 4000 different species of insects in Burns Bog. The most common insects in Burns Bog include: flies, bees, wasps, ants and spiders. Also, there are some rare bugs that are not often found outside of Burns Bog which include: rare butterflies, damselflies, dragonflies and unique insects that like to live in bog water. The insects that live in this type of ecosystem have adapted to the conditions. For example, the water boatman insect has legs that look like boat oars which it uses to glide through the surface of the water.

Insects are invertebrates, meaning that they do not have backbones. Insects make up a large part of the 95-97% of animals that are invertebrates. Insects are part of the phylum Arthropoda in which the body is divided into three parts: head, thorax and abdomen. The head is where the antennae (which is used for touch and smell), eyes and mouthparts are located. The thorax is divided into segments, has three pairs of legs and often one or two pairs of wings. The abdomen is the last segment located at the back end of the insect and contains the heart, reproductive and digestive organs.

Insects play an important role in the ecosystem. First, they are *food* for many animals and plants. Second, they are Earth's natural *decomposers* as they help break down plant and animal matter, as well as other things like wood and bacteria, while providing nutrients back to the to the soil. Third, they are

pollinators; 80% of flowering plants depend on insects to spread seeds and aid in the process of pollination.

Procedure:

Suggested First Class

1. Pass out magazines to the class. Have the students find a picture of an insect, cut it out, and glue it into their Science journal.

2. Brainstorm with the class about what an insect is, its role in nature, and where insects can be found in Burns Bog. Use the background information to guide this discussion.

3. Discuss how insects use adaptations to survive in the ecosystem of Burns Bog. See if the students can identify different adaptations from the pictures of insects that are in their Science journals. Tell the students about the water boatman insect that has legs that look like boat oars which it uses to glide through the surface of the water. Use the blackline master "Insects in Burns Bog" to see if the students can identify any adaptations from the pictures. Discuss the adaptations of four insects that live in Burns Bog.

    - Moth – can fly and hover, is camouflaged in its larval stage and sometimes into adulthood and has a mouth designed for nectar intake.
    - Damselfly – can fly, has great vision and long legs, will hide in trees or plants, lays eggs on overhanging plants near water surface or underwater and has claws in the larval stage.
    - Dragonfly – can fly, has large eyes, lays eggs in water that attach to the bottom with a sticky goo and its wings regulate body temperature.
    - Spiders – have good vision, can climb with claws on legs, and usually climb high into the web to look down on the food. Funnel spiders make a web like a funnel and insects will fall into the bottom of the web where the spider is waiting for food.

4. Pass out the "pooter" materials to each student and have each student make a "pooter". The directions of how to make a pooter can be found on the next page.

5. Once the students have the "pooter" constructed, have them practice using it by picking up rice.

How do you make a Pooter?

Materials: Each student will need: a plastic clear container with lid (deli containers work well), 1 thick straw or plastic tubing, 1 elastic band, a small piece of gauze, and a small piece of clay.

Directions: Cut two holes in the lid of the plastic container for the straw or plastic tubing. Cut a straw or tubing into two pieces. The straw or tubing pieces should be the following lengths – one 1/3 in length and the other is 2/3 in length. Wrap gauze around the shorter straw/tubing and fasten it with the elastic. Insert the straws/tubing into the lid and put the lid on the container. The short straw/tubing with the gauze should be inside the container. Seal the area around the straws/tubing with clay. Your "pooter" is ready to use! You will put the longer straw/tubing over top of the insect and you will suck on the short straw with the gauze. This will transfer the insect into the "pooter" container for you to study. The gauze prevents you from then sucking up the insect once it is inside the "pooter" container.

Suggested Second Class

6. Visit the Delta Nature Reserve with your class and head to the Open Forest area for this lesson plan. See the Trail Map of the Delta Nature Reserve if required.

7. Send the students off into the Open Forest area to search for bugs. Have the students collect the insects using their pooters. Use the blackline master "Insect Lab" to guide the students through this observation activity. The students can also take pictures of the insects that they find. Once they are done studying their insects, the insects should be safely released back in the Delta Nature Reserve.

8. In their Science journal, have each student draw a bog habitat – water or land habitat. It could be any part of the Delta Nature Reserve that you have visited.

9. Return to the classroom.

Suggested Third Class

10. Next, have the students build a model of a new species of insect that they have just discovered in the bog. It lives in the habitat that they just drew. The students should use recycled materials to build a 3-D model of the insect. The students will need to complete a short write up on the insect explaining the unique adaptations it has to survive in the bog ecosystem. Also, have the students give their insect a common and scientific name.

11. Review why insects are important to the bog ecosystem and present the habitats and insects to the class. If possible, display these habitats and insects.

Extension:

Using the collection of pictures that students took of the insects they collected during their visit to the Delta Nature Reserve, have the students make an insect ID book. Use the internet and resource books to identify the insects.

Technology Component:

The taxonomy of insects can be tricky. The Kingdom (Animal), Phylum (Arthropoda) and Class (Hexapoda = insects) are the same for all insects, but the Order is where the taxonomy differs depending on the kind of insect. For example, butterflies and moths belong to the Order: Lepidoptera

Use this link to use a key to determine the order of the insect.

http://www.sci.sdsu.edu/classes/bio462/easykey.html

Insects in Burns Bog

Burns Bog is home to many different species of insects. It is estimated that over 4000 different species are living in Burns Bog. The most common insects in Burns Bog include: flies, bees, wasps, ants and spiders. Also, there are some rare bugs that are not often found outside of Burns Bog which include: rare butterflies, damselflies, dragonflies and unique insects that like to live in bog water. The insects that live in this type of ecosystem have adapted to the conditions.

Insects are invertebrates, meaning that they do not have backbones. Insects make up a large part of the 95-97% of animals that are invertebrates. Insects are part of the phylum Arthropoda in which the body is divided into three parts: head, thorax and abdomen. Insects play important roles in the ecosystem: part of the food chain, decomposers, and pollinators.

Butterfly

Damselfly on a sundew plant

Dragonfly on a blueberry bush

Web of a funnel spider

Photo Credits: Marcel LaBreche

Insect Lab

Sketch of Insect	Notes and Observations about the Insect
Describe and Sketch the Habitat where the Insect Lives	**Describe and Sketch the Adaptations of the Insect**

Activity 9: Where in the World is That?

Purpose: Students will use observation markers and record the latitude and longitude coordinates in the Delta Nature Reserve to complete a scavenger hunt.

Subject: Science and Social Studies

Suggested Time: Three classes (includes a visit to the Delta Nature Reserve)

Materials:

- Whiteboard/Chalkboard
- Science journal and pencil
- A globe
- GPS receivers or smart phones with a GPS application – one per group
- Mapping the Delta Nature Reserve (blackline master)
- Seasonal Changes (blackline master)

Background:

Using Global Positioning Systems (GPS), students can find the exact location of a spot on Earth with latitude and longitude coordinates. Satellites transmit signals to equipment on the ground. The latitude and longitude coordinates are received and the exact location is identified. The data is not transmitted to but received from satellites. When using receivers it is important that you have an unobstructed view of the sky. In heavily forested areas, receivers can have problems picking up the satellites and giving the coordinates. It is also important to wait for an exact reading of the coordinates.

Definitions:

Latitude – lines that move in east-west circles around the globe. Latitude is stated first.

Longitude – lines that move in north-south circles around the globe.

Procedure:

Suggested First Class

1. Discuss GPS with the students.
    - Why do we use GPS?
    - What is latitude and longitude? Use a globe so the students can see the difference.
    - What technology is used to find GPS coordinates?
    - What problems can you encounter when locating GPS coordinates?

2. Demonstrate how to use GPS receivers to find the latitude and longitude coordinates.

3. Divide the class into small groups. The group size will depend upon the number of GPS receivers you have access to.

4. Head outside to the playground or the field. Pass out the GPS receivers and have the students practice locating the latitude and longitude for a given spot. The students should record this information in their Science journal. Did everyone record the same latitude and longitude coordinates?

5. Have each group select a mystery location outside in the schoolyard. The group will need to write down the latitude and longitude coordinates and any interesting observations. The observations will be used to describe the mystery location as clues.

6. Next, the students will locate each group's mystery location through the clues. Each group will read aloud the clues and the other groups will need to locate the spot. When the correct mystery location has been identified, the groups will locate and record the latitude and longitude coordinates in their Science journal.

7. As each group presents its mystery location, discuss the latitude and longitude coordinates as well as the observations.

Suggested Second Class

8. Visit the Delta Nature Reserve with your class. This activity will start at the Delta Nature Reserve sign, which is on the gravel road as you travel into the Delta Nature Reserve from Planet Ice (it is the red trail on your map). The students will need to work in small groups. Each group must have a GPS receiver and the blackline master "Mapping the Delta Nature Reserve" to complete this activity.

9. Follow the gravel road and use the blackline master mentioned above as this will guide your students through a trail of scientific discovery using observations and GPS coordinates. You may want to stagger when the groups start, or the whole class will be working together.

10. Return to the classroom.

Suggested Third Class

11. Discuss the observations and the GPS coordinates at the different markers on the trail. Discuss any discrepancies of the GPS coordinates and why that may have happened. Did students wait for the reading? Were there trees in the area? Was the sky visible?

12. Using the data and the observations that the students recorded while in the Delta Nature Reserve, have the students illustrate a map of the trail. The map should locate the key points of interest where you took the GPS coordinates and observations. The latitude and longitude coordinates do

not need to be recorded on the map – it is the observations that should be recorded on the map. The students should use a legend to identify the key points of interest.

Extension:

Select a specific latitude and longitude coordinate and track seasonal changes at that location. Note your observations of the changes during the different seasons as you visit the Delta Nature Reserve throughout the year with your class. Use the blackline master "Seasonal Changes" to note observations.

Technology Component:

Using Google Earth, find specific latitude and longitude coordinates within the Delta Nature Reserve.

Mapping the Delta Nature Reserve

Note: Observations should be in sentence format and should include sketches

Start at the Delta Nature Reserve sign near Planet Ice. Walk south along the gravel road.

Stop when you locate a sign that indicates when the Delta Nature Reserve first opened. What year did it open? _____

Record the latitude: _____ longitude: _____

Do not enter the trail at this stop. Continue south along the gravel road and take the next path into the Delta Nature Reserve. Before you start on the trail, record the GPS coordinates.

latitude: _____ longitude: _____

Describe the entrance to the trail.

Continue west along the path until you find three benches. Sit down on one of the benches and describe what you observe.

Sit on the bench that is closest to the boardwalk and record the GPS coordinates.

latitude: _____ longitude: _____

Continue west along the trail. You will see an S-curve in the trail. Before you take the S-curve, stop between the two trees. You will be going under branches. Before you enter, record the GPS coordinates.

latitude: _____ longitude: _____

Describe what you observe at this location.

Continue along the path. You will discover a sign. What is the sign about? _____

Record the GPS coordinates before the sign.

latitude: _____ longitude: _____

Describe what you observe at this location.

Before you continue along the path, can you spot these two tree trunks? Your teacher will tell you about these two tree trunks. Find the sign nearby and write down two facts about fungus.

Image One	**Image Two**
	

Write down what each of these images are:	**Image One:**	**Image Two:**
Find the sign that has information about fungus. Write down two facts on fungus.	**Fact One:**	**Fact Two:**

Continue along the path. On your right hand side of the trail, there is something man-made that is hidden in the bushes. What is it? _____

Record the GPS coordinates.

latitude: _____ longitude: _____

Describe what you observe at this location.

Continue along the path. You will see a turn to the right, but continue going straight on the trail. Stop when you find the tree stump and fallen trees that went across the boardwalk. At the tree stump record the GPS coordinates.

latitude: _____ longitude: _____

Describe what you observe at this location.

Note any other important observations about your walk on this boardwalk.

Answer Key: Mapping the Delta Nature Reserve

Start at the Delta Nature Reserve sign near Planet Ice. Walk south along the gravel road.

Stop when you locate a sign that indicates when the Delta Nature Reserve first opened. What year did it open? 1971 (this is at the sign titled "Wally's Walk")

Record the latitude: 49.14755 N longitude: 122.93270 W

Note: The latitude and longitude coordinates have been rounded off

Do not enter the trail at this stop. Continue south along the gravel road and take the next path into the Delta Nature Reserve. Before you start on the trail, record the GPS coordinates.

latitude: 49.14585 N longitude: 122.92987 W

Describe the entrance to the trail.

This will vary depending on the season, but the students should use their senses to record observations of what they see and a draw a sketch.

Continue west along the path until you find three benches. Sit down on one of the benches and describe what you observe.

Students should observe the sunken tractor in the bog using sentences and a picture.

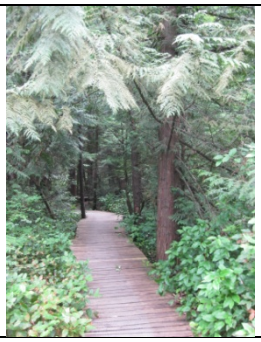
Sit on the bench that is closest to the boardwalk and record the GPS coordinates.

latitude: 49.14491 N longitude: 122.93099 W

Continue west along the trail. You will see an S-curve in the trail. Before you walk through the S-curve, stop between the two trees. You will be going under a tunnel of branches. Before you enter, record the GPS coordinates.

latitude: 49.14433 N longitude: 122.93026 W

Describe what you observe at this location.

	This will vary depending on the season, but the students should use their senses to record observations of what they see. At this point in the trail, you will be coming from an open meadow area and moving into a forest area. Discuss the differences between these two areas. What happens to the sunlight as you enter the forest?

Continue along the path. You will discover a sign. What is the sign about? skunk cabbage

Record the GPS coordinates before the sign.

latitude: 49.14402 N longitude: 122.92937 W

Describe what you observe at this location.

This will vary depending on the season, but the students should use their senses to record observations of what they see. There are many different plants, but there is lots of skunk cabbage in this area. If you are visiting the bog in the spring or summer you should be able to smell the skunk cabbage.

Before you continue along the path, can you spot these two tree trunks? Your teacher will tell you about these two tree trunks. Find the sign nearby and write down two facts about fungus.

Image One	Image Two
	

Write down what each of these images are:	Image One:	Image Two:
	Lichen grows on sides of trees. One interesting fact about Lichen is that it grows in areas where there is fresh air that is not full of pollutants. Lichen is a fungus and algae which grows together in a symbiotic relationship. Asymbiotic relationship is the mutual beneficial relationship between two or more different species. The fungus and algae both need each other to survive.	Conch is a fungus that grows on trees. It also absorbs its nutrients from the tree. Fungus does not need sun to grow. In fact, fungus prefers moist and shady habitats. Discuss with your students where the fungus is growing on the tree. Usually, fungus finds an area where there is the least amount of sunlight.
Find the sign that has information about fungus. Write down two facts on fungus.	**Fact One:**	**Fact Two:**
	• Decomposers • Break down dead plant and animal material into small parts that are used by plants	• Parasitic relationship with trees • Small roots on fungus absorbs nutrients out of the tree • Over 550 species of fungus in Western Canada

Continue along the path. On your right hand side of the trail, there is something man-made that is hidden in the bushes. What is it? There is a bench in the bushes.

Record the GPS coordinates.

latitude: 49.14374 N longitude: 122.92908 W

Describe what you observe at this location.

This will vary depending on the season, but the students should use their senses to record observations of what they see. Note the different plants that are in this area.

Continue along the path. You will see a turn to the right, but continue going straight on the trail. Stop when you find the tree stump and fallen trees that went across the boardwalk. At the tree stump record the GPS coordinates.

latitude: 49.14370 N longitude: 122.92729 W

Describe what you observe at this location.

This will vary depending on the season, but the students should use their senses to record observations of what they see. Below there are pictures of this area. Get the students to brainstorm what may have happened to the tree stump and the trees.

Note any other important observations about your walk on this boardwalk.

This will vary depending on the season, but the students should use their senses to record observations of what they see. What sounds do they hear? What colours do they see? Is there evidence of people?

Photo Credits: Jennifer Stonehouse

Seasonal Changes

Latitude: _____ Longitude: _____

Date: _____ Season: _____

Description of observation spot:

Do you see evidence of the season? Explain.

Latitude: _____ Longitude: _____

Date: _____ Season: _____

Description of observation spot:

Do you see evidence of the season? Explain.

Latitude: _____ Longitude: _____

Date: _____ Season: _____

Description of observation spot:

Do you see evidence of the season? Explain.

Latitude: _____ Longitude: _____

Date: _____ Season: _____

Description of observation spot:

Do you see evidence of the season? Explain.

Activity 10: Climate Change

Purpose: Students will learn about climate change and the role Burns Bog plays in the carbon cycle.
Subject: Science and Drama
Suggested Time: Four classes (includes a visit to the Delta Nature Reserve)

Materials:

- Whiteboard/Chalkboard
- Science journal and pencil
- Items or pictures of items to connect human activity to Burns Bog (examples: trash, car, binoculars, airplanes, scientists, fire fighters, bridge, boardwalk, etc.). Note: if you do not want to gather the items and/or pictures, then you could list the words on the board.
- Sound Map before Entering Burns Bog (blackline master)
- Sound Map after Entering Burns Bog (blackline master)
- Carbon Role Play (blackline master)
- Blank paper for comic strip
- Pencil crayons/felts

Background:

The temperature of the Earth has been warming over the past one hundred years, and scientists now believe that this change is caused by the burning of fossil fuels and large-scale landscape changes, like deforestation, that are occurring around the world. Scientists have now determined that things people are doing, like driving a lot, could be making the Earth warmer. Greenhouse gases, such as carbon dioxide (CO_2), are playing a part in global warming, which is, in turn, causing the climate to change. Scientists are still learning about greenhouse gases, global warming and climate change. Carbon dioxide is emitted into the atmosphere in a number of ways, through natural causes in the carbon cycle and through human actions such as driving a car. We need carbon dioxide in our atmosphere because it helps keep our planet warm; without it we would be living in cold conditions. However, there is now more carbon dioxide that is being emitted into the atmosphere than can be soaked up and stored through carbon sinks such as bogs. Bogs play an important role in helping to stabilize the climate globally. There are many ways that humans can reduce the amount of carbon dioxide that is being released into the atmosphere and it is important for people to think about their actions and how they can make a difference.

Definitions:

- **Climate Change** – The observable change of normal weather patterns within a region over the course of twenty to fifty years. For example, in northern communities within Canada, the winters have been warmer in the last decade compared to the 1950's. As a result, there is less winter sea ice for polar bears and hunters to travel across the landscape.

- **Greenhouse Effect** – The warming that results when solar energy becomes trapped by the atmospheric blanket of water vapour, carbon dioxide, nitrous oxide, methane and ozone. These gases are called greenhouse gases. Without this blanket, the earth would be as cold as a freezer.
- **Global Warming** – This term refers to the observed and projected increase in the earth's average temperature due to natural or human-induced climate change. The atmospheric blanket of greenhouse gases is getting too thick and is starting to cause climate change. A warmer Earth may lead to changes in rainfall patterns and melting ice, which causes sea level rise and other impacts to plants, animals and humans.

Procedure:

Suggested First Class

1. Show the students a variety of items and/or pictures (or the list of words on the board) of the following: trash, car, binoculars, airplanes, scientists, fire fighters, bridge, boardwalk, etc. Discuss how humans are connected to Burns Bog and how their impact can be both positive and negative.

2. Have the students make a T-chart in their Science journal. Use the T-chart to have the students divide the items as either positive or negative human impacts. For example, driving a car increases the carbon dioxide that goes into our atmosphere which is a negative impact, but fire fighters are helping to protect Burns Bog from fires and developing fire plans, which is a positive impact. Discuss with the class how the students grouped these items. Can any of them be listed as both a positive and a negative impact?

3. Have the students select one example of human impact and use the 5 W questions below to focus on the connections to Burns Bog. There is an example listed below and the prompts can be used to guide your students through this activity. Students should complete this activity in their Science journal.

   Example: *Cars*
   What is the human impact? *Driving a car*
   Where is the human impact taking place? *Driving on the highway that goes through Burns Bog*
   When is the event taking place? *24 hours a day/7 days a week*
   Why are they using a car? *To get around*
   What is the connection to Burns Bog? Is it good or bad for the environment? *Cars cause pollution and emit carbon dioxide into our atmosphere which is bad for our environment.*

4. Discuss and share the different examples that the students used for human impact using the 5 W questions.

5. Write the word "climate change" on the board. Ask the students if they have heard this phrase before. Do they know what climate change means? Have the students brainstorm in their Science

journal what climate change means to them. Discuss the meaning of climate change using the background information.

6. Ask the students to draw a sketch of a footprint (they could trace their own footprint) in their Science journal and have them write the word “carbon dioxide” inside their footprint. How is carbon dioxide connected to climate change? Brainstorm ideas as a class. Use the background information to teach the students how carbon dioxide is connected to climate change. Have the students write down inside their footprint what produces carbon dioxide.

7. Discuss and teach the class that Burns Bog accumulates and stores carbon dioxide in the plants and soil and is considered a carbon sink. Review with the class that plants take in the carbon dioxide and release oxygen into the atmosphere.

Suggested Second Class

8. Visit the Delta Nature Reserve with your class. This activity will start at the Delta Nature Reserve sign, which is on the gravel road as you travel into the Delta Nature Reserve from Planet Ice (it is the red trail on your map).

9. Before entering the Delta Nature Reserve, have the students complete a sound map on their own using the blackline master “Sound Map before Entering the Delta Nature Reserve”. Once they have completed the sound map, have the students pair up and share the sounds they heard.

10. Head into the Delta Nature Reserve. You can use any trail you wish or would like to visit for this activity. Complete a second sound map using the blackline master “Sound Map after Entering the Delta Nature Reserve”. Once they have completed the sound map, have the students pair up and compare the sounds in the Delta Nature Reserve to the sounds before entering the Delta Nature Reserve. Were the sounds the same? Were there new sounds?

11. In pairs, have the students group the sounds in any way they like in their Science journal. Then have the students group the sounds into natural sound and not natural sounds. What was a positive sound? Why? What was a negative sound? Why? What was their favourite sound?

12. Return to the classroom.

Suggested Third Class

13. As a class, review the sound mapping activities and the sounds that were heard in Burns Bog. Are there any sounds that impact the environment and contribute to climate change?

14. Brainstorm how students release carbon dioxide into the environment. Relate the sounds back to climate change and the students’ own carbon footprints.

15. Discuss ways that students can reduce their own carbon footprints and help decrease the amount of carbon dioxide that is going into our atmosphere.

16. In small groups, have the students create a role play of the carbon cycle and how the bog acts like a carbon sink to accumulate and store carbon. Use the blackline master "Carbon Role Play" so the students can see the different parts that are involved. Have the students create a role play to teach others about the carbon cycle and carbon sinks such as the bog. If possible, have each group select a different human activity that produces carbon dioxide to include in their role play.

17. Present the role plays to the class.

Suggested Forth Class

18. Have each student make a comic strip that teaches people how Burns Bog naturally helps to store carbon dioxide and how humans can both positively and negative impact Burns Bog.

Extension:

In small groups, have the students make a board game on climate change. The board game must include elements of climate change and ways to help protect Burns Bog. It should incorporate positive and negative human impacts on Burns Bog.

Technology Component:

Create a map on the computer. Use an image of Burns Bog and impose images of human impact in areas of Burns Bog.

Sound Map before Entering the Delta Nature Reserve

There are many sounds around us. Find a spot on your own and use only your sense of hearing to complete a sound map. You will be drawing the sounds you hear in the area to complete your sound map. Make an "X" on the page to represent yourself in the sound map. Each time you hear a sound draw the sound you hear using a symbol in relation to where you are. Ensure that you have a legend for your symbols. You will spend five minutes listening and drawing the sound map.

Sound Map after Entering the Delta Nature Reserve

There are many sounds around us. Find a spot on your own and use only your sense of hearing to complete a sound map. You will be drawing the sounds you hear in the area to complete your sound map. Make an "X" on the page to represent yourself in the sound map. Each time you hear a sound draw the sound you hear using a symbol in relation to where you are. Ensure that you have a legend for your symbols. You will spend five minutes listening and drawing the sound map.

Carbon Role Play

All living things contain carbon. Carbon is naturally found in our environment. Human activities also produce carbon and add to the existing carbon in our atmosphere. Carbon is found in many parts of our environment and continuously cycles through the environment:

- Carbon dioxide is found in the atmosphere
- Plants use carbon dioxide in the process of photosynthesis
- People and animals produce carbon dioxide by breathing
- Decomposers produce carbon dioxide and return it to the non-living parts of the ecosystem
- Carbon is found in the chemicals that make up rocks
- Carbon is found underground in fossil fuels such as coal, oil and natural gas
- Human activities produce carbon dioxide and add to the naturally produced carbon dioxide in the atmosphere
- The bog stores carbon dioxide

Part	Role
Atmosphere	CO_2 is found here
Plants	Take in CO_2 and use it in the process of photosynthesis
People and Animals	Produce CO_2
Decomposers	Produce CO_2 and return it to the non-living parts of the ecosystem
Rocks	Carbon is found in chemicals that make up rocks
Fossil Fuels (Coal, oil and gas)	Carbon is found underground in fossil fuels
Human Activities (burning fossil fuels)	Produce and add CO_2 into the atmosphere
Burns Bog	Stores CO_2

Activity 11: Traditional Plant Uses

Purpose: Students will learn about plants in Burns Bog and how First Nations people used these plants.

Subject: Science and Language Arts

Suggested Time: Three classes (includes a visit to the Delta Nature Reserve)

Materials:

- Whiteboard/Chalkboard
- Science journal and pencil
- Access to the computer lab
- Plants in Burns Bog (blackline master)
- School digital camera (student digital cameras or cell phone cameras – optional)
- Plant resource books (optional)
- Poster paper
- Pencil crayons/felts

Background:

Burns Bog was used by First Nations people (Tsawwassen, Semiahmoo, Sto:lo, Katzie and Musqueam) for thousands of years. The bog was an important food source for First Nations people, from the berries found in the bog to hunting the animals that lived in the bog. Many plants in the bog were used as medicines and had healing powers. This was one reason that First Nations people found the bog to be an important place.

Berries that First Nations people ate included:

- blackberries
- blueberries
- cranberries
- salal berries
- salmonberries

The animals that First Nations people hunted included:

- black bears
- black-tailed deer
- elk
- ducks

The plants and traditional uses included:

- Sphagnum moss – diapers and bandages due to the absorbent properties
- Labrador tea – makes a tea for colds and sore throats, and it can also be used as a mosquito repellent if it is rubbed on the skin

- Western bog laurel – a poisonous plant that was used to treat skin aliments
- Sundew plant – remove warts and corns; treat asthma and coughs; some groups believed it was a good luck charm for fishing
- Skunk cabbage – treats burns, and used in food preparation and storage (like wax paper)
- Horsetail – toothbrush
- Paper birch – paper

Procedure:

Suggested First Class

1. Discuss with the class that First Nations people used Burns Bog for food (plants and animals) and medicines. Brainstorm as a large group the kinds of things that are in Burns Bog that First Nations people would have used as food and medicines. Use the background information to lead this discussion.

2. Below you will find a table that lists plants and their traditional First Nations uses. Put the two columns on the board in a mixed-up order. Have the students match the plants with their traditional uses. Complete this activity in a large group and have the class make predictions based on knowledge that the students already have about Burns Bog.

Plants	Traditional First Nations Uses
Sphagnum Moss	Diapers and bandaids
Labrador Tea	Tea for colds and sore throats
Salal Berries	Food
Western Bog Laurel	Medicine to treat skin aliments
Sundew Plant	Removes warts and corns, and used to treat asthma and coughs
Skunk Cabbage	Treats burns, used in food preparation and storage (like wax paper)
Paper Birch	Paper
Horsetail	Toothbrush

3. Inform the students they will be going into the computer lab to continue to research these plants. Use the blackline master "Plants in Burns Bog" to guide the students' research on various plants in Burns Bog. Have the students start their search using the Burns Bog website **http://www.burnsbog.ca/pre-european_years.html**, and then have them continue with a Google search of the individual plants. The students will need to sketch the plants, list the traditional First Nations uses, and add additional information about the plant. Do not complete the last column "Observations in Burns Bog" as this will be done when you visit the Delta Nature Reserve.

Suggested Second Class

4. Visit the Delta Nature Reserve with your class and head to the Bog Woodland and Skunk Cabbage Meadow for this lesson plan. See the Trail Map of the Delta Nature Reserve if required. These areas are home to many of the plants the students were researching – Sphagnum moss, Labrador tea, salal, and skunk cabbage.

5. Use the blackline master "Plants in Burns Bog" to help you locate the plants and complete the last column of the chart. Students should note and make observations on the plant in its natural environment. Also, the students should take a picture of each of the plants listed on the blackline master. If you cannot find the plant in Burns Bog, make a note of this.

6. There are many additional plants and trees that are found in Burns Bog. Use the blackline master "Other Plants in Burns Bog" to have the students research three additional plants. The students should complete the blackline master and also take pictures of the three other plants.

7. Return to the classroom.

Suggested Third Class

8. The students will return to the computer lab and continue to research the three other species of plants that they observed while in Burns Bog. Students can also use plant resource books to complete the activity. Do not complete the last column "Is it an Invasive Species?"

9. Have the students present the other plant information they were researching. Create a list of the additional plants that the students found in Burns Bog.

10. Discuss what an invasive species is. Were any of the other plants that the students researched invasive species to Burns Bog? Identify those as invasive species on the blackline master "Other Plants in Burns Bog".

    Definition:

    - An *invasive species* is a non-native species that is living outside of its natural range. A non-native species may harm or destroy native species because it competes with native species for food and water. Sometimes, invasive species need to be removed from an area so native species can continue to grow in the area without competition.
    - Examples of invasive species in Burns Bog: blackberry (Himalayan and evergreen), scotch broom, cultivated blueberry & cranberry, European birch, and Japanese knotweed. The only invasive species for which a removal plan is being implemented is Japanese Knotweed.

11. The students will complete their own resource book or poster on First Nations uses of plants in Burns Bog.

Conservation In Action Opportunity

Do you want your class to help the environment by taking action?

The Climate Action & Environment office will help you organize an invasive species pull with your class. The students will have the opportunity to get into the Delta Nature Reserve or Watershed Park and help remove invasive species. For more information about this hands-on opportunity contact: **cae@corp.delta.bc.ca**

Extension:

Select one of the "other plants" that the students researched to create a bookmark or fact sheet. The bookmark or fact sheet must include a coloured sketch and facts on the plant.

Technology Component:

Combine all of the "other plants" that the students researched while in Burns Bog and create a PowerPoint resource on additional plants in Burns Bog. Student could pair up to complete information on the plants if they researched the same plant. In the end you will have a PowerPoint resource on a variety of different plants in Burns Bog.

Plants in Burns Bog

Plant	Sketch of the Plant	Traditional Use of the Plant	Other Information	Observations in Burns Bog
Sphagnum Moss				
Labrador Tea				
Salal				
Skunk Cabbage				

Paper Birch				
Horsetail				
Western Bog Laurel				
Sundew Plant (its small, look carefully)				

Other Plants in Burns Bog

Plant	Sketch	Observations in Burns Bog	Other Information	Is it an Invasive Species?

Activity 12: All About Plants

Purpose: Students will learn about plant parts and seed dispersal in Burns Bog.
Subject: Science and Drama
Suggested Time: Three classes (includes a visit to the Delta Nature Reserve)

Materials:

- Whiteboard/Chalkboard
- Science journal and pencil
- Celery
- Glass
- Water
- Food colouring
- Plant Parts Role Play Cards (blackline master)
- Plant Observations: Parts and Seeds (blackline master)
- Wind dispersal method (blackline master)
- Various art supplies to build seeds
- Fan
- Ecosystems within Ecosystems (blackline master)

Background:

Plants are found everywhere in Burns Bog and are an important component of Burns Bog. Vascular plants have four main parts and each part has a specific job: the *roots, stem, leaves* and *flower*. The *roots* anchor the plant and bring in water and minerals from the soil. The *stem* transports the water and minerals through the plant. It is made up of little tubes and is like a straw. It is the structural base of the plant and raises the height of the plant to bring it closer to the sun. The *leaves* are green in colour and help make food for the plant. The green substance in the leaves is called chlorophyll and helps make food for the plant through the process of photosynthesis. The *flower* of the plant produces seeds which form new plants.

The seed must travel away from the parent plant to ensure there is no competition for air, food, shelter, sunlight and water. Seeds have developed some creative ways to disperse from the parent plant. The methods are divided into four categories: wind, animal, water, and mechanical devices.

- **Wind** – These types of seeds are often small and light with plumes or wings to help them float through the air away from the parent plant. These plants generate a large number of seeds that are dispersed through the wind. Examples: Dandelions, or helicopters from Maple trees.
- **Animal** – Animals will gather these seeds (e.g. berries or nuts) for food and dispose of them as waste. Some of the seeds are dependent on having animals take the seeds away, such as squirrels carrying nuts. Other seeds have casings with hooks and attach themselves to animals or humans who then carry them away from the parent plant as a hitchhiker.

- **Water** – These seeds are washed away by rainfall runoff and travel through streams and rivers away from the parent plant. Some can float in water (e.g. coconuts).
- **Mechanical Devices** – Some seeds are enclosed in pods that burst open and fling seeds away from the parent plant. Others can drop from tall trees or grow on a vine.

Procedure:

Suggested First Class

1. Review the parts of the plant – roots, stem, leaves and flower – and discuss the role of each part. See the background information section for the parts and role of each plant part.

2. Place a piece of celery in a glass of water. Add a few drops of food colouring to the water to colour the water. Watch the coloured water travel up the celery stalk and turn the tubes the colour of the water. This demonstrates the job of the root and stem. (It works best if you leave the celery in the coloured water overnight).

3. Put the students into groups of four (so each student can be one plant part) and have them act out the parts of the plant and the specific job in a short role play. Pass out the blackline master "Plant Parts Role Play Cards" outlining the parts of the plant and the role each part plays.

4. Review the basic survival needs of plants and animals – air, food, shelter, sunlight and water. Seeds need to move away from their parent plant to ensure that there is no competition for air, food, shelter, sunlight and water.

5. Discuss the four methods of seed dispersal. Have the students think of examples of each type of seed dispersal. See the background section for the information.

Suggested Second Class

6. Visit the Delta Nature Reserve and head to any area for this lesson plan. See the Trail Map of the Delta Nature Reserve if required.

7. Take a nature walk to look for plant parts and signs of seeds or seed dispersal. Identify the different parts of the plant and any evidence of seeds that have travelled in Burns Bog. Use the blackline master "Plant Observations: Parts and Seeds" to complete this activity.

8. Return to the classroom

Suggested Third Class

9. Discuss the observations that the students noticed about plant parts and seed dispersal methods. Can the students think of any examples from Burns Bog or other areas where seeds travel through the wind?

10. Inform the students that they will be using random art supplies to make a seed and test it using the wind dispersal method. Use the blackline master “Wind Dispersal Method” to review the wind dispersal method and plan seed designs.

11. Give the students time to construct their wind dispersal seed. Students can work individually or with a partner. The students can choose their own materials to build the seeds, but everyone should start with the same item, such as a penny, nut, screw, etc. The students can adapt their seed to travel using the art materials available.

12. Test the seed designs using a fan as the wind.

13. Discuss the results of the seed designs. Reflect on changes that students would make to their original designs if given a second opportunity to tweak their design.

Extension:

Examine the picture of the tree stump. Ask the students: how do tree stumps represent an ecosystem within an ecosystem? Use the blackline master “Ecosystems within Ecosystems”.

Technology Component:

Research the process of photosynthesis. Design a video in any format (role play, game show, song, poem, interpretative dance, etc.) that explains the process of photosynthesis.

Plant Parts Role Play Cards

Part	Role
Root	The roots anchor the plant. They bring water and minerals from the soil to the plant.
Stem	The stem transports water and minerals through the plant using little tubes like a straw. It is the structural base of the plant and brings the plant closer to the sun by raising the height of the plant.
Leaves	The leaves come in different shapes but are green in colour and help make food for the plant.
Flower	The flower of the plant makes seeds and forms new plants.

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Plant Observations: Parts and Seeds

Find and sketch each part of a plant and a tree in Burns Bog.

Plant Parts	Plant	Tree
Root		
Stem		
Leaves		
Flower		

Use a Venn diagram to compare and contrast the plant and tree parts.

Do you see seeds? Do you see any evidence of a seed dispersal method? Record and sketch your observations.

Wind Dispersal Method

Here are examples of two seeds that use the wind dispersal method to travel away from their parent plant. Both are small and light with plumes or wings to help them float through the air. These plants can generate a large number of seeds that are dispersed through the wind. One dandelion plant can make up to 15,000 seeds per year.

Sketch your design and list the materials you will use on your seed design. Then, build your 3-D seed design. Get ready to test it. Give it a name. Be able to explain your design and thinking.

Sketch	**Materials Used**
Seed Name: _____	

Photo Credits: Jennifer Stonehouse

Ecosystems within Ecosystems

Examine the picture of the tree stump and then answer this question: How does a tree stump represent an ecosystem within an ecosystem?

Photo Credits: Jennifer Stonehouse

Activity 13: Research in Burns Bog

Purpose: Students will learn about the research that is happening in Burns Bog as well as use skills a scientist uses during a plot study in Burns Bog.

Subject: Science and Health and Career Education

Suggested Time: Three classes (includes a visit to the Delta Nature Reserve)

Materials:

- Whiteboard/Chalkboard
- Science journal and pencil
- Data in Burns Bog (Humidity, Temperature (Maximum), Temperature (Minimum), Wind Direction, Wind Speed) (blackline masters)
- Hula hoops (one per group)
- String
- Plot Study Observations (blackline master)
- School digital camera (student digital cameras or cell phone cameras – optional)
- Access to the computer lab or resource books
- Poster paper

Background:

Burns Bog is a unique ecosystem. For this reason, it is very interesting to scientists and as a result, there are many research projects that are going on about the bog. Below, you will find a list of projects with a description of each.

- **Water level monitoring:** Field staff with The Corporation of Delta have been monitoring the water level in Burns Bog since 2005. The purpose of this study is to measure the water level at many places throughout Burns Bog, and then compare the numbers over time to see if the bog is becoming wetter, drier, or staying the same.
- **Weather station:** The Corporation of Delta, Metro Vancouver, and Environment Canada put a weather station in Burns Bog in 2006. The weather station measures precipitation, humidity, air pressure, wind speed, and wind direction. This information is used to understand why the water levels change in the bog (because they are directly related to precipitation), and to track the conditions of the bog during the summer for possible fire hazards.
- **Vegetation monitoring:** Metro Vancouver has been monitoring 50 vegetation quadrats since 2005. The purpose of this study is to see whether the bog is becoming more bog-like (with Sphagnum mosses and bog plants), or whether it's drying out and turning into forest (with pine trees).
- **Butterfly and slug/snail studies:** The BC Ministry of Environment has been studying the butterflies in Burns Bog for many years. Recently, the Ministry also started studying the slugs and snails in the bog. The purpose of these studies is to find out whether there are rare species in Burns Bog, in what parts of Burns Bog they prefer to live, and how large the populations of these species are.

- **Sandhill Crane monitoring:** The BC Ministry of Transportation has been studying the Sandhill Cranes in Burns Bog since 2008. They put a tiny radio transmitter on one of these rare birds to see where they fly during the year, and how often they spend time in Burns Bog.

Procedure:

Suggested First Class

1. Write the word "scientist" on the board. Ask the students to sketch a picture of a scientist in their Science journal. Remind them to include their scientist doing "science" in the sketch.

2. Ask the students the following questions about their sketch.

    - Did anyone draw a male scientist? Female?
    - Did anyone draw a mad scientist?
    - Did anyone draw a scientist wearing a lab coat?
    - Did anyone draw a scientist in a lab?
    - Did anyone draw a scientist in nature?

    Share the sketches of the scientists doing science. Was there one common idea of what a scientist looks like among the students? Discuss how a scientist can look like anyone and how science happens everywhere!

3. Inform the class that there are several research projects that are currently happening in Burns Bog. Have the class brainstorm ideas about what scientists might be researching and studying in Burns Bog. Use the background information to share the research projects that are happening in Burns Bog.

4. Divide the class into small groups. Give each group a data set that has been gathered from the weather station in Burns Bog. Each group will have a different set of data to analyze by graphing the results for the month of January from 2007 to 2011. The students should examine the trends for the data and then present the trends to the class. Use the blackline masters "Data in Burns Bog" to complete this activity. There are five sets of data: humidity, temperature (maximum), temperature (minimum), wind direction, and wind speed.

Suggested Second Class

5. Visit the Delta Nature Reserve with your class and head to the Open Forest area for this lesson plan. See the Trail Map of the Delta Nature Reserve if required.

6. Inform the students that they will be conducting their own research project to see what living and non-living things are in this area of Burns Bog.

7. Divide the students into small groups and give each group a hula hoop. Each group should select an area to lay the hula hoop down on the ground. The area inside the hula hoop will become the study plot that the students will be observing.

8. In their Science journal, students should make a T-chart to record the living and non-living things inside the hula hoop. Can the students identify everything inside the hula hoop?

9. Next, each group will receive six pieces of string. The students should divide the hula hoop into sections using the string – three pieces of string should go vertically across the hula hoop and three pieces should go horizontally across the hula hoop.

10. Use the blackline master "Plot Study Observations" to complete this activity. Students can take pictures of the plot study during the activity to help make observations.

11. Return to the classroom.

Suggested Third Class

12. Have the students analyze the data. Research anything they were unable to identify using the computer lab or resource books.

13. Inform the students that part of doing research is communicating the results both in writing and orally. Give each group a piece of poster paper. Students will need to communicate their findings using the poster paper. Then, students will need to present their findings to the class.

14. Discuss how some scientists work in the field and have to endure all conditions from rain to snow or sunshine. Ask the students if any of them are interested in pursuing science or doing research as a career.

Extension:

Have the students research a career in science. Ask the students to select a career in science that interests them. The students should research the career and put together a one page description about this career and the skills needed for this career.

Research Critical Challenge:

Anthropologists and archaeologists love bogs because they can preserve the past. Preservation of animals and things from the past, including bog mummies, have been found in bogs. Things are preserved in the bog by acidic water, lack of oxygen and low temperature. Hair, leather and wool preserve very well in these bog conditions. Bog mummies have been found in Europe and are usually dark in colour with the skin and internal organs preserved.

Research the following questions:

- Compare and contrast an anthropologist and an archaeologist.
- How can preservation in the bog help scientists?
- What can scientists learn from the preservation of things in a bog?
- How do you think bog mummies help scientists study species of plants and types of animals that lived in a bog?

Quotes to respond to from "Tales from the Bog" (see note below):

"Not surprisingly, bog body research has taken wildly wrong turns."

"Strange things happen in the bog…I sort of like the idea that there's just some stuff we'll really never know."

Note: National Geographic published an article in September 2007 called "Tales from the Bog". This is good background information for the teacher, but it is not appropriate for the students to read. The article can be viewed online through the National Geographic website at:
http://ngm.nationalgeographic.com/

Technology Component:

Each student should select an image from the digital pictures taken while in Burns Bog. As they spend time observing the images, students will understand more about the ecosystem. Have the students use their images from Burns Bog to write a poem. Use the example below or create your own free flowing poetry. Use a Word document to import the image and write a poem.

Line 1: title – two words or two syllables that focus on the selected image

Line 2: description of the image/title in four words or syllables

Line 3: description of image in action (an observation about it, how it moves etc) in six words or syllables

Line 4: description of image in action (what it does/function etc) in eight words or syllables

Line 5: simile or metaphor for the title in two words or syllables

Example:
Skunk Cabbage
Smelly bog loving plant
Low plant that generates great heat
Smell attracts insects to help pollinate all around
Skunk queen

Plot Study Observations

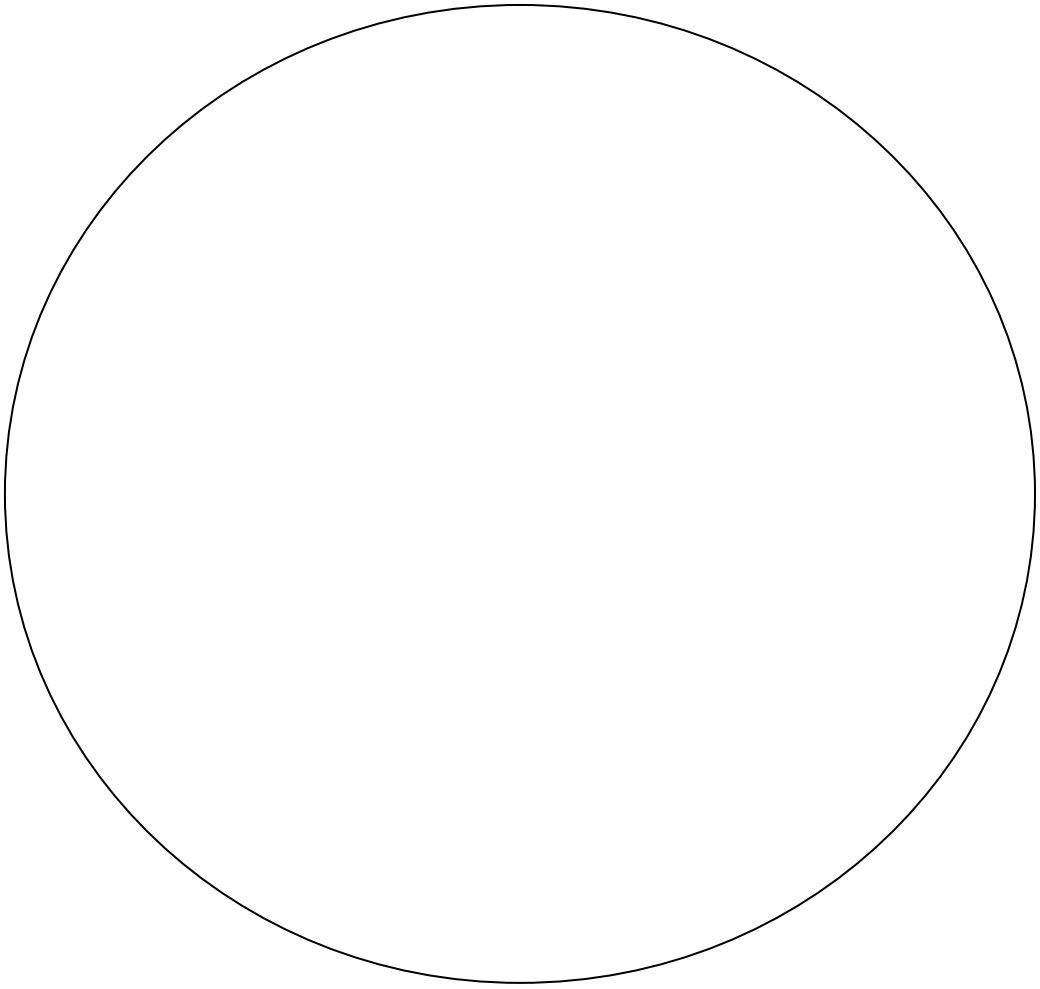
Location: _____ Date:_____ Time: _____Weather Conditions:_____

Location description: (circle) sunny/shady/sheltered/flat/sloped

rocky/sandy/dirt/

wet/dry

Draw the lines to represent the string. Sketch the major features that are located in your plot (ground surface, rocks, plants, paths, etc).



Sketch and make brief notes on the animals that you detected in your plot. Include: type, colour, location, size, tracks, sounds, etc.

Sketch and make brief notes on the plants that you detected in your plot. Include: type, stem or trunk, leaves or needles, flowers or cones.

Tally the numbers of plants and animals that are located in your plot. Make sure to tally each organism individually.

Data in Burns Bog – Relative Humidity

Weather Station in Burns Bog – *Photo Credits: The Corporation of Delta*

Relative Humidity Data for the Month of January from 2007 to 2011 (Measured in %)

Date (day/month)	2007	2008	2009	2010	2011
1/1	91.95	80.63	95.53	95.04	92.67
2/1	86.97	87.82	91.28	96.44	93.30
3/1	77.57	90.80	95.46	96.13	94.57
4/1	80.78	71.52	96.53	95.89	94.62
5/1	73.92	93.67	97.38	56.08	96.75
6/1	92.08	89.00	97.47	91.15	96.09
7/1	76.50	87.30	97.26	87.00	89.05
8/1	92.62	94.86	92.74	95.43	94.71
9/1	73.23	95.18	94.33	95.90	88.61
10/1	86.07	95.31	97.88	94.00	84.79
11/1	88.20	92.90	97.82	76.40	94.07
12/1	89.82	89.76	97.11	89.00	92.29
13/1	90.13	95.25	96.39	93.76	81.25
14/1	92.53	67.57	95.87	92.00	84.97
15/1	88.88	91.58	98.06	96.17	94.78
16/1	96.51	88.12	98.72	78.55	92.53
17/1	96.72	96.00	98.84	84.49	72.44
18/1	95.01	96.21	98.46	58.72	95.69
19/1	96.01	97.32	98.73	70.93	94.44
20/1	93.05	78.11	98.73	85.44	95.20
21/1	96.54	88.94	98.93	87.07	84.07
22/1	96.58	93.83	98.18	96.62	94.14
23/1	95.95	93.49	96.90	94.48	94.55
24/1	97.76	95.45	91.83	85.27	96.67
25/1	97.97	82.86	88.34	96.24	94.86
26/1	97.93	81.11	75.59	96.13	96.28
27/1	97.61	96.38	97.00	91.32	96.47
28/1	98.36	93.18	96.72	90.88	96.45
29/1	97.42	97.68	97.53	95.19	94.85
30/1	97.76	87.70	78.29	96.57	89.47
31/1	98.65	94.73	93.56	95.31	91.20

Data in Burns Bog – Temperature (Maximum)

Weather Station in Burns Bog – *Photo Credits: The Corporation of Delta*

Temperature (Maximum) Data for the Month of January from 2007 to 2011 (Measured in Degrees Celsius)

Date (day/month)	2007	2008	2009	2010	2011
1/1	8.80	5.00	2.40	8.90	2.70
2/1	11.80	7.00	1.80	7.90	3.80
3/1	8.20	8.40	0.60	7.50	4.70
4/1	5.50	9.20	3.00	6.20	2.80
5/1	62.90	9.20	3.30	8.30	4.70
6/1	6.40	4.20	5.50	5.80	6.80
7/1	10.30	4.40	7.90	3.90	8.80
8/1	6.76	3.20	7.00	6.00	4.90
9/1	9.20	5.00	4.50	10.40	4.70
10/1	1.23	6.40	2.50	10.60	1.10
11/1	0.40	11.20	4.90	12.60	1.90
12/1	-2.00	7.60	5.60	12.60	7.40
13/1	-0.80	8.10	5.80	10.00	9.20
14/1	0.00	6.70	4.00	8.00	11.50
15/1	1.10	2.90	3.30	10.30	11.00
16/1	2.30	1.40	1.90	8.00	12.80
17/1	3.10	1.40	1.90	9.80	9.40
18/1	3.66	3.30	4.40	11.00	4.70
19/1	3.70	2.70	3.30	12.00	4.70
20/1	7.10	4.90	1.50	10.40	3.10
21/1	4.00	5.20	0.30	12.90	6.40
22/1	6.57	3.80	0.70	9.80	7.40
23/1	8.20	4.30	5.50	8.60	7.60
24/1	8.80	4.50	1.80	7.70	7.40
25/1	7.30	4.30	3.40	9.50	8.70
26/1	7.90	2.70	1.80	9.80	11.30
27/1	5.00	2.70	0.60	7.90	7.80
28/1	3.50	0.90	5.90	8.80	7.50
29/1	4.20	2.70	4.70	11.00	7.80
30/1	7.10	4.10	5.60	8.40	5.20
31/1	4.10	5.20	7.20	9.50	2.70

Data in Burns Bog – Temperature (Minimum)

Weather Station in Burns Bog – *Photo Credits: The Corporation of Delta*

Temperature (Minimum) Data for the Month of January from 2007 to 2011 (Measured in Degrees Celsius)

Date (day/month)	2007	2008	2009	2010	2011
1/1	4.20	1.66	-1.30	4.50	-8.80
2/1	4.10	3.70	-4.00	4.89	-8.00
3/1	3.50	5.03	-4.00	3.70	-7.50
4/1	-0.40	5.50	0.00	4.70	-3.30
5/1	0.50	2.00	0.05	1.70	1.40
6/1	4.30	1.00	1.30	-1.70	4.30
7/1	5.19	-0.10	4.30	-2.20	4.00
8/1	1.80	0.20	1.50	2.90	0.20
9/1	0.10	0.40	-1.30	5.80	-4.80
10/1	-3.31	0.40	1.00	3.30	-6.60
11/1	-9.87	5.00	2.20	9.00	-4.00
12/1	-10.50	5.03	3.10	9.20	-0.34
13/1	-10.04	2.90	3.10	6.20	3.50
14/1	-11.70	2.60	1.00	5.80	8.00
15/1	-10.40	-2.90	1.35	1.70	7.30
16/1	-1.80	-3.60	0.90	0.00	7.36
17/1	0.70	-0.30	-0.20	5.20	4.70
18/1	0.30	0.10	-1.00	5.80	-1.50
19/1	2.28	0.20	-2.00	6.90	-3.30
20/1	0.00	-2.50	-2.50	5.40	1.40
21/1	2.20	-6.60	-1.90	4.30	3.10
22/1	3.24	-7.30	-0.90	0.80	0.70
23/1	6.50	-9.20	-2.50	0.80	4.80
24/1	-0.10	-6.90	-5.40	1.70	6.02
25/1	-0.80	-7.20	-7.80	4.10	6.80
26/1	-3.50	-2.30	-9.60	-0.40	0.62
27/1	-2.50	-5.20	-0.70	0.60	0.50
28/1	-1.00	-5.60	-0.20	4.80	1.10
29/1	-2.76	-2.30	1.20	4.80	3.00
30/1	-4.60	-2.30	-0.30	6.60	-3.30
31/1	-2.40	1.90	0.40	5.80	-4.30

Data in Burns Bog – Wind Direction

Weather Station in Burns Bog – *Photo Credits: The Corporation of Delta*

Wind Direction Data for the Month of January from 2007 to 2011 (Measured in Degrees. North is 0, south is 180)

Date (day/month)	2007	2008	2009	2010	2011
1/1	56.00	40.00	148.00	59.00	39.00
2/1	123.67	342.00	238.00	34.00	2.00
3/1	62.00	52.00	48.00	11.00	316.00
4/1	187.92	102.00	82.00	45.00	104.00
5/1	206.50	154.00	5.00	195.00	41.33
6/1	280.20	56.00	18.00	13.00	103.00
7/1	131.00	99.00	157.00	0.00	101.50
8/1	264.00	85.00	115.00	210.00	211.00
9/1	100.00	135.25	81.00	72.00	69.00
10/1	258.78	68.00	27.00	121.00	96.00
11/1	44.00	130.00	261.33	58.00	120.75
12/1	76.50	75.00	214.00	149.00	79.00
13/1	75.13	71.00	22.00	56.00	61.00
14/1	13.00	35.00	97.33	92.00	177.00
15/1	37.50	252.00	309.00	70.50	117.00
16/1	291.00	154.00	299.00	89.00	152.50
17/1	189.67	67.00	214.00	41.00	108.33
18/1	98.00	336.00	11.00	52.00	27.00
19/1	65.71	52.67	302.00	59.00	263.00
20/1	19.40	353.00	25.00	45.00	61.00
21/1	66.00	258.00	289.00	315.00	54.00
22/1	72.13	311.00	159.00	319.00	261.00
23/1	62.33	59.00	282.00	53.00	54.00
24/1	71.70	347.00	343.00	65.00	43.00
25/1	74.41	77.00	101.00	82.00	32.00
26/1	273.00	60.00	6.00	94.25	27.00
27/1	324.00	232.00	7.00	55.00	180.00
28/1	78.00	347.00	239.00	92.00	343.00
29/1	86.75	62.00	16.00	82.00	101.50
30/1	3.00	10.00	25.00	314.00	23.00
31/1	198.71	126.00	208.67	105.00	119.00

Data in Burns Bog – Windspeed

Weather Station in Burns Bog – *Photo Credits: The Corporation of Delta*

Windspeed Data for the Month of January from 2007 to 2011 (Measured in km/h)

Date (day/month)	2007	2008	2009	2010	2011
1/1	6.24	5.50	5.85	12.70	2.07
2/1	12.50	3.33	8.00	3.70	1.90
3/1	6.37	7.20	3.60	0.24	2.28
4/1	8.97	7.70	7.10	1.90	1.89
5/1	9.98	17.50	8.20	1.24	3.13
6/1	22.50	6.82	2.95	2.90	2.60
7/1	11.35	4.52	3.50	3.05	5.05
8/1	18.00	15.60	0.80	2.40	5.20
9/1	5.53	3.04	5.60	8.50	3.70
10/1	5.30	9.25	3.15	4.70	1.68
11/1	4.13	10.10	1.72	4.30	3.70
12/1	2.32	3.88	5.20	14.90	9.20
13/1	4.68	4.40	1.20	6.20	1.60
14/1	1.68	4.90	3.40	1.40	4.20
15/1	3.17	23.80	5.40	8.35	6.40
16/1	7.23	3.00	3.40	3.10	3.19
17/1	5.43	3.06	4.70	9.40	1.90
18/1	5.31	6.80	1.25	15.80	1.80
19/1	9.55	7.85	2.09	6.70	1.35
20/1	4.62	5.90	1.70	10.93	2.20
21/1	5.09	3.30	1.90	5.10	4.92
22/1	4.01	1.60	2.90	3.47	6.85
23/1	7.44	0.90	2.00	3.70	2.50
24/1	5.61	3.16	3.17	4.40	2.00
25/1	4.28	3.10	1.10	6.95	1.90
26/1	1.25	5.10	2.31	4.54	3.90
27/1	2.36	7.53	3.70	4.16	4.20
28/1	2.48	5.07	2.80	4.10	3.72
29/1	1.25	9.30	3.00	4.36	2.70
30/1	2.74	5.80	1.40	1.42	1.70

Activity 14: Restoration in Burns Bog

Purpose: Students will learn about how people are working to restore Burns Bog and learn about the restoration process.

Subject: Science and Language Arts

Suggested Time: Two classes

Materials:

- Whiteboard/Chalkboard
- Science journal and pencil
- Preserve, Conserve and Restore (blackline master)
- Land Use and Habitat Loss (blackline master)
- Restoration Efforts in Burns Bog (blackline master)
- Surrey North Delta Leader Article (blackline master)
- Paper for the brochure

Background:

In 1999, an Ecosystem Review was done by the British Columbia Environmental Assessment Office to determine what was necessary to preserve the ecology of Burns Bog. After the process was completed, it was determined that Burns Bog is globally unique on the basis of its chemistry, shape, plants and animals, and large size.

There have been disturbances to the Burns Bog ecosystem including: development (agricultural, residential, and industrial), peat mining, and fire. The raised water mound was determined to be an important feature of the bog. Ditch networks that were dug during the peat mining days had lowered the water table levels by 25 cm from 1930s levels. A further decrease of the water table levels could have an impact on the bog, so it was recommended that a large area of the bog be protected and be allowed to restore itself to its natural conditions.

There are a range of challenges that have resulted from the years of peat mining, drainage, filling, conversion to agriculture, and industrial and urban uses, which have contributed to habitat loss and drying out parts of the bog. Before peat mining and filling of land, Burns Bog covered about 48 km^2 with peat mass 4-5 m above sea level. Since peat mining, the area has been reduced to 30 km^2 with the peat mass 2-3 m above sea level. As a result of peat mining and drainage, changes occurred to the bog: water table levels have decreased in some places, some Sphagnum moss populations were lost, plant communities were altered (areas invaded by native and non-native species), large ponds were created, and large bare fields and drier surfaces were created which increase fire risk.

Hydrology is the principle focus for restoration of the bog. Drainage ditches are being blocked to retain precipitation and maintain the water table levels. The restoration goals are to return a high water table throughout the bog, to re-establish Sphagnum moss and to re-start the peat-forming process in areas that have been disturbed. A higher water table would bring changes favouring bog species and the entire bog ecosystem. Ditches have been blocked using naturally occurring beaver dams as well as human-made dams from peat, wood, and steel. Some areas of the bog can be reached by vehicles and

machines so that heavy construction materials can be used (e.g. steel plates), but other areas can only be reached by foot so natural materials such as trees and peat are used.

Beavers have great engineering abilities and have been a huge help by blocking ditches in Burns Bog. However, at times the dam construction can cause flooding on roads, so the dams need to be maintained to allow extra water to flow through the dam. A special pipe called a "beaver pond leveler" can be installed through the beaver dam, so that beavers can build the dam on top of the pipe and water levels can still be controlled to ensure flooding does not occur.

Efforts of ditch blocking need to be measured and recorded to see if the restoration efforts are helping to raise the water table levels in Burns Bog. Water levels are measured every four weeks using pipes that are anchored in many locations around the bog. Water levels and precipitation trends are tracked to see if water table levels are increasing. Changes in vegetation are also being measured in the bog. Higher water table levels would increase the growth of Sphagnum peat moss, which created Burns Bog and will help it survive in the future.

Procedure:

Suggested First Class

1. Write the words "preservation", "conservation" and "restoration" on the board. Ask the students what comes to mind when they see these words. Have them write down ideas in their Science journals and then discuss. Ask the students if they can define any of these words. Teach the students the definitions of these three terms and have them record the definitions in their Science journal. Use the blackline master "Preserve, Conserve and Restore" to examine and classify pictures as an attempt to preserve, conserve or restore. Give the students time to complete the activity and then discuss the answers. Could any of the pictures fit into more than one category? Can the students think of other examples of preservation, conservation and restoration in their community?

   Definitions:

   - Preservation – Recognizing the need to keep a remaining ecosystem that has not been damaged safe from destruction.
   - Conservation – Learning how to make wise choices or use of existing ecosystems.
   - Restoration – Human actions to help repair damage to the ecosystem.

2. Explain to the students that Burns Bog has changed over the years with land use, which has resulted in habitat loss. Use the blackline master "Land Use and Habitat Loss" to review different ways that land use has resulted in habitat loss in Burns Bog. The students should think about human impact using the images on their own and then with a partner. Discuss and brainstorm thoughts as a class.

   Pictures:

   - Bridge – development of highway through the bog
   - Path in Delta Nature Reserve – allows visitors to enjoy the bog (human impact = litter)
   - Tower in Delta Nature Reserve – urban development

- Homes – urban development
- Ranch – use in the past
- Train from peat mining – use in the past (evidence of past fires in the background)

3. Ask the students if they can guess what the word "hydrology" means. Hydrology is the main focus in the restoration process for Burns Bog.

   Definition:
   - Hydrology – the scientific study of the properties, movement, and distribution of water on the Earth's surface, and how water interacts with the environment (e.g. soil, plants, atmosphere).

4. Inform the students that humans and one animal are making a positive impact in Burns Bog towards the restoration efforts. Have the students guess the animal that is naturally helping to block ditches in Burns Bog. What do beavers do in nature? Teach the students that drainage ditches are being blocked by humans and beavers to restore water levels in the bog.

5. Use the blackline master "Restoration Efforts in Burns Bog" to read about and respond to questions on the restoration process in Burns Bog.

Suggested Second Class

6. Use the blackline master "Surrey North Delta Leader Article" to have the students read about the restoration efforts in action.

7. Make a brochure to educate people about why Burns Bog is an important ecosystem that needs to be preserved and to educate people about the conservation and restoration efforts that are in progress in Burns Bog.

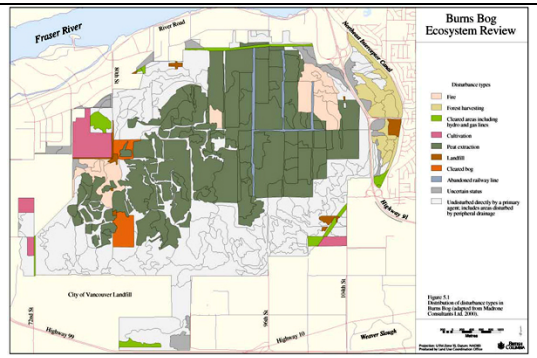
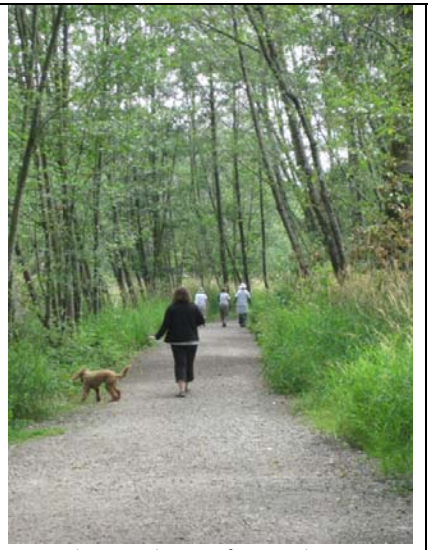
Extension:

Have the students write a paragraph from the point of view of a plant or animal living in Burns Bog and explain why restoration of Burns Bog is important. Or have the students write a paragraph from a beaver's point of view and explain how the beaver is helping to restore Burns Bog naturally by living in this ecosystem.

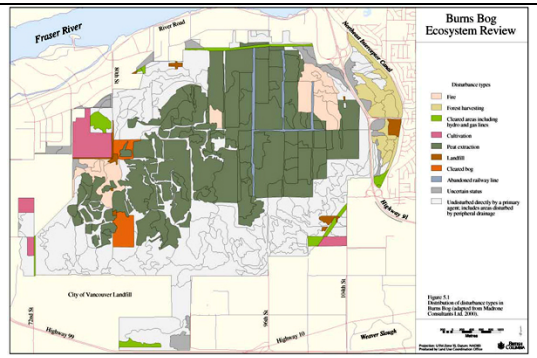
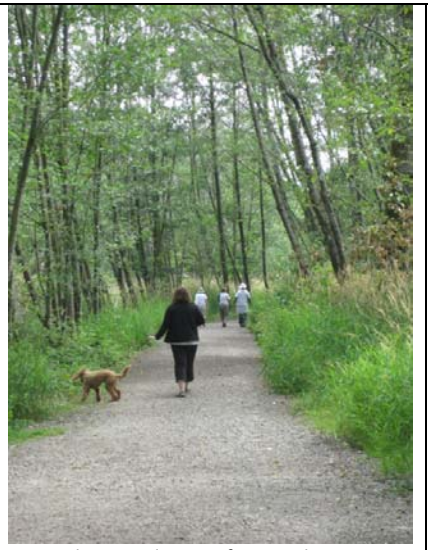
Technology Component:

Research the Burns Bog Conservation Society: www.burnsbog.org. Determine what the goals are of this society and what they are doing to support their goals.

Preserve, Conserve and Restore

Picture		 *Photo Credit: The Corporation of Delta*	 *Photo Credit: Jennifer Stonehouse*
Classify each picture as an attempt to preserve, conserve or restore			
Justify			

Answer Key: Preserve, Conserve and Restore

Picture		 *Photo Credit: The Corporation of Delta*	 *Photo Credit: Jennifer Stonehouse*
Classify each picture as an attempt to preserve, conserve or restore	**Preserve**	**Restore**	**Conserve**
Justify	**People are recognizing the need to keep Burns Bog safe from destruction and to preserve the remaining ecosystem that has not been damaged by humans**	**People are helping to restore or repair the damage to the ecosystem that was caused by previous human activities**	**People are learning how to conserve and make wise use of existing ecosystems**

Land Use and Habitat Loss

Explain how the pictures below of land use has or could result in habitat loss. How do these images impact the Burns Bog ecosystem? Plants? Animals? Biodiversity? Suggest ways that habitat loss could be reduced in these land use pictures. How can we look after the needs of the Burns Bog Ecosystem as well as the needs and wants of humans?

Write down your thoughts about these pictures and questions in your Science journal.

Photo Credit: Jennifer Stonehouse

Photo Credit: Jennifer Stonehouse

Photo Credit: Jennifer Stonehouse

Photo Credit: Jennifer Stonehouse

Photo Credit: Delta Museum & Archives

Photo Credit: Sarah Howie

Restoration Efforts in Burns Bog

In 1999, an Ecosystem Review was done by the British Columbia Environmental Assessment Office to determine what was necessary to preserve the ecology of Burns Bog. After the process was completed, it was determined that Burns Bog is globally unique on the basis of its chemistry, shape, plants and animals, and large size.

There have been disturbances to the Burns Bog ecosystem including: development (agricultural, residential, and industrial), peat mining, and fire. The raised water mound was determined to be an important feature of the bog. Ditch networks that were dug during the peat mining days had lowered the water table levels by 25 cm from 1930s levels. A further decrease of the water table levels could have an impact on the bog, so it was recommended that a large area of the bog be protected and be allowed to restore itself to its natural conditions.

There are a range of challenges that have resulted from the years of peat mining, drainage, filling, conversion to agriculture, and industrial and urban uses, which have contributed to habitat loss and drying out parts of the bog. Before peat mining and filling of land, Burns Bog covered about 48 km^2 with peat mass 4-5 m above sea level. Since peat mining, the area has been reduced to 30 km^2 with the peat mass 2-3 m above sea level. As a result of peat mining and drainage, changes occurred to the bog: water table levels have decreased in some places, some Sphagnum moss populations were lost, plant communities were altered (areas invaded by native and non-native species), large ponds were created, and large bare fields and drier surfaces were created which increase fire risk.

Hydrology is the principle focus for restoration of the bog. Drainage ditches are being blocked to retain precipitation and maintain the water table levels. The restoration goals are to return a high water table throughout the bog, to re-establish Sphagnum moss and to re-start the peat-forming process in areas that have been disturbed. A higher water table would bring changes favouring bog species and the entire bog ecosystem. Ditches have been blocked using naturally occurring beaver dams as well as human-made dams from peat, wood, and steel. Some areas of the bog can be reached by vehicles and machines so that heavy construction materials can be used (e.g. steel plates), but other areas can only be reached by foot so natural materials such as trees and peat are used.

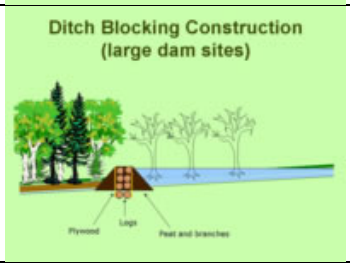
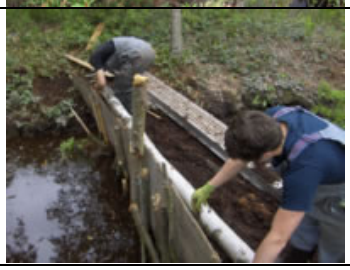
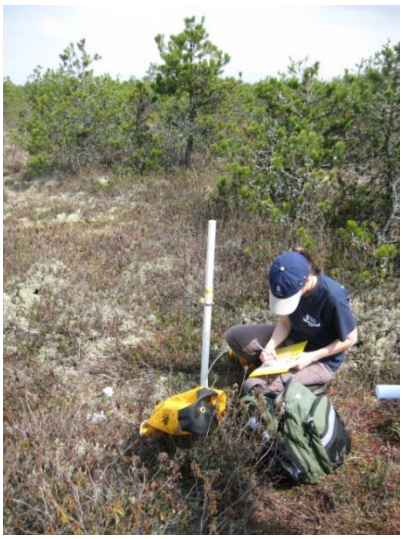
Ditch blocking construction in: Shallow, narrow ditches		
Ditch blocking construction in: Deep, wide ditches		

Photo Credits: The Corporation of Delta

Beavers have great engineering abilities and have been a huge help by blocking ditches in Burns Bog. However, at times the dam construction can cause flooding on roads, so the dams need to be maintained to allow extra water to flow through the dam. A special pipe called a "beaver pond leveler" can be installed through the beaver dam, so that beavers can build the dam on top of the pipe and water levels can still be controlled to ensure flooding does not occur.

Beaver lodges (left) and beaver dam (right) in Burns Bog - *Photo Credit: Sarah Howie*

Efforts of ditch blocking need to be measured and recorded to see if the restoration efforts are helping to raise the water table levels in Burns Bog. Water levels are measured every four weeks using pipes that are anchored in many locations around the bog. Water levels and precipitation trends are tracked to see if water table levels are increasing. It is important to note changes to vegetation in the bog. Higher water table levels would increase the growth of Sphagnum peat moss which created raised bogs.



Water levels are being measured and recorded in the bog - *Photo Credit: Paul Whitfield*

Questions on Restoration Efforts in Burns Bog

1. When, by whom, and why was the Ecosystem Review completed?

2. What did the Ecosystem Review determine when the process was completed?

3. What disturbances have there been to the Burns Bog ecosystem?

4. Describe the decrease of the water table levels in Burns Bog over the years and what was recommended for Burns Bog.

5. What challenges have resulted in Burns Bog due to peat mining and drainage over the years?

6. What is the principle focus for restoration in Burns Bog? How is this being done in Burns Bog?

7. What are the restoration goals?

8. How are ditches being blocked in Burns Bog?

9. What is being done to monitor the restoration efforts of ditch blocking?

Answer Key: Questions on Restoration Efforts in Burns Bog

1. When, by whom, and why was the Ecosystem Review completed?

   1999; British Columbia Environmental Assessment Office; to determine what was necessary to preserve the ecology of Burns Bog

2. What did the Ecosystem Review determine when the process was completed?

   globally unique on the basis of its chemistry, shape, plants and animals, and large size.

3. What disturbances have there been to the Burns Bog ecosystem?

   development (agricultural, residential and industrial), peat mining. and fire.

4. Describe the decrease of the water table levels in Burns Bog over the years and what was recommended for Burns Bog.

   decreased by 25 cm from 1930s levels; the remaining undisturbed areas should be protected and allowed to restore

5. What challenges have resulted in Burns Bog due to peat mining and drainage over the years?

   - decrease in the water table levels
   - loss of Sphagnum moss populations
   - plant communities were altered (areas invaded by native and non-native species)
   - creation of large ponds, and large bare fields
   - drier surfaces which are increasing fire risk

6. What is the principle focus for restoration in Burns Bog? How is this being done in Burns Bog?

   Hydrology; drainage ditches are being blocked to retain precipitation and maintain water table levels

7. What are the restoration goals?

   to return a high water table, re-establish Sphagnum moss, and re-start the peat-forming process

8. How are ditches being blocked in Burns Bog?

   naturally occurring methods like beaver dams, and by humans using wood

9. What is being done to monitor the restoration efforts of ditch blocking?

   water levels are being measured and recorded every four weeks to see if water table levels are increasing; precipitation is recorded hourly; vegetation in Burns Bog is also being observed

Restoration workers Mike Jeffery (left) and David Randt use soil and plywood to dam one of the drainage ditches in Burns Bog.(Courtesy Corporation of Delta)

Article reprinted with permission from the Surrey-North Delta Leader

Human beavers bring bog back to life

By Christine Lyon – Surrey-North Delta Leader
Published online: August 19, 2008

Mike Jeffery and David Randt meet at Delta Municipal Hall every morning at 7:15 a.m. They toss their orange coveralls, wading boots, shovels and plywood into a pickup truck and head to Burns Bog.

Jeffery and Randt spend their days damming the drainage ditches that carry water away from the bog. The men salvage sticks and branches which they use as stakes to secure the dam. Finally, they fill the layers of plywood with soil for added strength.

Since they started May 12, Jeffery and Randt have built seven new dams and upgraded 10 old ones in the raised peat bog, which occupies a quarter of Delta. Small dams take a day to construct, while larger structures can take up to a week.

Ditch-blocking has been going on since 2001 in an effort to restore the bog to its natural state. Steel barriers and wooden dams from previous years are still in tact.

Until the '80s, drainage ditches were dug throughout the bog to facilitate large-scale peat mining and cranberry farming. The ditches drained nearly 40 per cent of the original bog – a danger since precipitation is the dome-shaped area's only source of water.

Burns Bog is about half the size it once was because of agricultural and industrial land use. In 2004, the province, Metro Vancouver and the Corporation of Delta purchased 5,000 acres of the bog and created a plan to protect its unique ecosystem and the rare plants and animals living there.

Jeffery and Randt are two of the few people permitted on the bog. They lug their equipment to the dam sites on foot, since there are no roads and driving is a fire hazard.

Jeffery, 25, is studying forestry at BCIT and loves being able to work outside. Randt is studying geological engineering at UBC. The 19-year-old Delta resident is happy to lend an environmental hand in his own community. This is the second year Delta has employed summer students to restore the bog.

The pair runs into deer, owls, herons, hawks and eagles on a daily basis. They were pleased to discover the resident beavers are quick to patch up their faulty dams.

Project manager Sarah Howie explains beavers are attracted to the sound of running water.

"If one of the dams is leaking and water is going around or bypassing it, they'll hear that and they'll start adding onto the bypass until it stops flowing," she says.

Howie is an urban environmental designer for the Corporation of Delta and has been overseeing the hydrology aspect of the restoration project for almost four years.

"It's an engineering feat, what we're doing," she says, explaining the dams must be strategically placed and strongly built to hold back the water pressure. Water levels can rise two feet in winter.

Keeping water in the bog is the most important part of the restoration process because without water, a bog becomes a forest.

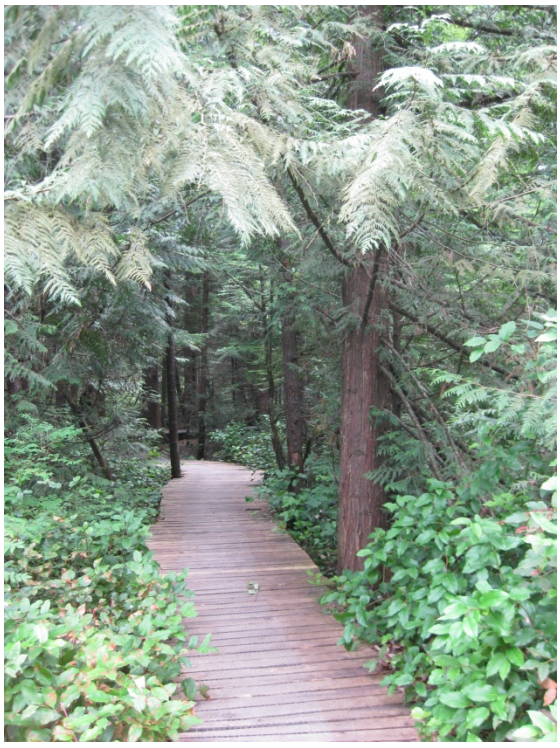
Peat, also known as sphagnum moss, is integral to maintaining the bog ecosystem since it releases acid and absorbs water. But peat regenerates very slowly compared to the rate it was harvested for horticulture in the 20th century.

Howie measures water and ground levels year round to determine whether or not the ditch-blocking efforts are worthwhile.

Data over the last three years has shown sphagnum moss is indeed expanding. That means the bog is starting to recover, thanks to a hard-working restoration crew and a few eager beavers.

Extra Activities

True or False Game
Vocabulary Bingo
Animals Word Search
Plants Word Search



True or False Game

Place the true and false signs on opposite sides of the classroom. Read aloud to the students the statements about Burns Bog. Please feel free to change these statements to match what you have been discussing with your class. Once the students hear the statement, have the students physically move to the side of the room that corresponds with the statement. Discuss why students are standing on that side. Have the students think about why someone could be standing on the opposite side of the room as them. Discuss the correct answer.

Optional: You could have an undecided sign in the middle of the room.

Note: This could be used as pre and post tests at the beginning and end of the unit on Burns Bog to assess what students know and have learned about Burns Bog.

Example statements:

Burns Bog is located in Delta, covers 3,000 hectares and is globally unique.

- True: Burns Bog is located in Delta, covers 3,000 hectares and is globally unique because of its chemistry, shape, plants and animals and large size. Burns Bog is 8 times the size of Stanley Park.

A bog is not a wetland, but is wet, acidic and nutrient poor.

- False: Burns Bog is a wetland. It is wet, acidic and nutrient poor.

Burns Bog has only been used for farming and ranching, peat mining, cultural and traditional uses by First Nations people.

- False: The above list is true, but it has also been developed over the years. The Vancouver Landfill is located in the southwestern corner of the bog, and Highway 91 runs through the bog.

Bogs are important for the environment.

- True: It provides habitat for plants and animals, including rare and endangered species. It also stores lots of carbon and helps the environment.

There have been several fires in Burns Bog over the years.

- True: Recent fires include the following years: 1996, 1998, 2005 and 2007

Sphagnum moss is a plant that is found in Burns Bog, but is not an important plant.

- False: Sphagnum moss is an important plant in Burns Bog. It absorbs water and can store up to 30 times its weight in water. Sphagnum moss helps create bogs.

Quicksand-like peat is present in Burns Bog and you can find a “hidden treasure” in the Delta Nature Reserve that sank in the quicksand-like peat.

- True: There is an item that sank in the quicksand-like peat in the early 1990’s. It is a tractor, but if your students do not know what it is, there is a lesson plan on this mystery item.

Burns Bog has the right components to preserve animals that have fallen into the bog.

- True: Animals that fall into the bog can be preserved by acidic water, lack of oxygen and a low temperature.

Burns Bog was not important to First Nations people.

- False: It was important to First Nations people. The plants and animals were used as a food source, and the plants were also used for traditional uses such as medicine and had healing powers. Burns Bog is still important for the culture of First Nations people.

Burns Bog is important to scientists.

- True: Several research projects are currently happening in Burns Bog.

In 2004, Burns Bog was purchased by the government and it is now a protected natural area.

- True: Many partnerships have formed. and agencies and people are working hard to preserve, conserve and restore Burns Bog.

Did You Know?

Since 1991, International Bog Day has been held on the last Sunday in July!

True

False

Undecided

Vocabulary Bingo

Play Burns Bog Bingo to review the vocabulary used in the Burns Bog unit. Example questions and answers are provided below. Other questions and answers that you have discussed in your unit can be used. The students will each receive a bingo card with the selected vocabulary. The students will fill in their bingo card using the vocabulary listed on their bingo card. Each word can only be used once. Discuss what equals a bingo! Play until you have a winner that yells out "Burns Bog".

Burns Bog Vocabulary Bingo Questions

Example questions and answers:

1. An area that is described as "land that has the water table at, near or above the land surface".
   Answer: wetland

2. A term for dead plant matter.
   Answer: peat

3. A special kind of wetland where at least 30 cm of dead plant matter has piled up because of the very wet conditions.
   Answer: peatland

4. A term for the individual different plants or animals found in an ecosystem.
   Answer: species

5. A term for all the members of one species within an ecosystem.
   Answer: population

6. A term that describes a group of two or more populations of different species that live within an ecosystem
   Answer: community

7. A term for living things.
   Answer: biotic

8. A term for non-living things.
   Answer: abiotic

9. The interactions among the biotic and abiotic components of the environment.
   Answer: ecosystem

10. Consumers that eat only plants.
    Answer: herbivores

11. A pathway of how food energy is passed from one organism to another.
    Answer: food chain

12. Several interconnected food chains.
    Answer: food web

13. Consumers that eat other animals.
    Answer: carnivores

14. Consumers that eat both plants and animals.
    Answer: omnivores

15. The physical space where an organism lives.
    Answer: habitat

16. Roots, stems, leaves and the flower are all part of this.
    Answer: plants

17. Two categories of living things. Plants and _____.
    Answer: animals

18. The bog receives water and nutrients through _____.
    Answer: precipitation

19. Decay that happens over time is called _____. This happens slowly in the bog due to the lack of _____.
    Answers: decomposition and oxygen

20. This plant is an important plant in Burns Bog. It absorbs and stores water.
    Answer: Sphagnum moss

21. An instrument used to measure the amount of precipitation.
    Answer: rain gauge

22. Compounds that form solutions that can be sour-tasting, react with metals, and cause serious burns on the skin.
    Answer: acids

23. A scale that measures the acidity of a substance using a number scale from 0 to 14.
    Answer: pH

24. The edge or perimeter of a peatland. An area where the bog meets the mineral-rich waters.
    Answer: lagg zone

25. Insects are in this phylum.
    Answer: Arthropoda

26. The bog stores this and helps the environment by reducing the greenhouse effect.
    Answer: carbon dioxide

27. Ditch blocking is an action that people are taking to repair damage to Burns Bog that was caused by previous human activities. Beavers are also naturally assisting in this process.
    Answer: restoration

Burns Bog Bingo

Fill in your Burns Bog Bingo card with any of the answers from the list below. Each box must contain a different answer. You must yell “Burns Bog” when you have a bingo!

wetland	Peat	peatland	species
population	community	biotic	abiotic
ecosystem	food chain	food web	herbivores
carnivores	omnivores	habitat	plants
animals	precipitation	decomposition	oxygen
Sphagnum moss	rain gauge	acids	pH
lagg zone	Arthropoda	carbon dioxide	restoration

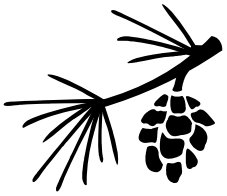
Burns Bog Word Search

Animals

Find and circle all of the kinds of bog animals that are hidden in the grid.
The words may be hidden in any direction.

W	M	H	N	R	L	E	C	D	K	R	T	R
G	R	D	V	W	G	P	E	F	N	Q	K	E
L	F	M	O	U	S	E	A	L	B	P	J	L
E	B	Y	G	L	R	E	O	E	X	Z	N	O
S	U	W	O	K	N	M	A	W	A	I	L	M
A	K	F	O	P	W	V	J	K	N	G	V	X
E	J	A	S	H	E	N	D	H	B	C	L	U
W	B	L	E	R	R	I	U	Q	S	Y	R	E
S	W	C	R	N	H	Z	C	J	R	L	G	N
D	Z	O	G	P	S	S	K	W	A	H	T	L
N	R	N	N	F	L	E	O	X	Y	E	D	Q
Q	X	H	O	K	T	O	L	M	E	R	F	J
E	P	L	T	O	M	D	U	R	T	O	L	T
L	L	A	Y	J	I	R	C	R	A	N	E	E
J	I	O	K	L	D	G	J	W	R	E	F	K
X	C	B	V	P	K	O	M	L	D	M	B	I

BEAR
BEAVER
COYOTE
CRANE
DEER
DUCK
EAGLE
FALCON
GOOSE
HAWK
HERON
MOLE
MOUSE
OWL
SHREW
SQUIRREL
VOLE
WEASEL



Burns Bog Word Search

Plants

Find and circle all of the kinds of bog plants that are hidden in the grid.
The words may be hidden in any direction.

W	M	H	N	R	Z	E	C	Q	K	R	T	R
G	R	D	V	C	X	P	R	F	D	Q	K	V
D	F	Y	D	V	S	L	A	L	C	P	J	G
F	B	Y	B	L	U	E	B	E	R	R	Y	J
H	U	W	R	I	N	M	A	W	A	I	L	L
E	K	Y	S	C	D	K	P	I	N	E	I	X
R	C	N	S	H	E	N	P	H	B	C	L	U
C	A	U	A	E	W	C	L	G	E	Y	R	A
S	H	L	R	N	S	Z	E	J	R	L	E	N
D	D	W	G	P	R	S	Q	R	R	X	T	L
N	R	S	N	F	S	S	O	X	Y	N	A	Q
Q	A	A	O	K	C	O	L	M	E	H	W	J
W	H	L	T	Y	M	D	U	H	T	S	L	T
L	Y	A	T	J	I	R	Z	F	K	H	J	E
J	C	L	O	U	D	B	E	R	R	Y	F	K
X	Q	B	C	P	K	O	M	L	D	M	Z	I

BLUEBERRY
CLOUDBERRY
COTTONGRASS
CRANBERRY
CRABAPPLE
HARDHACK
HEMLOCK
LICHEN
MOSSES
PINE
SALAL
SPRUCE
SUNDEW
WATERLILY