səlilwət / Burrard Inlet

Water Quality Objectives

an informational series for
governments • industries • researchers, educators, and eNGOs

səlilwətaɬ
Tsleil-Waututh Nation
PEOPLE OF THE INLET

Water Quality Objectives are water quality characteristics, including contaminant limits, set to protect ***water values*** including seafood consumption. These benchmarks are set and monitored for in water, sediment, and animal tissue.

For səlilwət / Burrard Inlet, these objectives were developed collaboratively by Tsleil-Waututh Nation and British Columbia, guided by a Roundtable of First Nations, other levels of government, health authorities, researchers, non-profit organizations, and industries. Together, we agreed on six səlilwət marine priorities, or ***water values***, that will be protected by achieving Water Quality Objectives. These values include:

- Shellfish consumption
- Finfish consumption
- Wildlife
- Marine aquatic life
- Cultural practices and recreational uses
- Institutional water uses

Take action!

Research and education are essential for improving water quality in səlilwət / Burrard Inlet, protecting shared water values, and restoring Tsleil-Waututh people's way of life.

You can help attain Water Quality Objectives by...

- **Contributing to or coordinating monitoring efforts (page 3):** empowers the body of contributors to efficiently (1) locate contaminant hotspots, (2) identify pollution control priorities, and (3) track pollution reduction progress.
- **Aligning your research (pages 4–5):** informs solutions and management actions by closing knowledge gaps and increasing understanding of pollution.
- **Providing education (page 6):** empowers individual and systemic change by informing best practices and regulations.

RESEARCHERS

EDUCATORS

NGOs

Key takeaways:

- Tsleil-Waututh people have carefully stewarded the lands and waters of səlilwət / Burrard Inlet since time out of mind.
- Water pollution has caused the Tsleil-Waututh people to stop eating clams and makes fish and whales sick.
- Governments, industries, researchers, and communities share responsibility for achieving Water Quality Objectives: *benchmarks** for protecting water values.
- Targeted research and education are essential to identify priority actions, inspire change, and restore water values.

*See glossary on page 9.

Index:

A brief overview

Hundreds of regulated and unregulated contaminant sources contribute to water quality problems in səlilwət / Burrard Inlet, and more than 700 contaminants have been recorded in the Inlet.

How are Water Quality Objectives set and achieved?

1. Identify water values

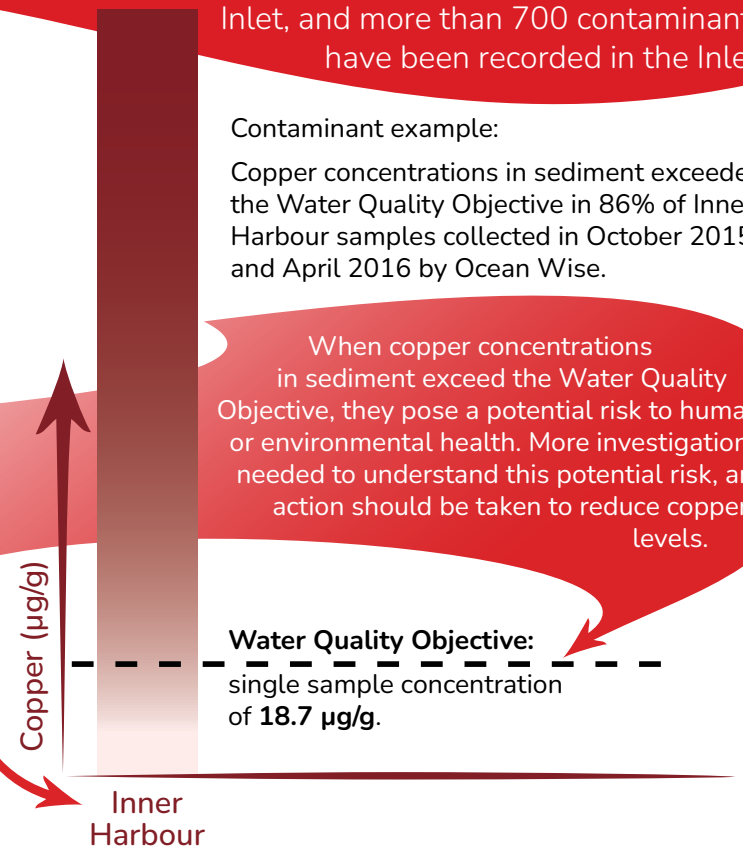
To set objectives for a specific contaminant, experts identify which **water value** is most sensitive to that contaminant in water, sediment, and tissue.

2. Set objectives

Objectives for each value are target concentrations that, once attained, contribute to protecting sensitive values.

3. Measure to manage

Coordinated monitoring helps identify *where*, *when*, *why*, and *how much* concentrations exceed water objectives. Understanding səlilwət / Burrard Inlet water quality patterns empowers effective **management** of pollution sources.



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Tsleil-Waututh Nation

PEOPLE OF THE INLET

A Legacy of Stewardship

Since time out of mind, Tsleil-Waututh people have carefully stewarded the lands and waters of səlilwət / Burrard Inlet, maintaining conditions that supported many villages and thousands of people. Our well-being is integrated with that of səlilwət, which has provided healthy, abundant food and is central to spiritual, cultural, ceremonial, and recreational practices.

Decreased Quality of Water—and Life

Since European contact, colonial development has severely degraded the territory. Contamination in səlilwət / Burrard Inlet has led to long-term shellfish harvesting and swimming closures, and it has diminished our ability to practice important cultural activities that require healthy, clean waters. These changes in water quality have fundamental consequences for our people, community health and ways of life. Current contaminant levels exceed what is allowable under our law and infringe upon inherent and constitutionally protected Aboriginal rights under Canadian law.

Restoration: A Sacred Obligation

Tsleil-Waututh people have a sacred obligation to protect, defend, and steward the territory. Successful restoration of səlilwət's health requires all people—governments, industries, experts, and individuals—to make decisions to protect the well-being, rights, and culture of all who depend on it.

"We have to weave all our knowledge together so that our grandchildren will be able to grow up on the mudflats like we did as kids."

~Tsleil-Waututh Elder

RESEARCHER & EDUCATOR ACTION #1:

Conduct coordinated monitoring and research.

One of the most significant gaps in monitoring Inlet water quality has been the availability of consistent and comparable data. Establishing collaborative leadership and monitoring efforts is crucial for developing insight into səlilwət / Burrard Inlet's most pressing issues and informing effective solutions.

Data sharing and coordination can improve consistency and comparability of results, reduce redundancy, increase efficiency, and facilitate informed decision-making. **Public data access** with **effective interpretation** could increase public engagement in protection of water quality. Data sharing **should include both the final data and associated metadata** to demonstrate that it is interoperable and reusable. Shared data can help determine where problem areas exist, identify where resources are most needed for pollution control, and track progress of pollution reduction efforts. A **public interface** should also include monitoring locations and easy interpretation of monitoring results.

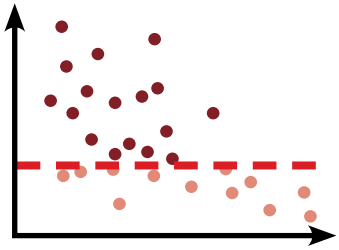
Achieving these objectives requires **coordinated monitoring** and **accessible results.**

1.

Review existing analyzed data. Currently, you'll find the best available data in BC's water quality assessment technical reports.

2.

Using these data, identify monitoring gaps you are suited to address.



3.

Identify data collection methods that allow **data comparison** with Water Quality Objectives.

Find sampling and monitoring guidance here!

4.

Before collecting data, confirm that laboratories processing your data can **detect concentrations less than objectives**.

5.

Ask the BC Ministry of Environment and Parks about **integrating your data** into their public database, EnMoDS.

Send an inquiry to: EnMoDSHelp@gov.bc.ca

Monitoring Task:
Expand and enhance targeted and coordinated monitoring.

Setting effective priorities for water quality restoration is challenging without a coordinated, strategic approach. Researchers can contribute towards monitoring coordination, and help close monitoring gaps, by following these steps prior to designing a monitoring or research program:

RESEARCHER & EDUCATOR ACTION #2:

Align research efforts to fill knowledge gaps.

To support restoration of traditional food sources and ways of life for Tsleil-Waututh people, we need to better understand the source, transport, and fate of marine contaminants that might affect both human and aquatic receptors in Burrard Inlet.

Step 1:
Review the data analyses conducted as part of the Burrard Inlet Water Quality Objectives update.

Step 2:
Conduct targeted monitoring and research accordingly, identifying priority contaminants and sources to address.

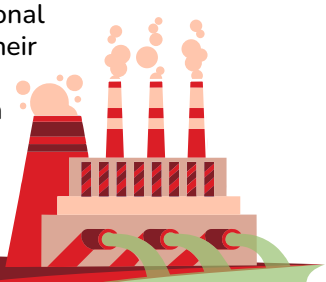
You can reduce current knowledge gaps by conducting research projects listed below.

Research Area #1:
Source, transport, and fate of contaminants

- Assess the presence and effects of Contaminants of Emerging Concern (CECs) in the marine food web, particularly in finfish, to understand their potential for biomagnification and subsequent impact on apex marine predators.
- Include high production volume chemicals such as glyphosate, s-metolachlor, and 2,4-Dichlorophenoxyacetic acid (2,4-D) in future monitoring programs due to their established toxicity to humans and aquatic life.
- Investigate the combined toxic effects of metal mixtures and other pollutants, known as “cocktail effects,” which can affect the expected toxicity of individual chemicals, challenging the current single-compound safety regulations.
- Execute long-term toxicity experiments to (1) examine effects of pharmaceuticals and personal care products (PPCPs), microplastic additives, and the adsorption/desorption processes of pollutants at environmentally relevant concentrations and (2) analyze PPCPs’ potential for biomagnification in the marine food web. Additionally, study the behaviour and fate of polybrominated diphenyl ethers (PBDEs) and polycyclic aromatic hydrocarbons (PAHs), including their remobilization during sediment disturbance and phototoxicity.

In sludge and biosolids from water treatment plants...

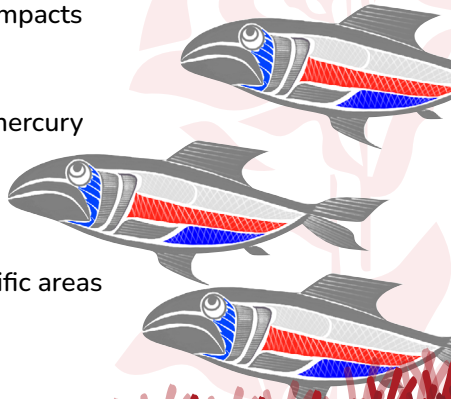
Examine the presence and effects of microplastics, pharmaceuticals, and personal care products, as well as their degradation rates, to understand their impact on the marine environment when introduced to soil.



In water...

Conduct an evaluation of the bioavailable contaminant levels, e.g. lead, to understand potential impacts on aquatic life.

Conduct short-term studies to determine the ratio of methylmercury to total mercury in marine water columns, using the findings to refine marine water objectives and evaluate mercury bioavailability in specific areas like səlilwət / Burrard Inlet.



In sediment and marine biota...

Undertake studies to determine if levels of persistent contaminants such as arsenic, mercury, polychlorinated biphenyls (PCBs), dioxins and furans are due to current pollution or historical deposits.

Research Area #2:

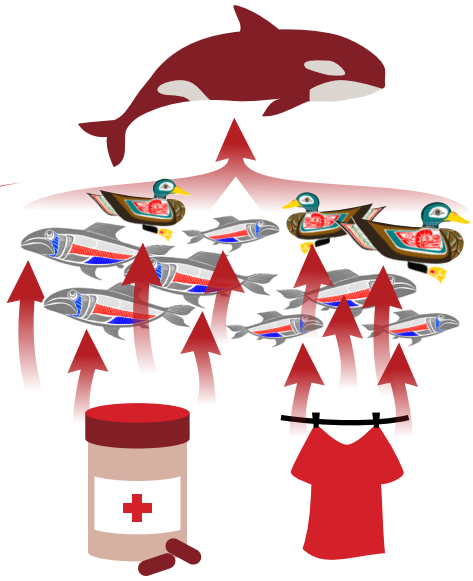
Effects of contaminants on human and aquatic receptors

Burrard Inlet has historically provided food to people living around the Inlet, particularly Tsleil-Waututh people. Increased urbanization and industrialization in the area poses health risks to humans and aquatic life through mobilization and transport of contaminants.

Research needs include:

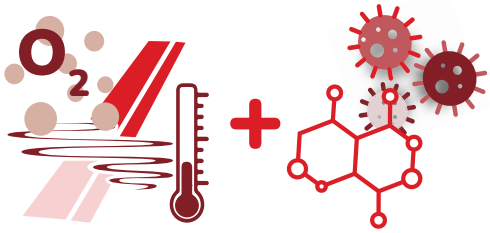
- Conduct comprehensive human health and ecological risk assessments for CECs based on results from toxicity tests.
- Implement monitoring of microplastics to assess their physical impacts, including stress, starvation, entanglement, and smothering of seabeds, on marine life.
- Investigate levels of contaminants, e.g., arsenic, metals, PCBs, dioxins and furans, and CECs, in seafood to inform human health risk assessments and establish safe daily consumption limits.
- Perform risk assessments for microplastics, CECs, and PPCPs considering toxicity test outcomes and the potential effects of cooking or processing seafood at high temperatures.
- Analyze water for PPCPs and metabolites.
- Study the impact of PAHs on benthic organisms.

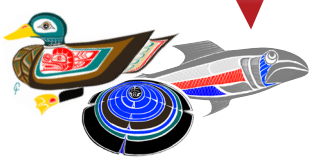
Evaluate PPCPs and microplastics in the local marine food web to better understand their potential for biomagnification and impacts on marine top predators.



Conduct long-term toxicity assessments using environmentally relevant levels of physical parameters. This research would increase our understanding of...

...potential adverse effects of changing physical parameters on other pollutants' bioavailability in səlilwət / Burrard Inlet





...potential adverse effects on marine biota in səlilwət / Burrard Inlet.

Further investigate **contaminant uptake and accumulation in additional species**, particularly intertidal species which are currently harvested by people (e.g., crabs).

Link research results to actions that help reduce contamination in səlilwət / Burrard Inlet.

RESEARCHER & EDUCATOR ACTION #3:

Educate and communicate.

As researchers, educators, and community organizers, you can use these talking points to explain the importance of implementing and attaining Water Quality Objectives (WQOs).

Education Objective #1:
Promote awareness of Water Quality Objectives (WQOs).

WQOs protect us all.

The vision of the WQOs is to increase the benefits of səlilwət / Burrard Inlet to all in the region. We can do so by reducing stressors and improving water quality in a way that balances ecological, social, economic, health, and First Nation cultural values.

səlilwət / Burrard Inlet is our kitchen.

Tsleil-Waututh people say "When the tide went out, the table was set." However, shellfish harvesting has been closed since 1972 due to contamination. Tsleil-Waututh's aspiration is to someday eat clams, oysters, and mussels from səlilwət / Burrard Inlet again.

Protecting water is protecting and upholding Indigenous rights.

BC's Declaration of the Rights of Indigenous Peoples Act action plan states, among its goals, that Indigenous Peoples should "have meaningful and sufficient access to abundant and healthy traditional foods and have peaceful enjoyment of their harvesting rights." Pollution of the Inlet can make people sick when they harvest and consume seafood or practice other Indigenous ways of life. Water, sediment, and animal tissue must be clean to protect Indigenous rights.

səlilwət WQOs are groundbreaking.

They are unlike previous objectives because they:

- *Are the first water quality policy co-developed and co-approved by Indigenous and BC governments.*
- *Are founded on Indigenous values.*
- *Protect coastal Indigenous seafood consumers.*
- *Were formed through collaboration among a diversity of people and jurisdictions.*
- *Consider səlilwət / Burrard Inlet as a whole system.*

We're working together to understand and solve the problem.

Tsleil-Waututh Nation works with BC and other First Nations, governments, health authorities, industries, academics, and organizations to understand how clean or dirty the water, sediment, and animal tissue in səlilwət / Burrard Inlet are, what is causing pollution, and how we need to work together to clean it up.

WQOs are benchmarks defining low-risk conditions for practicing our values.

These values include:

- *human consumption of shellfish*
- *human consumption of finfish*
- *aquatic life (including reproduction)*
- *wildlife (including reproduction)*
- *cultural practices and recreational uses*
- *institutional water uses*

Implementation is essential.

Setting objectives is one step toward a cleaner and safer Inlet. Attaining the objectives is the ultimate goal and will require compliance, enforcement, accountability, engineering upgrades, and widespread adoption of the səlilwət / Burrard Inlet Water Quality Objectives.

Each member of the public is responsible for helping achieving these objectives.

You can help improve water quality in səlilwət by taking action to reduce pollution. For example, you can:

- *Use eco-friendly household products.*
- *Properly dispose of hazardous waste.*
- *Install rain barrels and rain gardens.*
- *Minimize use of fertilizers and hazardous chemicals.*
- *Pick up pet waste.*

Encourage your communities to join your efforts!

Education Objective #2:

Lead or support a targeted education campaign to promote best water quality practices.

Educators can empower individuals, governments, and businesses to make responsible choices by raising their awareness of pollution sources and everyday solutions. Marketing and outreach campaigns should increase awareness of:

Sources of microbiological pollution entering waterways.

Examples: pet waste, leaky sewer pipes

Best practices for managing potentially hazardous materials that may contain organic compounds like polychlorinated biphenyls (PCBs), polychlorinated dibenzodioxins (PCDDs), or polychlorinated dibenzofurans (PCDFs).

Example: Don't burn garbage, plastic, or treated or painted wood.

Best practices for reducing release of plastics and structural pollutants.

Examples: microplastics, microfibres, and tire particles

Proper methods for disposing of batteries and other metal-containing materials.

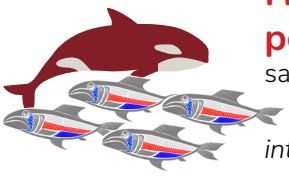
Medication disposal laws and initiatives.

Examples:

- *Vancouver city bylaws ban disposal of medications in the garbage.*
- *B.C. Medication Return Program (free return of unused medications to participating pharmacies.)*

Pest management alternatives to reduce or eliminate the use of pesticides.

Business education and credentialing programs like Salmon Safe.



How stormwater pollution affects salmon, whales, and people.

See twnation.ca/stormwater for an interactive StoryMap.

If you develop education or outreach materials addressing Burrard Inlet water quality or Water Quality Objectives, you can support others by making resources publicly available.

Frequently Asked Questions

What evidence proves we need change?

A 2022 study[1] of contaminants in səlilwət / Burrard Inlet showed:

- More than 700 contaminants have been recorded in səlilwət / Burrard Inlet since 1971.
- At least 56 contaminants exceeded low-risk levels for practicing water values.
- At least 24 contaminants exceeded levels safe for subsistence seafood harvest and consumption, part of the coastal Indigenous ways of life.
- BC wastewater discharge permits legalized the release of 27 contaminants that exceeded low-risk levels.

What have we accomplished so far?

We have created new policy that is holistic, founded on Indigenous values, and more protective of human health and the environment.

We co-created this policy with multiple levels of government and other agencies and industries with influence on water.

We have worked with BC and other First Nations, governments, authorities, industries and non-profit organizations to understand how clean or dirty the Inlet's water is, what is causing pollution, and what needs to be done to clean it up.

We have set high expectations for everyone to improve water quality so Tsleil-Waututh people can once again harvest food from the Inlet, we can all feel safe entering the Inlet's waters, and a diversity of aquatic life can return to these waters.

Why are these objectives important to all?

Water is life. The Water Quality Objectives connect the dots between human actions, rights, and wellbeing. This education is an early step toward improving relationships with First Nations.

How are Water Quality Objectives relevant to me?

Water quality impacts in səlilwət / Burrard Inlet result from multiple stressors, so Water Quality Objectives can only be attained with cooperation by all. Researchers can help by filling knowledge gaps, coordinating monitoring, comparing results to WQOs, and identifying solutions to pollution.

Which contaminants are addressed by səlilwət / Burrard Inlet Water Quality Objectives?

- Metals, e.g., arsenic, cadmium, copper, lead, mercury, nickel, and zinc
- Pathogens
- Microplastics
- Persistent Organic Pollutants (POPs), e.g., PBDEs, PCBs, PCDDs, PCDFs, and PAHs
- Pesticides
- Pharmaceuticals and personal care products
- Contaminants of Emerging Concern

Learn more in the water quality assessment technical reports.

What can I do within my existing role? Where do I fit in?

1. Carry out the actions included in this guide.
2. Examine the relationship between your organization and water quality.
3. Identify opportunities to integrate the Water Quality Objectives into your work, e.g. identifying pollution sources, controlling contaminant sources, implementing benchmarks for monitoring, and providing education.
4. Be an active participant in the səlilwət / Burrard Inlet Water Quality Roundtable.
5. Use your influence to make or call for real improvements to səlilwət / Burrard Inlet water quality, setting the Water Quality Objectives as standards to achieve.

1 Rao, A.S. (2022). A review of Burrard Inlet water quality data to understand the impacts of contamination on Tsleil-Waututh Nation's safe harvesting practices. Tsleil-Waututh Nation Research Report.

Where to Learn More

Find more resources at
twnation.ca/tlrstewardship.

Where can I learn more about Water Quality Objectives?

- Policy overview
- Policy report
- Contaminant-specific technical reports

Where can I learn more about research and monitoring needs?

- **Knowledge gaps report*:** a list of existing research and monitoring needs
- Coordinated monitoring report: suggested approach to monitoring in the Inlet
- Assessment and attainment monitoring reports

**Coming soon to twnation.ca/tlrstewardship.*

- ## How has water quality affected Tsleil-Waututh food harvest?

Rao, A.S. (2022). A review of Burrard Inlet water quality data to understand the impacts of contamination on Tsleil-Waututh Nation's safe harvesting practices. Tsleil-Waututh Nation Research Report.

Where and how is the Inlet impacted by development?

Map: Impacts of Colonial Development in Burrard Inlet

How does stormwater affect the Inlet, and what can we do to reduce impacts?

StoryMap: Restoring a Healthy Inlet - Tsleil-Waututh Nation

Glossary

benchmark *noun*

a standard or point of reference against which water quality parameters, including contaminant levels, may be compared. These may include minimum concentrations at which research or other knowledge suggests there is a significant risk associated with a water value.

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This practitioner guide was produced for the Tsleil-Waututh Nation by ESSA Technologies, Inc.
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