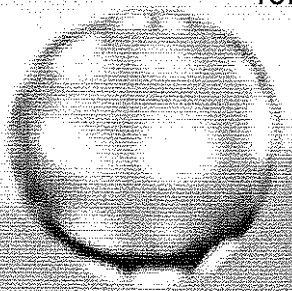
Water

the Source of Life

Prepared by Susan MacMillan

British Columbia Agriculture
in the Classroom Foundation
Summer Institute 2001 Unit Plan
for Grades Four and Five



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Participants (20 educators from Kindergarten to Grade 12) spend one week at the Montfort House Rural Resource Centre situated on UBC's Farm on Vancouver Island. Here they develop a number of practical teaching strategies for their classrooms using examples drawn from the agricultural, environmental, economic and nutritional concepts featured in the Bc Integrated Resource Packages for their particular grade or subject area.

The agricultural community sponsors participants for the costs of learning resources, tuition, meals and accommodation.

Participants taking the course for credit create teaching modules such as this to share with other educators from around the province.

Applications can be made on the BC AITC web site at www.aitc.ca/bc or directly at the AITC office. Contact Lindsay Babineau at 604-556-3088 for an application form.

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- BC Turkey Marketing Board
- CIBC Agriculture Division
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TABLE OF CONTENTS

INTRODUCTION

The focus of this unit is on **WATER IN AGRICULTURE**. It begins with a broad introduction to the theme of WATER, then focuses specifically on the role that water plays in farming. At this age level it is appropriate to begin close to home but then to develop an awareness of how water is used in farming in different parts of our province. I have also chosen to look at farming in developing countries, especially where water is scarce. This unit may be used as a whole but parts of it would stand on their own.

There are so many other facets to the topic of water and you may decide to focus on some of these aspects, too. Some of the possible sub topics are:

- The Water Cycle and Weather
- Conservation of Water
- Water Pollution
- Making our Water Safe
- Experiments to Investigate Water
- The Uses of Water
- The Waterworks
- Water – One of the Natural Resources of BC

There are many links with both the Grade 4 and Grade 5 IRPs so this unit would be especially useful for teachers with a combination grade 4/5.

LINKS TO THE IRPs

The lessons and activities in this unit support the following Prescribed Learning Outcomes from the Grades 4 & 5 Integrated Resource Packages.

SCIENCE

It is expected that students will:

GRADE 4 *Earth and Space Science (Water)*

- categorize the various uses of water
- outline the importance of water for life
- use the physical properties of water to describe or illustrate the water cycle
- describe human impacts on the Earth's water resources

GRADE 4 *Application of Science*

- perform an experiment by following a procedure

GRADE 5 *Earth and Space Science (BC's Non-Living Resources)*

- describe how non-living resources are used in society
- describe the environmental impact of using non-living resources

SOCIAL STUDIES

It is expected that students will:

GRADE 4 *Applications of Social Studies*

- identify and clarify a problem, issue or inquiry
- assess at least two perspectives on a problem or issue

GRADE 4 *Society and Culture*

- describe how people's basic needs are met in a variety of cultures

GRADE 5 *Applications of Social Studies*

- identify and clarify a problem, issue or inquiry
- defend a position on a regional issue in light of alternative perspectives
- design, implement, and assess strategies to address community problems or projects

GRADE 5 *Environment*

- demonstrate understanding of sustainability, stewardship, and renewable versus non-renewable natural resources

CAPP

It is expected that students will:

GRADE 4 *Career Development(Career Exploration)*

- identify a variety of job situations in the community

This unit also supports many of the Prescribed Learning Outcomes from the Grades 4 and 5 **ENGLISH LANGUAGE ARTS** Integrated Resource Package.

The unit includes activities and experiences which are based on the **PRINCIPLES OF LEARNING** as described in the Introduction to each of the IRPs:

- Learning requires the active participation of the student.
- People learn in a variety of ways and at different rates.
- Learning is both and individual and a group process.

This unit of study was also planned to link with a number of the **CROSS-CURRICULAR INTERESTS** outlined in each IRP in Appendix C:

- Environment and Sustainability
- Multiculturalism
- Career Development

SUGGESTED INTRODUCTORY ACTIVITIES

One or more of these activities could be used to introduce the unit to the students:

#1 Give each group of students a small container of water and an empty container of a different shape but same volume. In groups have the students brainstorm the things they already know about the properties of WATER,. Guide their thinking with questions such as:
"How does the water look, feel, smell, taste, sound?"
"What words describe the water when you move it from one container to another?"
"What happens to water when it gets really cold, really hot?"
"Do the container with water and the one without have the same weight?"

Make a master list of these "facts" to post in the classroom. Add to the list during the course of the unit and delete any that might prove not to be facts.

Some of the facts will be:
* you can see through it * it has no smell * it has no taste * it flows * it drips * it can be stirred * it has weight * it is wet * it takes the shape of the container * it exists in three states, liquid, solid, gas

#2 Read a book about water to the students. An excellent one is THE WONDER THING by Libby Hathorn and Peter Gouldthorpe. In a lyrical poem with illustrations of linoleum block prints, the reader is guided on a journey around the world while the uses of water in different cultures are depicted. The word WATER is not used until the last page of the book. Unfortunately this book is out of print but it may be available in your school or public library.
After reading the book go back to each page and discuss how water is being used in the illustration. This could lead to individual or group research projects about the parts of the world depicted in the book.
Another beautiful picture book to introduce this unit is WATER DANCE by Thomas Locker. The author-illustrator takes the reader on a journey which depicts the many facets of water in nature. As well as a poetic text and inspiring paintings this book includes hundreds of scientific facts about water.

Either of these books could inspire the students to write poetry about water.

#3 Start a water WORD BANK. that can be used both in research and poetry writing about water. Some might be:

damp	**steamy**	**muggy**	**humid**	**drenched**	**misty**
drizzly	**soaked**	**sparkling**	**trickling**	**reflecting**	**dripping**

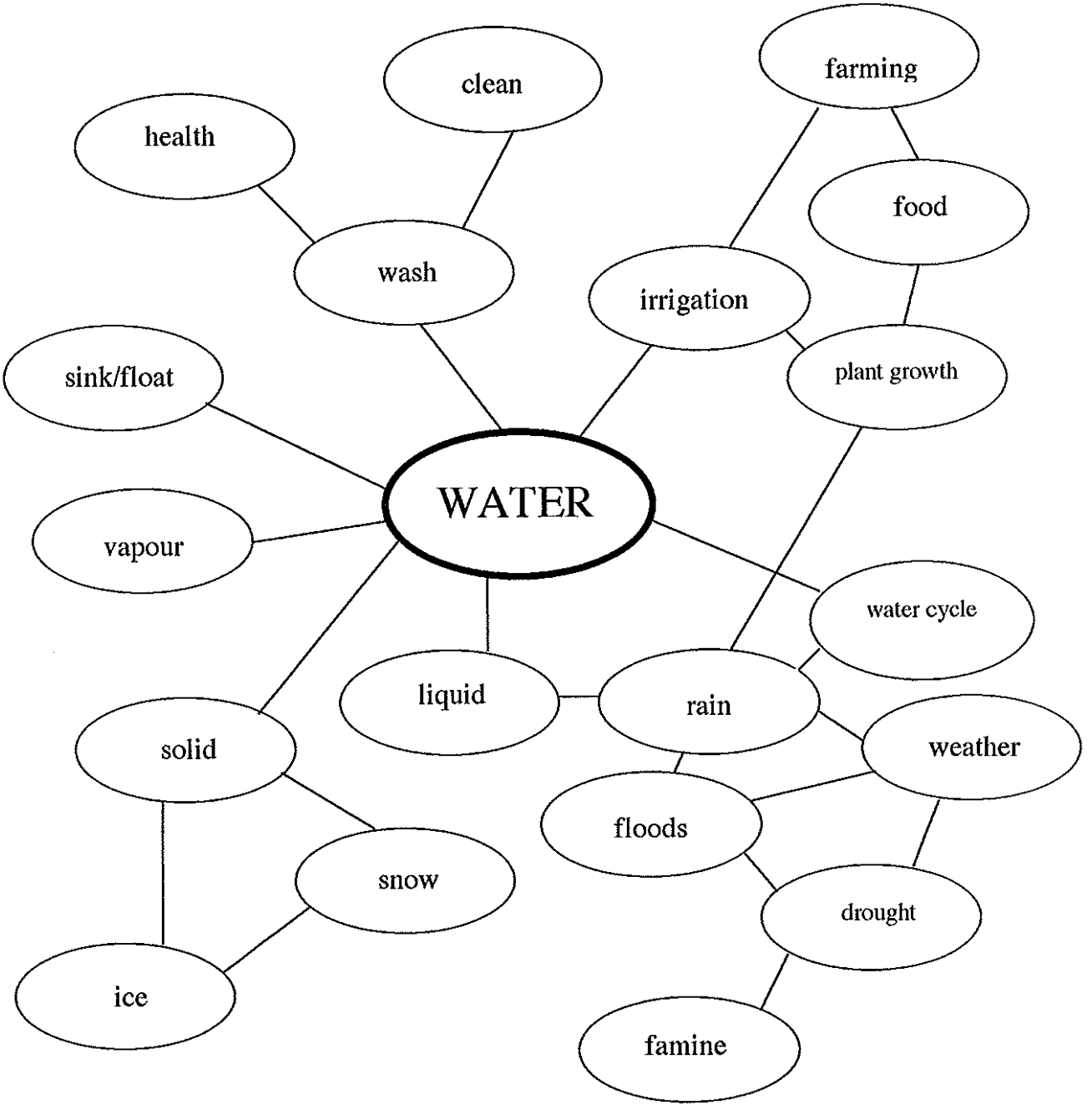
#4 Compare water to two other substances known by the children e.g. sand and rice. Set up a centre with a large tub for each of the substances. Also provide things for pouring and experimenting – spoons, measuring cups, funnels, bottles, sieves, scales etc. In small groups students can take turns closing their eyes while the others in the group choose a tub for the child to touch. After the student has identified the contents she has to say how she knew it was water, rice or sand. After everyone has had a turn to experiment with the tubs, have them work together to fill in a chart with descriptive words about the three materials.

water	sand	rice
wet	gritty	grainy
cold	dry	hard
see through	brown	white
liquid	solid	rough
_____	_____	_____
_____	_____	_____

Some possible questions to guide the students' thinking:

- How do each of these things feel, smell, look, different?
- Is there anything the same about two or all of them?
- What happens when you pour each of them into a funnel?
- What happens when you stick a wet (or dry) finger into each of them?
- What happens when you drop something heavy into each of the tubs?
- Can you see the bottom of any of the tubs?
- Which of these weighs more?

#5 Make a word web starting with the word WATER. This example is simply a start.



LESSON ONE

Learning Outcome

Students will list, describe and classify the various uses of water.

- After using one of the Suggested Introductory Activities, assign the students the following task to work on at home:

  "With your family, list all the ways you can think of that water is used in our world." [Blackline Master #1]

- The next day ask each student to describe ONE of the uses on their list. Then explain that they are going to categorize all of the things on their lists. If necessary, model how to do this. As a class, decide on broad categories such as:

  PERSONAL HYGIENE, RECREATION, INDUSTRY, PLANT LIFE, ANIMAL LIFE TRANSPORTATION .....

- Give each of these categories a colour and have students use pencil crayons to colour –code their list, by circling each numeral with the correct colour.

- Create a large chart for each of the categories. Allow time over the next day for students to write items from their list on the correct chart so that there are no duplications.

- Discuss each of these and suggest that students add more items to the chart as the unit progresses.

- If time permits students could be put into groups to research one of these categories. The information could be presented in the form of a booklet, a collage, a model, or other representation of their choice.

LESSON TWO

Learning Outcome

Students will describe and illustrate the water cycle, using the properties of water.

There are many different activities that can be done to teach students about the water cycle. Choose one or more of the following.

1. Ask," What is a cycle?" (A sequence of recurring events.) Have students name some cycles that are part of our lives:

- spring, summer, fall, winter
- morning, afternoon, evening, night
- egg, caterpillar, pupa or chrysalis, butterfly

2. Read the book THE WATER DANCE by Thomas Locker. (see Student Books) This book describes the water cycle in poetic language but also includes a scientific explanation of it.

3. Do separate experiments to illustrate EVAPORATION and CONDENSATION.

EVAPORATION

To demonstrate that temperature affects the rate and amount of evaporation, fill two similar dishes with an equal amount of water. Put one in the fridge and the other by a sunny window or under a lamp. After two days, compare the amount of water remaining in each dish. Ask, "What happened to the water in the dish by the window?"

Explain that this experiment shows what happens outdoors at a pond, lake or ocean. The sun's rays are absorbed by the water causing the water to warm up. This causes evaporation. [Blackline Master #2]

Some students my wish to investigate some other aspects of evaporation such as:

- Does water evaporate faster in different types of containers?
- Does the wind affect the rate of evaporation?
- Can water evaporate if you cover the top of the container with different types of materials? (gauze, wax paper, plastic wrap etc.)

CONDENSATION

Pour one cup of hot water into a one litre bottle with a narrow neck. Put on the cap for a few minutes to allow moisture to be retained in the bottle. Remove the cap and place a large ice cube over the mouth of the bottle. Observe what happens to the air filled with water vapour when it is cooled.

Explain that this experiment shows what happens to the water from Earth after it evaporates and rises into the atmosphere where it is cooler.

[Blackline Master #2]

4. Do an experiment to illustrate the water cycle. *Innovations in Science, Level 4 – Waterworld* describes such an experiment, using ice cubes in a plastic bag. (See TEACHER RESOURCES.)

5. Show a video which illustrates the water cycle. One such video is entitled THE WATER CYCLE by Bill Nye. (See TEACHER RESOURCES.) After watching this video lead the students in drawing a sketch of the water cycle and labeling it with the words **condensation, evaporation, precipitation, transpiration, perspiration** as well as features such as **ocean, sun, clouds, rain hail or snow.** Have each student pair up with a younger buddy to explain the water cycle to them.

6. The students can do an Interactive Jigsaw Puzzle of the Watercycle at http://www.fi.edu/fellows/fellow8/dec98/watercycle/jigsaw.htm

LESSON THREE

Learning Outcome

Students will compare and contrast the affect of amount and type of water on the growth of a plant and determine if a plant can grow in water with no soil. Students will perform an experiment by following a procedure.

Activities

Students of this age know that plants need water to survive. Therefore, they can experiment with different variables and compare the results. Some possibilities are:

1. *"Does the amount and type of water affect the growth of a plant?"*
   Have four similar plants. Water one of them about once a week, another every day; one not at all and the fourth with salt water. Compare and record results. (Groups of students could have different types of plants and compare their results with another group's.) [Blackline Master #3]

2. *"How does a garden mist spray affect plant growth?"*
   Have a number of similar plants. Use a mist sprayer to spray different amounts of water on each one, including one that gets no misting. Compare and record results. [Blackline Master #3]

3. *"Can plants grow in water with no soil?"*
   Put several layers of paper towel on a plate. Scatter several bean or radish seeds over the towels. Wet the paper then cover the seeds with another paper towel. Sprinkle more water on top. Put the plate in a warm place and examine the seeds in a few days. Compare and record results. [Blackline Master #3]

Hydroponics

After the students have ascertained that seeds will germinate in water with no soil, introduce the concept of hydroponics – a method of growing plants in water. It is possible to grow a bulb like a hyacinth in a container of water. The container needs to be tall and with a small neck on which the bulb can sit while its roots will be under water. Alternatively, you can purchase materials to grow plants hydroponically from a garden centre, including the containers and nutrients to put in the water.

These are some facts about **hydroponics** that you can share with the students:

Hydroponics

1. Plants grown in soil spend a lot of energy growing large roots to find water and nutrients, but hydroponic plants only need small roots and they often grow faster than plants grown in soil.
2. Many plant diseases are carried in the soil. Often these are treated with chemicals. Many vegetables can be grown close together with hydroponics with much less chance of getting diseases.
3. Lettuce plants can be grown on rotating frames and picked every day and new ones can be put in where other have been taken out so that there is a continual supply.
4. Some seeds have been grown in space using hydroponics.
5. Scientists in the Antarctic grow fresh, green vegetables this way.
6. People living on tiny islands with little soil can grow crops hydroponically.
7. Hydroponics may be an ancient form of growing plants. It is thought that the Hanging Gardens of Babylon may have been hydroponic.

LESSON FOUR

Learning Outcome

Students will distinguish between all the water on the Earth and "usable water".

Background

Roughly 70% of the Earth's surface is covered with water, however, most of this is salt water. Only 3% is fresh water and most of that is frozen in polar ice caps and glaciers. Less than 1% of all the water on Earth is "usable water", the water that we depend on for our needs. In this lesson you will demonstrate this fact to the students.

Discussion

Ask:

"Where are all the places in the world where water is found?"

Make a list. This will include: ponds, lakes, rivers, reservoirs, waterfalls, oceans, streams, clouds, dams, our bodies, rain, snow, hail, ice, fog, wells, springs, puddles, fountains, etc.

This brainstorming can be done as a whole class or in small groups and then reported back to the whole class and recorded.

During the discussion afterwards explain the concepts of:

surface water – fresh water on the Earth's surface, including running water such as rivers and streams and standing water like ponds and lakes

groundwater – When rain and snow fall to Earth some of the moistures soaks into the ground, seeping into small spaces between soil and rock particles. The water in this saturated area is called groundwater. It moves downward until it meets the:

water table – the level below which the soil is saturated with water.

aquifer – the water-soaked region under the ground

[It would be helpful to make a labelled illustration to show these concepts.]

ACTIVITY

Materials needed:

- six 4-litre plastic milk jugs full of water
- variety of measuring cups
- clear glass pitcher
- three clear glasses
- an eyedropper

1. Review the charts from Lesson One which lists the various uses of water. Look at a globe. Ask, "Estimate how much of the Earth's surface is covered with water." Tell students that 70% or almost 3/4 of our Earth's surface is covered in water.
2. Show the six 4-litre plastic milk jugs full of water and explain that this represents all of the water on Earth. Ask them to predict how much of that water is usable by humans and animals. (They can either write down their prediction or draw a picture of it.)
3. From one of the milk jugs, measure out 3 cups into the glass pitcher. Explain that this amount of water represents all of the "fresh water". The water still in the milk jugs represents all the salt water in the oceans and seas. Put these aside.
4. From the water in the pitcher, measure out 1 cup into a glass. The water still in the pitcher represent fresh water that is locked up in the polar ice caps and glaciers. Put the pitcher beside the milk jugs.
5. From the 1 cup of water in the glass pour out 1/3 cup into another glass. This represents the water in the atmosphere in the form of water vapour. Add this to the water in the pitcher. The 2/3 cup of water left represents all of the fresh ground water and surface water (lakes and rivers) on the Earth.
6. From the 2/3 cup of water remove an eyedropper full. Squeeze out five drops of water into another glass. This represents all of the fresh water that is available for us to use. The rest is either polluted or deep within the Earth's crust. Pour it into the pitcher, too.

When the demonstration is finished have the students respond in writing, sharing their thoughts and feelings about what they have learned. You might give them some possible sentence starters:

- Before the demonstration I predicted that .....
- I was surprised that .....
- I wonder if .....
- Now I understand .....
- I feel that .....
- I think that .....
- Now I will .....
- .....

[Blackline Master #4]

For students who find this much writing a challenge, have them tape their responses or share them orally with a partner.

LESSON FIVE

Learning Outcome

Students will list the uses and sources of water on farms and after visiting two farms will compare them.

The next two lessons involve visits to two farms in your area. Choose two that grow different crops, have different types of water supplies and use different irrigation systems, if possible.
Before beginning this lesson get information about the source of water in the area in which you teach. If you live in an urban area, all of the families will, no doubt, have the same source of water. In a more rural community some of them will use well water.

Three of the books listed in the STUDENT BOOKS and TEACHER RESOURCES sections are particularly useful for this lesson:

Protecting our Planet: Keeping Water Clean, by Ewan McLeish
Where does Water Come From? by C. Vance Cast
The Magic School Bus at the Waterworks, by Joanna Cole

Activities

1. Ask: "Where does the water come from that we get out of our taps?"
2. Read the book: *Where does Water Come From?* by C. Vance Cast.
3. Have a water technician from your community's water treatment plant come to your class to explain the process in your community. If your school is in a very rural area, perhaps invite someone who has a well-digging business.
4. Before visiting the two farms have the students brainstorm for the uses of water on each of the farms. During the visit to the farms they can verify their list, making deletions and additions.
5. MAKE A WELL (Especially if one of the farms uses well water.)
   Materials: a small aquarium, sand, water, glass tube about 25cm. long, small piece of cheesecloth
   - Fill the aquarium about half full with sand.
   - Add water to simulate a water table.
   - Wrap cheesecloth around the tip of a glass tube and insert into the sand.
   - Water will flow from the sand into the "well".

You may want to share the following information about wells with your students:

Information about Wells

1. Wells are an important source of water in many parts of the world.
2. Dug wells were the only kind for many centuries and are still used today in some places. People use a pick and shovel to dig. If the ground is soft and the water table is shallow, then dug wells can work. They are often lined with stones to prevent them from collapsing. They cannot be dug much deeper than the water table. When that point is reached the well keeps filling up with water. Most of these well are 1.3m in diameter which is the smallest size needed for two people to work inside.
3. Driven wells are built by driving a small-diameter pipe into soft earth, such as sand or gravel. A screen is usually attached to the bottom of the pope to filter out sand and other particles. (Like the one built in the aquarium.) The problem with this type of well is that they can only tap shallow water and because the source of the water is so close to the surface, contamination from pollutants on the surface can occur.
4. Drilled wells. Most modern wells are drilled, which requires a huge drilling rig. These are often mounted on big trucks. They use rotary drill bits that chew away at the rock, or if the ground is soft, large auger bits. These wells can be drilled very deep. Often a pump is place at the bottom to push water up to the surface.
5. Because the water level in the aquifer that supplies wells does not always stay the same wells can run dry if there is a lack of rain.
6. More than half the people on Earth depend on groundwater for their water supply. In some countries, such as Malta and Australia, groundwater is the *only* source of water for most of the population. In Prince Edward Island, *all* the people rely on it for their needs.

LESSON SIX

Learning Outcome

Students will list, illustrate and describe some of the different types of irrigation systems and after a visit to two farms, compare and contrast the reasons for, and efficiency of their use.

Background

Irrigation has been around since humans have been cultivating plants It played a role in the rise and fall of civilizations as far back as the days of Mesopotamia and the pharaohs of Egypt. Over the years, many devices have been created to make farming easier and more profitable. Unfortunately, in some parts of the world the methods and efficiency of irrigation systems are much the same as they were a thousand years ago. In the western world irrigation accounts for much of the fresh water used today.

There are many different irrigation methods. The following list is provided by the Nevada Division of Water Planning:

Center-Pivot: Automated sprinkler irrigation achieved by automatically rotating the sprinkler pipe or boom, supplying water to the sprinkler heads or nozzles, as a radius from the center of the field to be irrigated. Water is delivered to the center or pivot point of the system. The pipe is supported above the crop by towers at fixed spacings and propelled by pneumatic, mechanical, hydraulic, or electric power on wheels or skids in fixed circular paths at uniform angular speeds. Water is applied at a uniform rate by progressive increase of nozzle size from the pivot to the end of the line. The depth of water applied is determined by the rate of travel of the system. Single units are ordinarily about 1,250 to 1,300 feet long and irrigate about a 130-acre circular area.

Drip: A planned irrigation system in which water is applied directly to the Root Zone of plants by means of applicators (orifices, emitters, porous tubing, perforated pipe, etc.) operated under low pressure with the applicators being placed either on or below the surface of the ground.

Flood: The application of irrigation water where the entire surface of the soil is covered by ponded water.

Furrow: A partial surface flooding method of irrigation normally used with clean-tilled crops where water is applied in furrows or rows of sufficient capacity to contain the designed irrigation system.

Gravity: Irrigation in which the water is not pumped but flows and is distributed by gravity.

Rotation: A system by which irrigators receive an allotted quantity of water, not a continuous rate, but at stated intervals.

Sprinkler: A planned irrigation system in which water is applied by means of perforated pipes or nozzles operated under pressure so as to form a spray pattern.

Subirrigation: Applying irrigation water below the ground surface either by raising the water table within or near the root zone or by using a buried perforated or porous pipe system that discharges directly into the root zone.

Traveling Gun: Sprinkler irrigation system consisting of a single large nozzle that rotates and is self-propelled. The name refers to the fact that the base is on wheels and can be moved by the irrigator or affixed to a guide wire.

Supplemental: Irrigation to ensure increased crop production in areas where rainfall normally supplies most of the moisture needed.

Surface: Irrigation where the soil surface is used as a conduit, as in furrow and border irrigation as opposed to sprinkler irrigation or subirrigation.

The decision about which of these to teach to your students will depend on the type of irrigation systems used at the two farms you will visit. You will definitely want to include those used at these farms and perhaps one or two others that are quite different.

Before going to the farms, brainstorm with the students some questions to ask the farmer about his/her irrigation systems:
"Which type(s) of irrigation systems do you use?"
"Why did you choose these?"
"Do you feel there is another type that would work as well as or better than these ones?" *etc.*

After the field trips discuss with the students the different types they saw and the farmers' reasons for choosing those ones. Also compare the efficiency of the systems. Be sure to link ones like **sprinkler** irrigation to evaporation which they learned about in Lesson 2. **Flood** irrigation can be linked to the experiments done in Lesson 3 where one of the plants was over-watered.

Another important issue to explore during the visit to each farm is to find our how the farmer gets rid of wastewater so that it doesn't end up in streams and other waterways. This could lead to a study of other practices in our province which affect our fresh water systems – forestry, cattle ranching, use of pesticides, etc. and what is being done to lessen their impact.

Follow-up Activities

1. After the farm visits the students can do a comparison of various aspects of the two farms. [Blackline Master # 5]

2. Blackline Master #6 can be used if you wish to review some of the different types of irrigation systems.

3. On a blank map of British Columbia have the students mark the main crops in each of the areas of our province. There is a Commodity Map in *"Grow BC"*, published by British Columbia Agriculture in the Classroom Foundation. The section on "The Regions" also has pertinent information, including an Agricultural Profile, Frost-free days and Annual precipitation for each region of our province. Students could consider such questions as:

    - Which areas of our province will require the most irrigation (the least)?
    - Which crops grown in our province require the most water (the least)?

LESSON SEVEN

Learning Outcome

Students will identify and clarify a problem, issue or inquiry around the topic of water and assess at least two perspectives on this problem or issue.

If possible, choose an issue or problem which is current in your area. (The possible introduction of water meters is such an issue in our town at the moment.) If there is no current issue then choose a generic one. Possible choices are:

- Should water meters be installed in our town?
- If they are installed in every home, should they be installed in farms, too?
- Should farmers pay less for their water than home-owners?
- Should farmers be allowed to irrigate at any time of the day or night in an area with restricted irrigation to homes?
- Should farmers be allowed to run noisy sprinkler systems during the night if it disturbs people living nearby?
- Do the farmers in your community get rid of waste water in environmentally friendly ways?
- Could farmers and forestry workers in all parts of our province be doing more to lesson the impact of their work on our fresh water?

After choosing an issue to focus on, have students do a survey of family, friends and perhaps school staff. The responses should include not simply a YES or NO, but also a reason for that response. Use Blackline Master # 7 to record this information.

In groups, have them put together the data on the different perspectives on the issue, assess the reasons for the differences and then determine which perspective they agree with and why.

Group presentations can then be done in the form of:

- interviews with people on either side of the issue
- a role play involving two people with differing viewpoints discussing the issue
- a debate
- a graphic display of answers and rationale
- a newspaper article (or two articles from either point of view)

LESSON EIGHT

Learning Outcome

Students will assess the relationship between life in a developing country and both weather and access to water.

If you live in a community where there are immigrants who have come from developing countries, especially if they are parents of students in your school, they will be an invaluable resource during this lesson. Alternatively, you may have some people in your community who have worked in a developing country and would be able to share their experiences with your students. There are also a number of children's books that focus on this topic, specifically:

The Orphan Boy by Tololwa M. Mollel, & Paul Morin
Bringing the Rain to Kapiti Plain by Verna Aardema
Food Watch by Martyn Bramwell
Protecting our Planet: Keeping Water Clean by Ewan McLeish,
Food for the World by Su Swallow

No matter which resources you use, these are some of the important points the students need to understand:

- The weather is not the same in different parts of the world.
- All countries do not have the same seasons as we do.
- Droughts are common in some countries. So, too, are flood, hurricanes and diseases which destroy crops and livestock.
- Whether or not people in developing countries have sufficient food usually depends on the amount of rainfall, which can be either too little or too much.
- In many developing countries people do not have water piped into their houses as we do.
- These people get their water from sources such as a community well/pump; water trucks which visit on regular basis (unless they break down or the road is impassible), a spring, a river, a well some distance away.

- When water is not available in the community, people spend a large portion of their day collecting water. This means that there is no time to do other things such as go to school.
- For a variety of reasons irrigation methods in many developing countries are the same types that were used many centuries ago. These are usually labour–intensive and often don't provide enough water to the crops.
- Because of lack of equipment etc. people in developing countries spend much of their time growing basic crops to feed themselves. Again, this means that they have little time for other things.
- Most of these countries are getting help to develop ways of collecting water when it rains, soil erosion prevention, more efficient means of irrigation, drilling wells etc.

As a follow-up to this lesson there is an internet web site:
(http://www.wateraid.org.uk/education/index.html)
where the students can do a quiz which guides them through the stages of providing a rural village with a clean safe water supply. This is the site of a British organization called WATER AID, a development group that works through partner organizations in Africa and Asia to help people in developing countries improve their quality of life by improved domestic water supply, sanitation and associated hygiene practices.

LESSON NINE

Learning Outcome

Students will describe the process of growing rice and demonstrate an awareness of its importance as a food.

I have chosen to develop this lesson to help students learn about a crop which is not grown in our country and one which depends on an abundance of water. The main resource that I found is:

The Story of a Grain of Rice by Raphaelle Brice,

but you may find others.

Background Information

Rice is the most important food on earth and is eaten daily by most people in the world. In Asian countries many of the people eat rice at every meal. The Chinese and Indians first learned to cultivate rice about 7000 years ago. It is grown today in much the same way as it was then. Almost all of the rice in the world is grown in Asia. However, some is grown in the United States and a little in southern Europe. Rice is not just grown for food. Rice-straw can be used to make baskets, mats and large flat hats for the rice growers. Rice husks as used to feed animals or to make fertilizer.

Reading the book *The Story of a Grain of Rice* is a good way to help students understand the process of growing rice in different countries in the world. It also includes some history, recipes and a lesson on how to eat with chopsticks.

After reading the book the students can order and illustrate the steps in growing rice. Have them fold a large piece of paper into eight sections, put the heading GROWING RICE and put the following steps in order:

Beat and dry the rice.
Husk the rice.
Winnow the rice.
Replant in paddy-fields.
Sow the rice in the seed-bed.
Drain the paddy-fields.
Flood the paddy-fields.
Harvest the rice.

You can also cook some rice dishes. Perhaps invite someone from the Asian community to help with this activity.

LESSON TEN

Learning Outcome

Students will identify a variety of jobs situations which involve water and agriculture.

This concept will begin as soon as you start the unit and continue throughout. As the children are learning about all the different aspects of water, draw their attention to the different jobs that are involved in each activity or situation. Keep an ongoing list on a chart on the wall.

It is important to have the students talk to, or interview some people in these careers. When you visit the two farms allow time for questions about the jobs connected with water. There may be more than one person at each of these locations in such a role. Also, too, when you invite an engineer from the water treatment plant or a well-digger, ensure that there is an opportunity to focus on these specific careers. Other experts in some aspect of water and agriculture (some may be parents of children in your class) could be invited to visit. The focus of the visit would be mainly on the jobs these people do. Try to include experts of both genders and if possible, a variety of cultures.

Before each visit, brainstorm with the students questions that they would like to have answered. Some of these might include:

- What do you do in your job?
- Why did you choose this career?
- What kind of training/schooling did you have to have?
- Are there any other jobs that you could do with this training?
- What special skills/abilities do you have that are important in your job?
- Are there people in other parts of our province who do the same job as you? Which parts?
- If I wanted to have the same career as you, which subjects would it be important for me to take in High School?
- Are there any volunteer jobs that would help me reach that goal?
-

At the end of the unit, students could make a class collage using magazine pictures that relate to jobs connected with water and agriculture.

LESSON ELEVEN

Learning Outcome

Students will outline the importance of water for life and reflect on their learning during the unit on water in agriculture.

This lesson will be a review of the unit and will help students reflect on and synthesize their learning. Some possible points for discussion are:

- Explain the statement: WATER IS THE SOURCE OF LIFE.
- What do you know about water now that you didn't know at the start of this unit?
- What are some of the changes you think could be made in the use of water, especially in agriculture, both in BC and in the rest of the world?
- Discuss the fact that water is considered a "non-living resource" and a very important one in our province. Are we using this resource wisely?
- Do you think that BC should export some of its fresh water to other parts of Canada and to parts of the United States where there is not enough water?
- Some scientists say that water will replace oil as the most important resource in the twenty-first century. Why might they think this?
- What will **you** do differently now, with your new knowledge?

POSSIBLE ACTIVITIES

1. Make a group picture of the IDEAL WATER COMMUNITY. Be sure your community includes at least one farm.

2. Make posters to display around the school which show IMPORTANCE OF WATER.

If you teach grade 5 be sure to link what the children have learned about water to *BC's Non-Living Resources* from the Social Studies IRP -*Earth and Space Science* when you come to study that.

Uses of Water

Name _____ Date _____

Water is all around us. It is used in our world in many ways and for many different purposes. Make a list of some of these ways.

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

Blackline Master #1

Water Experiments

Name _____ Date _____

Experiment #1 - EVAPORATION

Draw and label what we did. Explain what happened and why.

Experiment #2 - CONDENSATION

Draw and label what we did. Explain what happened and why.

Blackline Master #2

Plants and Water

Name _____ Date _____

Title of Experiment _____

Question:

Hypothesis:

Materials:

Procedure

Illustrations of my experiment(s)

Results and Conclusion:

Blackline Master #3

How Much Water is There?

Name _____ Date _____

Write down your thought and feelings about the demonstration of how much "usable water" there is in our world.

Blackline Master #4

Comparing Two Farms

Name _____ Date _____

Things to compare	Farm #1	Farm #2
Size of farm		
Crops grown		
Animals on the farm		
Water source(s)		
Types of irrigation		

Why did each farmer choose the type(s) of irrigation for his farm?

_____

_____

_____

Do you agree with their choices? Why or why not?

_____

_____

_____

Blackline Master #5

Types of Irrigation Systems

Name _____ Date _____

Draw and label 4 different types of irrigation systems you have learned about.

Blackline Master #6

Exploring an Issue

Name _____ Date _____

Question _____

YES

REASONS

NO

REASONS

Blackline Master #7

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GLOSSARY

aqueduct A canal, tunnel or other structure that carries water from one place to another

aquifer An underground region saturated with water

condensation The process of changing from a gas (or vapor) into a solid or liquid

drought A prolonged period of dry weather

evaporation The process of changing from a liquid into a gas (or vapour)

famine An extreme shortage of food, causing widespread hunger and possibly mass starvation

groundwater (ground water) Water contained in pores and cracks of the soil and rocks beneath the Earth's surface. Groundwater fills aquifers and supplies wells and springs.

hydroponics A method of growing plants in water with added nutrients

humidity Water vapour

irrigation The artificial application of water to farmland

leaching The process by which water seeping through soil dissolves and carries away nutrients, pesticides and other materials

nutrients The chemicals and minerals that are used by plants to grow

paddy fields Flooded field where rice is grown

precipitation Water that falls from the atmosphere in the form of rain, snow, hail or sleet

reservoir A pond or lake where water is stored for later use

runoff Rain and other water that runs off the land into lakes, rivers and other bodies of water

sewage Waste water

transpiration The release of water by plants

water The only substance that can exist as a liquid, a solid and a gas. Its molecule is composed of two hydrogen atoms and one oxygen atom.

watershed The land area that drains into a stream

water cycle A continuous process during which water evaporates from the Earth, condenses in the air, returns to Earth in the form of precipitation, evaporates again, and so on

water table The level in the ground below which the soil is saturated with water.

well A hole dug into the Earth for the purpose of obtaining water, oil, or natural gas.