UNIT 1

INTRODUCTION

NECHAKO WHITE STURGEON AND ITS ENVIRONMENT

Introduction to Unit 1

Subject(s): Science

Grade(s): Intermediate

Number of Lessons: 2 (can be split into 3 or 4 lessons depending on time)

Duration of Unit: 1 week

Rationale/Overview: The purpose of this unit is introduce the students to the Nechako white sturgeon, its status as endangered, and the Nechako watershed.

Background and Teacher Preparation Required: This is the introductory unit to this course. No prior knowledge about Nechako white sturgeon is necessary.

Cross-Curricular Connections: L.A., P.E. and/or D.P.A., Social Studies, Fine Arts

Extensions and Adaptations: This unit is supposed to be taught before either the Nechako watershed or the Nechako white sturgeon units.

Overview of Lessons

LESSON 1-1: INTRODUCTION TO THE NECHAKO WHITE STURGEON

Time of Lesson: 1 - 1.5 hours

Instruction Objectives: Student can participate in a discussion about the Nechako white sturgeon and explain what the endangered status means.

Strategies and Activities: Story about sturgeon, brainstorm about Nechako white sturgeon, define and discuss endangered status.

Materials:

- SMARTboard PowerPoint presentation: *Introduction to this Course*
- Handout: *Worksheets 1a & 1b - Nechako White Sturgeon Facts and Endangered Status*
- Book: "*The Tale of the Great White Fish*" by Maggie Devries
- SMARTboard Interactive Activity: *Unit 1 Definitions.notebook*

LESSON 1-2: INTRODUCTION TO THE NECHAKO WATERSHED

Time of Lesson: 1.5 hours

Instruction Objectives: Student can define the Nechako watershed and locate the Nechako watershed on a map, understand the parts of a watershed (rivers, land and riparian zone).

Strategies and Activities: Watershed activities outdoors, discussion about watersheds, mapping exercise.

Materials:

- Watershed observation activity: paper and pencils (outdoors)
- Watershed activity: paper and washable markers (outdoors)
- SMARTboard PowerPoint presentation: *Map of the Nechako Watershed*
- Classroom Map: map of the Nechako Watershed, coloured sticky dots
- Handout or Interactive: *Worksheet 1c - Crossword*. See CD for interactive version.
- SMARTboard Interactive Activity: *Unit 1 Definitions.notebook*

Lesson 1-1: Introduction to the Nechako White Sturgeon

Time of Lesson: 1 - 1.5 hours

Rationale: The purpose of this lesson is to provide the students with an overview of the Nechako white sturgeon and the challenges it currently faces. The goal is to have students be aware of local issues in order to connect to the Nechako watershed.

Instructional Objectives: Student can participate in a discussion about the Nechako white sturgeon and explain what the endangered status means.

Strategies and Activities: Story about sturgeon, brainstorm about Nechako white sturgeon, define and discuss endangered status.

Materials:

- Book: *"The Tale of the Great White Fish"* by Maggie Devries
- SMARTboard PowerPoint presentation: *Introduction to this Course*
- Handout: *Endangered Species*
- SMARTboard Interactive Activity: *Unit 1 Definitions.notebook*

Prerequisite Concepts and Skills: None.

Student Assessment:

- Observation and participation in class and small group activities.
- Completion of worksheets.
- 'Ticket out the Door' "What does endangered mean?" "How large is a Nechako white sturgeon" "How many sturgeon are in the river?" etc.

SUGGESTED ACTIVITIES

Activity (5-10 minutes)

Have PowerPoint presentation *Introduction to this Course* on the SMARTboard with the opening slide showing.

Start a general conversation about what the students already know about the Nechako white sturgeon. Write on white board their key points.

Key Points

White sturgeon are the largest freshwater fish in Canada. Fraser River white sturgeon reach 6m in leanth, and Nechako River white sturgeon reach over 3 metres in length.

They live over 100 years.

Lived during the time of the dinosaurs.

Some may have participated in sturgeon releases in 2008 and 2009.

Activity (15-20 minutes)

Show *Introduction to this Course* PowerPoint presentation. Stop presentation where needed to continue conversation, or play through.

Ask

Why do we care so much about the Nechako white sturgeon?

What does endangered mean?

Endangered: Species in danger of becoming extinct.

Extinct: Species does not exist any longer.

Extirpated: A species no longer existing in a specific location, but exists elsewhere.

Activity (10 minutes)

On the white board work through a brainstorming exercise to come up with as many factors affecting the decline of the Nechako white sturgeon and then the ways we are working to recover the species.

Ask

What factors have caused the species to become endangered?

What is being done to help recover the species?

Factors include:

- overfishing
- introduction of exotic species
- dikes and drainage projects
- industrial and municipal pollution
- reduced or changes in food source for juvenile (young) sturgeon
- climate change influence food and water temperature
- hydroelectric dam building (Kenney Dam): block access to spawning sites, eliminate spring flooding, trap nutrients on which salmon depend, reduce downstream turbidity (so that juveniles are more visible)

Recovery includes:

- stop fishing
- live releasing of sturgeon caught in gill nets during the Food, Societal and Ceremonial fishery.
- endangered status
- research into their biology, reproduction, habitat needs etc.
- research into global warming
- building the Conservation Centre in Vanderhoof that will work as a hatchery to help improve juvenile survival in the river. Construction to be completed in spring 2014
- adding better substrate into the river
- education & awareness (River's Day, school presentations)

Activity (10-15 minutes)

Handout *Worksheets 1a & 1b.* Work through the worksheets as a class or in small groups. All the information for the worksheet should have been covered in the PowerPoint presentation and through class discussions.

Activity (5 minutes)

Unit 1 Definitions. Open up this SMARTboard activity and quickly review the definitions from this lesson.

Closure (10 minutes)

Read *Tale of a Great White Fish* by Maggie DeVries. This book has been provided to your school through this project. If your school does not have this book, please contact us!

Ask

Reflect on what the decline of the Nechako white sturgeon means to you. If it was to become extinct, what have we lost?

Nechako White Sturgeon

Facts and Endangered Status

Fill in the facts below about the Nechako white sturgeon:

- The Nechako white sturgeon lives in the _____ River.
- Nechako white sturgeon are _____ distinct from Fraser River white sturgeon – meaning that Nechako white sturgeon do not spawn with other populations of white sturgeon.
- There are less than _____ adult Nechako white sturgeon left!
- _____ fish are needed to have a healthy population in the Nechako River.
- Female Nechako white sturgeon spawn when they reach _____ years old and males between _____ years old. There are not many _____ fish in the Nechako River.
- Nechako white sturgeon are at risk of becoming _____ in the next twenty years!

SARA - Endangered Species

Nechako white sturgeon are listed as an Endangered Species by the Species at Risk Act (SARA) of Canada. Endangered species are in danger of becoming extinct. What does extinct mean?

_____

What does extirpated mean? _____

How is extinct different than extirpated? _____

_____

There are special rules for species that are endangered.

- Can you keep Nechako white sturgeon if you catch one while fishing? _____
- Can you keep any part of the Nechako white sturgeon (e.g. a scute from its back)? _____
- If a Nechako white sturgeon dies, can you keep it or eat it? _____

What will happen to the Nechako white sturgeon if we catch and keep them?

_____

_____

There are other species that can be seen or live in our area that are species of special concern:
Bull trout • American white pelican • Long-billed curlew • Short eared owl • Western toad

Learn more about SARA by going to http://www.sararegistry.gc.ca/default_e.cfm.

(Material from the Learn to Fish program, Freshwater Fisheries Society of BC)

Nechako White Sturgeon

Reasons for Endangered Status

List 4 possible factors that impact Nechako white sturgeon and have contributed to them being classified as an endangered species:

_____

_____

_____

_____

_____

_____

_____

_____

Draw a picture of one of the things that is being done now to help recover the species.

Worksheet 1a & 1b Answer Key

Worksheet 1a - Facts & Endangered Status

Fill in the facts below about the Nechako white sturgeon:

- The Nechako white sturgeon lives in the **Nechako** River.
- Nechako white sturgeon are **genetically** distinct from Fraser River white sturgeon – meaning that Nechako white sturgeon do not spawn with other populations of white sturgeon.
- There are less than **350** Nechako white sturgeon left!
- **More** fish are needed to have a healthy population in the Nechako River.
- Female Nechako white sturgeon spawn when they reach **40** years old, and males when they are **teens-20s** years old. There are not many **juvenile or young** fish in the Nechako River.
- Nechako white sturgeon are at risk of becoming **extirpated** in the next twenty years!

What does extinct mean?

The species no longer exists, There are no animals of that kind alive on the planet.

How is extinct different than extirpated? **A species goes extinct in a certain area, or a unique population of a species goes extinct. This is the case for Nechako white sturgeon - they are genetically distinct from other white sturgeon, but if they go extinct there will still be other white sturgeon in the world. The genetic diversity will be lost.**

There are special rules for species that are endangered.

- Can you keep Nechako white sturgeon if you catch one while fishing? **No**
- Can you keep any part of the Nechako white sturgeon (e.g. a spine from its back)? **No**
- If a Nechako white sturgeon dies, can you eat it? **No**

What will happen to the Nechako white sturgeon if we catch and keep them?

The numbers will continue to decrease and increase the rate of extinction.

Worksheet 1b - Reasons for Endangered Status

List 4 possible factors that impact Nechako white sturgeon and have contributed to them being classified as an endangered species:

overfishing
introduction of exotic species
dikes and drainage projects
industrial and municipal pollution
reduced or changes in food source for juvenile sturgeon
climate change influence food and water
agriculture, removing water from the river
agriculture, pesticides and fertilizers seep into groundwater or overland into river
landscape changes - Kenney Dam
shallower river due to dam
temperature
riverbank encroachment
block access to spawning sites from dam
dam eliminates spring flooding
dam traps nutrients
changes to turbitiy and river chemistry from dam

Lesson 1-2: Introduction to the Nechako Watershed

Time of Lesson: 1.5 hours

Rationale: The purpose of this lesson is to introduce the Nechako watershed and for the students to develop a sense of place. People's empathy for special places strengthens their commitment to stewardship of our natural environment. Additionally, our local history is strongly tied to the Nechako River, as First Nations along with the first explorers and settlers used the Nechako River and the rivers within the watershed for survival. Constructing a sense of place has a key role in developing education and interpretation material about our natural and cultural environment.

Instructional Objectives: Students can define the Nechako watershed and locate the Nechako watershed on a map and understand the parts of a watershed (rivers, land and riparian zone). Students can explain how individuals and their actions can help conserve the Nechako watershed.

Strategies and Activities: Outside activity to grasp concept of a watershed, in class discussion.

Materials:

- Watershed observation activity: paper and pencils (outdoors)
- Watershed activity: paper, blue watersoluable markers, water bottles (outdoors)
- SMARTboard PowerPoint presentation: *Map of the Nechako Watershed*
- Classroom Map: map of the Nechako Watershed, coloured sticky dots, post-its, pins, markers etc.
- Handout or Interactive: *Worksheet 1c - Crossword*. See CD for interactive version.
- SMARTboard Interactive Activity: *Unit 1 Definitions.notebook*

Student Assessment:

- Observation and participation in class and small group activities.
- Ability to identify features and locations on a map that relate to watersheds.
- 'Ticket out the Door' "Name one factor that influences a watershed."

LESSON PLAN

Activity (15 minutes)

Collect materials for outdoor activity: paper (2 per student), blue water soluable markers, pencils, water bottle.

Tell your students that you will now practice the first part of the scientific method: **observation** by making detailed observations of their watershed. Part of being a good scientist is making **detailed observations** and **effectively communicating or describing your observations to another person**. Have the students take their paper and pencil with them and quietly line up to go outside and observe their watershed. This is an individual activity.

Take the class outside to the playing field, playground, forested area, or open area. The location of this activity is not important, other than the fact that students need to be able to see a distance away.

Have them form a circle and then turn to face outside of the circle, take three big steps and sit! They should be fairly evenly spaced with at least two metres between each student. Now they are to write/draw everything they observe for ~5 minutes in silence, no discussion. Note that you have not defined a watershed yet or discussed the topic with the students in detail. If some ask what they are supposed to observe, direct them to write/draw whatever they see before them (could be houses, buildings, play ground equipment, grass, trees, storm drain, cars, people, squirrels, ants etc.)

Have the class gather around and discuss the different observations they made of their watershed.

> *Ask*
>
> When rain falls on all of the things you just observed in your watershed, where does it go? *Lead a discussion toward water travelling downhill into rivers and waterways. All the things in their drawing are within a watershed.*

Transition to next activity.

Activity (10 minutes)

Divide into small groups. Tell the class they will be making model watersheds simply by crumpling up a piece of paper.

Pass out one blank sheet of paper and one blue water soluable marker to each group of three students.

One student crinkles the paper into a tight ball and then gently pulls the paper flat again without smoothing the paper entirely. The paper should look like a mountainous relief map.

The second student traces the **ridges** (high points) on the paper with the blue marker without going down into any of the valleys.

Ask

What will happen when the model watershed is "rained" on? Specifically, ask them where will the water go?

Before spraying the model, tell the students you want them to observe the direction of water flow. A drop of water will roll down one side of a ridgeline into one watershed or roll down the other side and enter another watershed. The wet ink should show this pattern.

The third student "rains" on the piece of paper by gently squirting with the water bottle. Enough rain will run the blue marker down the "hills" into "river valleys".

Ask

What happened to the blue marker? Where did it run? *Your discussion should lead them to the understanding that the high points or ridgelines on their model watershed define the boundaries of a watershed.*

What watershed are you in now? *Nechako Watershed*

Watershed (or Basin): The area of land where all of the water that is within it or drains into the same place – either a lake, marsh, stream, river or groundwater.

Sub Basin: A watershed within a watershed - a smaller river drainage.

Tributary: A river that flows into a main stem river or lake. It does not flow into the sea or ocean.

Return to classroom for next activity.

Activity (25 minutes)

Show *Map of the Nechako Watershed* PowerPoint presentation. Stop presentation at "Why are we learning about watersheds?".

Ask

Why are we learning about watershed? *Because we live within it and our actions influence our water and other living things around us.*

What are some of the human uses of lands within a watershed? Identify which have positive and negative impacts on water.

- farming and agriculture
- forest harvesting
- reservoirs, dams and waterworks
- sewage disposal
- landfills
- towns
- industrial sites
- roads
- culverts
- ports and harbours
- First Nation food, social and cultural fisheries
- recreational land activities (e.g. ski resorts)
- recreational water activities (e.g. boating)
- fishing
- transportation by water
- ditches and storm drains (water disposal)
- tree planting
- restoration projects
- recycling

Continue showing *Map of the Nechako Watershed* PowerPoint presentation.

Key Points

Stop at the slide "The Nechako Watershed" point out your community, Prince George where the Nechako flows into the Fraser River, the river's path, the boundary of the watershed, any other interesting points for the students.

Flip to the next slide for facts about the Nechako watershed.

Facts about the Nechako River and Watershed

- Nechako means "big river" in the Carrier language.
- The Nechako river is 290 km in length (compare distance from Prince George to Burns Lake) and is a major tributary to the Fraser river.
- Nautley River is the largest tributary.

Flip to the next slide for a quick overview of Kenney Dam and the Reservoir.

Ask

Who knows the story about why Kenney Dam was built?

- Built in 1952 in the upper Nechako. It diverted westward, generating hydroelectric power before entering the **Kemano River.** The power is used for aluminium production and electricity for northern BC. As a result, the Nechako River is smaller and has a different hydrograph *(A hydrograph is a graph showing the rate of flow or discharge versus time past a specific point in a river. The rate of flow is typically expressed in cubic metres per second (cms or m^3/s)* than it did historically. This may be a potential limitation for Nechako white sturgeon, as the river doesn't experience flushing of the system that likely cleaned the spawning grounds of sediment, and contains less water (a changed hydrograph). This topic will be discussed in more detail in a later lesson.

Continue showing *Map of the Nechako Watershed* PowerPoint presentation.

Ask

What is a tributary? *A tributary is a stream or river that flows into a main stem river or a lake. It does NOT flow directly into the sea or the ocean.*

Can you name some of the sub basins/tributaries of the Nechako watershed?

- Cheslatta River
- Nautley River
- Stuart River
- Chilako River
- Endako River
- Stoney creek
- Murray Creek
- Chilco Creek
- Clear Creek
- Sinkut River etc.

Activity (15 minutes)

Present the hardcopy map of the Nechako watershed to the class. Pin on the wall or place on a table and have student identify lakes, rivers and key features and locations on the map. Use sticky post-its, markers or labels.

Ask

What things can we do as individuals or as a community to improve the watershed environment for the Nechako white sturgeon?

Leave the map on the wall of the classroom for the duration of this course as a reference for later lessons.

Activity (10 minutes)

Hand out hardcopy or use interactive version on SMARTboard of *Worksheet 1c*. This activity can be take home or in class depending on the time.

Activity (5 minutes)

Unit 1 Definitions. Open up this SMARTboard activity and quickly review the definitions from this lesson.

Closure (10 minutes)

Review what the students learned about watersheds today and why watersheds are important.

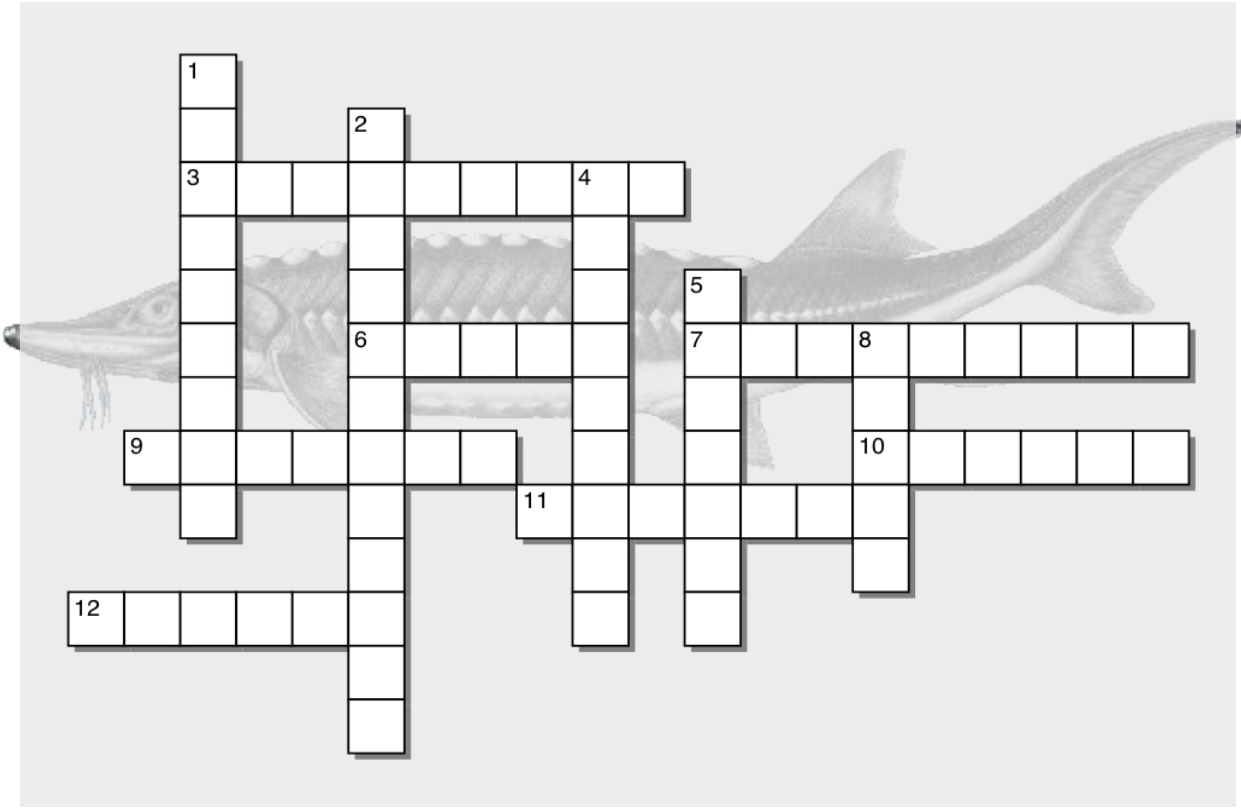
Ask

How does all the activity humans do within a watershed influence animals such as the Nechako white sturgeon?

What can we do differently to make things better for Nechako white sturgeon?

Nechako White Sturgeon

Crossword



Across

3) A river that flows into another river or lake.

6) The high point of a watershed.

7) A way that people educate others about important topics and issues.

9) Means 'big river' in Carrier.

10) The low point of a watershed.

11) Chemicals and other toxins _____ the Nechako River.

12) Water from the Nechako River is diverted west to generate power before entering the _____ River.

Down

1) The area of land where all of the water that is within it or drains into the same place.

2) Taking detailed _____ of our surroundings helps us learn and understand our environment better.

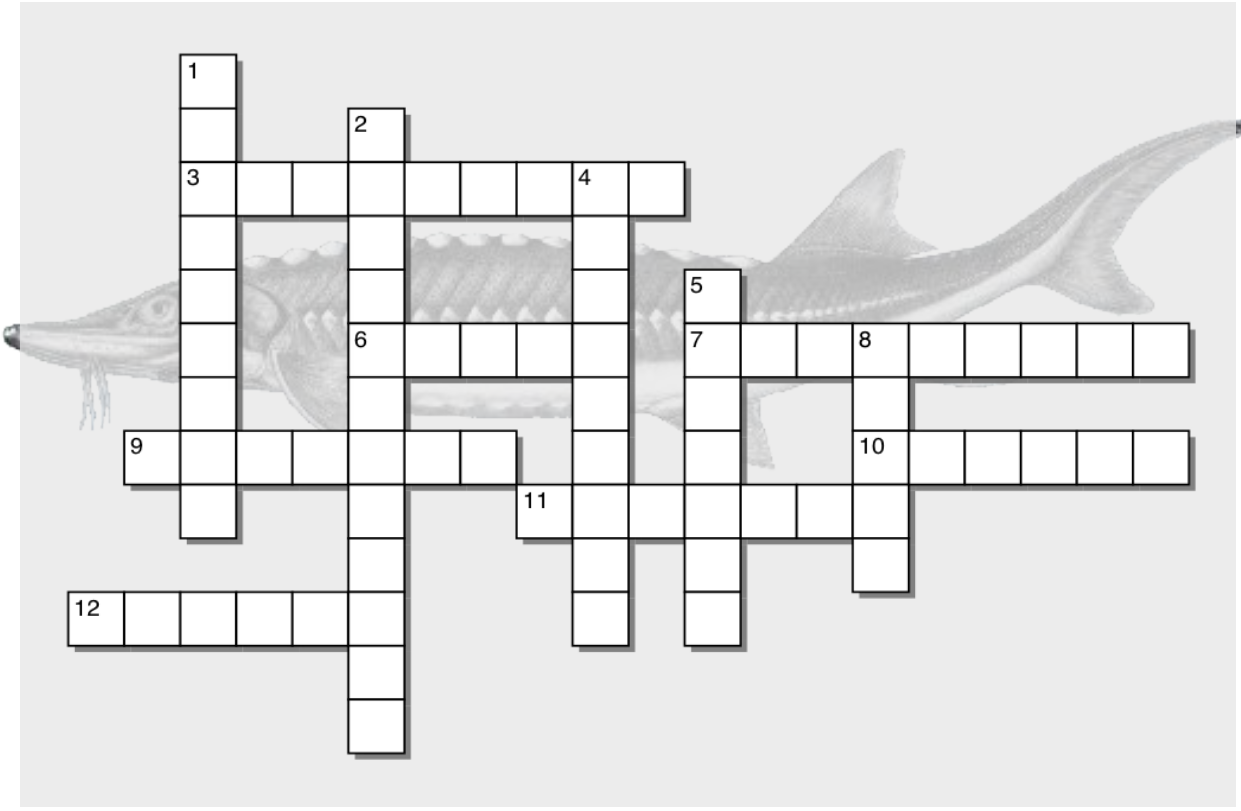
4) Kenney Dam creates a _____ .

5) The largest sub basin of the Nechako watershed.

8) A channel that carries water downhill.

Nechako White Sturgeon

Crossword - ANSWER KEY



Across

3) A river that flows into another river or lake. [TRIBUTARY]

6) The high point of a watershed. [RIDGE]

7) A way that people educate others about important topics and issues. [AWARENESS]

9) Means 'big river' in Carrier. [NECHAKO]

10) The low point of a watershed. [VALLEY]

11) Chemicals and other toxins _____ the Nechako River. [POLLUTE]

12) Water from the Nechako River is diverted west to generate power before entering the _____ River. [KEMANO]

Down

1) The area of land where all of the water that is within it or drains into the same place. [WATERSHED]

2) Taking detailed _____ of our surroundings helps us learn and understand our environment better. [OBSERVATIONS]

4) Kenney Dam creates a _____ . [RESERVOIR]

5) The largest sub basin of the Nechako watershed. [NAUTLEY]

8) A channel that carries water downhill. [RIVER]

UNIT 1 TEST

A number of test questions have been developed for this Unit. The questions include matching, definitions, multiple choice, True-False, and short answer in this document. Please feel free to customize the test for your class, considering the topics or materials you covered or focused on during the Unit.

You can find test questions for this Unit on the thumb drive that accompanies this curriculum:

- *Unit_1_Test.docx*

GRADE: _____ TEACHER: _____ SCHOOL: _____

Feedback Form for Unit 1

Please fill in the information below and return to the NWSRI. Please feel free to email any questions or comments to Lana Ciarniello at aklak@telus.net.

Background Information:

Is the information presented age appropriate and presented in an age appropriate manner? Yes or No

Was there enough information provided to conduct the lessons successfully?
Yes or No

If no, what additional information and/or resources would be useful?

Activities:

Were the activities engaging to the students? Yes or No

Was the timeline of the activities a good estimate?
Too Long ____ Too Short ____ Just Right ____

Any comments?

Worksheets:

Were the worksheets effective in teaching and/or reviewing the unit material?
Yes or No

Were the answer keys helpful? Yes or No

Additional Resources:

If used, were the resources suggested or provided for this unit useful? Yes or No

What else would you suggest be needed for this unit?