

A NATIONAL FILM BOARD OF CANADA RELEASE

# PERSPECTIVES IN SCIENCE



Teacher's  
Guide

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Products and Services**

**TEACHER'S GUIDEBOOK**

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The Word &amp; Image Studio

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National Film Board of Canada  
Office national du film du Canada

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Designed for junior and senior  
secondary school students,

## **PERSPECTIVES IN SCIENCE 2**

will help you:

- deliver your lesson material;
- develop critical thinking  
in your students;
- encourage discussion; and
- build students' problem-  
solving skills.

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**A cross-curricular  
video series  
exploring  
science,  
technology  
& society**

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This set of three videocassettes on

## 1 Forestry

## 2 Soil

## 3 Air

presents current issues in a modular structure designed to facilitate learning through lively discussion.

Each cassette is composed of five “chapters”:

1. A drama (**Forestry, Soil**) or animated short (**Air**), followed by...
2. Discussion
3. Analysis
4. Perspectives
5. Alternatives

Chapters 2-5 are each divided into three short modules – Science, Technology and Society – with each section presenting documentary viewpoints of Canadians involved in related aspects of the topic.

Intended to complement your school’s science curriculum, each video can be viewed in segments appropriate to your lesson plan.

### Suggestions for use:

- View the drama or animated short to discover critical concerns, then proceed to a discussion of possible solutions by viewing Chapter 5: Alternatives.
- Examine impacts on society by viewing the Society segment of each chapter.
- Examine perspectives of Science, Technology and Society in a single chapter.
- Select individual segments to support your lesson plan.

## HOW TO USE THIS GUIDE

This guidebook has been designed to help you to:

- Present appropriate segments of the three videos in this series by identifying the **KEY POINTS** within each segment.
- Prepare a class activity to illustrate important points by suggesting a cross-curricular **LESSON PLAN** that can be used to develop students' skills in critical thinking, discussion/debate, independent research and cooperative problem-solving.

For each of the three videocassettes – **Forestry, Soil, Air** – there is an introductory description of the drama or animated short portrayed in Chapter 1, followed by key points for Chapters 2 through 5. Each chapter is broken down into three segments, with suggested lesson plans.

The segments of each chapter are identified by these symbols & headings:

**SCIENCE****TECHNOLOGY****SOCIETY**

Each suggested lesson plan is applicable not only to the specific heading it accompanies, but also as a cross-curricular tool that can connect science to social studies, for example, or technology to economics.

Finally, forestry-, soil- and air-related resources are listed at the end of the appropriate video section, including:

- Recommendations for further reading or research;
- Other video titles available from the NFB;
- Community groups, organizations and government agencies that may be contacted for additional information.

The inside back cover of this guidebook lists other products available from the National Film Board of Canada. We would be happy to provide your school with details about other programs in our educational series. Contact our regional sales offices, listed on the back cover, for further information.

**Chapter 1: Drama — GOOD LOGGING IS NO CRIME\***

This drama portrays a government forester's dilemma when faced with having to choose between short-term profits and environmental sustainability.

When a small logging community's local mill applies for a cutting licence, the forester must consider the community's economic realities and the future of its resource base.

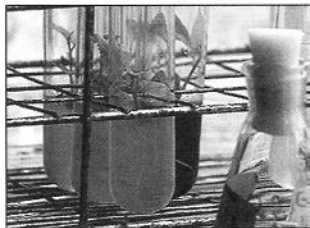
**Chapters 2-5** explore:

- Diversity;
- Natural succession;
- Energy flows;
- Clonal propagation;
- Soil protection;
- The scientific community's responsibility for ongoing research into forest ecosystems.



Foresters apply the research in the development of:

- Silviculture plans;
- Fisheries and wildlife protection strategies;
- Site preparation;
- Harvesting operations;
- Post-harvest treatments.



Alternatives to clear-cutting, such as selective logging with horses, are examined together with initiatives to establish integrated approaches to sustainable development that involve all members of society.

\*Producer: Julie Stanfel

**SCIENCE**

Herb Hammond, *SILVA Ecosystem Consultants Limited*  
Dr. Hamish Kimmins, *University of British Columbia Forest Sciences Department*

**KEY POINTS:**

- Diversity – the word that describes forests best.
- Forests are subject to constant change.
- Human intervention (such as cutting down forests to create farmland or harvesting for timber) is a major factor that initiates change.
- Natural succession: seed germination, the food chain, and plants adapting to a particular climate and conditions create a diverse forest which is stable in its diversity.

**TECHNOLOGY**

Marcel Rivard, Peter Bradford, Dave Bishop, *MacMillan Bloedel Limited, Sprout Lake Division*  
Kurt Raynor, *Software Development Supervisor, MacMillan Bloedel Limited*

**KEY POINTS:**

- How to prepare a 'pre-harvest silvicultural prescription':
  - Walk through the site;
  - Locate the timber;
  - Identify any pests and diseases;
  - Examine other plants and shrubs to determine soil condition and moisture content;
  - Prepare a plan for logging and post-harvest treatment;
  - Decide where logging roads are needed;
  - Consider aesthetics: use landscape or viewscape management to maintain an appealing view once the timber has been harvested;
  - Consider other resources such as wildlife habitat.

**SOCIETY**

Vicky Husband, *Environmentalist*  
Chief Earl Maquinna George, *Chief, Abousat Nation*

Steve Lawson, *Environmentalist*  
Peter Webster, *Elder, Abousat Nation*

**KEY POINTS:**

- The ancient forest belongs to all of us; we are all responsible.
- Clear-cut logging damages the environment by causing soil erosion and sediment flow into streambeds and by adversely affecting wildlife habitat.
- The environment is ours in trust; we must respect it.
- Communities should collect information and gain knowledge in order to become better stewards of the environment.



## LESSON PLAN

**Discuss this statement:**

*"The forest is stable in its diversity."*

Why is it important to preserve that diversity?



## LESSON PLAN

**I. ANALYZE 2. PLAN 3. TAKE ACTION**

How can this 3-step process be applied to an improvement project in your community, such as a park/playground/public pavilion?

**Ask students to work in small groups to apply the 3-step process to their chosen project.**

- Which authorities would be involved?
- Who should be asked for advice and approval?
- What barriers might the project encounter?
- How would students encourage cooperation?



## LESSON PLAN

What are some ways that communities can collect information to become more knowledgeable about environmental conservation?

**Ask the students to brainstorm a list of resources. Once the list is compiled, have each student select one resource and do a follow-up (write a letter, consult a professional, visit the library). At a subsequent class, pool the information in a 'Conservation Checklist' or handbook.**



**SCIENCE**

Dr. Hamish Kimmins, *University of British Columbia Forest Sciences Department*

**KEY POINTS:**

- How forests grow: the importance of photosynthesis.
- The role of decomposition in nutrient production.
- Other factors contributing to the ecosystem: climate, soil, water.

**TECHNOLOGY**

*Employees of MacMillan Bloedel Limited:*

Bernie Waatainen, *Alberni Woodlands Forestry Department*

Ron McLaughlin, *Wildlife Biologist*

Terry Rollerson, *Soil Scientist*

Bill Pollard, *Resource Data Co-ordinator*

Dave Bishop, *Wildlife Biologist*

**KEY POINTS:**

- Forest management for the purpose of timber harvest should also include consideration for wildlife habitat and other parts of the forest environment.
- When planning timber harvests, MacMillan Bloedel also conducts studies of wildlife habitat, including elk, deer, eagles, trout and salmon.
- Taking responsibility: working with government agencies to develop guidelines that employ sound management techniques for timber harvest while protecting other resources.

**SOCIETY**

Dr. Dave Brand, *Director, Environment, Natural Resources Canada*

Anthony Ritchie, *Development Analyst, Natural Resources Canada*

**KEY POINTS:**

- Networking: the importance of forming partnerships for the benefit of all; government programs that encourage networking.
- Working toward thoughtful stewardship of our forests by considering other resources of equal value. What's important to us?
  - Preservation of animal and plant species and their habitats;
  - Water quality;
  - Cultural values;
  - Employment.
- The goal of Tree Plan Canada: To encourage people to get involved at the community level (children and their parents, Scouts and other youth-oriented organizations, religious organizations).





## LESSON PLAN

Have the students apply the concept of energy flow to their choice of:

- Their own backyard;
- The community park;
- A local 'natural area.'

**Draw a diagram illustrating the circular nature of energy flow according to their findings.**



## LESSON PLAN

What does it mean to take responsibility for one's actions?

**Discuss the concept of cause-and-effect in other areas of science:**

- **Medicine;**
- **Biotechnology;**
- **Computer technology.**



## LESSON PLAN

**NETWORKING –**

**Discuss the benefits** of having people from different communities and diverse backgrounds work together.

**Brainstorm** ways to get the following groups working together to create an environmentally thoughtful community:

- Residents;
- Schools;
- Religious organizations;
- Service clubs or community centres;
- Municipal government;
- Local businesses.

**SCIENCE**

Dr. Trevor Thorpe, *University of Calgary, Department of Biological Sciences*

**KEY POINTS:**

- Methods of replacing trees cut for timber:
  - Natural regeneration – a slow process;
  - Clonal propagation – guaranteeing superior plant stock.
- Clonal propagation is still at an experimental stage.
- Requirements must parallel those of the original specimen:
  - Mineral elements;
  - Sugar;
  - Vitamins;
  - Amino acids;
  - Plant hormones.

**TECHNOLOGY**

*Employees of MacMillan Bloedel Limited:* Sandy Maher, *Nursery Superintendent*  
 Diane Nicholls, *Tree Improvement Supervisor* William Beese, *Forest Ecologist*  
 Norm Crist, *Manager, Silviculture & Nurseries, Northwood Pulp and Timber Limited*

**KEY POINTS:**

- Preparing a silvicultural plan:
  - Examine the planting site to determine desired stock type;
  - Use seed that genetically matches the planting site;
  - Create conditions for pollen clouds and cross-breeding at a seed orchard;
  - Produce seedlings for regeneration;
  - Prepare the site for planting;
  - Monitor results.

**SOCIETY**

Dirk Brinkman, *President, Brinkman & Associates Reforestation Limited*  
 Ken Georgetti, *President, B.C. Federation of Labour, CLC*

**KEY POINTS:**

- Economics: traditionally the driving force behind decision-making in the forestry industry.
- Changing corporate attitudes with a new view: planning for the future with a sound restocking plan.
- 'Value-added': rather than exporting raw logs, enhance their value by manufacturing quality products in Canada before export.



## LESSON PLAN

**FIELD STUDY**

Plan a **1. Guest Speaker** (*conservation authority, local industry*)

*OR 2. Field Trip* (*greenhouse, tree nursery, research laboratory*) to expose your students to some innovative research taking place in or near your community.



## LESSON PLAN

**SITE PREPARATION BY BROADCAST BURNING –**

How does burning work to prepare the planting site?

**Ask students to research the effects of fire on vegetative growth.**

Name some alternate methods of site preparation.



## LESSON PLAN

**SPIN-OFF BENEFITS OF 'VALUE-ADDED' –**

**Brainstorm** ideas for products that could be manufactured from timber.

**Identify** the jobs, industries and other areas that would be favourably affected.

**SCIENCE**

Herb Hammond, *SILVA Ecosystem Consultants Limited*

Dr. Hamish Kimmins, *University of British Columbia Forest Sciences Department*

**KEY POINTS:**

- Elements of ecologically sound management extend beyond the boundaries of science to include:
  - Moral values;
  - Ethical standards;
  - Thoughtful stewardship;
  - Contributions from political and economic institutions.

**TECHNOLOGY**

Doug Gook, *Horse Logger, Cariboo Horse Loggers' Association*

**KEY POINTS:**

- Benefits of logging with horses:
  - Ability to harvest suitable timber while retaining younger specimens for the future;
  - Preservation of older trees and other plant species that will contribute to the forest base;
  - Maintaining diversity in the forest stand: important for healthy balance of plant and animal species;
  - Retention of organic matter: a valuable source of nutrients and moisture for the developing forest.

**SOCIETY**

Wayne McCrory, *McCrory Wildlife Services*

**KEY POINTS:**

- Damaging effects of clear-cut logging over a brief time span:
  - Elimination of grizzly bear habitat.
- Importance of better logging and landscape management.
- Wilderness preservation as a sound economic solution:
  - Popularity and accelerated growth of wildlife-oriented tourism and its potential contribution to Canada's income and employment.



## LESSON PLAN

**Discuss the statement:**

*"Science cannot give you moral values."*

How can society reconcile scientific advances with ethical standards? What does it take to be 'good stewards of the land'?



## LESSON PLAN

*It's been said that much has been sacrificed in the name of progress. Logging with horses represents a shift in technology, back to the way that things used to be done.*

Is 'faster always better'? How do we decide?  
Who should decide?



## LESSON PLAN

*Wildlife-oriented tourism is recognized as being both popular and of enormous economic benefit.*

Why else do we need to preserve the wilderness?

For free publications and more information about scientific and technical aspects of Canadian forests and forestry, contact:

Northern Forestry Centre, 5320-122 Street, Edmonton, Alberta T6H 3S5  
Telephone 403-435-7210, Fax 403-435-7359

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These publications may be ordered, for cost of materials, from the Ontario Ministry of Agriculture, Food, and Rural Affairs:\*

**Best Management Practices series**

*Farm Forestry and Habitat Management*, Ontario Ministry of Agriculture and Food (no publication number or date)

*Fish and Wildlife Habitat Management*, Ontario Ministry of Agriculture, Food and Rural Affairs, ISBN 0-7778-4906-2, 1996

**Factsheets**

*Planting and Maintaining Field Windbreaks*, Order No. 90-057, February 1990, AGDEX 572

*Planting Trees in the Landscape*, Order No. 89-115, May 1989, AGDEX 275

**\*Contact:**

Publications Order Desk, OMAFRA, 1 Stone Road West, Guelph, Ontario N1G 4Y2  
Telephone 519-826-3700

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**Books**

*Diversity: Forests, People, Communities*, The Report of the Ontario Forest Policy Panel, Queen's Printer for Ontario, Toronto 1993

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**Newsletters**

*Sawmill & Woodlot Report*, Ontario Woodlot and Sawmill Operator's Newsletter, edited and published by Ontario Woodlot & Sawmill Operators Association, Box 599, Dickinson Street, Manotick, Ontario K4M 1A5

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**Related videos from the NFB**

*Blockade: Algonquins Defend the Forest* In 1989, the Algonquins of Barriere Lake took on the government and the logging industry in a struggle to save their traditional hunting grounds. A film that raises important questions about our attitudes towards the environment and the exploitation of natural resources. 27:00 Order number: C9190 092

*Great Northern Forest* The vast boreal forest is the largest ecosystem in North America. Through superb photography, the film makes clear that much of this beauty and magic is threatened by uncontrolled logging, toxic chemicals and global warming. 48:00 Order number: C9194 016

*Trouble in the Forest* Hosted by David Suzuki, this compelling film examines the problem of acid rain, including the frightening phenomenon of forest dieback, and proposes some solutions. 47:00 Order number: C0188 078

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**Other sources**

Federal government offices such as Environment Canada and Agriculture Canada. Consult the blue pages of your local telephone book for office locations and toll-free numbers.

Also check Internet sites related to Sustainable Development and Forestry.

**Chapter 1: Drama – A LAST CROP OF HOUSES\***

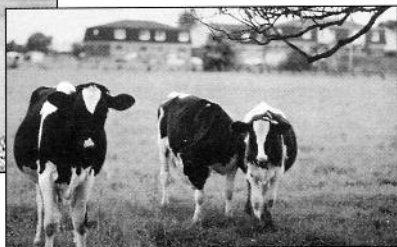
This drama focuses on the sale of a family farm to suburban real estate developers – a common occurrence in today's agricultural scene. Father and son strongly disagree on the ethics, effects and economics of the sale. Can their diverging opinions be resolved? Is there a way to preserve the family farm?

**Chapters 2-5** investigate:

- The development and use of farm equipment;
- Strategies and technologies for:
  - Soil preparation;
  - Seeding;
  - Crop management;
  - Crop yields.

Alternatives to established farming practices, such as organic farming and the use of horse-driven equipment, are examined in the light of research pertinent to soil degradation, sustainability and the needs and expectations of society.

\*Producers: Julie Stanfel, Tim Latchem







## SCIENCE

Dr. Donald Rennie, *Dean Emeritus, College of Agriculture, University of Saskatchewan*  
 Ken Perl, *Department of Environmental Sciences, Lethbridge Community College*

### KEY POINTS:

- “Soil is a living body.”
- Soil composition; importance of organic content.
- Loss of organic matter leads to poor structural integrity of the soil.
- In western Canada, water is the key to production. ‘Water-efficient’ farming practices – such as working crop residues into the soil – assist in water retention by adding organic matter.



## TECHNOLOGY

Ken McEwen, *Irrigation Farmer, Saskatchewan*    Robert Menzies, *Dryland Farmer, Saskatchewan*  
 Brian Fowler, *Dryland Farmer, Saskatchewan*    Mick Gould, *Dryland Farmer, Saskatchewan*

### KEY POINTS:

- Matching farming practices to soil requirements:
  - Seed earlier or grow shorter-season crops on lighter lands; till as little as possible.
  - Grow grains and cereal crops on heavier lands, for moisture retention throughout the growing season.



## SOCIETY

Neil Strayer, *Organic Farmer, Saskatchewan*  
 Elmer Laird, *President, Canadian Organic Producers Marketing Co-operative Limited*

### KEY POINTS:

- Soil fertility is directly linked to organic content: **soil fibre**, which, in turn, influences soil’s ability to retain moisture.
- Definition of **organic farming**: farming without the use of agricultural chemicals or pesticides.
- Methods and benefits of organic farming:
  - Growing legumes to increase nitrogen and essential trace minerals, contribute fibre, improve soil tilth;
  - Keeping livestock; enriching soil with manure;
  - Crop rotation for weed control, pest control and increased fertility.



## LESSON PLAN

**Discuss this statement:**

*“Soil is a living body.”*

Why is organic content important?



## LESSON PLAN

Agriculture is not simply a matter of planting seeds and, later, harvesting crops. Why is soil such an important factor?

**Ask the students to research the differences between sandy soil and clay loam.** What are the essential requirements of each? What is the one element that can be used to add body to sandy soil *and* produce lighter, more friable soil in a clay belt?



## LESSON PLAN

**ROLE-PLAY OR DEBATE –**

*Farming with chemical additives was introduced as an effective means of problem-solving – killing weeds, amending depleted soil with fertilizers, etc. But some of these benefits have been outweighed by negative effects. Organic farming has been recognized as a solution to these negative effects but it, too, has its difficulties.*

**Divide the class into 2 groups. Assign a farming method to each group, asking them to research the pros and cons of their method. Then have each group select a spokesperson and stage a role-play or debate.**

**SCIENCE**

Senator Herb Sparrow

Dr. Richard Coote, *Land Resource Research Centre, Research Branch, Agriculture Canada*

Bryan Yusishen, *Land Resource Specialist, Manitoba Agriculture*

**KEY POINTS:**

- Soil degradation and associated problems:
  - Erosion;
  - Acidification;
  - Compaction;
  - Loss of organic matter;
  - Devastating effects of mining and oil industries;
  - Loss of topsoil through urban encroachment.
- Research into soil movement (wind, water runoff, tillage equipment).
- Remote sensing as a soil assessment tool.
- Ultimate goal: recommendations for sound soil management practices.

**TECHNOLOGY**

Brian Fowler, *Dryland Farmer, Saskatchewan*

Mick Gould, *Dryland Farmer, Saskatchewan*

Ken McEwen, *Irrigation Farmer, Saskatchewan*

Dennis Erickson, *Mixed Farmer, Saskatchewan*

**KEY POINTS:**

- Improved tillage and seeding methods are essential to conserve soil.
- Equipment geared toward these new methods is very expensive and beyond the reach of the average farmer; a co-operative arrangement among farmers, conservation clubs, or demonstration groups could be the answer.

**SOCIETY**

John J. Kiss, *Executive Manager, Saskatchewan Soil Conservation Association*

Graham Dorn, *Soil Conservation Specialist, Saskatchewan Agriculture and Food*

Jim Tokarchuk, *Chief, Soil and Water Management, Manitoba Agriculture*

Donald Lobb, *Conservation Farmer, Ontario*

Galen Driver, *Soil and Water Management Branch, Ontario Ministry of Agriculture and Food*

**KEY POINTS:**

- Government programs to encourage soil conservation:
  - Establishing shelter belts;
  - Seeding grass and forage crops;
  - Improved tillage systems.



## LESSON PLAN

Where is our topsoil going?

**Ask the students to work together to make a sketch illustrating soil movement**

*(natural effects such as wind and water, human intervention such as road-building, urban development, thoughtless agricultural and industrial practices)*. For every point they illustrate, discuss a possible solution to prevent loss of topsoil.



## LESSON PLAN

Is co-operative farming a feasible alternative?

**Discuss this notion** in the context of early Canadian pioneers and modern-day communal cultures such as the old-order Mennonites of Ontario and the Amish of Pennsylvania.

**Research examples** of co-operative farming currently practiced in Canada and in other countries.



## LESSON PLAN

**GUEST SPEAKER –**

Is there an active conservation group in your community? What are its concerns, activities and projects?

**Ask the students if there are any conservation activities that they are currently involved in.**

What can each of us do, as members of a community, or by working together in groups?

**SCIENCE**

Harry Pietersma, *Co-ordinator of Interpretation, Upper Canada Village, Ontario*  
 Tom Brown, *National Museum of Science and Technology*

**KEY POINTS:**

- Introduction of mechanized farming following the pioneer years.
- Far-reaching effects of mechanization.

**TECHNOLOGY**

Dr. Walter Bilanski, *Ontario Agricultural College, University of Guelph*  
 Bill Verspagen, *Technician, School of Engineering, University of Guelph*  
 Russell Memory, *Manager, Air Seeder Department, Flexi-Coil Ltd.*  
 Jim Halford, *President, Valcon Equipment*

**KEY POINTS:**

- Soil type influences development of farm machinery, including:
  - Plow;
  - Diskers;
  - Seed drill;
  - Tillage equipment.

**SOCIETY**

*Members of the Leeds County Draft Horse Association:*

Robin Philips	Sheila Philips	John Male
Elswood Gamble	Aden Freeman	Ruth Freeman

**KEY POINTS:**

- There is a new trend toward old-style farming with draft horses instead of modern mechanized equipment.
- Benefits include:
  - Lower cost;
  - Being more closely involved with your work;
  - Less soil compaction;
  - Ability to work areas that are inaccessible by tractor;
  - Horses gain experience; machinery depreciates;
  - Aesthetic enjoyment of being 'close to the land.'



## LESSON PLAN

**MACHINES – FROM PAST TO PRESENT**

Ask each student to trace the development of a 'machine' of their choice (e.g. in music: Victrola, hi-fi, stereo, cassette deck, CD player; or wheeled conveyance: unicycle, bicycle, early automobile, the latest sport utility vehicle). Do early models still exist? Can they be used? Are they practical? A novelty? Are they feasible alternatives to their modern counterparts? Compare answers.



## LESSON PLAN

**DEBATE –**

- (a) *The world's population needs agriculture to survive. We need to invent more equipment that works faster and better.*
- (b) *Why attempt to make technological improvements in agricultural equipment? We should all go back to the 'gentler' farming practices of early pioneers.*



## LESSON PLAN

*Working with animals – whether in farming or any other occupation – involves ethical questions in terms of their proper care and treatment.*

**Discuss the repercussions of using animals as a labour force.** What might be some guidelines for their care?



## SCIENCE

Ken Perl, *Department of Environmental Sciences, Lethbridge Community College*  
Senator Herb Sparrow

### KEY POINTS:

- To find lessons for the future, we should look to the past.
- Ancient cultures made great strides in the arts, communication, philosophy and science while their agriculture flourished. The decline of these empires corresponds to the decline of agricultural resources. As soil fertility diminished, so did their prosperity and growth.
- It will take national will to rebuild Canada's precious soil resource.



## TECHNOLOGY

Ken McEwen, *Irrigation Farmer, Saskatchewan* Brian Fowler, *Dryland Farmer, Saskatchewan*  
Dennis Erickson, *Mixed Farmer, Saskatchewan*

### KEY POINTS:

- Current decline of farming in Canada:
  - Impact of low grain prices;
  - Rising cost of farm supplies, fuel and other necessities;
  - Larger operations required to meet costs; linked to economic decline of nearby towns and small communities.
- Increase in world market prices would create a healthier economic atmosphere, which in turn would encourage young people to re-establish the family farm as a viable occupation.



## SOCIETY

Mike Quinn, *Executive Co-ordinator, Prairie for Tomorrow*  
Josef Schmutz, *Biologist, University of Saskatchewan*

### KEY POINTS:

- Critical importance of the prairie ecosystem:
  - Wildlife habitat;
  - Special properties of native plants.
- "The reason we have endangered species is because we have endangered spaces."
- The Ferruginous Hawk and Burrowing Owl are examples of two endangered species whose survival depends on the preservation of original, native prairie.





## LESSON PLAN

- Ancient Greeks
- Ancient Romans
- Ancient Egyptians
- Anasazi Indians
- Aztecs

Ask the students to choose two of these advanced civilizations and find out:

1. Four facts about their agriculture (e.g. methods, crops, implements).
2. Three of their lasting contributions (e.g. pottery, architecture, philosophy, astronomy).
3. One lesson from their history that we could benefit from today.



## LESSON PLAN

*Farming is a business.*

Discuss the two ends of this spectrum.

*Farming is a way of life.*



## LESSON PLAN

*"We have endangered species because we have endangered spaces."*

Exploiting the environment for the survival of our own species has caused the extinction of many plants and animals. With a growing human population, is it possible to retain natural habitats for wildlife and still provide sustenance for ourselves?

**Arrange for a guest speaker, video viewing or field trip to learn about a group, industry, government agency or private individual who is working towards collective conservation.**

These publications may be ordered, for cost of materials, from the Ontario Ministry of Agriculture, Food and Rural Affairs:\*

*Best Management Practices series*

*A First Look: Practical Solutions for Soil and Water Problems*, Ontario Ministry of Agriculture and Food, Publication 476, 1988

*Horticultural Crops*, OMAF, ISBN 0-7778-1248-7, rev. 1993

*Integrated Pest Management*, OMAFRA, ISBN 0-7778-4495-8, 1996

*Irrigation Management*, OMAFRA, ISBN 0-7778-4497-4, 1995

*Nutrient Management*, OMAFRA, ISBN 0-7778-2684-4, 1994

*Soil Management*, OMAF (no publication number or date)

\*Contact:

Publications Order Desk, OMAFRA, 1 Stone Road West, Guelph, Ontario N1G 4Y2

Telephone 519-826-3700

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**Books**

Troeh, Frederick R., J. Arthur Hobbs and Roy L. Donahue. *Soil and Water Conservation*, 2nd Ed., Prentice Hall, Englewood Cliffs, New Jersey 07632

Lal, R. and F.J. Pierce, eds. *Soil Management for Sustainability*. 1991. Soil and Water Conservation Society, 7515 North East Ankeny Road, Ankeny, Iowa 50021

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**Kits**

*Don't Treat Soil Like Dirt: A Classroom Resource on Soil Conservation* (includes videotape and soil sample), produced by the Federation of Ontario Naturalists and Soil and Water Conservation Society, Ontario Chapter; c/o Stewardship Information Bureau, University of Guelph, Research Park Centre, 150 Research Lane, Suite 104, Guelph, Ontario N1G 4T2

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**Related videos from the NFB**

*Protecting Our Planet series* A global education series of seven 15-minute programs on two videocassettes, featuring young people from different countries taking action to effect positive change. Detailed teacher's notes are included. Order number: 193C 9192 090

*The Ecology Series* A five-volume, award-winning series exploring the importance of plants and animals in relation to the ecosystem. Includes: *Land Above the Trees*, *The Temperate Rain Forest*, *The Intertidal Zone*, *Estuary* and *Wild in the City*.

Order number: 193C 0188 105

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**Other sources**

Federal government offices such as Environment Canada and Agriculture Canada. Consult the blue pages of your local telephone book for office locations and toll-free numbers.

**Chapter I: Animated Short – DEADLY DEPOSITS\***

A humorous animated film in the tongue-in-cheek style of a hard-boiled detective story, DEADLY DEPOSITS disguises a serious lesson in the health hazards posed by poor air quality. Masquerading as a murder mystery, the film uncovers details about the harmful effects of environmental pollutants encountered daily as we live, work and breathe.

A closer examination of air pollution, its sources and environmental impact, is presented in Chapters 2-5.

**Chapters 2-5**

Analysis includes:

- Scientific techniques of atmospheric study;
- Technology's responsibility to society;
- Current efforts to regulate and control air contaminants.

An exploration of the fuel cell as a viable alternative to fossil fuel energy reveals production and cost-related hurdles yet to be overcome.

Emphasis is placed on the urgent need to develop sound energy-efficient technologies without sacrificing the health and well-being of society and the environment.

\*Producers: Julie Stanfel, Tim Latchem



**SCIENCE**

Tim Oke, *Urban Meteorologist, University of British Columbia*

**KEY POINTS:**

- Vehicles comprise the primary source of pollutants in our atmosphere; other sources are industrial and domestic.
- Carbon monoxide is a by-product of the internal combustion engine – the largest pollution source in most Canadian cities.
- Secondary pollutants result from a combination of chemicals mixing in the atmosphere; these form a plume which is absorbed into the general air flow across entire continents. As plumes add up, concentrations of pollutants worsen.

**TECHNOLOGY**

Angelo Castellan, *Environmental Advisor, Ontario Hydro*

**KEY POINTS:**

- There are three main methods of generating electricity:
  - Hydroelectric;
  - Nuclear;
  - Fossil fuel (coal, oil, natural gas).
- Fossil fuels are favoured by Ontario Hydro because:
  - They are widely available;
  - They are easily combustible.
- Using fossil fuels has environmental drawbacks because of the toxins they produce. The formation of greenhouse gases – such as carbon dioxide – has negative effects on the entire ecosystem.

**SOCIETY**

Dr. David Bates, *Professor Emeritus of Medicine, University of British Columbia*

Dr. John Molor, *Environmental Medicine*

**KEY POINTS:**

- Exercising causes one's breathing rate to double or triple: exercising out-of-doors accordingly increases one's exposure to pollutants.
- School children are particularly at risk. Air pollution can limit lung development and cause other physical ailments.
- Buildings constructed to conserve energy harbour chemical pollutants.



## LESSON PLAN

*Metropolitan areas produce pollutants that contribute to the 'megalopolitan plume.'*

Such plumes are spreading into non-industrial areas: visibility over the Grand Canyon, for example, has diminished because of pollution from Las Vegas, more than 200 miles away.

**Identify four other problem areas in the world and name a corresponding symptom for each**

*(e.g. Athens – severe deterioration of historic structures).*



## LESSON PLAN

*"The warming of the Earth will lead to some very significant shifts in weather patterns, climatic changes, the melting of ice caps – it'll throw the whole ecosystem into disarray."*

**Have the students chart a domino pattern of negative occurrences caused by the greenhouse effect.**



## LESSON PLAN

*"In the last 40 years, at least 60,000 different chemicals have been introduced into the environment...some of these can cause problems."*

What are some symptoms of chronic, low-grade exposure to toxic chemicals? **Ask the students to brainstorm a list of common household items that contain chemicals.** How many are known to be harmful? Does every item carry a warning that it may be hazardous? What are some of the warning symbols?

**SCIENCE**

Dr. Hans Martin, *Director, Air Quality Research, Environment Canada*

**KEY POINTS:**

- Human activities (driving cars, producing chemicals that evaporate into the atmosphere, generating power from power plants, using pesticides) have changed the chemistry of the Earth's atmosphere.
- It is possible to track the movement of pollutants from across the globe by measuring air contaminants.

**TECHNOLOGY**

Angelo Castellan, *Environmental Advisor, Ontario Hydro*

**KEY POINTS:**

- "We have an obligation to society to manage our environmental impacts."
- Two methods of reducing greenhouse gas emissions:
  - System measures – minimizing use of fossil fuels by utilizing nuclear, hydroelectric and other sources;
  - Technological measures – lower-sulphur fuels, energy-efficient programs.
- Sustainable development in the energy field means considering:
  - Economic needs;
  - Environmental needs;
  - Social needs.

**SOCIETY**

Dr. David Yap, *Air Resources Branch, Ontario Ministry of Environment and Energy*

Duncan Fraser, *Air Pollution Meteorologist, Ontario Ministry of Environment and Energy*

**KEY POINTS:**

- The Ontario Ministry of Environment and Energy is a government regulatory branch that monitors atmospheric contaminants.
- Common pollutants include:
  - Sulphur dioxide – impurities in the air;
  - Ozone – a photochemical product;
  - Carbon monoxide – from vehicles;
  - Nitrogen dioxides and total reduced sulphur – from pulp and paper, etc.
- The air quality index is regularly reported for public information.
- Litigation is a last resort; companies are given guidelines to assist them in controlling their emissions of atmospheric contaminants.



## LESSON PLAN

**Discuss how:**

*Human activities have changed the chemistry of the Earth's atmosphere.*



## LESSON PLAN

**ASSIGNMENT –**

**Have the students work in pairs to:**

1. Contact a local industry;
2. Define its primary product;
3. Find out what measures of environmental controls are currently in place. Is the company involved in monitoring and/or improving energy-efficiency?

**(In an area with limited industry, request a tour, invite a company representative to speak, or shift the emphasis to a regulating body: a government office or environmental control agency. How are they working with industry?)**



**SCIENCE**

Dr. Keith Prater, *Vice-President, Technology, Ballard Power Systems*

**KEY POINTS:**

- Traditionally, power has been produced by the heat engine, which burns fuels and causes the formation of undesirable air contaminants.
- The fuel cell, which runs on a combination of hydrogen and oxygen, is the basis of a new energy system which can provide power in an environmentally benign way.
- Hydrogen and oxygen are used because they are the simplest, react the most rapidly and, because no fuel is burned, do not create pollution through combustion by-products.

**TECHNOLOGY**

Dr. Keith Prater, *Vice-President, Technology, Ballard Power Systems*

Dr. Craig Greenhill, *Science Applications International, Corporation Canada*

**KEY POINTS:**

- Overcoming cost barriers by developing mass-production techniques.
- Fuel cell transit vehicle: a working demonstration of a new technology with no adverse effects on the environment.

**SOCIETY**

Honourable David MacDonald, *Professor, Environmental Ethics, Concordia University*

Mike Margolick, *Environmental Economist*

**KEY POINTS:**

- As a country that depends on fossil fuels, we are paying a high price – on a long-term basis – from an environmental point of view.
- What's required is a transition to a non-fossil fuel energy economy:
  - New methods in urban planning are geared toward increasing energy efficiency. Neo-traditional design follows basic patterns that were common in smaller towns of the pre-war and immediately post-war eras.
- The urban village model is very energy-efficient and also offers other benefits:
  - Better air quality;
  - Lower municipal taxation;
  - More affordable housing;
  - Fewer traffic problems.



## LESSON PLAN

**DISCUSSION:**

*“Is it possible for society to function using only ‘clean’ technology?”*



## LESSON PLAN

*The environment is delicate and is easily damaged by a wide range of human activities. How can individuals place less stress on the environment? **Ask the students to draw up a set of guidelines for living in a more environmentally thoughtful way.***



## LESSON PLAN

*Once again, it appears that we can learn valuable lessons from the past and apply these lessons to shape a better future.*

**Brainstorm practical ideas for gaining co-operation between various sectors of society.**

How can we bring the past and the present together for a better future? What are some other areas where this sort of collaboration would be useful?

**SCIENCE**

Dr. Hans Martin, *Director, Air Quality Research, Environment Canada*

Dr. Rob MacDonald, *Institute of Ocean Science, Fisheries and Oceans Canada*

**KEY POINTS:**

- “We have created a new environment and, largely, we don’t know what it is.”
- The role of the scientist is to identify trade-offs between economics and environmental effects; decisions are ultimately made in the political arena.

**TECHNOLOGY**

Dr. Keith Prater, *Vice-President, Technology, Ballard Power Systems*

Angelo Castellan, *Environmental Advisor, Ontario Hydro*

**KEY POINTS:**

- Renewable energy techniques need to be developed.
- The potential of fuel cells to provide power in every home in a non-polluting manner.
- “Other energy-efficiency techniques can give us some breathing space, but in the long run, we’re going to have to deal with the issues of population growth, resource utilization and our expectations.”

**SOCIETY**

Honourable David MacDonald, *Professor, Environmental Ethics, Concordia University*

**KEY POINTS:**

- The key is in changing the way people look at the world and the way in which we do things. There are things people can do – at the family level – to make a real difference.
- If we act quickly:
  - The extent of the problem will be reduced;
  - The time it lasts will be significantly shorter;
  - There will be more options of beneficial things that can be done to improve conditions even more in the future.



## LESSON PLAN

*Who should have the final word on scientific and technological advances?*

- The general population;
- Elected officials;
- Knowledgeable professionals in the scientific community.



## LESSON PLAN

*“We, as the human race, over the next few years, are going to have to seriously question whether we can continue to maintain the standard of living, the standard of energy use, that we currently have – particularly in the developed countries – while continuing to increase our population. At some point, something is going to break.”*

**Ask the students:** Is there one thing you would be willing to give up? Is it possible to give up anything at all? Would you find it easy to change your lifestyle in the way that’s required?



## LESSON PLAN

**Discuss this statement:**

*“We have the naive belief that science and technology are always improving things – but at what cost? We may have unleashed a genie that’s pretty destructive.”*

These publications may be ordered, for cost of materials, from the Ontario Ministry of Agriculture, Food and Rural Affairs:\*

### Factsheets

*Air Quality Inside Livestock Barns*, Order No. 93-001, January 1993, AGDEX 400-717

*Farm Workers' Health Problems Related to Air Quality Inside Livestock Barns*, Order No. 93-003, January 1993, AGDEX 400-717

*Odour, Noise and Dust Complaints and the Farm Practices Protection Act*, Order No. 93-097, December 1993, AGDEX 700

### \*Contact:

Publications Order Desk, OMAFRA, 1 Stone Road West, Guelph, Ontario N1G 4Y2  
Telephone 519-826-3700

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### Books

Armour, Reg and Audrey Lang. *Environmental Planning Resourcebook*. Published by Lands Directorate, Environment Canada, in association with Supply and Services Canada, Multisciences Publications Ltd., 1253 McGill College, Montreal, Quebec H3B 2Y5

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### Related videos from the NFB

*The Air We Breathe* How certain political choices and sociocultural forces have led to the growing crisis of air pollution and how certain cities are working towards change. 49:00 Order number: C9196 017

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### Resource Directories

Environmental Resources Directory (includes a listing of audio-visual resources, books, kits and pamphlets) Public Focus, 489 College Street, Suite 500, Toronto, Ontario M6G 1A5. Telephone 416-967-5211

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### Other sources

Federal government offices such as Environment Canada and Agriculture Canada. Consult the blue pages of your local telephone book for office locations and toll-free numbers.

Related films available from the NFB:

**Perspectives in Science I** Designed to foster lively discussion and learning on science and technology issues for use in Grades 7-10 Science, Social Studies, Science and Society and Environmental Studies classes. Includes three one-hour segments: *Toxic Waste, Water* and *Biotechnology*; an introductory video, *The Program in Action*; and a comprehensive Teacher's Guide.  
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**Asking Different Questions: Women and Science** An exploration into the life and work of five women scientists, going beyond an examination of the impact of gender on science to question the very methods and goals of modern science and technology. 51:00 Order number: C9196 053

**Who's Counting? Classroom Version** World-renowned political economist Marilyn Waring demystifies the language of economics with vigour, clarity and humour, offering a radical new way of looking at how global systems work. Includes three 30-minute videos on local and global politics, women and economics, and the environment, plus support material. Order number: 193C 9196 040

**Adam's World** Elizabeth Dodson Gray, feminist theologian, environmentalist and futurist, speaks about the severity of the global environmental crisis and targets the root causes as springing from the beliefs and assumptions of a patriarchal system. 19:00 Order number: C0189 005

**The Human Race series** From an ancient village on the Nile to the megalopolis of Mexico City, Gwynne Dyer's series weighs the implications of how we live together, and our complex relationship with the environment. Includes four 50-minute videos: *The Bomb Under the World*, *The Tribal Mind*, *The Gods of Our Fathers* and *Escaping from History*. Order number: 193C 9194 091

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