Chum Salmon

Northern Waters Inspiration

Chum salmon are the most common type of salmon in the NWT and are found in the Mackenzie River, Liard River, Slave River, Great Slave Lake and Great Bear Lake. Scientists believe that the fact that they are getting caught in greater numbers and in more places is a result of climate change — the warming temperatures allowing more eggs hatching in time for the young salmon to reach the ocean.

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OR OLIVING

Salmon Arrive Early

September 23, 2013, Yellowknifer Mackenzie River fish research project continues into third year.

SMART Board / Promixa Ready
 Northern Resources

Gr.8 Freshwater in the NWT NORTHERN WATERS

OBJECTIVE : This unit will guide your students to learn more about freshwater in their community, and ongoing efforts of the NWT Water Stewardship Strategy "to make sure the waters of the NWT remain clean, abundant and productive for all time."

Water is the source of all life: humans, animals, insects, plants and climate all depend on it. Everything is connected and the source of all life is a clean and plentiful water supply. The Northwest Territories is located within the Mackenzie River Drainage Basin, which is the longest river and largest drainage basin in the country. We share this watershed with many communities south of us in British Columbia, Alberta and Saskatchewan. There are extractive industries that require large amounts of water taking place in our watershed, such as pulp and paper, mining, fracking and the Alberta oil sands. All of these industries consume water and produce contaminated wastewater. This is why we must have a holistic understanding of our watershed, and be aware of the threats to our land from upstream and local impacts.

- Pg 2 Curriculum Links
- Pg 4 Teacher's Resources
- Pg 5 Lesson Plans

Pg 16 Wild Ideas Pg 17 URLs

CURRICULUM Links

Science

Part A: Mix and Flow of Matter Outcomes: 2 Part E: Freshwater and Saltwater Systems Outcomes: 1,2,3,4

Social Studies

Attitudes (embedded throughout) Ancient Societies Modern Societies Current Events

Dene Kede

Part 2: Hunting Camp Part 3: Birch Bark Canoes Part 4: Leadership The Land (use Dene names and show how people and animals use water in various ways, field trip to a local water body. listen to Elder's stories about a local water body)

<u>Innuuqatgiit</u>

Water I-96 Land I-92 Ice I-100

English Language Arts

General Outcome #1: Specific Outcomes: 1.1, 1.2, 2.2, 2.4 GO #2: SO: 1.1 GO #3: SO: 1.2, 1.3, 2.1, 2.2, 3.1, 3.4 GO #4: SO: 1.2, 4.1, 4.2, 4.3 GO #5: SO: 1.1, 1.2, 1.3, 2.1, 2.3, 2.4

CURRICULUM Links

Freshwater and Saltwater Systems (Social and Environmental Emphasis)

Overview: Earth is sometimes described as the water planet: over two-thirds of Earth's surface is covered by oceans and freshwater features. By exploring examples of aquatic systems, students come to appreciate the dynamic nature of these systems and learn about the interaction of landforms, sediments, water and climate. Students also investigate factors that affect the distribution and health of living things in aquatic environments and the supply and quality of water for human use.

Focusing Questions:

How do water, land and climate interact? What are the characteristics of freshwater and saltwater systems, and how do they affect living things, including humans?

Key Concepts

The following concepts are developed in this unit and may also be addressed in other units at other grade levels. The intended level and scope of treatment is defined by the outcomes below.

- water quality
- water-borne materials
- erosion and deposition
- stream characteristics
- continental drainage systems
- climate
- adaptations to aquatic ecosystems
- human impact



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TEACHER'S Resources

Books

A King Salmon Journey

Debbie S. Miller Illustrated by Jon Van Zyle (III) University of Alaska Press, 2014 ISBN 978-1602232310 http://www.alaska.edu/uapress/ browse/detail/index.xml?id=508

In Arctic Waters

Laura Crawford Illustrated by Ben Hodson Arbordale Publishing, 2013 ISBN 978-1607188629 http://www.arbordalepublishing.com

Though this is a book for younger children, it could be a good model for a class project to write a story for use by lower grades in your school.

One Well: The Story of Water on Earth

Rochelle Straus Illustrated by Rosemary Woods Kids Can Press, 2007 ISBN 978-1-553379546 http://www.kidscanpress.com/US/ One-Well-P3000.aspx

Videos

Life Source: Ensuring Safe Drinking Water in the NWT (21:04)

http://www.hss.gov.nt.ca/ publications/video/life-sourceensure-safe-drinking-water-nwt

Where We Get Our Fresh Water (3:47)

http://resources4rethinking.ca /en/resource/where-we-get-ourfresh-water

Websites

Ecology North Tap Water Bottled Water Curriculum

www.ecologynorth.ca

Elders in Schools Handbook

http://www.ece.gov.nt.ca/files/ publications/elders_in_schools_ handbook_en_web.pdf

Northwest Territories Water Stewardship Strategy

http://nwtwaterstewardship.ca

Maps of NWT Watersheds and Water Bodies

http://nwtwaterstewardship.enr. gov.nt.ca/?q=maps

Watershed Learning Resources

http://www.canadiangeographic. ca/watersheds/map/?path=english/ learning-resources-list

Watershed Questionnaire

http://gordonfoundation.ca/ watershed101/worksheet.pdf

Wise Water Use – Environment Canada

http://www.ec.gc.ca/ eau-water/default. asp?lang=En&n=F25C70EC-1

Program on Water Governance – Eau Canada

http://watergovernance.ca/wpcontent/uploads/2010/04/FS_ Water_Use.pdf

Satellite Image and Interpretation – Mackenzie River Delta

http://www.earthobservatory.nasa. gov/IOTD/view.php?id=8320

NWT Regional Land and Water Boards http://mvlwb.com

LESSON Plans

Lesson 1: Dive into Northern Water!

1 class period.

Ask the students if they know how much of the world's water (which appears so plentiful) is drinkable.

Water: A Valuable Resource [Infographic]

Hand out this infographic and use the following demonstration, adapted from Project Wet.

Our planet is 71% covered by water, but only a small amount is available for human consumption. How small? Let's demonstrate with an example.

You'll need:

- Large beaker that will fit 1,000 mL
- 2 small graduated cylinders
- Eyedropper
- Blue food dye
- Salt
- Freezer or cooler of ice
- Potted plant
- Drinking water glass

Steps

- Fill the beaker with 1,000 mL of water and add a few drops of blue food dye. This represents all the water on earth (1.4 billion km3). Now pour 30 mL into a smaller graduated cylinder. This represents all the freshwater on earth (2.5%). Pour salt into the remaining 970 mL to represent saltwater that humans can't use.
- The cylinder with the 30 mL represents all the freshwater on the planet, but there is a large portion of that which is unavailable for humans – water frozen in icecaps or glaciers (1.74% of the freshwater on Earth). Pour 6 mL from this into another smaller cylinder and place the remainder in a freezer or cooler with ice to show it is also inaccessible to humans.
- Use the eyedropper to extract 1.5 mL from the 6 mL cylinder. Most of the none-frozen freshwater is ground water (0.75% of the freshwater on Earth). The amount in the eyedropper represents all the surface water on Earth in lakes and rivers (0.008% of the freshwater on earth). Pour the remainder of the 4.5 mL into a plant to show that it is groundwater, too deep for humans to use.
- 4. Squeeze one small drop from the eyedropper into the drinking glass. This is how much clean freshwater there is available for use on Earth!



Lesson Plans

Where We Get Our Fresh Water (4:00)

This video will clearly explain how little of the Earth's water is available for drinking and will set the scene for a more in-depth discussion.

Water Footprint infographic

What do we need water for? Now that we know how much water is available to use, discuss what we use water for. Hand out the above inforgraphic and have a class discussion.

Generate a KWL chart on what your students know about water in your community (What do they Know, Want to learn, and What they have Learned).

What does water provide? Students may speak about recreational activities (fishing, canoeing), transportation (skiing, snowmobiling, boating, getting to cabins), cultural activities (hunting, visiting sacred sites, community trips), industrial uses (transport – ice road trucking, barging), household use, community gardening, energy production and environmental importance (wildlife habitat, waterfowl breeding, flyways)...

How much water do you use? Look on the infographic handout: how much water is used to make a hamburger? A car? Generate electricity? What information on there is the most surprising?

How does the ecosystem need water? Ask students to recall what they learned in Grade 7 – ecosystems and interactions.

Assessment Opportunity

Record observations about the students' participation in the class discussion. If your students are not comfortable contributing in a large group setting, allow for an opportunity to share with a partner, or small group.

Grade 7 connection

If teaching a Grade 7/8 split class, assign the Grade 7s to review impacts of extractive industries on water health. This can include computer research on headlines relating to mercury levels in fish, mercury in water, health concerns in Athabasca and Fort Chipewyan, etc.



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LESSON Plans

Lesson 2: Drinking Water in Our Community

3 to 4 class periods.

The following two activities and worksheets are adapted from the Grade 7/8 Tap Water Bottled Water curriculum developed by Ecology North. For additional lessons, contact Ecology North at 867-873-6019.

Mapping Our Watershed

You'll need:

- Printed **Mapping Our Watershed** worksheets (next page)
- Watersheds of the Northwest Territories map (contact Environment and Natural Resources (ENR) for a laminated copy or it is available online here)
- Community Water Catchment Basin Map Map, also available from ENR.

2010 GNWT Report on Drinking Water

A few copies of the **2010 GNWT Report on Drinking Water**.

• Chart paper, yellow and green construction paper, scissors and markers for each group

Ask your students what is a watershed? A watershed is all the area of land that drains into one main lake or river. It is also called a drainage basin or catchment area. This is nature's way of dividing up a landscape. Watersheds can be all different sizes, from small to very large. Have them imagine a small lake near their community and that they are on a canoe in the middle of the lake, looking around them. The watershed of that lake could be all the land that you can see around you. On the other side of the hill, the water will flow downhill in a different direction, draining into a different lake, so that lake has its own watershed.

Steps

- 1. Divide students into groups of three or four
- Set up the maps (Watersheds of the Northwest Territories map, your Community Catchment Basin) and reports in different spots in the classroom, so groups can cycle by
- 3. Their task is to create a map of your community's watershed using the materials and then complete the worksheet on the next page

When the map collages are complete, have each group discuss the potential impacts that human use can have on the health of the watershed. Also discuss how natural features and weather events can impact water. Make sure they consider any potential sources of contamination and any protected areas within the watershed.

Watersheds Computer Lab Warm-up Activities

- Mackenzie River Basin Initiative
- Canada Water Week Watersheds 101 Worksheet In a computer lab, have students explore this Mackenzie River Basin Initiative interactive infographic (above) from the Walter & Duncan Gordon Foundation and use the Canada Water Week Watersheds 101 Worksheet and answer questions about Canadian watersheds.

Watersheds of the Northwest Territories

In a computer lab, have students explore this interactive infographic from the Walter & Duncan Gordon Foundation Mackenzie River Basin Initiative, and use the worksheet and answer questions about Canadian watersheds.

Watershed 101

Interactive Google Maps watershed mapping is also available from the Canadian Geographic. Input your community into the info bar on the right side and click "Take me to my Watershed."

MAPPING Our Watershed

A watershed is all the area of land that drains into one main lake or river. It is also called a drainage basin or catchment area. Watersheds can be all different sizes, from small to very large. Small watersheds can be within larger ones. Large watersheds can contain many small rivers and lakes, which all eventually drain into a larger one. Picture the Mackenzie River that flows all the way from Great Slave Lake to the Beaufort Sea. This massive river receives water from a huge extent of land, including much of British Columbia, Alberta and Saskatchewan.

In your groups, follow these steps to learn about your watershed:

- Look at the large Watersheds of the Northwest Territories map. It shows many watersheds across the NWT. Can you find the sub-basin where your community is located?
 - a The name of my community's sub-basin is
 - b Name four other watersheds adjacent to your community sub-basin and what communities are located in them:

- 2. Fnd out where your community draws its drinking water.
- 2010 GNWT Report on Drinking Water Read pages 10–13

Drinking Water Quality Database

Under Find your community in the "Please Choose Community" drop-down menu, choose "chemical tests" and look for the raw water source.

a Where is your community's "raw water source"? If it doesn't have a name, you can write "no name."

b Which kind of water source does your community have? (circle the right answer)

Lake River Groundwater well

Sourcewater is the term used to describe the water that eventually becomes our drinking water. Protecting the source is a first step to ensuring that our drinking water is safe now and into the future.

MAPPING Our Watershed

- 3. Using the Government of Northwest Territories community catchment basin map, find your community and learn where your drinking water comes from.
 - a Using this map as your guide, draw and label your community and any other communities in your sub-basin on some chart paper. Outline the source watershed.
 - b Draw and label the sourcewater and other major bodies of water in the watershed (streams, rivers, lakes, etc.).
 - c Using yellow construction paper cut-outs, note 3-5 human land or water uses within the watershed.
 - d Using green construction paper cut-outs, note 3-5 things that occur naturally in your watershed.

 How do you think the natural features on your map can impact the water? What about extreme weather events like flooding? Think about types of soil, vegetation, etc.

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2. How do you think the human-made features on your map can impact the water? Think about vehicles, roads, landfills, etc.

3. How can human uses of land and water be

planned to protect drinking water? Think about flow directions, location of your community landfill, etc.

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The GNWT Spatial Data Warehouse

This is an interactive mapping site where you can choose features that you would like to see mapped. Features can be naturally occurring ones, such as lakes, rivers and hills or man-made structures such as buildings, roads or industry. Explore this site to help you develop your map!



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Lesson Plans

Community Drinking Water

Students will use the NWT Drinking Water Quality Database and other sources to learn more about their community's drinking water source, water-treatment system and how drinking water is tested to ensure it is safe. Based on their background research into the local watertreatment system, students will prepare questions they would like to ask the plant operator in preparation for the field trip to the water-treatment plant.

Have students complete the **Community Drinking Water** worksheet. After going through the answers to the first six questions, encourage students to think about what they would like to learn more about and what questions they would like to ask the water treatment plant operator. Individually or in groups, students read through the introduction to the career of being a water treatment plant operator, and then brainstorm and record three careerrelated questions they would like to ask the operator.

A class visit to community water treatment facilities provides a valuable opportunity for hands-on, interactive learning about the water treatment process. Personal interaction with local treatment facility operators enables students to learn more about a career option that is found in every NWT community. Students should bring the questions they have prepared for the water treatment plant operator. Students will need a notebook and pen for taking notes and answering their questions.

Assessment Opportunity

Assess student responses to the two worksheets and the reflective writing piece.

You'll need:

- Printed **Community Drinking Water** worksheets (next page)
- 2010 GNWT Report on Drinking Water
- A few printed copies of the above report.
- Access to a computer lab
- Contact staff at the local water-treatment facility to arrange a site visit

Ask your students how do we know our tap water is safe to drink? We know our community water is safe to drink because it comes from clean source water and is treated and monitored at the local water treatment facility. Ask students what they know about water treatment. Remind students of the NWT Drinking Water Quality Database (above) and hand out the **2010 GNWT Report on Drinking Water**. Hand out the worksheets and let students know that once they have completed the background research on drinking water in the community, you will be going on a field trip to the water treatment plant.

Life Source: Ensuring Safe Drinking Water in the NWT (21:00)

If it is not possible to visit the treatment plant, watch this video, produced by the GNWT Health and Social Services, and discuss how NWT drinking water is protected and what the water treatment facility does.

The Northwest Territories Drinking Water Quality Database

This is an online resource that provides the following information:

- What kind of drinking water treatment system is found in each community
- how drinking water is tested
- when drinking water is tested
- recent drinking water test results for each community

COMMUNITY Drinking Water

	Drinking Water Quality Database Please use the Northwest Territories 2010 GNWT Report on Drinking Water to answer the following questions:	4. Why is chlorine used in the water treatment process?
1.	From what water source does your community get its drinking water?	5. What is turbidity, and why is it measured in source drinking water?
2.	What type of water treatment plant does your community have? (Select "Community Water Supply Systems" on the right-hand side.)	6. How many times a year is drinking water tested for a set of 28 different physical and chemical parameters (items)?
3.	 Drinking water is frequently tested for the bacteria E. coli (Escherichia coli). a Why do water treatment operators test for this bacteria? 	 Please list 5 questions that you would like to ask the local water treatment plant operator so you can increase your understanding of water treatment in your community.
		а
		b
	b Where does E. Coli come from?	С
•••••		d
	c What happens if a water-treatment plant operator finds that E. coli is present in a drinking water sample?	e

Lesson Plans

Career Choices

Water treatment and wastewater treatment is an essential service provided in each NWT community by water treatment and wastewater treatment plant operators. Trained water and wastewater treatment facility operators are in high demand in NWT communities and these positions provide ongoing training and learning opportunities.

- 8. What would you like to learn about being a water treatment plant operator?
- 9. What are three career-related questions you would like to ask the water treatment plant operator?
- a b c
- 10. Write a reflective writing piece based on the career and job-related answers you receive from your interview with the water treatment plant operator.

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WILD Ideas

Build a Watershed Model

Canadian Geographic lesson plans guiding students to build papier-mâché watershed model. This activity is meant for Grade 10 students, so to make it easier the class could prepare one large model together.

Cleaning Home Water Tanks (9:30)

Health and Social Services has prepared this video, which illustrates how homeowners can clean their tanks and explaining why this is important. For a discussion guide, contact Ecology North.

This is a great activity to include if you teach in a community that relies on trucked water. After being pumped from the source water, treated in the water treatment plant and transported by truck, water then sits in water tanks in houses or public buildings. Cleaning those tanks is the last important step in ensuring safe and clean water.

Learning from our Elders

Chlorine: How it Works and Why We Use It (8:00)

Take a field trip to a local body of water with an Elder from your community who is willing to tell stories about it, or bring a local Elder into the classroom to talk about water. Have students consider the importance of the water body to their community now, and in the past. Help the students to consider the changes in how residents access drinking water now compared with when their Elders were young. Ask the students to reflect on why chlorine is added to tap water now, when their Elders used to drink water without chlorine. For more information on what chlorine is and why we use it watch the video (above).

Land Conservation

In small groups, have students research a protected area initiative or land use plan conservation area near their community. Students can design a poster or make a presentation to the class to answer the following questions:

- Does the area protect the community's drinking water source?
- What other values does it conserve?
- Are there threats to this area?
- Have students been to the area? What were their impressions of it and what did they do there?

Water Reporter

Create a community newsletter about local water! The content of the newsletter can highlight all that the class has been learning about drinking water including traditional uses for water, current impacts on water, community monitoring, interviewing the local water plant operators, talking about watersheds, etc. Every student can provide a short article about one of these subjects, with pictures. This newsletter can actually be printed and distributed in the community!

D <u>The Story of Bottled Water</u> (8:00)

This video is an American example, but it will explain the concept of manufactured demand, and how bottled water is unnecessary in communities with clean tap water. For more activities on this subject, contact Ecology North for their Tap Water/Bottled Water curriculum.

URLS

Some hyperlinks have been embedded throughout the **Freshwater in the NWT** resource. If a link appears to be broken, try visiting the homepage or keying in the URL as it's written below.

Chum Salmon Research in the NWT http://www.nnsl.com/frames/

newspapers/2013-09/sep23_13sal.html

Dene Kede curriculum

http://www.ece.gov.nt.ca/early-childhoodand-school-services/school-services/ curriculum-k-12/aboriginal-languages#denekede-grade-6

Inuuqatigiit curriculum

http://www.ece.gov.nt.ca/earlychildhood-and-school-services/schoolservices/curriculum-k-12/aboriginallanguages#inuuqatigiit

Elders in Schools handbook

http://www.ece.gov.nt.ca/files/publications/ elders in schools handbook en web.pdf

Epcor water infographic

http://corp.epcor.com/News/2013/Pages/ water-valuable-resource-infographic-waterweek.aspx

Where We Get Our Freshwater video http://resources4rethinking.ca/en/resource/ where-we-get-our-fresh-water

Water footprint infographic http://gordonfoundation.ca/publication/693

NWT Water Stewardship maps

http://nwtwaterstewardship.enr.gov.nt.ca/ sites/default/files/YELLOWKN-%23492871v1-MAP_WATERSTRATEGYMRB_SB_E_ PDF_0.pdf

NWT Centre for Geomatics community catchment basins

http://nwtwaterstewardship.enr.gov.nt.ca/ sites/default/files/YELLOWKN-%23492871v1-MAP_WATERSTRATEGYMRB_SB_E_ PDF_0.pdf

Walter & Gordon Duncan Foundation infographic

http://gordonfoundation.ca/water/mackenzieriver-basin-initiative

Life Source http://www.hss.gov.nt.ca/publications/video/ life-source-ensure-safe-drinking-water-nwt

NWT Water Stewardship Strategy http://nwtwaterstewardship.ca

Maps of NWT watersheds and water bodies http://nwtwaterstewardship.enr.gov. nt.ca/?q=maps

Watershed questionnaire http://gordonfoundation.ca/watershed101/ worksheet.pdf

GNWT Report on Drinking Water http://www.maca.gov.nt.ca/resources/GNWTreport-on-drinking-water-2010.pdf

Wise Water Use – Environment Canada http://www.ec.gc.ca/eau-water/default. asp?lang=En&n=F25C70EC-1

Program on Water Governance – Eau Canada http://watergovernance.ca/wp-content/ uploads/2010/04/FS Water Use.pdf

Satellite image and interpretation – Mackenzie River Delta http://www.earthobservatory.nasa.gov/IOTD/ view.php?id=8320

Canadian Geographic Watershed lesson plans http://www.canadiangeographic.ca/ watersheds/map/?path=english/learningresources/making-a-watershed-model

Clean Your Water Tank video http://www.youtube.com/ watch?v=SRy5ex3JCHY

Chlorine video

https://www.youtube.com/ watch?v=ag9U9MWYzzo

The Story of Bottled Water http://storyofstuff.org/movies/story-ofbottled-water





WWF is Canada's largest international conservation organization, working to build a future where people live in harmony with nature. The Schools for a Living Planet program empowers educators and students of all ages with the tools they need to lead us into a sustainable future. Schools for a Living Planet is grounded in the principles that make WWF a global success - including strong science and a focus on solutions.

Ecology North is a charitable, non-profit organization that has engaged Northerners in handson learning opportunities in the Northwest Territories since 1971. Our mission is to bring people and knowledge together for a healthy Northern environment. Education, public engagement and youth involvement are integral to all of our program streams that include climate change adaptation, watershed protection planning, waste reduction, food sustainability and alternative energy promotion.

This project was made possible with the financial support of CIBC. For more information, visit <u>www.cibc.com</u>.

WWF-Canada and Ecology North would like to thank the classroom teachers across the Northwest Territories who contributed many of the ideas presented here, especially Alex Bond, Richard McKinnon and Shawn Mosey. Ecology North Education Committee member Tasha Stephenson also provided guidance. This resource is available as a free download from WWF Canada Schools for a Living Planet. Visit <u>schools.wwf.ca</u>. © 1986 Panda symbol WWF-World Wide Fund For Nature (also known as World Wildlife Fund). ® "WWF" is a WWF Registered Trademark.