Howe Sound Pulp & Paper's

Pulp & Paper School

Pulp & Paper School
Introduction

Unit Background:
The goal of this unit is to assist teachers during their studies of BC’s Natural Resources and Papermaking. All the data provided is the most current available as of 2000, and has been verified using a number of different sources including the BC Ministry of Environment, Lands, & Parks, the Canadian Pulp and Paper Association, and TAPPI.

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Lesson 4: What is Paper?
Students make basic paper.

Lesson 5: Paper Testing
Students discover and test various properties of paper

Extension Activities

Tours
Arrangements for mill tours and papermaking sessions can be made through HBFP Community Relations: Tel: 884-2675 Fax: 884-2172 email: hsppcomments@mail.canfor.ca

More information about Howe Sound Pulp & Paper, including a virtual tour, is available on our website: www.howesoundpp.com
Lesson 1 -- Getting to Know BC

Introduction:
BC is a vast province with a landbase that is used in a variety of ways. Through colouring the BC map and completing the activity sheet, students will be able to put BC's land resources in perspective.

Development:
1. Hand out worksheets and read over the directions together. Discuss new terminology:

   Timber Harvesting Land Base -- the forested land that has been identified as practical and economical for future harvesting projects. You may want to discuss why not all the forest land is part of the harvesting land base (terrain, geographical location, watersheds etc).

   Protected Forest -- areas of land that are protected to development naturally without the pressure of any commercial activities (mining, logging, urban development).

2. Complete worksheets and discuss answers (#6 -- a. T b. T c. F d. T)

3. Ask students what fact that they have learned surprised them the most? The least?

Conclusion:
Ask students to think about what they think wood is -- in other words, if you could put a piece of wood under a microscope, what would you see?

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**Background Information:**

Area in BC: 992,836 km² (95 million ha)
Area forested in BC: 587,000 km²
Area in Timber Harvest Land Base: 220,000 km²
Land occupied by lakes, rivers, & streams: 20,000 km²

1998 Statistics:
Productive Forest Land in BC: 45,800,000 hectares
Total Area Harvested in BC: 113,501 hectares
Less than 0.002% of BC's total area was harvested

188,887 hectares were replanted in BC
94,000 hectares regenerated naturally
Total = 282,887 hectares of new forests
Getting to Know BC

Colour in order from largest to smallest each map of BC in a different colour -- make sure you also colour in the legend!

Legend

☐ Total Area of BC
☐ Area of BC's Forest
☐ Area of BC's Timber Harvesting Land Base
☐ BC's Government Protected Forests
Getting to Know BC Questions

Name: ___________________________ Date: ______________

Use your map of BC to help you answer the following questions:

1. Which is bigger: BC’s timber harvesting area, or BC’s total forest?

2. Why does your answer make sense?

3. We think of BC as being covered with trees, but in reality only 62% of BC’s land is covered with trees. What other things are on the land other than trees?

4. Why do you think that only some of the forested area is part of the timber harvesting land base?

5. Many different groups of people use the forest. List all the groups that you can think of:

6. Circle whether or not the following statements are True (T) or False (F).
   a. More trees are destroyed by insects and fire than are commercially harvested. T  F
   b. Most of the trees cut down in the world are used for firewood. T  F
   c. Canada’s forests are getting smaller and smaller. T  F
   d. Each year 23 trees are planted for every person living in Canada. T  F
Lesson 2 -- Trees in Canada

Introduction:
The purpose of this lesson is to show students that there are an enormous number of trees in Canada, and that these trees have a natural lifecycle in which they will eventually die. This lesson will allow students to compare the ways trees die and discuss the pros and cons of each way.

Development:
1. Ask students what happens to a seedling after it has been planted -- a simple diagram on the board may help students visualize that the seedling will grow until it is very big. What happens to the tree then?
2. Hand out the "Trees in Canada" worksheet and explain to students that each tree represents 1 million hectares of trees (1 hectare = 2.47 acres = 10,000 sq. m) and in Canada there are 417 million hectares of trees.
3. Discuss the possible reasons for a tree dying, and how many the students think die each year. Explain to students that most trees die from infestations, forest fires, or harvesting. Ask students how many trees they think die from each of these events.
4. Complete the "Trees in Canada" sheet:
   1. infestations (colour in 5 trees black)
   2. forest fire (colour in 2 trees red)
   3. harvesting (colour in 1 tree blue)

Conclusion:
Discuss whether the students are surprised by these facts. As a class discuss the pros and cons of each event (eg infestations: is a natural event, but spreads easily and may have to be controlled with pesticides)

Background
It is important to note that before humans intervention, our forests used to burn down every 90 to 200 years -- this has been proven by core samples of soil that show regular layers of ash indicating forest fires. Today, we rarely let forest fires burn naturally because of the threat to property etc. but foresters are now using this information determine the natural cycle of our forest. The hope is to use this information to harvest trees in a manner that would mimic the timing and patterns of the natural forest fires that would occur if we didn't intervene.
Trees in Canada

Each tree below represents 1 million hectares of the trees that are in Canada.

Each year _________ million hectares of trees die. List the reasons that you think may cause trees to die.

_________________________

Trees die because of:
1. ___________________ (colour in ___ trees black)
2. ___________________ (colour in ___ trees red)
3. ___________________ (colour in ___ trees blue)

If we are going to lose trees each year -- which is the most environmentally friendly way? Why?
Lesson 3 -- What is Wood?

Introduction:
The goal of this lesson is for students to understand that wood is a renewable resource that we all use everyday. Students will examine the physical properties of wood and classify the various uses of wood.

Development:
1. Discuss the terms "renewable" and "non-renewable" and generate a list of resources that fall under each category.
   
   Example: Renewable: fish, water, trees, hydro power, solar power. Non-Renewable: oil, gas, coal, minerals

2. Have students brainstorm all the ways they use paper everyday -- for example: the stick they play hockey with is made of wood.

3. Ask students to classify their list into at least 4 different categories. Students may want to do this with a partner, using both of their inventories to generate a master list. As a class discuss the categories the students chose.

4. Hand out pieces of wood and ask the students what they think it would look like under a magnifying glass or microscope -- you may want students to draw this.

5. Show pictures of wood under a powerful microscope, and discuss what they see (see resource sheet)

Conclusion:
1. Have students write a paragraph about what their day would be like if wood didn’t exist.

Background Information:
Renewable: capable of being replaced by natural ecological cycles
Wood use in the world: 54% Firewood
38% Lumber
18% Pulp & Paper
Statistics: www.cppc.org
What is Wood -- Teacher's Reference Sheet
Bass Wood

Pores
(run vertically through
the tree and transport
sap from the roots to
the leaves)

Ray Cells
(transports nutrients over
the grain off the tree
(horizontally through the
tree)

Wood Fibre
(run vertically through
the tree and give the wood
structure -- this is what is
used to make paper)
What is Wood -- Teacher's Reference Sheet

Black Ash Wood

**Pores**
(run vertically through the tree and transport sap from the roots to the leaves)

**Ray Cells**
(transport nutrients over the grain off the tree (horizontally through the tree)

**Wood Fibre**
(run vertically through the tree and give the wood structure -- this is what is used to make paper)
Lesson 4 -- What is Paper?

Introduction:
The purpose of this lesson is for students to make paper. This lesson can also be done in conjunction with Lesson 5 -- Testing Paper. You may also want to consider contacting Howe Sound Pulp and Paper Community Relations and arranging for a representative to visit your class. This representative will bring a paper making kit, video, and other resources to help with Lessons 4 and 5.

Development:
1. Materials needed: two buckets, paper making decals, large plastic totes, and irons; old newspapers, paper towels, and a class set of blotters.

2. Follow the instructions on the "Making Paper" activity sheet. Note: decals can be made from a wire coat hanger reshaped into a square with an old pair of nylons stretched over.

3. For ease of classroom management, you may want half the class to be working on Lesson #5, while waiting to make paper.

Conclusion:
You may want to experiment with the steps for making paper and discuss the resulting product. Students can add more or less pulp, food colouring, sparkles, thread, flowers, or a variety of other materials to the pulp to make more creative sheets of paper.

Background Information:
Evidence shows that the Chinese used old chopped-up fishing nets to make the world's very first paper. Three hundred years later, around 100 A.D., a Chinese scholar and government official named Ts'ai Lun made paper out of tree bark and scraps of linen and hemp. Because he documented his invention, Ts'ai Lun is generally known as the man who "invented" paper. The art of papermaking was kept secret in China for centuries. It was not until 798 A.D. that paper was made outside the Orient. The process slowly spread through Africa and Europe in the 10th century, and finally reached England around 1494, two years after Columbus sailed to America.
Making Paper

1. First, tear up about 1 cup of toilet tissue into pieces about the size of a postage stamp. Place these into the blender and add enough water to cover the paper (about 1–2 cups should do).

2. Blend the mixture for about 30 seconds.

3. Pour your pulp into the large plastic bin, and add more water until the bin is about half full. This mixture is called the slurry. Stir the slurry around with your hands — the consistency should be similar to very thin oatmeal.

4. Lower the deckle down into the slurry at about a 45-degree angle to the bottom of the bin, and then straighten it out so that it is horizontal. Swirl the deckle around in the slurry a little, so that the fibers are suspended and evenly distributed in the water. Now, with the fibers still in motion, lift the mold and deckle straight up out of the water.

5. Hold the mold and deckle over the bin so that water can drain out into the bin. As the water is draining out, gently shake the mold and deckle from side to side and forwards/backward to help the fibers settle. An even layer of pulp should cover the mesh. If you see a lot of holes return the sheet to the slurry and begin again. If the layer is too thin, you may need to make another batch of pulp and add it a little at a time until slurry reaches the desired consistency.

6. When the water has stopped draining out, remove the deckle. Open the deckle and let the top portion lie flat. Place a layer of paper towels or blotters on top and gently press out the water.

7. Using a rolling pin, firmly but gently roll to remove more water. Carefully remove the top layer of towel. Your sheet will be attached to the bottom mat — carefully peel it off and place it on a couple of dry blotters. Use an iron set to cotton (no steam) to gently dry your sheet. It is important that you press the paper with the iron, not wipe. NEVER LEAVE THE IRON ON THE PAPER, IT MAY CATCH FIRE.

8. You may SIZE (make your sheet water repellent) your paper by spraying it with starch or Scotchguard™ after it is dry.

9. Once you have mastered the technique, experiment with new materials to make and decorate your paper. Pull apart some cotton balls and add them to the slurry (real cotton, as opposed to synthetic, works best). Or try adding confetti, glitter, or dried flowers to the damp sheet before drying. Add a few drops of food coloring to the slurry to make colored paper. There is no limit to the number of different looks you can achieve.
Lesson 5 -- Paper Testing

Introduction:

The purpose of this lesson is for students to explore the various properties of paper. Paper is much more complex than most people recognize, and it is designed to meet very specific requirements. Students will explore these properties by conducting several simple experiments. Note: teachers may want to do this lesson in conjunction with Lesson 4 -- Making Paper. Paper samples are also available for Howe Sound Pulp and Paper's Community Relations.

Development:

1. Materials needed: class set of "The Properties of Paper" activity sheet, class set of various types of paper (at least 3 different types -- ie towel paper, writing paper, butcher paper), markers, eyedroppers, and small water containers.

2. Ask student to answer the questions on "The Properties of Paper" worksheet.

3. As a class, go through the students' results. Why were some samples better for writing, tearing, or absorbing than others? Why does this make sense (it is what they were engineered for)?

Conclusion:

As a class discuss the results of the experiment. Why did students have different answers to some of the questions (ie personal interpretation of words such as "easiest" or "best].

Background Information -- Fast Facts

Canada's forest products industry is now a $40 billion business directly and indirectly employing 1,007,000 people. It is also the biggest net contributor to Canada's international trade balance - $50 billion - a figure which represents about two times that of the next largest sector.

A small Eastern Canadian Black Spruce tree with a 6-inch diameter at breast height could make over 12,500 sheets of 10 millimeter weight 8.5 x 11-inch bond writing paper. Or, it could make 22,500 20 bills instead.

Canada is the world's largest supplier of paper grade market pulp, accounting for 29 percent of the global capacity in 1998.
The Properties of Paper

Task #1

1. Tear each of the paper samples in half.

2. Which sample was the easiest to tear? ________________________

3. Which sample was the hardest to tear? ________________________

4. Look at the edges of each tear -- are they all the same? ____________

Task #2

1. With the felt pen, write your name on each of the samples.

2. Which sample is the best to write on? ________________________
   Why do you think it is? ________________________

3. Which sample is the worst to write on? ________________________
   Why do you think it is? ________________________

Task #3

1. Put a drop of water on each sample.

2. Which sample absorbed the water the fastest? ________________

3. Which sample absorbed the water the slowest? ________________
   Why do you think the samples were different? ________________
Extension Activities

To extend your students experiences considering the following extensions activities:

1. Take a mill tour of Howe Sound Pulp and Paper -- contact Community Relations to arrange your tour for grades 5 and older.


3. Have your students write a story about how they think they will be using paper when they are 50!

4. Create a paper time capsule -- decide what kinds of paper you would put in that would tell people 100 years from now what life was like during the early 21st Century!

5. Visit your local recycling center and take an inventory of all the different types of paper that are recycled in your community.

6. Have your students debate what the most important use of paper in the world is.

7. Visit these cool websites for more information:
   www.cppa.org  Canadian Pulp and Paper Association
   www.tappi.org/paperu/welcome.htm  TAPPI
   forestsforourfuture.org/welcome.htm  Forest are our Future
Pulp & Paper School
Intermediate Lessons

Unit Feedback

We would appreciate any feedback you could give us about your experience with the Pulp & Paper School. Please circle the number that represents how strongly you agree with the following statements — 5 = strongly agree       1 = strongly disagree

1. The lessons and activities in this unit helped my class study natural resources in BC.
   5 4 3 2 1

2. The lessons and activities in this unit followed a logical sequence that helped students gain knowledge about BC’s forests.
   5 4 3 2 1

3. The lessons provided enough background for teachers in terms of explaining industry terms and statistics.
   5 4 3 2 1

4. Student activities encouraged students to think about forest and how it is used.
   5 4 3 2 1

5. Student activities challenged students to rethink their beliefs and opinions in relation to the forest industry.
   5 4 3 2 1

6. The activities encouraged students to use various science skills such as observe, hypothesise, classify, and follow detailed directions.
   5 4 3 2 1

7. Comments: Please tell us about lessons you would like to see in this unit, resources you would find valuable, or any other information you would like us to know. 

   ____________________________
   ____________________________
   ____________________________
   ____________________________
   ____________________________

Optional: Name: ___________________ School: ___________________

Thank you for your time!

Please mail to:
Community Relations
ESFP
Port Mellon, BC
V0N 2B0