Locally Developed Course

Grande Yellowhead Public School Division

Water Experience
15

Parks Canada (Palisades) Stewardship Education Centre

Pre-Immersion Course Package

Grande Yellowhead
Public School Division

Table of Contents

Water Experience 15 Page

Overview of Water Experience Course

The objectives of this course are to build water navigation skills, aquatic ecosystem knowledge and leadership skills in a context of critical thinking. We feel that this is particularly important as we strive to better educate youth for their own safety and as ambassadors for our wild places.

Water Experience 15 embodies the principles of place-based education. It has been developed for implementation at the Parks Canada Palisades Stewardship Education Centre in Jasper National Park. Students following this course will be engaged in video-conference team teaching and learning provided by the expertise of the Palisade's Educational Director and his staff as well as their GYPSD teacher. They will be required to participate in and complete instructional material prior to their immersion experience.

During the Immersion component of this course, to encourage a culture of teamwork, empathy, and ethical citizenship, youth will share meals and communal living spaces. They will be expected to work collaboratively in an effort to build caring, cooperative and respectful relationships that value diversity. They will initiate discussions that lead to genuine interaction and encourage innovative ideas that demonstrate diverse perspectives.

There will also be post immersion activities and course material to complete prior to receiving credit for the course. Students will gain greater understanding of water safety/ risk management, paddling techniques, ecological impacts of waterways. They will work collaboratively to share their knowledge and skills with a diverse audience and identify innovative problem solving approaches that apply to the sustainability of our most precious resource.

Pre-immersion sessions: Four hours of classroom-based sessions are facilitated by a teacher who will either join the students in person or through a videoconference suite. A Bridgit connection with a SmartBoard may be necessary. Included in this teacher package is a PowerPoint presentation divided into 4 sessions for use during the pre-immersion course. Other resources needed for the delivery of the course can be found in more detail in the Instructor Notes that follow.

Immersion sessions: Delivered on-site at the Parks Canada Palisades Stewardship Education Centre near Jasper, Alberta, these sessions will require students to stay in residence at the PSEC site for four days of programming, usually running 8h00 to 21h00. This portion of the course is very hands-on and will require full participation by students. PSEC Education Team staff, will be on-site to deliver the programming, but teacher chaperones will be needed as well during this time. The 35 level course mainly takes place off-site and is described as a journey. Exact locations are decided upon by the PSEC facilitators who base their decision on the weather, group's abilities, and other safety factors.

Post-immersion sessions: Three more hours of classroom-based sessions will be facilitated in the same way as the pre-immersion sessions. Students will link what they experienced and learned in Jasper with what is happening in their home communities or regions. A culminating project is part of the final student assessment and will usually involve sharing with people outside the course.

Water Experience 15: PRE-IMMERSION Instructor Package

The following plans and activities are to be completed prior to the students' visit to the Palisades Centre. Within this Pre-Immersion package, you will find activities.

Technology
In the following activities, students will need some access to various technologies such as videoconferencing and/or SmartBoard where presentations can be shown. Make sure students are situated in the home school appropriately to allow access to this technology. Organizers of this part of the Water Experience course should give videoconference speakers ample time to organize their presentations.

Recommended Course Materials
It is suggested that students keep a binder that they devote to the Water Experience 15 course (Pre-Immersion, Immersion and Post-Immersion activities). There will be a series of handouts and a journal that students will be expected to keep and look back on as the course progresses. As part of their reflection exercises throughout the program, students are encouraged to take photographs of activities that they take part in and other ideas relating to the Water Experience course.

Recommended Course Materials List

- Journal/notebook or binder and writing utensils & cameras
- Eau Canada, Edited by Karen Bakker (2007) to be used in WE 15 and WE 25.

Assignments
Any reflection assignments or notes are to be kept in the student's folder and can be used to evaluate the student in the course. Some handouts will be collected by the course administrator or teacher to be used in the student's evaluation.

Session 1

Topics this first class will cover:

- Introductions
- Topics to be covered during the Course
- Course readings & other materials
- Schedules for the three components of the course (pre, post, and immersion)
- Introduction to Water Issues

Learning outcomes:

- Students will understand the basic framework of the Water Experience courses.
- Students will understand the major learning themes for the 150 level course.
- Students will understand that there are many water issues facing Canada and the world, and will begin to understand some of the complexities related to water issues.

Lesson Preparation & Resources Needed:

- *Eau Canada* texts (or photocopies of chapter 1 & 2, pages 1 - 35) for each student.
- All student handouts are included in this Instructor Notes package. Copies will need to be made before the course starts.
- There is also a **PowerPoint file** that is to be used during the pre-immersion classroom sessions. Most slides from that document have been inserted here for your information. They are all inside blue squares.

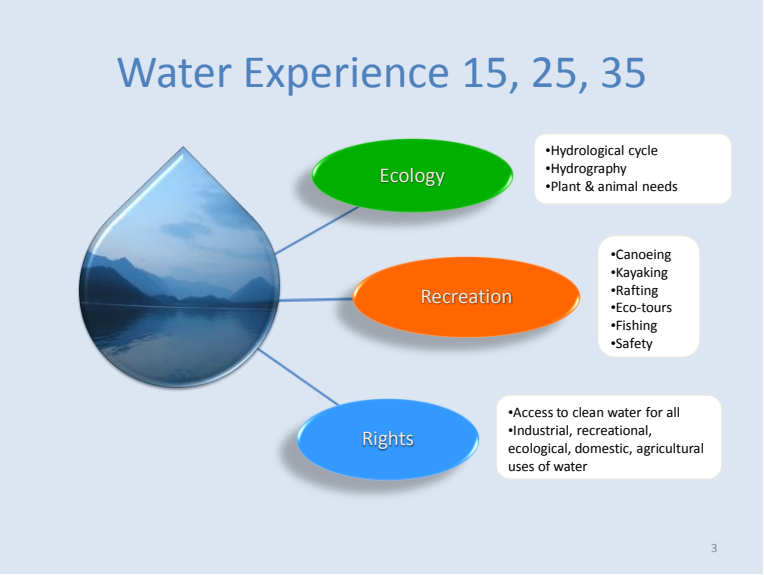
---

1. Put up the first PowerPoint slide. Explain to the students that there are three main water topics that will be covered in this course. Take 5 - 10 minutes to explain and discuss the following:

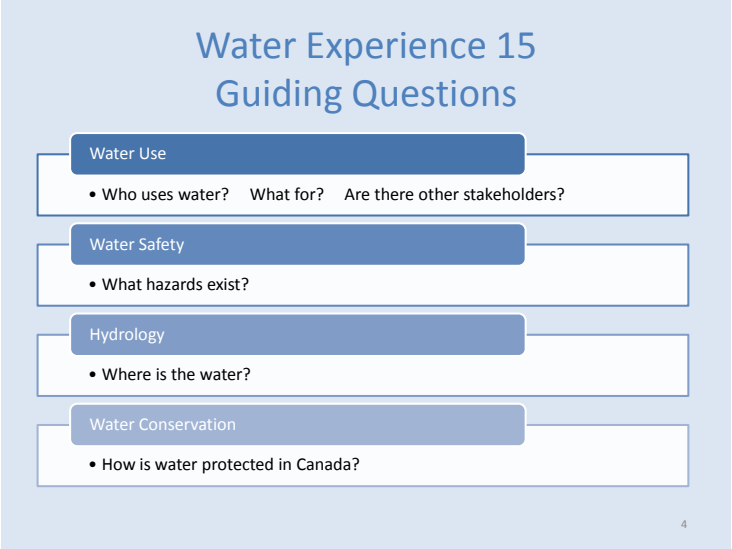
   - Water **Ecology** refers to the hydrological cycle, hydrography (where the water is) and basic plant and animal needs related to water. This will be discussed briefly in Water Experience 15 but will be the main focus in the 25 level course.

   - Water **Recreation** will be present throughout the three levels, but will of course take place mainly during the Immersion portion of the course. In the 15 level, students will be introduced to canoeing, kayaking, and rafting. In the 25 level, students will be kayaking, rafting and canoeing while working on ecosystem monitoring activities. In the 35 level course the main activity of the Immersion portion will be the planning and execution of a two night trip on Maligne Lake, while kayaking or canoeing.

   - Water **Rights** will also be a main area of concern during all three levels, and we will be looking at some issues in the pre and post portions of the courses. One of the main resources that will be referred to during Water Experience 15, 25 & 35 is *Eau Canada*, a Canadian book from 2007, edited by Karen Bakker.



2. The following diagram shows the topics that will be covered in the pre-immersion sessions.



3. Hand out the *Eau Canada* books (or photocopies of chapter 1 & 2, pages 1 - 35.) Intro the book by reading the Editor's Bio (in the book's Appendix) and by explaining that it covers politically charged issues.

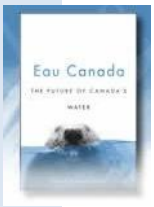
   The articles in this book are not meant to be memorized, but instead should be skimmed and then discussed. It may be above some students' reading levels if they are asked to read on their own without input from the teacher or other students, so ensure that the students understand this before beginning. Effective note-taking strategies should be reviewed together and a time limit should be given for each reading assignment that is sent home so that students do not spend frustrating hours concerned with details when it is the big picture that we are looking for.

* Extension activity : Research the Waterkeeper Alliance (where the proceeds from the sale of this book are donated).

Eau Canada

The main resource for Water Experience courses

"This book focuses on two aspects of our relationship with water: water governance and water management. "Water governance" refers to the decision making process we follow, whereas "water management" refers to the operational approaches we adopt. Governance refers to how we make decisions and who gets to decide; management refers to the models, principles, and information we use to make those decisions...



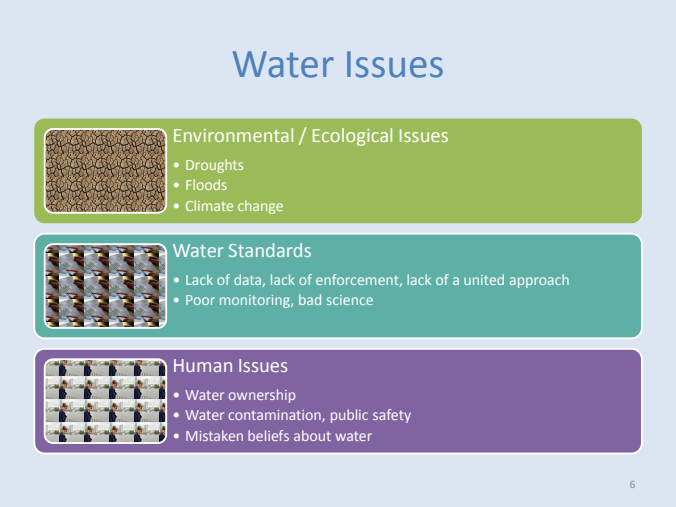
Significant changes are going to be made to water governance and management in Canada over the next decade. One of the premises of this book is that informed public input is essential to good policy outcomes. Accordingly, the goal of this book is to introduce these issues to the broader Canadian public in the hope that people will continue to engage with, and build upon, the ideas and debates presented here. Our water is too important to do otherwise."

Eau Canada, page 16

5

4. Ask the students to spend 10-15 minutes and skim the introduction to this book (Pages 1 - 20). They will need to jot down as many of the water problems or issues that Canada is facing as they can in their folders. Beside each issue, they need to put a number representing their prior knowledge on that subject (1 = I know very little, 10 = I am an expert).

5. After 10-15 minutes, go through the issues raised (see the PowerPoint slide) and add any others that the students have discovered. Discuss which issues are already widely known about, and which ones are new to the group.



6. Who Owns the Water of the Great Lakes? Watch the Quick Time Video Clip (5 minutes 48 seconds) http://www.youtube.com/watch?v=NhE28kcTE70 which raises some good questions about water governance and management.

   The following Background Information "Who Owns the Water of the Great Lakes?" (page 6) could be used in class if desired, or you could just jump straight into the video clip. It is interesting to see how the students in the video change their attitudes as they debate and discuss the issues and how the Chicago youth feel that the water belongs to them.

The following Discussion Questions may be used in class after the video clip:

- What is the major issue surrounding the water in the Great Lakes?
- What does the scientist mean when she says she thinks we need to be careful about "commodifying the basis of life"?
- Some companies have looked at the Great Lakes as a resource that should be shared throughout the United States. What do you think?
- Do you think that transporting water from the Great Lakes is a cost effective solution to providing water in other regions? Does every community have the right to obtain sufficient water?

7. If there is time, read the second chapter dealing with Canadian water misconceptions, "Great Wet North?" by John B. Sprague (pages 23 - 35 in Eau Canada). Hand out the following worksheet (pages10 & 11 in this document) and discuss the questions orally before reading the chapter, which will help to focus the students' reading.

   If there is not time to read together, discuss the associated questions and ask that this activity be completed at home in time for the next course when it will be discussed. Review the rubric that will be used to evaluate the assignment.

Rubric	**"Great Wet North?" Questions - Depth of ideas presented**		
4	3	2	1
Students demonstrate a thorough understanding of key concepts. Issues are dealt with in depth.	Students demonstrate a good understanding of key concepts.	Students demonstrate a general understanding of key concepts.	Students indicate a lack of conceptual understanding. Issues are dealt with at a superficial level and/or in isolation.

Without water, life would not exist. Even though more than 70% of Earth's surface is water, most of this is salt water, and there is only a limited amount of clean, fresh water on Earth. Both population growth and global climate change are currently affecting the water supply. As the use and demand for water continues to increase, learning how to conserve and recycle water is becoming more and more important.

The Great Lakes, which include Superior, Michigan, Huron, Erie and Ontario, are the largest group of freshwater lakes in the world, covering an area of more than 90 thousand square miles. Rainwater and groundwater from the surrounding area, called the Great Lakes watershed, drain into the Great Lakes to replenish the water supply. The watershed includes all or part of the states of Minnesota, Wisconsin, Illinois, Indiana, Michigan, Ohio, Pennsylvania and New York, as well as part of the Canadian province of Ontario. About 37 million residents who live in this area rely on the Great Lakes for their drinking water. Many animals and plants that make the watershed home also rely on the water.

Many towns outside of the Great Lakes watershed, such as Waukesha, WI, get their water from an aquifer. An aquifer is an underground layer of rock, which contains water in its open spaces. Wells are drilled into the aquifer in order to draw up the water. However, rainwater recharge of underground aquifers can take place very slowly. For instance, the water in the Ogallala aquifer, which supplies water to eight states in the Midwest, accumulated over tens of thousands of years. Today, water is being extracted from the aquifer at a rate which is over one hundred times the replacement rate.

The issue of selling or diverting water from the Great Lakes has been discussed in political arenas for years. But in the coming years, some people think that the need to transport water from the Great Lakes to other areas by tankers or pipelines will become a more pressing issue. Some politicians are looking for a national water policy to aid areas lacking the necessary water supply, but Great Lakes leaders are not so quick to support the idea. They recognize that poor urban planning and speedy over-development in some cities may have contributed to the lack of necessary water resources. They feel that it is not fair to put the Great Lakes' ecosystem at risk in order to make up for this lack of foresight by developers. As a result, the Great Lakes Compact, an agreement among eight states and two Canadian provinces to prevent water diversion from the Great Lakes, has been drafted to provide legal protection for the water supply. As of September 2008, the Great Lakes Compact was not yet in effect, as it still awaited approval in multiple states.

In an effort to avoid having to take water from distant sources, some cities are looking for sensible and efficient ways to protect their water supply through better water management techniques and conservation. For example, Las Vegas now recycles all of its waste water. In addition, there are over 13,000 desalination plants worldwide that provide drinking water from the ocean's saltwater.

Teachers' Domain, Who Owns the Water of the Great Lakes?, published September 5, 2008, retrieved on December 24, 2009, http://www.teachersdomain.org/resource/wnet08.sci.ess.watcyc.wnetgrlake/

by John B. Sprague pages 23 - 35 in *Eau Canada* (2007)

1. On page 23, the author explains that there is a difference between volume of water and renewable supply of water. What is this difference? Use words from the text and your own words to describe it.

2. On page 25, what does Sprague say 6.5 % represents? What does 2.6% represent?

3. Why is it important to have a good understanding of the usable supply of water that Canada has?

4. Allowing the export of Fresh Water... What's your opinion and why?

5. Give an example of an acceptable (to you) use of water, and an unacceptable use of water.

6. Give an example of an acceptable (to you) diversion of water, and an unacceptable diversion.

7. Write here the words or ideas from this chapter that you would like to know more about.

Rubric	**"Great Wet North?" Questions - Depth of ideas presented**		
4	3	2	1
Students demonstrate a thorough understanding of key concepts. Issues are dealt with in depth.	Students demonstrate a good understanding of key concepts.	Students demonstrate a general understanding of key concepts.	Students indicate a lack of conceptual understanding. Issues are dealt with at a superficial level and/or in isolation.

Session 2

Topics this second class will cover:

- Review of activity & text from previous session ("Great Wet North?")
- Drowning prevention & outdoor safety

Learning outcomes:

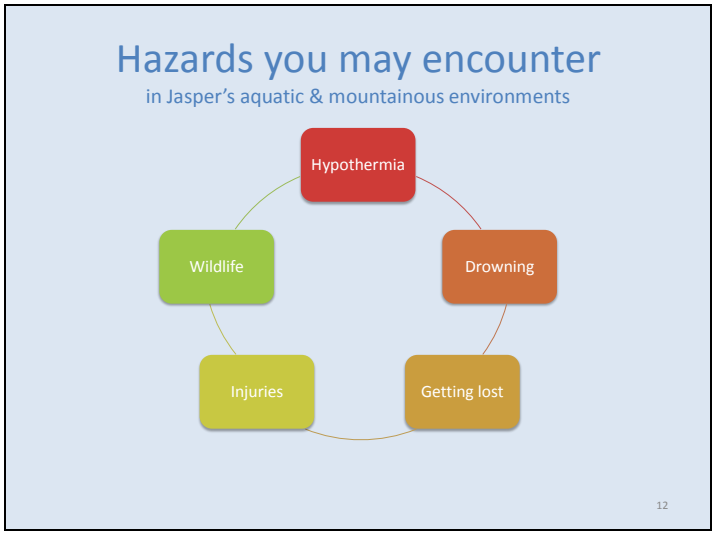
- Students will understand that there are many water issues facing Canada and the world, and will begin to understand some of the complexities related to water issues.
- Students will understand and be able to list some of the hazards associated with outdoor water activities (or activities near water).
- Students will be able to list some mitigating factors to reduce the risks associated with outdoor water activities.

---

1. The first activity will be to discuss and correct as a group (or the teacher can collect) the assignment from the previous class. Spend the most time discussing answers to questions 3 and 4.

2. Set up an informal debate: For or Against Canada exporting freshwater to other countries. Debate for 5 minutes, and then have everyone switch sides and argue for the opposite idea for another 5 minutes. Ensure that everyone gets the chance to share their ideas, and that they all understand at the end of the debate that there are not always easy answers to these types of water management questions. This is only the first complex question of many.

3. Put up the following PowerPoint slide. Explain to the students that during the rest of this class, they will be researching hazards that they could encounter in a typical mountainous & aquatic environment.



4. Take this time to uncover / discuss some of the possible hazards that are faced on the Athabasca River and Maligne Lake (where students may be visiting in the Immersion portion of the course). Discuss some of the situations that the kids have faced themselves or ones they have heard of.

5. Hand out the *Drowning Prevention, Public Safety and Hazards* assignment sheet (pages 14 & 15). Explain to the students that they have the rest of the class to work on the assignment. It will be due the next time you meet. Review the rubric that will be used to mark it. If for some reason the river hazards website (http://www.performancevideo.com/river_hazards) is unavailable, a copy of the information there is in this document's Appendix.

Part 1:

Rubric	**Drowning Prevention & Public Safety - Depth of ideas presented**		
4	3	2	1
Students demonstrate a thorough understanding of key concepts. Issues are dealt with in depth.	Students demonstrate a good understanding of key concepts.	Students demonstrate a general understanding of key concepts.	Students indicate a lack of conceptual understanding. Issues are dealt with at a superficial level and/or in isolation.

Part 2:

Rubric	**The Most Dangerous Hazard - Depth of ideas presented**		
4	3	2	1
Students demonstrate a thorough understanding of key concepts. Issues are dealt with in depth.	Students demonstrate a good understanding of key concepts.	Students demonstrate a general understanding of key concepts.	Students indicate a lack of conceptual understanding. Issues are dealt with at a superficial level and/or in isolation.

1. Using the internet, research **at least two** of the following four questions. Be prepared to share your findings. You are allowed to copy and paste, but make sure you copy the site address where you found the information you use.

- What are the Lifesaving Society's Top 10 Water Smart tips?
- Research Canadian drowning statistics. Who is drowning? Where are they drowning? What are some recommendations?
- Research the transport Canada's regulations for personal watercraft. What equipment is mandatory?
- What is the difference between a lifejacket and a PFD? Research some different lifejackets and PFDs. Copy and paste pictures and descriptions into a document to share with others.

Rubric	**Drowning Prevention & Public Safety - Depth of ideas presented**		
4	3	2	1
Students demonstrate a thorough understanding of key concepts. Issues are dealt with in depth.	Students demonstrate a good understanding of key concepts.	Students demonstrate a general understanding of key concepts.	Students indicate a lack of conceptual understanding. Issues are dealt with at a superficial level and/or in isolation.

2. The Most Dangerous Hazard…

Write a paragraph about the hazard that you find to be the most dangerous; the hazard on a lake or river that you wouldn't touch with a ten foot pole. Explain what it is, why it's dangerous, and how it could be avoided. Be prepared to share your paragraph with the group next class. Creative writing is encouraged!

Use your notes from today and visit http://www.performancevideo.com/river_hazards for more descriptions of moving water hazards for boaters.

Rubric	**The Most Dangerous Hazard - Depth of ideas presented**		
4	3	2	1
Students demonstrate a thorough understanding of key concepts. Issues are dealt with in depth.	Students demonstrate a good understanding of key concepts.	Students demonstrate a general understanding of key concepts.	Students indicate a lack of conceptual understanding. Issues are dealt with at a superficial level and/or in isolation.

Session 3

Topics this third class will cover:

- Review of activity from previous session (Drowning Prevention, Public Safety, and Hazards)
- Hydrology (Where is the water? Important vocabulary)

Learning outcomes:

- Students will understand and be able to list some of the hazards associated with outdoor water activities (or activities near water).
- Students will be able to list some mitigating factors to reduce the risks associated with outdoor water activities.
- Students will be able to define what a watershed is and will also be able to name some of the associated processes and parts.
- Students will be able to search out various drainage basins in Canada using online resources.
- Students will understand what a drainage basin is and will be able to identify their home river's drainage basin (if they are from Canada.)

Lesson Preparation & Resources Needed:

- "Canada's Hydrologic Diversity" in print format (included in this document) is also available from the Environment Canada website (*http://www.wsc.ec.gc.ca/hydrology)*
- *Bill Nye* video clip from www.watchknow.org (It may also be available on YouTube.)
- Students would benefit from having access to their own computers with internet capabilities during this lesson. If possible, arrange to have access to laptops or the computer lab.

---

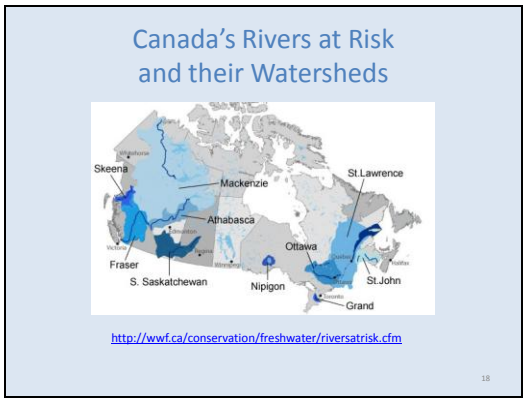
1. The first activity will be to discuss and correct as a group (or the teacher can collect) the assignments from the previous class. Be sure that everyone has the chance to share their paragraphs on *The Most Dangerous Hazard*.

2. Show the You Tube clip of the water cycle rap to introduce the next topic. It can be found at http://www.youtube.com/watch?v=i3NeMVBcXXU Explain to the students that the water cycle was something they should already know about and that the next step in understanding water is to learn about watersheds and hydrography / hydrology. These concepts are essential to cover if one is going to have a good understanding of aquatic ecosystems. They also tie in with water rights issues as well.

3. Hand out the reading assignment (Canada's Hydrologic Diversity, pages 18 & 19). Read as a group if you like. Encourage the students to underline all the new vocabulary they find. Have each student write a brief summary of the text they have just read and also draw a map of Canada. Compare maps and also discuss any vocabulary that the students found difficult or that was new. The most interesting part will be looking at the maps of Canada: What did the students include? What did they leave out? Why were some lakes, rivers, etc. included and others not included? What is their significance?

4. Go to the Natural Resources Canada website (http://atlas.nrcan.gc.ca/site/english/maps/reference/national/drainbasins) and search the Athabasca River. Discuss how Jasper is at the start of the river and that there are many communities downstream which are affected by our use and treatment of the water. Ask students to search another river (perhaps their home river, if they are not from the area). Determine the drainage basin it lies in and which ocean it drains into.

5. As a group or individually, go to the World Wildlife Fund's website: http://www.wwf.ca/conservation/freshwater/
Look around the site for a few minutes and come up with at least one interesting / shocking fact related to water issues and share this with the group.



6. Ask the students to complete the *What is a watershed?* definition & labelling worksheet (page 20) by the next class. The answers can be found on the website listed on the assignment sheet (http://assets.wwf.ca/downloads/whatisawatershed.pdf). Review the rubric that will be used to assess this assignment. (N.B. This rubric is not on the assignment due to a lack of space. Include it as a separate sheet if you like).

Rubric	**Watershed Descriptions & Vocabulary - Completeness**		
4	3	2	1
Students have completed all parts of the assignment. Definitions are accurate and concise. It is tidy and easy to read and will serve well for reviewing.	Students have completed all parts of the assignment. Definitions are accurate. It is mostly tidy and easy to read and will serve well for reviewing.	Students have completed all parts of the assignment. Definitions are mostly accurate. It is not tidy and easy to read and will be difficult to use for reviewing.	Students have not completed all parts of the assignment. Definitions are not accurate. It is not easy to read and will be difficult to use for reviewing.

Canada's Hydrologic Diversity *WE15 In-class Assignment*

"The relatively wet, mountainous Montane and Boreal Cordillera and Pacific Maritime ecozones covering British Columbia, southwestern Alberta and much of the Yukon Territory form the western fringe of the country. High runoff from these ecozones drains westward into the Pacific Ocean – exceeding 3,000 mm annually in some coastal areas – and eastward into the vast, dry Interior Plains. The latter region comprises the flat, fertile Prairies ecozone in the south and the Boreal and Taiga Plains ecozones to the north. Generally, runoff on the Plains averages well under 200 mm per year, especially in the south where it can average less than 50 mm.

Most of central and eastern Canada is covered by the rugged Boreal and Taiga Shield and Southern Arctic ecozones, for which annual runoff trends from 15 mm in the northwest to 800 mm in the southeast, to over 1000 mm along the Atlantic coast. Surrounded by the Shield, the extensive wetlands of the Hudson Plains ecozone drain northward into Hudson and James bays.

The humid Mixed Wood Plains ecozone of the Great Lakes-St. Lawrence River Valley encompasses the heavily populated area of southern Ontario and southern Quebec. Annual runoff ranges from as low as 200 mm in the southwest to over 600 mm in the northeastern end of the ecozone. To the east of the Mixed Wood Plains lies the rugged, wet Atlantic Maritime ecozone which covers all of the provinces of New Brunswick, Nova Scotia and the Atlantic provinces and a portion of eastern Quebec. Runoff increases significantly from west to east, varying from 600 mm annually in the western part of the ecozone to 2000 mm along the Atlantic coast.

In the far north, the desert-like Northern Arctic ecozone straddles the Northwest Territories and Nunavut. Few data on runoff are available in this ecozone, but in view of the very low precipitation (100-200 mm annually) annual runoff is considered to be very low also. Even less is known about runoff from the glaciated, mountainous Arctic Cordillera ecozone, most of which covers Nunavut's east coast.

The climates of Canada range from continental in the south to boreal or subarctic in the mid-latitudes and arctic in the north. Maritime influences modify both the west and east coast climates, the east coast less, because of the predominantly eastward movement of interior air masses. Permafrost occurs throughout the mid- to northern latitudes. Annual precipitation varies from 50 mm in the far north to as much as 4000 mm on the Pacific Coast."

From Environment Canada
http://www.wsc.ec.gc.ca/hydrology/main_e.cfm?cname=hydro_e.cfm#rwi

1. Write a short summary of the above text that succinctly explains the main points:

2. Draw a free-hand map of Canada and label the different areas. You will need to include: **Name of the area** and at least one **descriptor** (dry, high runoff, wetlands, etc.). Include all oceans, major lakes and rivers.

Headwaters

_____
_____
_____
_____

Surface Runoff

Water from rain and snowmelt that flows over land when the soil is saturated and unable to absorb it.

_____

Groundwater is subsurface water that moves through or is stored in pores, cracks, and crevices in the earth. It is a source of water for wells and springs, and is often a significant source for lakes and rivers.

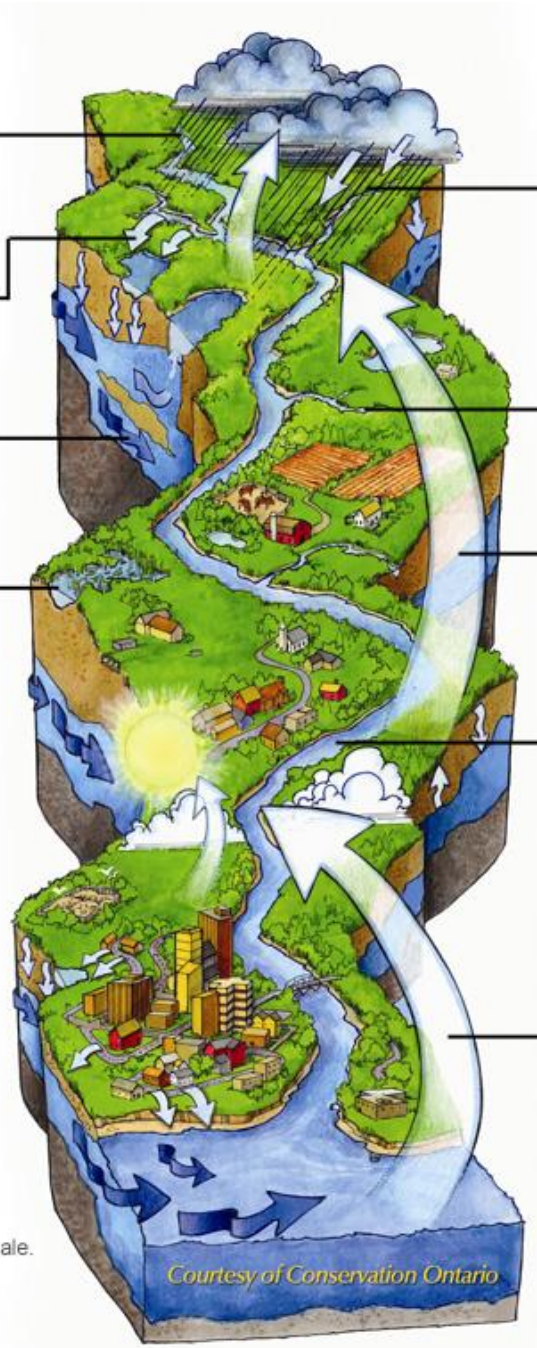
Wetlands

_____
_____
_____
_____

What is a watershed?

_____
_____
_____
_____
_____

As the image above illustrates, watersheds are complex systems with multiple interacting and interconnected parts and processes. Soil, vegetation, animals, climate, water and humans are all integral elements of the watershed. Water extraction, land use changes, urban developments, and industrial, forestry and agricultural operations all impact the watershed. Keeping rivers healthy requires an integrated approach to planning and management that considers the cumulative impacts of these many pressures at the watershed scale.



_____

Process where water vapor condenses and falls as rain or snow

Streams and Tributaries

_____
_____
_____
_____

Transpiration

Process whereby water from within plants and trees is transformed to vapor and released to the air.

Mainstem

_____
_____
_____
_____

Evaporation

Process whereby water from transformed to vapor - moving from the surfaces of oceans, lakes and rivers to the air.

http://assets.wwf.ca/downloads/whatisawatershed.pdf

Moving Water Conservation to Centre Stage *WE15* Anticipation Guide

by Brandes, Brooks & M'Gonigle pages 281 - 300 in *Eau Canada* (2007)

Directions: On the continuum in front of each of the numbers, place an "x" that indicates where you stand in regard to the statement that follows. Be prepared to defend and support your opinions with specific examples. After reading the text, compare your opinions on those statements with the author's implied and/or stated messages.

Strongly Agree Strongly Disagree

1. The largest source of new water won't be new at all but, rather, more efficient use of the water we already have.
2. It will be impossible to meet future water demands simply by reducing water use.
3. Changing behaviours and attitudes of Canadians is a major first step in meeting our water demands.
4. Ecological governance means thinking about ecosystem health and processes both upstream and downstream and throughout the watershed.
5. Australia, South Africa, Europe, Israel, Florida and California are on the right track with their water management approaches.
6. The Hoover Dam should be celebrated as a "temple of modernity."
7. The financial costs of new water supply schemes are greater than the ecological costs.
8. Simple "off the shelf" technologies (such as low-flow showerheads) are not enough to significantly reduce water consumption.
9. Government leadership and action are important parts of water conservation.
10. Demand management means having incentives, public education, and real-cost pricing to help reduce water demand instead of trying to figure out how to supply more water.
11. Efficiency is more important than conservation.
12. The "soft path" approach asks *Why?* instead of *How?* and has sustainability as its fundamental principle.
13. Demand Management and Soft Path thinking need to be adopted together in order to conserve water.

Session 4

Topics this fourth class will cover:

- Review of activity from previous session (What is a Watershed?)
- Water Conservation & Protection in Canada

Learning outcomes:

- Students will understand the role of Parks Canada in the protection of water resources.
- Students will understand some of the complexities related to water conservation in Canada.
- Students will be able to list the bodies of water they may be visiting during the PSEC Immersion portion of this course.
- Students will be able to list the activities that are permitted and prohibited in National Parks that have to do with water.

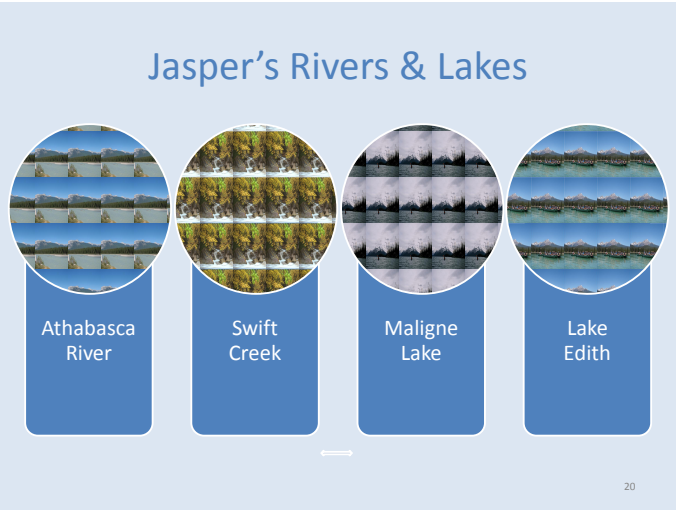
Lesson Preparation & Resources Needed:

- Students would benefit from having access to their own computers with internet capabilities during this lesson. If possible, it would be good to have access to laptops or the computer lab.
- "Moving Water Conservation to Centre Stage" By Brandes, Brooks and M'Gonigle. Pages 281 - 300 in *Eau Canada* (2007).

---

1. The first activity will be to discuss and correct as a group (or the teacher can collect) the assignment from the previous class (What is a Watershed?). This should have been a straightforward assignment, but ask if there were any questions or problems encountered while completing the worksheet.

2. Open up Google maps and go to Jasper, Alberta. Find the following bodies of water on the map as a group, or if each student has access to a computer, have them locate the lakes & rivers on their own. Spend about 10 minutes on this.



3. For another 10 minutes, brainstorm with the students the different types of activities that one can normally do on a lake or river: Kayaking, canoeing, motor boating, jet skiing, fishing, swimming, rafting, tubing, etc. Then, put the activities in the following categories on the Smart Board:

   Permitted / Not permitted, and add the sub-categories --> Permitted but not recommended / Permitted with certain restrictions. Leave the correction of this activity until the next class, as the students will now have the opportunity to search the Parks Canada website for answers and will also have the opportunity to ask a Parks Canada interpreter next class what the answers are if they are unable to find them on their own.

4. Ask the students to research in groups or individually the role that Parks Canada plays in protecting water resources. Search the Parks Canada website http://www.pc.gc.ca and any others that may be useful for 10-15 minutes. A key idea here will be *Ecological Integrity*. Try to discover what Parks Canada says about water resources, especially Marine conservation areas and heritage canals. After 10 - 15 minutes, come back together as a group and discuss what the students discovered. Students should make a list of questions in their folders about Parks Canada's role and also the role that all Canadians play in water conservation. These are questions that the group will try to answer during their upcoming trip to the PSEC and after reflecting on the next reading. Good websites include:
   http://www.pc.gc.ca/eng/progs/np-pn/ie-ei.aspx
   http://www.chrs.ca/Main_e.htm --> The Rivers --> Athabasca River

5. Hand out and read together "Moving Water Conservation to Centre Stage" By Brandes, Brooks and M'Gonigle. Chapter 14, pages 281 - 300 in *Eau Canada* (2007). Hand out the Anticipation Guide (page 21 in this document) to the students and have them complete it prior to beginning to read. An anticipation guide is a tool that has statements that may be true (taken directly from the text) or false. It will give the students an idea of what they are about to read and will introduce some of the key concepts. It also gets the students making judgments before reading and also after reading. It is a good way to see the shifting beliefs as students gain more understanding. This text is long but takes a good look at what decisions should be made in Canada to protect our

water supplies. Discuss as you go and feel free to spend less time on certain parts and more time on others that the students find interesting.

Water Experience 15 Student Handouts

The following student handouts are already included in the Instructor Notes above, but are also included here for ease of photocopying.

Without water, life would not exist. Even though more than 70% of Earth's surface is water, most of this is salt water, and there is only a limited amount of clean, fresh water on Earth. Both population growth and global climate change are currently affecting the water supply. As the use and demand for water continues to increase, learning how to conserve and recycle water is becoming more and more important.

The Great Lakes, which include Superior, Michigan, Huron, Erie and Ontario, are the largest group of freshwater lakes in the world, covering an area of more than 90 thousand square miles. Rainwater and groundwater from the surrounding area, called the Great Lakes watershed, drain into the Great Lakes to replenish the water supply. The watershed includes all or part of the states of Minnesota, Wisconsin, Illinois, Indiana, Michigan, Ohio, Pennsylvania and New York, as well as part of the Canadian province of Ontario. About 37 million residents who live in this area rely on the Great Lakes for their drinking water. Many animals and plants that make the watershed home also rely on the water.

Many towns outside of the Great Lakes watershed, such as Waukesha, WI, get their water from an aquifer. An aquifer is an underground layer of rock, which contains water in its open spaces. Wells are drilled into the aquifer in order to draw up the water. However, rainwater recharge of underground aquifers can take place very slowly. For instance, the water in the Ogallala aquifer, which supplies water to eight states in the Midwest, accumulated over tens of thousands of years. Today, water is being extracted from the aquifer at a rate which is over one hundred times the replacement rate.

The issue of selling or diverting water from the Great Lakes has been discussed in political arenas for years. But in the coming years, some people think that the need to transport water from the Great Lakes to other areas by tankers or pipelines will become a more pressing issue. Some politicians are looking for a national water policy to aid areas lacking the necessary water supply, but Great Lakes leaders are not so quick to support the idea. They recognize that poor urban planning and speedy over-development in some cities may have contributed to the lack of necessary water resources. They feel that it is not fair to put the Great Lakes' ecosystem at risk in order to make up for this lack of foresight by developers. As a result, the Great Lakes Compact, an agreement among eight states and two Canadian provinces to prevent water diversion from the Great Lakes, has been drafted to provide legal protection for the water supply. As of September 2008, the Great Lakes Compact was not yet in effect, as it still awaited approval in multiple states.

In an effort to avoid having to take water from distant sources, some cities are looking for sensible and efficient ways to protect their water supply through better water management techniques and conservation. For example, Las Vegas now recycles all of its waste water. In addition, there are over 13,000 desalination plants worldwide that provide drinking water from the ocean's saltwater.

Teachers' Domain, Who Owns the Water of the Great Lakes?, published September 5, 2008, retrieved on December 24, 2009, http://www.teachersdomain.org/resource/wnet08.sci.ess.watcyc.wnetgrlake/

by John B. Sprague pages 23 - 35 in *Eau Canada* (2007)

1. On page 23, the author explains that there is a difference between volume of water and renewable supply of water. What is this difference? Use words from the text and your own words to describe it.

2. On page 25, what does Sprague say 6.5 % represents? What does 2.6% represent?

3. Why is it important to have a good understanding of the usable supply of water that Canada has?

4. Allowing the export of Fresh Water... What's your opinion and why?

5. Give an example of an acceptable (to you) use of water, and an unacceptable use of water.

6. Give an example of an acceptable (to you) diversion of water, and an unacceptable diversion.

7. Write here the words or ideas from this chapter that you would like to know more about.

Rubric	**"Great Wet North?" Questions - Depth of ideas presented**		
4	3	2	1
Students demonstrate a thorough understanding of key concepts. Issues are dealt with in depth.	Students demonstrate a good understanding of key concepts.	Students demonstrate a general understanding of key concepts.	Students indicate a lack of conceptual understanding. Issues are dealt with at a superficial level and/or in isolation.

1. Using the internet, research **at least two** of the following four questions. Be prepared to share your findings. You are allowed to copy and paste, but make sure you copy the site address where you found the information you use.

- What are the Lifesaving Society's Top 10 Water Smart tips?
- Research Canadian drowning statistics. Who is drowning? Where are they drowning? What are some recommendations?
- Research the transport Canada's regulations for personal watercraft. What equipment is mandatory?
- What is the difference between a lifejacket and a PFD? Research some different lifejackets and PFDs. Copy and paste pictures and descriptions into a document to share with others.

Rubric	**Drowning Prevention & Public Safety - Depth of ideas presented**		
4	3	2	1
Students demonstrate a thorough understanding of key concepts. Issues are dealt with in depth.	Students demonstrate a good understanding of key concepts.	Students demonstrate a general understanding of key concepts.	Students indicate a lack of conceptual understanding. Issues are dealt with at a superficial level and/or in isolation.

2. The Most Dangerous Hazard…

Write a paragraph about the hazard that you find to be the most dangerous; the hazard on a lake or river that you wouldn't touch with a ten foot pole. Explain what it is, why it's dangerous, and how it could be avoided. Be prepared to share your paragraph with the group next class. Creative writing is encouraged!

Use your notes from today and visit http://www.performancevideo.com/river_hazards for more descriptions of moving water hazards for boaters.

Rubric	**The Most Dangerous Hazard - Depth of ideas presented**		
4	3	2	1
Students demonstrate a thorough understanding of key concepts. Issues are dealt with in depth.	Students demonstrate a good understanding of key concepts.	Students demonstrate a general understanding of key concepts.	Students indicate a lack of conceptual understanding. Issues are dealt with at a superficial level and/or in isolation.

Canada's Hydrologic Diversity *WE15* *In-class Assignment*

"The relatively wet, mountainous Montane and Boreal Cordillera and Pacific Maritime ecozones covering British Columbia, southwestern Alberta and much of the Yukon Territory form the western fringe of the country. High runoff from these ecozones drains westward into the Pacific Ocean – exceeding 3,000 mm annually in some coastal areas – and eastward into the vast, dry Interior Plains. The latter region comprises the flat, fertile Prairies ecozone in the south and the Boreal and Taiga Plains ecozones to the north. Generally, runoff on the Plains averages well under 200 mm per year, especially in the south where it can average less than 50 mm.

Most of central and eastern Canada is covered by the rugged Boreal and Taiga Shield and Southern Arctic ecozones, for which annual runoff trends from 100 mm in the northwest to 800 mm in the southeast, to over 1000 mm along the Atlantic coast. Surrounded by the Shield, the extensive wetlands of the Hudson Plains ecozone drain northward into Hudson and James bays.

The humid Mixed Wood Plains ecozone of the Great Lakes-St. Lawrence River Valley encompasses the heavily populated area of southern Ontario and southern Quebec. Annual runoff ranges from as low as 200 mm in the southwest to over 600 mm in the northeastern end of the ecozone. To the east of the Mixed Wood Plains lies the rugged, wet Atlantic Maritime ecozone which covers all of the provinces of New Brunswick, Nova Scotia and the Atlantic provinces and a portion of eastern Quebec. Runoff increases significantly from west to east, varying from 600 mm annually in the western part of the ecozone to 2000 mm along the Atlantic coast.

In the far north, the desert-like Northern Arctic ecozone straddles the Northwest Territories and Nunavut. Few data on runoff are available in this ecozone, but in view of the very low precipitation (100-200 mm annually) annual runoff is considered to be very low also. Even less is known about runoff from the glaciated, mountainous Arctic Cordillera ecozone, most of which covers Nunavut's east coast.

The climates of Canada range from continental in the south to boreal or subarctic in the mid-latitudes and arctic in the north. Maritime influences modify both the west and east coast climates, the east coast less, because of the predominantly eastward movement of interior air masses. Permafrost occurs throughout the mid- to northern latitudes. Annual precipitation varies from 50 mm in the far north to as much as 4000 mm on the Pacific Coast."

From Environment Canada
http://www.wsc.ec.gc.ca/hydrology/main_e.cfm?cname=hydro_e.cfm#rwi

1. Write a short summary of the above text that succinctly explains the main points:

2. Draw a free-hand map of Canada and label the different areas. You will need to include: **Name of the area** and at least one **descriptor** (dry, high runoff, wetlands, etc.). Include all oceans, major lakes and rivers.

Headwaters

_____
_____
_____
_____

Surface Runoff

Water from rain and snowmelt that flows over land when the soil is saturated and unable to absorb it.

_____

Groundwater is subsurface water that moves through or is stored in pores, cracks, and crevices in the earth. It is a source of water for wells and springs, and is often a significant source for lakes and rivers.

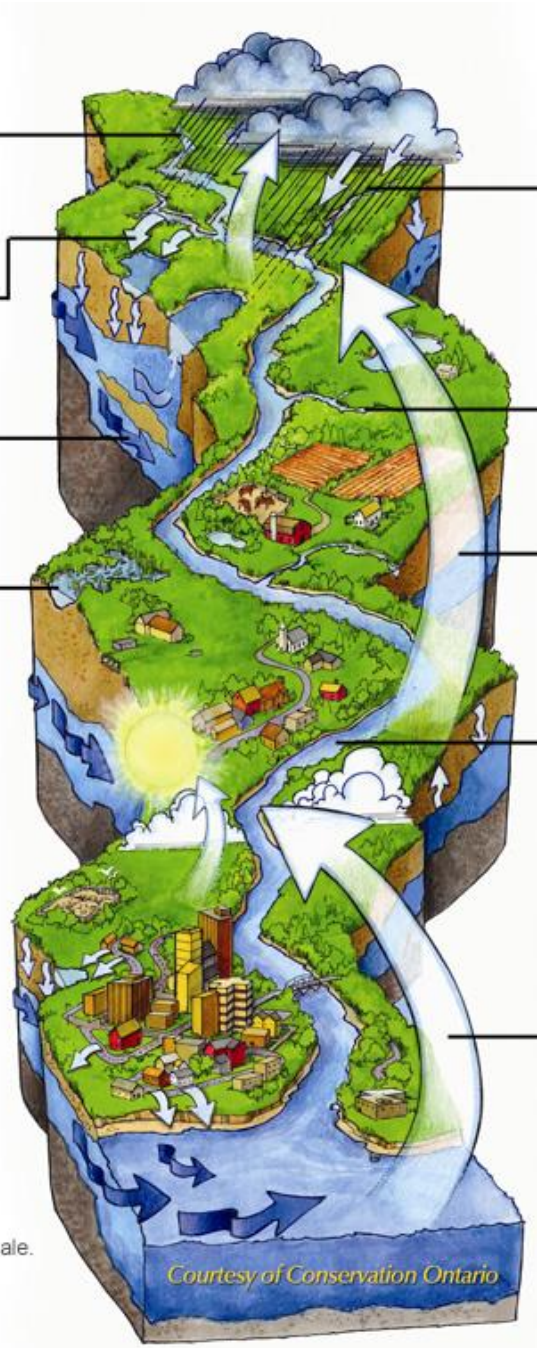
Wetlands

_____
_____
_____
_____

What is a watershed?

_____
_____
_____
_____
_____

As the image above illustrates, watersheds are complex systems with multiple interacting and interconnected parts and processes. Soil, vegetation, animals, climate, water and humans are all integral elements of the watershed. Water extraction, land use changes, urban developments, and industrial, forestry and agricultural operations all impact the watershed. Keeping rivers healthy requires an integrated approach to planning and management that considers the cumulative impacts of these many pressures at the watershed scale.



_____

Process where water vapor condenses and falls as rain or snow

Streams and Tributaries

_____
_____
_____
_____

Transpiration

Process whereby water from within plants and trees is transformed to vapor and released to the air.

Mainstem

_____
_____
_____
_____

Evaporation

Process whereby water from transformed to vapor - moving from the surfaces of oceans, lakes and rivers to the air.

http://assets.wwf.ca/downloads/whatisawatershed.pdf

Moving Water Conservation to Centre Stage *WE15* Anticipation Guide

by Brandes, Brooks & M'Gonigle pages 281 - 300 in *Eau Canada* (2007)

Directions: On the continuum in front of each of the numbers, place an "x" that indicates where you stand in regard to the statement that follows. Be prepared to defend and support your opinions with specific examples. After reading the text, compare your opinions on those statements with the author's implied and/or stated messages.

Strongly Agree Strongly Disagree

1. The largest source of new water won't be new at all but, rather, more efficient use of the water we already have.
2. It will be impossible to meet future water demands simply by reducing water use.
3. Changing behaviours and attitudes of Canadians is a major first step in meeting our water demands.
4. Ecological governance means thinking about ecosystem health and processes both upstream and downstream and throughout the watershed.
5. Australia, South Africa, Europe, Israel, Florida and California are on the right track with their water management approaches.
6. The Hoover Dam should be celebrated as a "temple of modernity."
7. The financial costs of new water supply schemes are greater than the ecological costs.
8. Simple "off the shelf" technologies (such as low-flow showerheads) are not enough to significantly reduce water consumption.
9. Government leadership and action are important parts of water conservation.
10. Demand management means having incentives, public education, and real-cost pricing to help reduce water demand instead of trying to figure out how to supply more water.
11. Efficiency is more important than conservation.
12. The "soft path" approach asks *Why?* instead of *How?* and has sustainability as its fundamental principle.
13. Demand Management and Soft Path thinking need to be adopted together in order to conserve water.

River Hazards

from http://www.performancevideo.com/river_hazards

The following river hazards are described briefly which forces the paddler to adapt an inquisitive attitude. The river sense of experienced boaters is based on this approach.

Don't let these descriptions intimidate you. Your purpose is to understand the hazards clearly, enabling you to know when they are a factor to your safety. If you would like further explanation, ask local instructors to point them out on nearby rivers.

A **Foot entrapment** is simply catching a foot in rocks on the bottom of the river. It is caused by trying to stand up while getting swept downstream in water usually in water mid-thigh to mid-torso deep. Prevention is easy: stay in the safe swimmer's position (on your back, feet up and pointed downstream) unless the water is less than knee deep. Practice swimming and manoeuvring through rapids aggressively, on your back, looking between your feet at the side of the river you wish to avoid. In very deep water practice swimming freestyle, on your stomach. River swimming wisdom is to ball up when swimming over a sheer drop of more than 3-4 feet.

Strainers are trees or single branches in the current, with river water flowing through, causing a severe pinning hazard. Strainers are caused by erosion. Trees fall because of old age, floods, and storms. Look for them on wooded riverbanks, along small creeks after high water, often found on the outside of bend, and on less frequented rivers. Assume they are present unless you know otherwise. Use downstream vision to spot bobbing twigs or irregular flow patterns.

Man Made Entrapments Anything manmade in the river is dangerous and are a constant cause of alarm and are inherently more dangerous than most things natural. Keep an eye out for bridge pilings, low head dams, junked cars, any man made junk found commonly in urban riverways, under highway crossings, and at abandoned dam sites. Maintain a habit of visual downstream scanning. Avoid anything suspicious!

Broaches Getting pinned on a rock, either amidship or at the ends. Avoid sharp rocks that can potentially crease a boat or serve as point to be wrapped by your kayak! Develop the instinct to lean into the rock with your boat and body leaning together like a bell buoy. Reach your body out to "Love the rock". Practice this skill with an instructor on gentle, shallow water until it becomes instinct.

Undercut Rocks Undercuts are a water feature where a slab of rock, or rock shape, forces the current flow to go under the surface. Learn to spot them by the dark shadow on the upstream side of the rock, the lack of pillowing action by oncoming water, and by the lack of a predictable eddy on the downstream side. Most dangerous undercuts are well known by locals, and listed in guidebooks.

Entanglement Getting tangled exiting your boat is most likely to be caused by ropes, and loose lines, in your boat. Practice wet exits and critically evaluate your outfitting for entanglement potential. Treat throw ropes as a potential hazard. Keep them neatly bagged, and carry a knife for rescue.

Vertical Pins occur when the bow buries and gets pinned on the bottom after a steep drop. This is not a concern until you are paddling drops of over 3 or 4 feet. Advanced paddlers prevent them by checking the water depth first, and leaning back into a 'boof' move to keep the bow up. Paddling boats with a large volume bow reduces this risk substantially- That's why creek boats have high volume!

Hydraulics The killer hydraulics have evenly formed backwash, water moving back upstream for four or more feet. Holes with more of a wave shape are intimidating, but typically less hazardous than water flowing smoothly upstream. Dams, and hydraulics that are very regular, and perpendicular to the current are far more dangerous than hydraulics angled with one end downstream.

Long Swims Many people unfamiliar with the sport might expect long swims to be a primary killer. Since most beginner/intermediate rivers have pools between the drops, this is rarely the case. Wearing a tight PFD, matching your ability to an appropriate river, and being dressed for a swim can be excellent defence against a long swim. Of course another great precaution is a competent group of friends with either a shore or boat based rescue plan.

Back to basics: wear a helmet in kayaks, and learn to tuck tight forward to the deck when you flip ...dress appropriately for the water and air temperatures. Drysuits and wetsuits are a must if the combined water and air temperature is under 100 degrees.