



Grade 8–12



ʔíkt, Floods

A Deep Dive on Watershed Issues

There are several issues that can impact the health of the Okanagan watershed. Some of these include:

- flooding
- forestry
- climate change
- government decisions
- aquatic invasive species.

The Okanagan has always experienced flooding. It is a valley that was carved by water and ice. However, the Okanagan Basin is experiencing increasingly intense ʔíkt and debris-flow hazards. Most recently, the Syilx Okanagan territory was heavily impacted by extreme flooding, on and off reserve, in 2017 and 2018.

Since European contact, the population on Syilx Okanagan territory has settled largely in the valley bottom, filling in 85% of natural wetlands, with homes, businesses and institutions, adjacent to water or on floodplains.

Based on current climate change research, the magnitude of extreme spring freshet (runoff) is projected to increase, and conditions similar to those experienced in 2017 and 2018 are expected to become the norm. Further, there is

limited knowledge as to how these flood hazards interact with exposed communities and ecosystems, nor is there a consistent basin-wide approach to flood risk management.

However, efforts are being made to address this issue and develop solutions. In 2018, the Okanagan Nation Alliance (ONA) began a flood risk assessment. Find more information on this project here.

<https://syilx.org/projects/t%CC%93ik%CC%93t-flood-adaptation-project/>

The ONA has also worked with the Okanagan Basin Water Board to create flood maps for the valley. Find the maps and more information here.

<https://storymaps.arcgis.com/stories/81b982cbfe1b4115ac3d7a655b119a9c>



Flooding



Forestry

The forestry sector is causing some of the most detrimental impacts to *siwłk^w* in the Okanagan watershed. There are 31 different forestry companies with 64 different forestry licenses operating in Syilx territory¹ and they range from major corporations to small independent companies. Approximately 6,613,547 m³ of trees can be harvested per year within the territory.

Severe deforestation has altered ecosystems to the point where they are not functioning naturally or properly. Without trees,

there is significant loss of habitat for key species. Without trees, there are no roots to stabilize the land, making it prone to erosion and allowing *siwłk^w* to flow wildly over the land.

Syilx Elders know that water is in the wrong place at the wrong time now, with no trees to hold the *siwłk^w*. The result has been more severe droughts and floods. We have been witness to this in recent years, especially with climate change.

Aquatic ecosystems have been severely impacted by all these factors and more.



Log booms on Okanagan Lake near Kelowna

¹ BC Ministry of Forests, Lands, and Natural Resource Operations, 2018



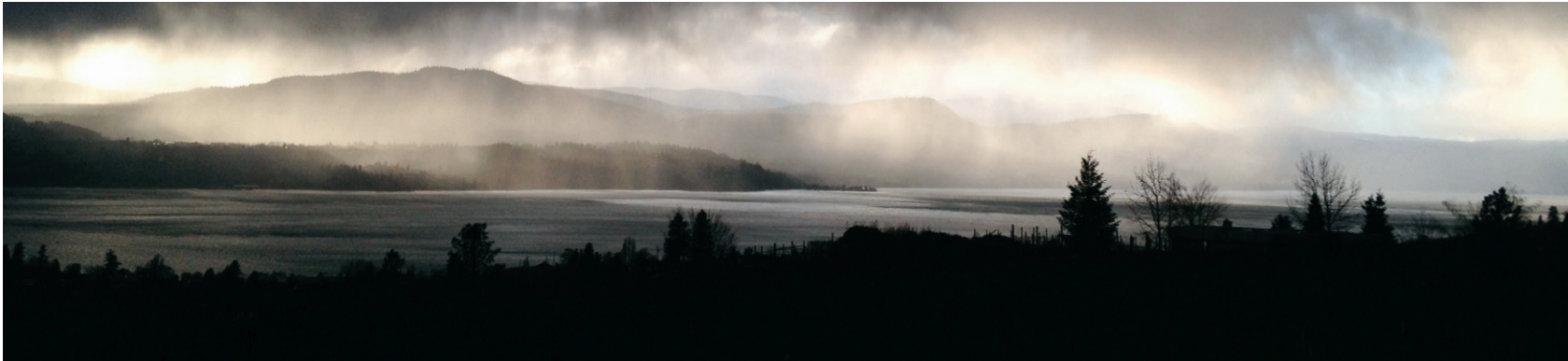
Climate Change Impacts

Climate change presents complex problems and reality – in its nature and in what it asks of us by way of response. Climate models show a strong warming trend for the Syilx territory, particularly in the summer. Precipitation is expected to decrease in the summer, and increase in the winter, with a marked decrease in the amount of snowfall. Changes to temperature, precipitation and wind patterns will:

- affect runoff, groundwater recharge, and river systems, resulting in less predictability and increased variability in the timing and volume of water flows;
- result in more frequent and more severe extreme weather events such as flooding, drought, increased runoff, erosion, and uncontrolled wildfire;

- change and increase pest populations (insects, diseases, weeds, and invasive species)
- contribute to seasonal and long term changes in both water quality and quantity; and
- result in higher rates of evapo-transpiration that will increase demand for irrigation and put pressure on water storage².

In 2024, the Okanagan Basin Water Board launched an “Okanagan Climate Indicators Dashboard” which shows changes in the last 100 years to valley temperatures, precipitation types and patterns, streamflows and lake inflows. Find more on the dashboard at: <https://obwb.ca/indicators/>.



Threatening weather

² https://soscp.org/wp-content/uploads/2020/02/OK_Climate_Projections_Report_Final.pdf.



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Government

The federal government has a unique relationship with Indigenous People in Canada. The Constitution of Canada recognizes and affirms the existence of Section 35 Aboriginal Title and Rights. These rights lie in the practices, customs, and traditions that are integral to the distinctive cultures of Aboriginal Peoples. Syilx practices, customs, and traditions are directly tied to siwłk^w, water and a responsibility to care for siwłk^w as a relative.

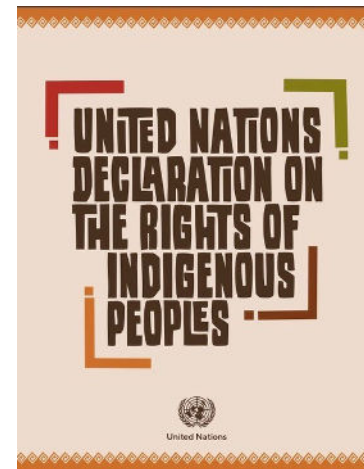
The Supreme Court of Canada, in the 2014 Tsilhqot'in decision, affirmed that Aboriginal title is real and meaningful and can exist over large areas. Aboriginal title includes vesting the full beneficial and economic interest in the land to the Aboriginal group. Where Aboriginal title exists, consent is required for the Crown or industry to use that land. Failing Aboriginal consent, the Crown has to meet the test of justifiable infringement. If the Crown authorizes activities on lands which are demonstrated to be Aboriginal title lands, then projects and permits may be cancelled with damages owing to the related Aboriginal group.

The Syilx People have never extinguished title to their territory in any manner. They have never ceded their lands, nor have they been conquered. The Syilx community continues to assert their Aboriginal rights to the tmx^wulax^w (land) and siwłk^w within their territory and express their inherent right to self-determination. They are committed to upholding their rights and responsibilities, and to addressing the continued infringements on our Aboriginal Title and Rights.

Our inherent rights and responsibilities to siwłk^w are also enshrined internationally in the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), which has been fully endorsed by the Canadian government. This includes the standard of free, prior, and informed consent which requires the creation of space for Indigenous perspectives and knowledge to be heard in a manner that is consistent with the honour of the Crown.

Read more on UNDRIP here:

https://www.un.org/development/desa/indigenouspeoples/wp-content/uploads/sites/19/2018/11/UNDRIP_E_web.pdf



The Syilx People have never extinguished title to their territory, nor ceded their lands, nor been “conquered.”



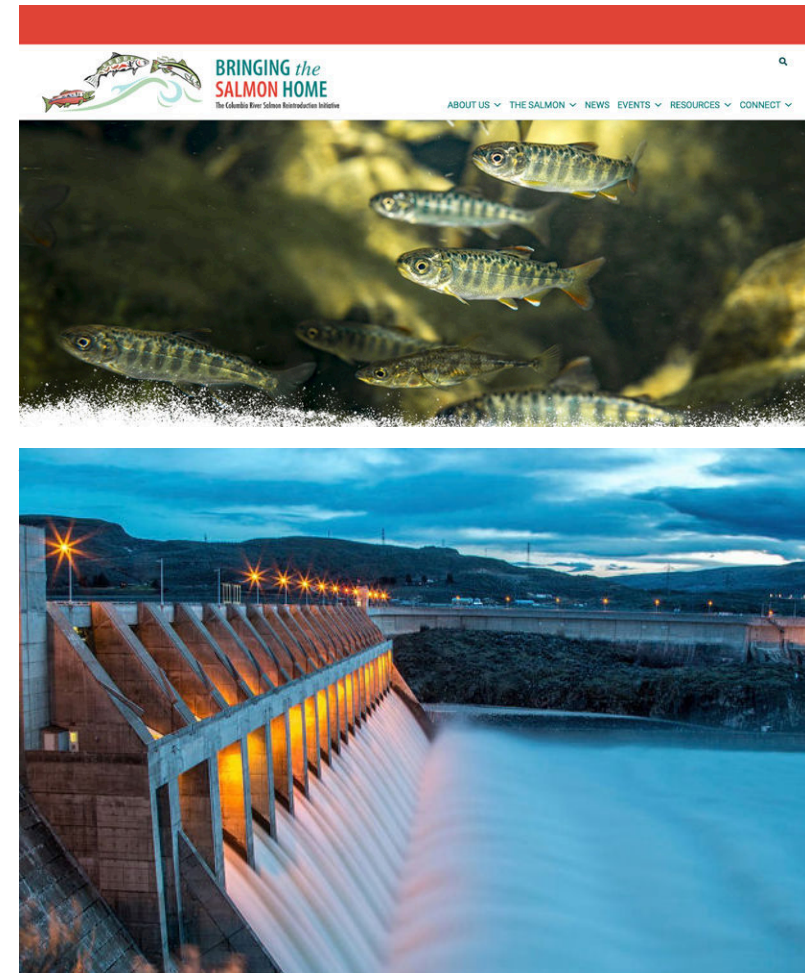
Columbia River Treaty

The Columbia River Treaty (CRT) is a trans-boundary water storage treaty, between Canada and the U.S., that has two major components: holding back 15.5 million acre-feet (MAF) of water per year for flood control, while also optimizing hydroelectric energy production in the Columbia watershed every year. The CRT treaty, signed in 1964, resulted in the Province of B.C. storing a large amount of annual spring run-off behind three Canadian dams (Duncan Dam, Hugh Keenleyside Dam, and Mica Dam). This flooded the Slocan Valley (Arrow Lakes) and converted the Upper Columbia watershed into a massive reservoir system, flooding an estimated 270,000 acres, and forever altering the environment.

This storage of water has generated millions of dollars of revenue, the majority of which goes to the Government of B.C. as annual general revenue. However, it was developed and agreed upon by Canada and the U.S. without consultation, involvement or consent of the Syilx Okanagan Nation. This exclusion of the Syilx People in the original Columbia River Treaty process, alongside its dams and their impacts, represents one of the most significant and on-going infringements of Syilx Okanagan Title and Rights.

The current CRT negotiation represents the first time any First Nation has ever been at the table during international treaty negotiations. Our presence at these negotiations is ground-breaking and has set a precedent for Indigenous

communities around the world to ensure that Indigenous rights and participation in treaty negotiations are recognized.



Chief Joseph Dam



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Aquatic Invasive Species in the Okanagan

Aquatic invasive species (AIS) are species that are found outside of their native habitat and cause harm to their new environment. They are highly persistent and competitive.

LEARN MORE <https://www.oiso.ca/species-category/fish>

Invasive zebra and quagga mussels begin their lives as tiny swimming larvae, which are carried by water currents. As they mature, they attach themselves to hard substances like rocks, other mussels, logs, and boats. Mussels feed by filtering water and removing plankton (tiny plants and animals) from it. The problem is that they can filter out all the plankton from a lake or stream, leaving nothing for native animal species to eat. These mussels would be a serious threat to Okanagan salmon if entering our Okanagan waterways and lakes.

Additionally, invasive mussels promote toxic algae which pollutes our drinking water.

The Okanagan Basin Water Board (OBWB) and its Okanagan WaterWise outreach and education program has undertaken a massive campaign to educate everyone on how we can keep zebra and quagga mussels out of the Okanagan waterways.

VISIT <https://dontmoveamussel.ca/>



Goldfish are also sometimes released into Okanagan waterways. This may seem like a good idea, but goldfish can put our native fish at risk. Goldfish can out compete native fish species for food and prey on smaller

ones. Additionally they can carry a disease called koi herpesvirus, which can harm native fish populations.

If you have a pet that you can no longer care for, find a new home for it (maybe a school, nursing home, office or fish club member), or contact your local pet store. And, if you have a fish that dies, it's best to bag it and put it out in the garbage. Do not flush your dead fish since they can spread disease.

LEARN MORE

<https://www.okwaterwise.ca/waterwise-in-the-community.html>.



Rocky Mountain
Ridged mussel
Gonidea angulata



INVASIVE Zebra mussel
Dreissena polymorpha



INVASIVE Quagga mussel
*Dreissena rostriformis
bugensis*

***Important Note:** Know the difference between the invasive zebra and quagga mussels and our indigenous endangered Rocky Mountain Ridged Mussel – sk'wuk'wr'in?



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ACTIVITY Invasive Species Inquiry Project

Grades: 6–9 (Adaptable for Grades 10–12)

Subjects: ADST/STEAM

Number of lessons/time: 3 lessons

<https://www.pbs.org/newshour/extra/lessons-plans/lesson-plan-killer-robots-battle-invasive-species/>

Invasive species:

An invasive species is a non-native introduced plant or organism without natural predators that negatively alters its new environment.

Native species:

A species that is within its known natural range, and occurs naturally in a given area or habitat, as opposed to an introduced species or invasive species. Also known as endemic species, indigenous species.

Invasive species spread rapidly and can negatively impact our ecosystem and native species. In the Okanagan there are both aquatic and terrestrial invasive species present.

The Syilx culture views water as a relative, not a resource, and when invasive species threaten the watershed and our salmon, it affects all of us. This design project will allow for students to inquire and develop a prototype of a device that will help with invasive species.



Purple loosestrife is a wetland plant that is native to Europe and Asia, but was brought to North America in the early 1800s and has become a problem in the Okanagan and beyond.



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Big Ideas

- Design can be responsive to identified needs. (Gr. 6–8)
- Social, ethical, and sustainability considerations impact design. (Gr. 9).

Curricular Competencies

- Choose a design opportunity.
- Identify criteria for success and any constraints. (Gr. 6–8)
- Critically analyze and prioritize competing factors, including social, ethical, and sustainability considerations to meet community needs for preferred futures. (Gr. 9)
- Engage in a period of research and empathetic observation in order to understand design opportunities. (Gr. 9)
- Evaluate a variety of materials for effective use and potential for reuse, recycling, and biodegradability. (Gr. 9)
- Take creative risks in generating ideas and add to others' ideas in ways that enhance them. (Gr. 9)

First Peoples Principles of Learning

- Learning ultimately supports the well-being of the self, family, community, the land, the spirits, and the ancestors.
- Learning involves patience and time.

Content

- Technical drawing, including sketching techniques and manual drafting techniques
- Elements of plans and drawings
- Evolving consumer needs and wants



American bullfrogs are native to eastern North America. They were introduced to B.C. for frog leg farming and some escaped, causing problems for native frogs and other native species.



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What to Do

1. Ask students to pair up and brainstorm what are invasive species (terrestrial and aquatic).

2. Define “invasive species” versus “native species” to students and discuss what constitutes an invasive species: fast growth, rapid reproduction, no natural predators, high dispersal ability, tolerance of a wide range of environmental conditions, able to change the soil or water conditions so native species can't grow, typically involving human interference.

3. Watch “Invaders! Invasive Species in BC” (1:42)
<https://www.youtube.com/watch?v=W4Ds8aFh8hM>

4. Explain to students that there are invasive species in our Okanagan watershed. Can anyone think of any?

5. Watch the solution that was released in Florida in response to invasive species
<https://www.youtube.com/watch?v=gA2pFBE3ToM&t=20s> and <https://www.pbs.org/newshour/extra/lessons-plans/lesson-plan-killer-robots-battle-invasive-species/>

6. Tell students that they will be designing a sketch, drawing, and prototype of their very own to help with local invasive species. It can be preventative or reactive (explain to students that what was seen in the YouTube clip was reactive). It can be a design like what has been seen in the YouTube clips, or it can be a campaign to raise awareness and prevent the spread.



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Materials

Invite students to bring any project supplies that they would like from home or from the natural world.
NOTE: Encourage students to first confirm supply list with you, the teacher, and ensure that when gathering supplies from the natural world they are appropriately collected. Provided supplies could include (modify with what is accessible for your class):

- Access to technology (laptops/ipads/wifi)
- Writing and drawing utensils (pens, pencils, pencil crayons, erasers, markers, etc.)
- Ruler
- Card stock
- Empty plastic water bottles/can/glass bottle
- Cardboard boxes
- Saran wrap
- String
- Paper clips
- Tin foil

- Balloons
- Scissors
- Glue (glue sticks, white glue/glue gun)
- Exacto knife
- Popsicle sticks
- Pipe cleaners
- Batteries (AA, AAA)



Eurasian watermilfoil is native to Europe, Asia and North Africa. It's believed that it was first introduced to North America in the 1940s, and made its way to B.C. in the mid-70s.
Learn more about milfoil control in the Okanagan at

<https://obwb.ca/milfoil/>.



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What to Do, continued

7. The first lesson should be strictly research for the students. Allow them to identify what invasive species they are targeting and develop a plan. Students can use the Okanagan Invasive species website to research: <https://www.oiso.ca/>

8. Remind students about internet safety and copyright.

9. The following class, invite students to roam around the room “pitching” their product to each other. Instruct students to listen to at least three other pitches and pitch their own at least three times as well.

10. Collect their initial “pitches” as formative assessment, but allow students the opportunity to revise their plan if they wish.

11. Have students complete a material/supply list for their prototype that can be approved by the teacher.

12. Review safety protocols and success determinants and allow students ample time to work on their design.

13. Allow time for students to present their prototypes to their peers and identify strengths and areas for improvement.



[FIND A SPECIES](#) [REPORT A SPECIES](#) [MAP](#) [GALLERY](#) [RESOURCES](#) [ABOUT](#)

[ALERTS](#)

Find an Invasive Species by Category

Select a Category from the list below and click the Search button to look for Invasive Species under that Category

AMPHIBIANS & REPTILES	AQUATIC PLANTS	BIRDS
FISH	INSECTS & SPIDERS	MAMMALS
OTHER	TERRESTRIAL PLANTS	



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Safety Plan

Students will not be allowed to use an Exacto knife or hot glue gun without supervision. This **MUST** be done with the teacher oversight.

- Personal protective clothing: ensure students are wearing closed-toed shoes.
- Review scissor safety and how to pass them properly/walk with them.
- Stay in work space as much as possible to avoid foot traffic and tripping hazards.
- Keep work space clean and clear of clutter.

Success determinants

- A successful design/prototype will have been well thought out and will address a local invasive issue.
- The issue is clearly identified and the design presents a viable solution.

Possible Extensions

Ethical decisions behind killing off invasive species: write a persuasive paper based on the invention looked at in class (Florida's solution to lionfish) and decide whether killing invasive species is ethical or unethical. Defend your argument.



Ecosystem protection warning



The Red-Eared Slider is native to southeastern U.S., Mexico, Central America and Brazil, but has been introduced to the Okanagan and other parts of B.C.