

Summary

This lesson focuses on how biotechnology is being used in our forests today. Using a timber-theft crime story and additional information, students will complete a profile to assist them in understanding how biotechnology techniques can be used.

Through this role-play activity you and your class will see how biotechnology can be used as a tool to help maintain forest biodiversity.

Activity Info



Level: Grade 7

Subject: Life Science, Interactions with Ecosystems, Geography, Natural Resources

Estimated Duration: 30 minutes discussion, 30 minutes CSI Form and Profile, 30 minutes wrap-up

Materials: paper, pencils/pens, activity worksheets, story.

Learning Outcomes

Students will:

- Identify some positive and negative effects and intended and unintended consequences of a particular scientific or technological development.
- Describe the science underlying particular technologies designed to explore natural phenomena, extend human capabilities, or solve practical problems.
- Identify the importance of plants on the Canadian economy and describe the impact of the industrial use of plants on the environment.

Teacher Background

Biotechnology is the short form for biological technology. It involves the use of living

organisms, or parts of living organisms, to provide new methods of production, make new products and to find new ways to improve our quality of life.

Scientists with the Canadian Forest Service are researching many forms of biotechnology that may have the potential to improve our forest communities. Biotechnology researchers can identify different trees that are resistant to insect pests and disease. For example scientists can identify spruce trees that have a natural resistance to the spruce weevil. Understanding this natural resistance may give us another tool in protecting forests from insect infestations.

Scientists are also using biotechnology to identify disease-stricken trees. By using a highly sensitive deoxyribonucleic acid (DNA) amplification technique, researchers can detect a single infected seedling among a thousand healthy seedlings. By removing the sick seedling, the disease is unable to spread, and the other seedlings stay healthy.

Current research in forest science focuses on improving trees through genetic engineering, protecting forests with biological pest control methods and assessing the environmental impacts of biotechnology-derived products.

Biotechnology is even being used to catch thieves. Scientists are developing a way to match the DNA in suspected stolen logs with the DNA from the stumps of illegally cut trees. Before the development of this technology foresters had to look at the physical characteristics of the logs and stumps, trying to match growth rings and tree diameter, to catch the thieves.

Western red cedar is an important species in British Columbia's coastal forest. In fact, it has been the cornerstone of the northwest coast Aboriginal culture and is British Columbia's provincial tree. Traditionally, western red cedar was used to make canoes, totem poles, clothing, mats, baskets, nets and medicine. Today it is used for outdoor furniture, house siding, decking, shingles and fencing.

Many wildlife species are dependent upon British Columbia's western red cedar forests such

as pileated woodpecker, stellar jay, bald eagle, peregrine falcon, grizzly bears, black bears, mink, fox, spotted owl, Roosevelt elk and the western mountain cougar.

Harvesting western red cedar is common in certain areas of British Columbia, but quotas are strictly enforced. The chief forester sets harvest levels by completing detailed technical reviews which consider conservation, jobs, forest growth rates and more. To help conserve important wildlife habitat and biodiversity, harvesting restrictions and no-harvest zones are designated when necessary.

Procedure

Step 1

Explain to the class that they will become Bio-Detectives, role-playing an investigation of a forestry-related crime.

Step 2

Begin by discussing with your students how they think detectives solve crimes. You can help them by asking questions such as:

- What information do detectives need to gather to investigate and solve a crime (fingerprints, footprints, tire tracks or physical evidence)?
- What tools do detectives use to help them solve these crimes (interview suspects and witnesses, look for corroborating evidence)?

Step 3

Divide the class into five Bio-Detective teams.

Step 4

Hand out copies of the *Western Red Cedar Caper*, and the Crime Scene Investigation and Victim Profile sheets.

Step 5

Ask one of your students to read the *Western Red Cedar Caper* out loud to the class. Have each Bio-Detective team work together to complete the Crime Scene Investigation sheet and answer the questions on the Victim Profile sheet.

Step 6

Once the groups have completed the Victim Profile sheets, bring the class together and review the results.

- Did everyone discover the same things?
- What was different?
- What were some of the key factors needed to solve the crime?

Step 7

Discuss with the class ways that biotechnology is improving or helping our forests and our way of life. Do they have an opinion on the usefulness of biotechnology?



Extensions

- There have been media reports about incidents of tree theft in British Columbia. Ask your students to find an example and relay their news story to their classmates.
- The Model Forests of Canada are continually doing research on harvesting techniques that attempt to do as little damage to habitat as possible (they call it sustainable forest management). Ask your students to search the Web site and complete a one page report on an interesting project being completed on a Model Forest.

Model Forest Network
www.modelforest.com

Biotechnology in Canada
<http://www.nrcan-rncan.gc.ca/cfs-scf/science/biotechnology/>

The Western Red Cedar Caper

It was the third Tuesday in November of 2000, when my partner and I got the call. I remember it well, as we had just left our favourite coffee spot and I was complaining about the weather. It was raining again! It had been raining for the last week now and I was already tired of the damp, overcast season that was upon us. Winter in Vancouver, British Columbia is always overcast, rainy and cool, and that day was the worst yet. At only 10 C, the rain seemed to go right through my bones.

Another suspicious load of timber had been found abandoned, still on the truck bed, on a south-bound pull-off area, on Hwy 99, about 30 km south of Squamish. We arrived at the scene at 4:15 a.m. and there were a number of people milling about. My partner and I have seen this too many times. Our hearts sank as we looked at the victims -

10 huge western red cedar logs. Based on the average diameter of these logs (50 cm) these trees would have been between 50 to 60 meters in height. Harvesting B.C.'s western red cedar forests is highly regulated and these trees had been illegally taken.

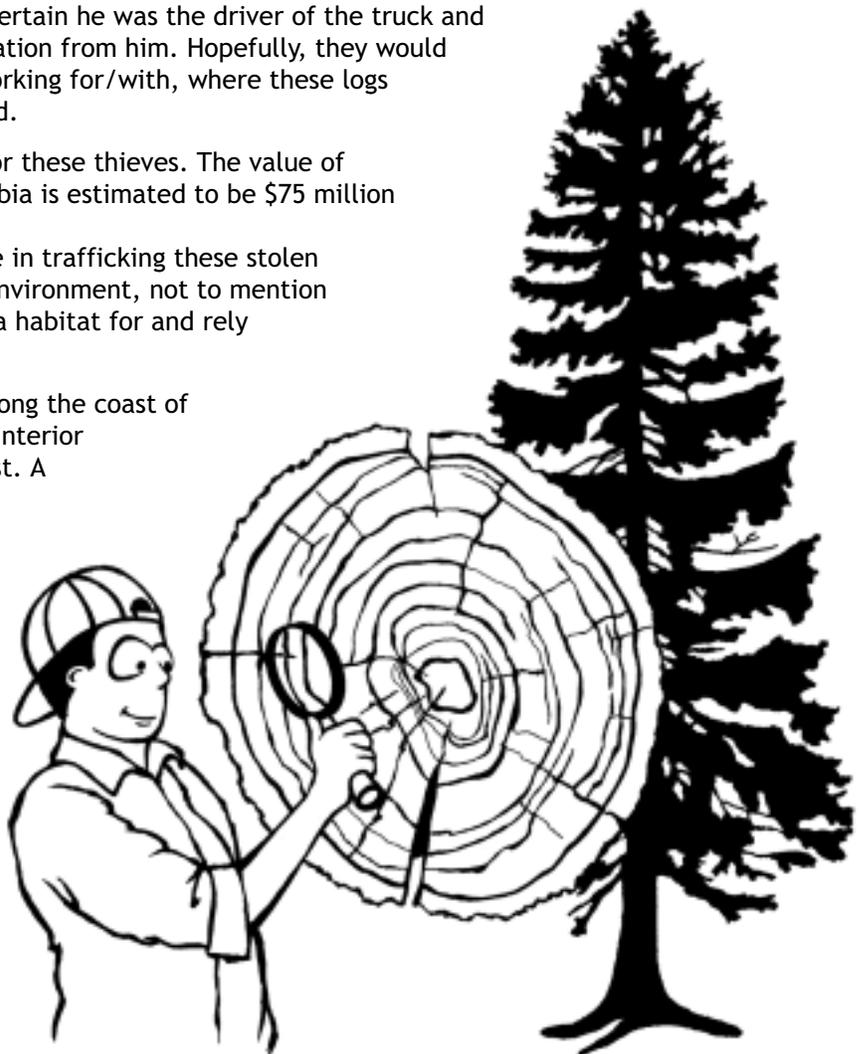
The RCMP had picked up an individual who was walking down the highway close to where the logs were found. They were certain he was the driver of the truck and were in the process of collecting information from him. Hopefully, they would obtain information about who he was working for/with, where these logs came from, and where they were headed.

There is no question about the motive for these thieves. The value of timber stolen each year in British Columbia is estimated to be \$75 million to \$150 million. There is money to be made in trafficking these stolen goods, but at an incredible cost to our environment, not to mention the wildlife species these trees provide a habitat for and rely upon.

Western red cedar are typically found along the coast of British Columbia, in the wet belt of the interior where the climate is cool, mild and moist. A mature red cedar can reach 60 meters in height with a trunk that can spread out quite wide at the base. The bark is grayish and stringy, and tears off in long strips on mature trees.

When my partner and I returned to the office, we did a Web search and discovered that the Department of Forestry had located a fresh 40 acre cut of an old growth stand. The location was about 100 km directly south of Bella Coola and approximately 40 km east of the coastline.

Now we had to match the victims to the crime scene.



Crime Scene Investigation Sheet

Name of Investigators: _____

Date of Crime: _____ Time of Investigation: _____ a.m. p.m.

Environmental Factors: Weather (circle one) sunny, partial cloudy, overcast

Temperature: _____ Precipitation: _____

Location & Description of Crime Scene: _____

Location of Victim(s) (if different from the crime scene): _____

Collecting evidence:

1. What steps or procedures can we use to connect the victim(s) to the crime scene? List at least four examples (Hint: think of what detectives use today to solve any type of theft crimes):

- a. _____
- b. _____
- c. _____
- d. _____

2. Why do you think the crime happened? What was the motive? _____

3. How will this crime affect plants and animals left behind in the habitat? _____

4. Explain why this event is considered a crime. How it is different than regular logging practices?

Victim Profile

Name of Victim(s): _____

Number of Victims: _____

Description of Victim(s): height: _____ diameter: _____

Colour of Bark: _____ Texture of Bark: _____

Age: _____ (approximately)

Habitat/Home (description, location): _____

What other species in this forest depend on the victim(s) for their survival?
Explain how those species are dependent on the Victim(s):

Birds: _____

Mammals: _____

Plants: _____

Insects: _____
