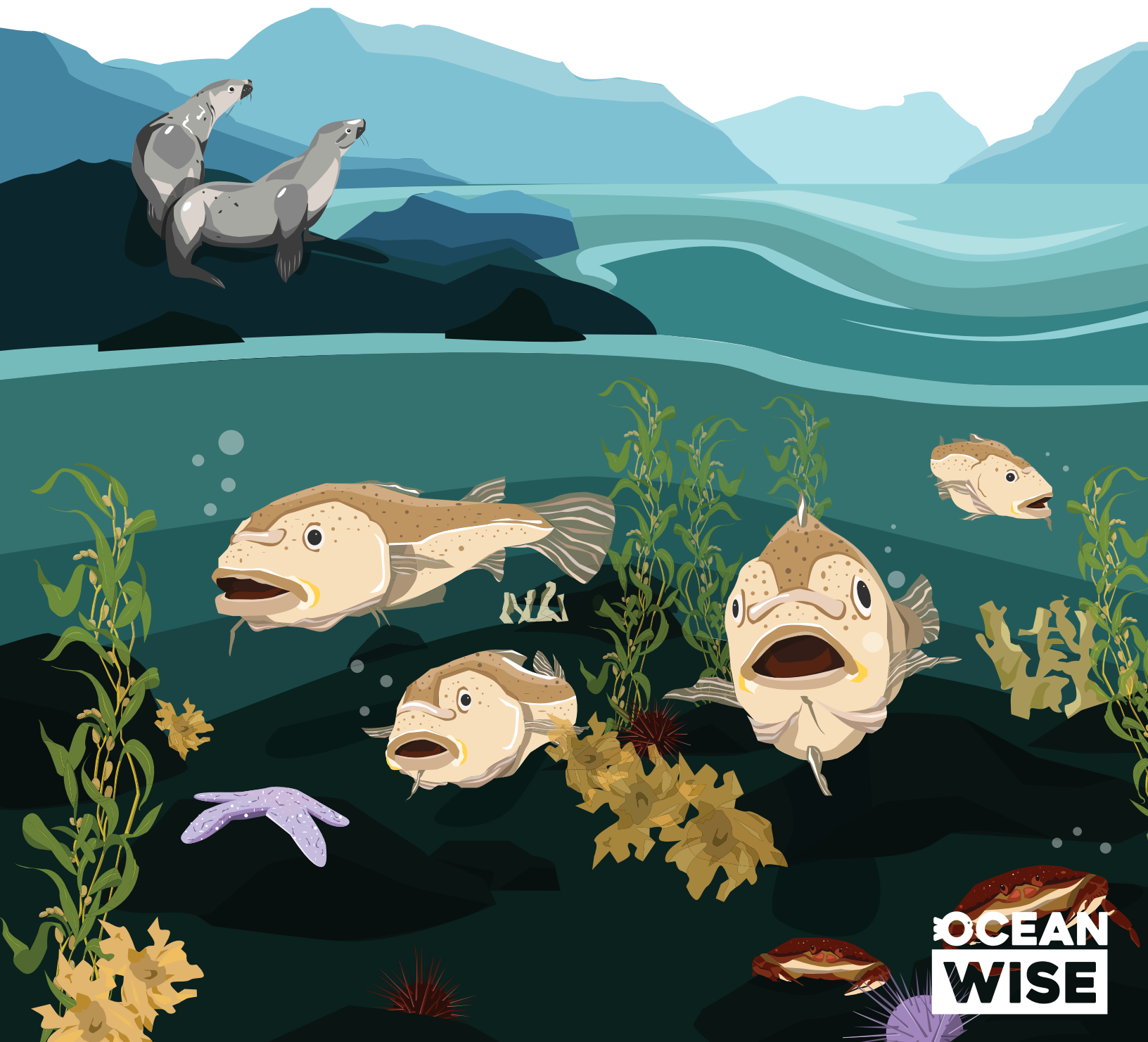


Átl'ka7tsem-Txwnéwu7ts Howe Sound Edition



We acknowledge and are grateful that many Ocean Wise employees live, work and play on the traditional, ancestral and unceded territories of the x^wməθk^wəyəm (Musqueam), Sk̓wx̓wú7mesh (Squamish), and sə́lilwətaʔɬ (Tsleil-Waututh) peoples.

Átl'ka7tsem/Txwnéwu7ts/Howe Sound is within the traditional, ancestral, and unceded territories of the Sk̓wx̓wú7mesh (Squamish), sə́lilwətaʔɬ (Tsleil-Waututh), and x^wməθk^wəyəm (Musqueam) peoples.



INTRODUCTION

Átl'ka7tsem/Txwnéwu7ts/ Howe Sound is a coastal fjord ecosystem in the Salish Sea. It is a vital area to First Nation communities, providing natural resources that allowed Indigenous peoples to thrive for generations before colonization. Following colonization and years of destructive human activity, such as industrial and coastal development, efforts are currently underway by government, industry groups, and local communities to transition the Sound's marine ecosystem from crisis to recovery. Indigenous communities, in particular, are working hard to restore life and traditional practices for generations to come.

To restore and maintain the ongoing health of the coastal ocean environment we need to understand its species and habitats, the impact of human activities on this biodiversity, and adaptation actions to succeed despite the effects of climate change.

In 2021, Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound was designated as an UNESCO Biosphere Region due to its global ecological significance as well as the collaborative efforts of First Nations, government, industry groups, and other community members towards sustainable management and restoration. A year prior to the designation, Ocean Wise released an [extensive report](#) on the state of the Howe Sound ecosystem with health ratings, key issues, and action plans for important species and geography across the Sound. In this kit, students will be encouraged to utilize the 2020 report to discover more about the biodiversity, sustainable resource management, and climate action specific to this area.

Using Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound as a case study, students can recognize how ecosystems, species, human impact, and climate change are interconnected. This work is essential for students to make informed decisions as the future stewards of our planet.

NOTE TO EDUCATORS

Each lesson follows the same format throughout the kit with **Critical Questions** and **Reflections** built into the **Activities** section.

The kit follows the overarching theme of **Regeneration**, integrating decolonization practices with scientific, conservation, and Indigenous Knowledge. The **Thought Book** component prompts students to journal on regeneration and consider its connection to each lesson's focus. Through reflection, students will consider their role in decolonization and climate action and be encouraged to become change makers within their community.

Finally, each lesson ends with ways to **Take Action**. We invite educators and students to create their own actions, acknowledging that those provided may not be accessible or applicable to all. We recognize that individual action should be coupled with systemic change but aim to engage students through active approaches and creative problem solving.



LESSON 1: SENSE OF PLACE

BACKGROUND

Átl'ka7tsem / Txwnéwu7ts / Howe Sound is a coastal fjord in the Salish Sea, just north of the bustling city now known as Vancouver, British Columbia. Lying within the unceded territory of the Skwxwú7mesh Úxwumixw / Squamish Nation, the Sound is a Traditional Knowledge hub for Indigenous communities and a valuable habitat for important biodiversity.

Átl'ka7tsem is one of three Squamish Nation place names for this deep underwater fjord, meaning paddling out of the fjord toward the Salish Sea. The Sound itself has provided life essentials for these communities for Coastal and Interior Salish Peoples for the past 10,000 years and more.

Historically, colonial industrial activities and coastal development have left the water polluted and the ecosystem damaged. However, significant efforts in recent decades have improved the health of the fjord and allowed valued species to recover.

The Átl'ka7tsem / Txwnéwu7ts / Howe Sound watershed is delineated by the line of hills and mountains from which rivers drain into Átl'ka7tsem / Txwnéwu7ts / Howe Sound. Impacts on the watershed upstream are carried downwards, directly affecting water quality and greatly impacting terrestrial and marine life.

CRITICAL QUESTIONS

1. How would you describe this place to someone who came from far away? What would be the most important information to include? What are the most important facts to know about Átl'ka7tsem /Txwnéwu7ts / Howe Sound?
2. What learning, and action, needs to take place to regenerate relations between settlers and Indigenous Peoples?

OBJECTIVES

- Students will locate Átl'ká7tsem/ Txwnéwu7ts/ Howe Sound on a map and recognize the watershed. .
- Students will label places in Átl'ká7tsem/ Txwnéwu7ts / Howe Sound with English and Skwxwú7mesh Snichim/Squamish language names
- Students will explore the concept of regeneration and reflect on its connection to the themes of this lesson

ACTIVITIES

ENGAGE

1. Watch: [TEDxYouth talk “Beyond sustainability: A call for regeneration”](#)
2. Find: your location in [Google Earth](#), then locate the watershed of Átl'ká7tsem / Txwnéwu7ts / Howe Sound
3. Find: Locate Nch'kay' / Mt. Garibaldi in Google Earth, and relate it to your location

EXPLORE

Using [OWHS 2020](#) p. 15 “Species and Habitats”, [Squamish Atlas](#), the A/T/H [Interactive map](#), and Google Earth, locate and find Skwxwú7mesh Snichim / Squamish language names for landmarks in Átl'ká7tsem / Txwnéwu7ts / Howe Sound that are listed in student workbook.

EXPLAIN

Using [Google Earth project](#), or the paper map in the Student Workbook, label locations with English and Skwxwú7mesh Snichim / Squamish language names. Outline the Átl'ká7tsem / Txwnéwu7ts / Howe Sound watershed (as much as is shown on map).

Through its source or meaning did any connection come up as to how this place got its Skwxwú7mesh Snichim name?

THOUGHT BOOK

REFLECT

1. What does regeneration mean to you?
2. How would you describe this place to someone who came from far away? What would be the most important information to include? What are the most important facts to know about Átl'ka7tsem /Txwnéwu7ts / Howe Sound?
3. What learning, and action, needs to take place to regenerate relations between settlers and Indigenous Peoples?
4. How can I help regenerate relations between settlers and Indigenous Peoples through my own understanding and actions?
5. Whose land do you live on? Do you feel connected to those who have lived here before you? How do you enhance this connection?

TAKE ACTION

1. I will learn to pronounce the Skwxwú7mesh Snichim for a landmark near my community or in the language of an Indigenous community where I live.
2. I will learn the land acknowledgment specific to where I live at [Native-Land.ca](https://www.native-land.ca)

THE WHY

It is important to learn the place name of where you live in the language of the Indigenous communities who were the first peoples of that area. This will put you on the first step towards reconciliation and understanding of your role in the history of colonization.

LESSON 2: SPECIES AND HABITAT

BACKGROUND

Marine biodiversity refers to the huge number of living organisms in the ocean, such as microbes, invertebrates, fish, marine mammals, reptiles, birds, plants, and fungi.

Owing to colonial history, the unique species and habitats of Átl'ka7tsem/Txwnéwu7ts/Howe Sound were subjected to industrial contamination, leaving habitats degraded or destroyed and caused many species to decline or simply disappear. However, thanks to dedicated work from Indigenous Peoples, local communities, and the government's efforts to clean up the water, these habitats have seen an astounding comeback. Many of these species, including top-level predators such as killer whales, are now being seen throughout the Sound.

Unfortunately, there continue to be many stressors on the Sound's marine life, notably climate change. Many species are struggling to rebound, including sea stars, marine birds, lingcod and rockfish. To effectively protect key species and habitat, actions to address stressors with consistent, comprehensive monitoring, is necessary.

Citizen science, the collection of data by the public, plays an important role in this work to protect species and their habitats against climate change. By gathering and sharing information through apps such as [Ocean Wise's WhaleReport Alert System](#), scientists can keep people informed on how their daily lives affect the ecosystem around them.

CRITICAL QUESTIONS

1. How and why does species diversity differ in different kingdoms, orders, and families?
2. How are species found in Átl'ka7tsem/Txwnéwu7ts/Howe Sound interdependent?
(Students should consider the food web and chain, as well as less direct interdependence, i.e., discarded mollusc shells creating shelter for other marine invertebrates)
3. What can we do to help the regeneration of species at risk when thinking about their interdependencies?
4. How do human actions impact biodiversity in my area and further away? Why is diversity an important feature of a sustainable ecosystem?

OBJECTIVE

Students will explore the biodiversity of Átl'ka7tsem / Txwnéwu7ts / Howe Sound and how species are interdependent.

ACTIVITIES

ENGAGE

1. Watch: Howe Sound Marine Biodiversity videos - [Whytecliff Park](#), [Porteau Cove](#), and [Britannia Beach](#)
2. Discuss: questions that arise after watching the videos. **Potential discussion questions:**
 - Why is it important to catalogue the species of Átl'ka7tsem / Txwnéwu7ts / Howe Sound?
 - What kinds of human activities impact the biodiversity of this area?
 - How do scientists monitor the ecosystem's health?
 - How does Western scientific knowledge compare to Traditional Ecological Knowledge when monitoring ecosystems?

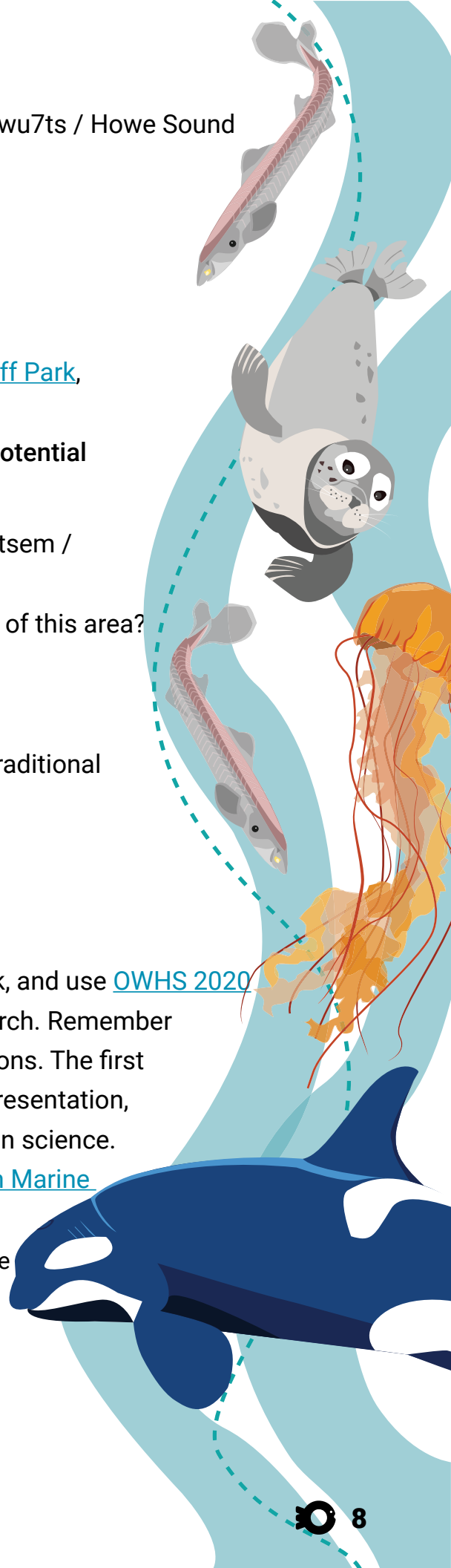
EXPLORE

Students choose a species from the list in Student Workbook, and use [OWHS 2020](#) and other resources (internet, books, etc.) to complete research. Remember to connect species to Squamish Nation/Traditional connections. The first set of prompts in the student workbook are directed to the presentation, the following are further research prompts focusing on citizen science. Students will need to reference the [Howe Sound/Átl'ka7tsem Marine Reference Guide's interactive map](#).

Please note: There are three 'Area Bookmarks' that relate to these connections. You will find these areas towards the top of the interactive map, near the Squamish Harbour.

EXPLAIN

Students present their species information to a group (we recommend using posters, PowerPoint, or video).



THOUGHT BOOK

REFLECT

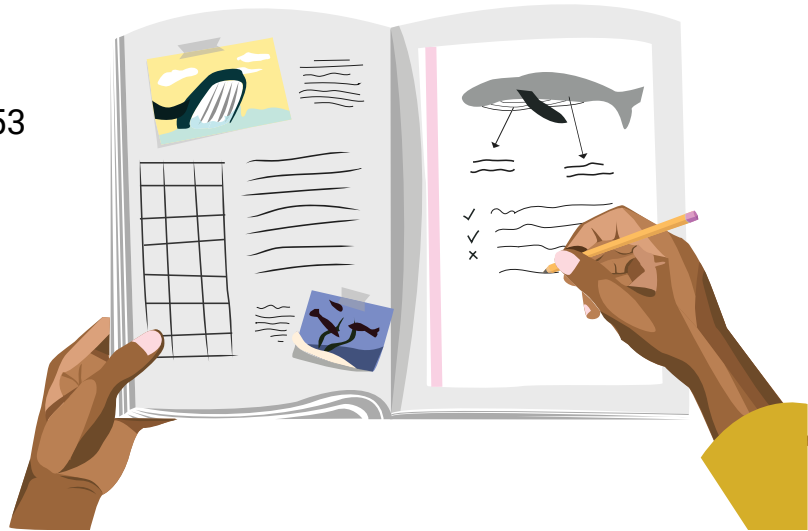
1. What were you most surprised to learn from your peers' presentations? List your three biggest takeaways, including one Traditional or cultural takeaway.
2. How and why does species diversity differ in different kingdoms, orders, and families?
3. How are the species found in Átl'ka7tsem/Txwnéwu7ts/Howe Sound interdependent?
4. What can we do to help the regeneration of species at risk?

TAKE ACTION

I will assist a local citizen science group and share my sightings.

Resources:

- [WhaleReport Alert System](#)
- [Citizen Science in OWHS 2020](#) page 349-353
- [iNaturalist](#)
- [eBird](#)
- [20 Citizen Science Projects for Students](#)



THE WHY

Citizen science helps scientists learn about the health of species and ecosystems to better inform the public on how to help.

For example: Reporting sightings on Ocean Wise's [WhaleReport Alert System](#) informs ships of where whales are in real time, to allow them to shift course to avoid the whales. This lowers the impact of noise pollution on whales, improving their ability to feed, communicate, and get their bearing. Seeing trends in the number and location of any species offers up a lot of information that helps humans help species and their ecosystems.

LESSON 3: SURVIVAL NEEDS

BACKGROUND

Ocean ecosystems are numerous and diverse. They are defined by environmental factors (abiotic) and by the community of organisms living there (biotic). Abiotic environmental factors include available oxygen and nutrients, salinity, temperature, pH, light, pressure, substrate, and circulation. All ecosystems need interaction between abiotic and biotic factors for the survival of organisms, as all living things need four things to survive: food, water, oxygen, and shelter.

Human activities have impacted species' ability to meet their essential needs. In the last few years, important conservation actions have taken place to address ecosystem damage, restore key habitats, and protect species in Átl'ka7tsem / Txwnéwu7ts / Howe Sound. For example, efforts are ongoing to establish new eelgrass beds, as part of the continued restoration of the Squamish Estuary. Eelgrass beds help ensure food is plentiful across ecosystems by providing shelter, promoting clean and oxygenated water.

Similar efforts have been spearheaded by Ocean Wise along the Pacific coast for a Seaforestation project. Seaforestation works to establish kelp ecosystems in locations with appropriate abiotic factors. The goal is not only to promote healthy environments and biodiversity, but also to enable carbon sequestration. Carbon is sequestered very efficiently by kelp, as when kelp tissues end up on the ocean floor, carbon can be stored for centuries and safely removed from the atmosphere in large quantities.

Many Indigenous peoples believe there is a fundamental connection between themselves, their land, and the entirety of nature associated with it. This connection, they believe, is one unknown to settlers. Many consider it their hereditary obligation to look after the land, a responsibility passed down for thousands of generations. Many Indigenous communities have relied on the land and ocean for survival for thousands of years before colonization.

CRITICAL QUESTIONS

1. What do humans need to survive in the Átl'ka7tsem/Txwnéwu7ts/Howe Sound ecosystem?
2. What can we do to preserve and/or regenerate what we need for survival for coming generations? Consider biotic and abiotic ecosystem components.
3. Reflecting on certain Indigenous communities' beliefs of living and non-living spirits, how does this point of view change your understanding of the land, water, and everything within it?

ADDITIONAL MATERIALS

- [Kelp Forest in DANGER - Royal BC Museum Learning Portal](#)

OBJECTIVES

- Students will describe biotic and abiotic factors necessary for life on Earth by comparing kelp ecosystems in Átl'ka7tsem / Txwnéwu7ts /Howe Sound to other kelp forests.
- Students will learn about the Indigenous views of spirituality and their connection to all ecosystems and life itself.

ACTIVITIES

ENGAGE

1. Watch: [Seaweed: an ocean-based climate solution](#)
2. Watch: [Abiotic Factors - Kelp Forest--Aquatic Biology \(weebly.com\)](#)
3. Read: [What is Aboriginal spirituality? - Creative Spirits](#)

EXPLORE

Invite students, individually, in pairs, or in small groups, to choose one of the following sites:

- Tofino
- Haida Gwaii
- Puget Sound

Students compare the kelp habitats in Howe Sound to these ecosystems by researching and completing the chart in the student handbook. They will compare the abiotic factors of each place, as well as the diversity of species that depend on kelp.

EXPLAIN

Students write a summative comparison of the two environments, focusing on the ecosystems' ability to sustain life. They will describe how the abiotic factors play into the success of the ecosystem.



THOUGHT BOOK

REFLECT

1. What can we do to preserve and/or regenerate ecosystems for the coming generations? Consider biotic and abiotic components.
2. Reflecting on certain Indigenous communities' beliefs of living and non-living spirits, how does this change your understanding of the land, water, and everything within it?
3. How has an ecosystem in your local area changed over time?
4. What actions can one someone take to help abiotic factors of an environment? How would these actions affect the living plants, animals, and fungi in the ecosystem?

TAKE ACTION

I will take part in a [shoreline cleanup](#).

THE WHY

We need to stop the leak of plastics into our oceans! More than 800 marine species are known to be affected by plastic pollution, including all sea turtles, more than 40% of cetaceans, and 44% of marine birds. Shoreline cleanups are a great way to work collaboratively to fight plastic pollution and keep litter out of our ecosystems.



LESSON 4: STEWARDSHIP AND GOVERNANCE

BACKGROUND

Governed by ten local government bodies and Sk̓wx̓wú7mesh Úxwumixw/Squamish Nation, communities throughout the Sound have been working together for many years on collaborative restoration, protection and sustainable growth in this unique geographic area. To ensure a sustainable future, careful management of this fjord remains necessary for both the environment and the people who call it home.

Pressure from population growth, tourism, and development is impacting the marine environment throughout the Sound. Increased collaborative efforts to protect and restore this area, with a focus on species, habitats, and cultural and traditional areas is necessary. Furthermore, climate change has impacted every environment in Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound, and coordinated actions by communities, industry groups, and government, are needed to decrease greenhouse gas emissions.

Indigenous peoples are leading the way out of a problematic past in which 'conservation' gave cover for erasure, displacement, and land appropriation. Development of Indigenous Protected and Conserved Areas (IPCA's) in what is now called Canada, establish the assertion of Indigenous government of land and water. This represents a long-term, intergenerational commitment to sustainable ecosystem stewardship. With ongoing environmental degradation and threats of steep ecological decline, it is time for stewardship of land and waters to be returned to Indigenous peoples.

CRITICAL QUESTIONS

1. In what ways do people interact with Átl'ká7tsem / Txwnéwu7ts / Howe Sound?
2. What are the most inspiring initiatives underway to protect Átl'ká7tsem / Txwnéwu7ts / Howe Sound?
3. What cultural or traditional areas are being considered for further protection? Why should these areas be considered?
4. How do First Peoples perspectives and knowledge inform sustainable practices?
5. How do society and governance contribute to efforts promoting regeneration?

OBJECTIVES

Students identify the cultural and economic benefits of Átl'ká7tsem/ Txwnéwu7ts / Howe Sound.

ACTIVITIES

ENGAGE

1. Watch: "[This B.C. ecosystem came back from ecological disaster – now climate change could undo it](#)" featuring the environmental impacts of Britannia Mine and remediation efforts taken to promote the health of the ecosystem
2. Read: "[Herring Roe Harvest Returns to Howe Sound](#)" using the [I notice, I wonder, It Reminds Me Of strategy](#) in the student workbook
3. Watch: [Blue Economy Strategy: Your oceans, your voice, your future](#)

EXPLORE

1. What is the cultural and traditional importance of Átl'ká7tsem/ Txwnéwu7ts/ Howe Sound to the Skwxwú7mesh people?
2. How could the Blue Economy impact our future and the fight against climate change? What are some ways Átl'ká7tsem / Txwnéwu7ts / Howe Sound is important for the Blue Economy?

EXPLAIN

Using the [Debate at a Glance](#) resource, organize a debate. Choose one of the following debate topics:

Risks vs. Benefits of Coastal Development in Átl'ka7tsem/ Txwnéwu7ts / Howe Sound

- Use: [OWHS 2017: Risks of Coastal Development](#).

For vs. Against Closing the Howe Sound Pulp and Paper Mill

- Use: [OWHS 2020 : Pulp Mill: Marine Effluent](#) and [OWHS 2017 : Pulp Mill Effluent](#)

In preparation for the debate, invite students to use the report (see hyperlinks above).

Consider whether to incorporate further resources or invite students to do their own research to support their deliberation.

THOUGHT BOOK

REFLECT

1. In what ways do people interact with Átl'ka7tsem / Txwnéwu7ts / Howe Sound?
2. What are the most inspiring initiatives underway to protect Átl'ka7tsem / Txwnéwu7ts / Howe Sound?
3. What cultural or traditional areas are being considered for further protection? Why should these areas be considered?

TAKE ACTION

I will plant a tree, or a native species plant, in my community.

THE WHY

Did you know that trees are a natural solution to climate change? A tree that lives to 100 years old can take in up to 450kg of carbon dioxide over its lifetime! Trees also provide us with the air we breathe and are safe habitats for many species.



LESSON 5: CLEAN WATER

BACKGROUND

After years of colonial pollution and heavy usage of the Átl'ka7tsem/Txwnéwu7ts/Howe Sound waterways, efforts have been made by government, industry groups, and local communities to clean up the water. Today, the positive impacts of these actions are finally being seen, with some metals, dioxin, and furan concentrations decreasing to safer levels. Climate change has further impacted the Sound as rising ocean temperatures are causing stress to marine organisms, leaving them more vulnerable to the toxic effects of contaminants.

This degradation has had a huge impact on the way Indigenous peoples have been able to interact with Átl'ka7tsem/Txwnéwu7ts/Howe Sound. These communities depend on the waterways for everything from cultural importance to providing food for their peoples. Future restoration of Howe Sound should prioritize the deep Indigenous knowledge of these waterways. Indigenous communities surrounding the Sound have knowledge that precedes colonialism, when the water was healthy and thriving. A vision that we hope to achieve again.

CRITICAL QUESTIONS

1. How have human actions changed and why has the water quality in Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound changed over time?
2. How do you think Squamish Nation's relationship of water in Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound has changed over time? Has this impacted their relationship with organisms found in Átl'ka7tsem/ Txwnéwu7ts/Howe Sound?
3. What are the most significant ways that water quality affects all life dependent on Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound?

ADDITIONAL MATERIALS

- [I Notice, I Wonder, It Reminds Me Of field cards](#), (Found on Page 21)

OBJECTIVES

- Students will investigate the history of water quality in Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound.
- Students will recognize non-human species need for clean water.
- Students will learn the importance of water to Indigenous communities.

ACTIVITIES

ENGAGE

1. Watch: [Two Minutes on Oceans: The Land-Ocean Connection](#)
2. Listen: [Squamish Legend The Flood](#) or Read: [MOA-UBC Squamish Flood Legend](#)
3. Use: [I Notice, I Wonder, It Reminds Me Of...](#) to make observations and generate questions as student examine the following:
4. a. [Britannia Mine: OWHS 2020 Report](#) p. 257 Figure 1 and graphs pages 258 and 259 (or on Google Earth)
5. b. [Howe Sound Pulp and Paper Corporation Mill](#): photo of Mill on p. 264 (or on Google Earth)

EXPLORE

1. What questions do you have about contamination and how to stop it?
2. What questions do you have on Indigenous connections to water and what it means to their culture?

EXPLAIN

As a class, students will brainstorm the importance of water. Then, break into small groups (of four or five) and assign each group a 'top reason' that water is the most important resource on earth. Students will create an argument supporting why their assigned reason is the most important.

Examples of top reasons:

- Soluble
- Weather/Climate
- Basis of all life/Survival Needs
- Erosion

Discuss: How does your top reason impact Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound throughout time?



THOUGHT BOOK

REFLECT

1. How have human actions changed and why has the water quality in Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound changed over time?
2. How do you think Squamish Nation's relationship of water in Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound has changed over time? Has this impacted their relationship with organisms found in Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound?
3. What are the most significant ways that water quality affects all life dependent on Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound?
4. How can industrial waste in the water be dealt with responsibly?

TAKE ACTION

- Take the [Ocean Wise plastic challenge](#)
- I will join my class in [marking storm drains](#) in our community.

THE WHY

Plastics find their way into our oceans in big pieces (i.e., litter such as plastic water bottles) and small pieces (i.e., tiny fibres released when washing a synthetic sweater). Lowering our plastic consumption, as well as being mindful of what we put down our drains, helps keep plastic out of waterways and makes our oceans healthier.



LESSON 6: CLIMATE CHANGE AND OCEANOGRAPHY

BACKGROUND

Climate change refers to shifts in long-term (thirty years or longer) patterns of weather, including variations in temperatures, precipitation levels, and/or extreme weather events. While our climate naturally changes over long periods, it is now clear that human activities are responsible for the warming experienced over the past 150 years. Increasing concentrations of greenhouse gases (GHG) in our atmosphere, most notably carbon dioxide (CO₂), has affected the amount of carbon that can be removed via natural systems.

As is true in all coastal ecosystems, climate change is impacting Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound, directly and indirectly. As noted in the OWHS 2020 report, Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound is in a critical state for six of the seven climate themes covered. These direct impacts of climate change include rising sea levels, ocean acidification, warming ocean temperatures, changing stream flows, and more intense storms. Indirect impacts include storms destroying eelgrass beds, as well as salmon and forage fish spawning habitat destroyed by coastal squeeze or flooding.

Although the impacts of climate change are increasingly pervasive, communities across the globe are progressively taking action to protect our planet. Ocean monitoring is crucial to understand the full impact of climate change. Given the rapidly changing climate, scientific, local, and Indigenous monitoring can complement each other and greatly assist co-management of marine species. Scientific and Indigenous monitoring methods complement each other by operating efficiently at different scales and with different foci, both required for improved decision making for environmental and resource governance.

CRITICAL QUESTIONS

1. What are the most powerful ways Átl'ká7tsem/ Txwnéwu7ts/ Howe Sound can be protected from the ongoing impacts of climate change?
2. What are the most impactful ways to reduce greenhouse emissions at the individual, local, provincial, national, and global level?
3. What are some examples of how scientific understanding enables humans to respond and adapt to climate change?

ADDITIONAL MATERIALS

Ocean Acidification Experiment Materials (see next page)

OBJECTIVES

- Students will examine direct and indirect impacts of climate change on Átl'ká7tsem/ Txwnéwu7ts/ Howe Sound.
- Students will explore individual and community responses to climate change in Átl'ká7tsem/ Txwnéwu7ts/ Howe Sound.

ACTIVITIES

ENGAGE

1. Watch: [Why CO2 Matters for Climate Change by BBC News](#)
2. Watch: [What is Sea Level Rise?](#)
3. Watch: [Warming Oceans: How it Happens Shoreline Erosion and Sea Level Rise](#)

4. Additional Resources

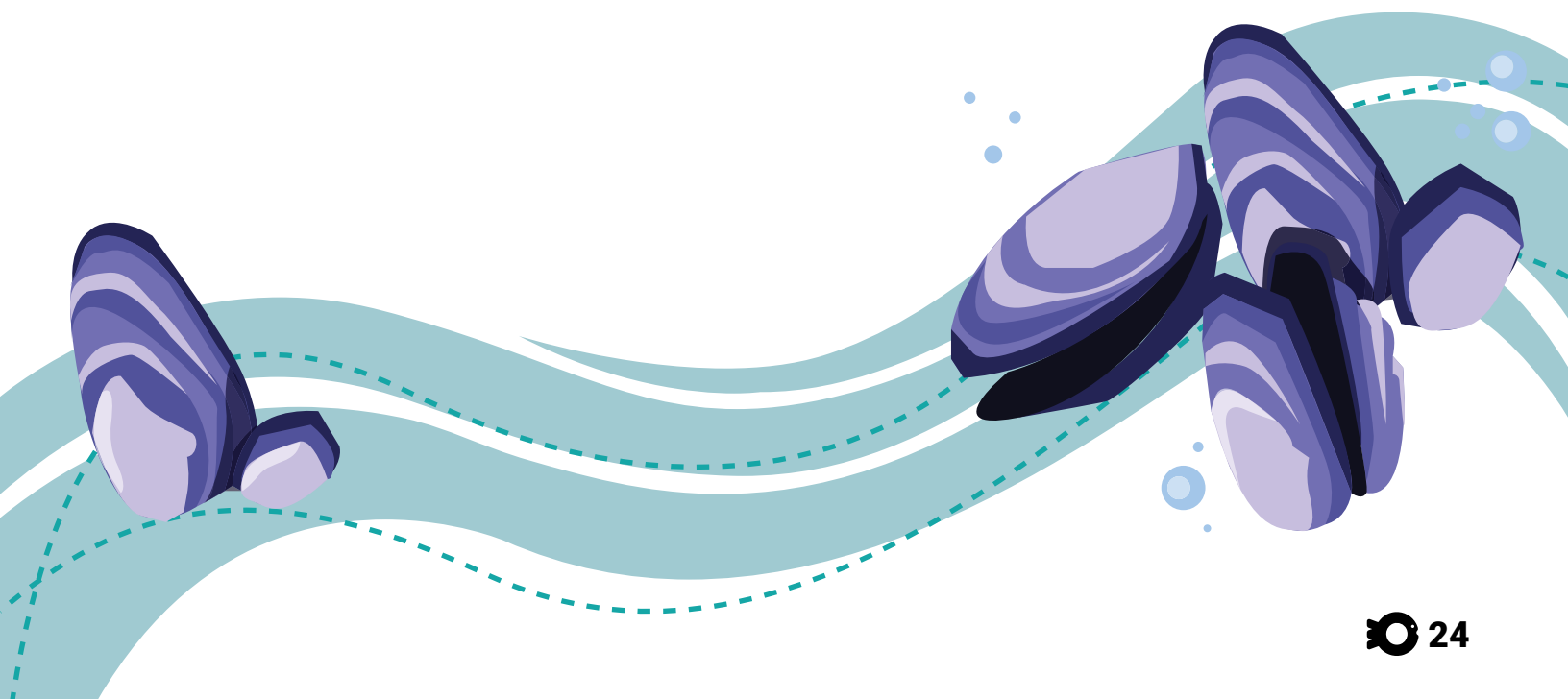
- Watch: [Causes and Effects of Climate Change | National Geographic - YouTube](#)
- Watch: [Katharine Hayhoe: The most important thing you can do to fight climate change: talk about it | TED Talk](#)
- Listen: [What's Your 2022 Climate Resolution? | How to Save a Planet \(gimletmedia.com\)](#)

EXPLORE

- How do you think climate change is affecting the region you live in?
- What questions do you have about climate change?

EXPLAIN

1. Soil Erosion Experiment: [instructions](#) and [demonstration video](#). Through discussion, tie experiment findings to shoreline erosion and sea level rise.
2. [Ocean Acidification Experiment](#): Through discussion, connect experiment findings to the Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound area and how it is impacted by ocean acidification.



THOUGHT BOOK

REFLECT

1. What are the most powerful ways Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound can be protected from the ongoing impacts of climate change?
2. What are the most impactful ways to reduce greenhouse emissions at the individual, local, provincial, national, and global level?

TAKE ACTION

- I will calculate my [carbon footprint](#)
- I will minimize my carbon footprint by buying goods produced locally whenever possible and encourage my family to do the same
- Check out the [Do One Thing: Climate Change videos](#) and choose an action to take from the challenge.
- Unplug your computers, TVs, and other electronics when not in use.

THE WHY

Although systemic change can have greater impact, individual action should not be underestimated. All efforts that reduce the amount of carbon dioxide in the atmosphere will contribute to the fight against climate change. Small changes, such as buying local goods or riding your bicycle instead of driving, can reduce carbon emissions and help fight climate change.

LESSON 7: MARINE PROTECTED AREAS

BACKGROUND

Species and habitat protection can be achieved through marine protected areas (MPAs), fisheries closures, marine parks, wildlife refuges, or even a “critical habitat” designation of natural, historical, and cultural values. This protection is just as important in the marine environment as it is on land.

In British Columbia, 52% of land is under a conservation designation, but more of our water needs to be protected. MPAs and other designations can provide industry-free areas for recreation, protection for traditional uses, safeguards for cultural heritage and archaeological resources, and ensure impact-free areas for species, habitats, and natural processes to thrive. In Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound, MPAs preserve eelgrass and estuaries, critical for storing carbon and enhancing vegetation that shelters coastal communities from storm damage and rising sea levels. Through systemic planning, MPA networks will contribute to certainty of access for the communities that rely on marine resources for social, cultural, and/or economic reasons.

In 2019, eight new marine refuge areas were created to protect nine glass sponge reefs, bringing the total number of protected glass sponge reefs in Átl'ka7tsem/Txwnéwu7ts/Howe Sound to eleven.

CRITICAL QUESTIONS

1. How do the Marine Protected Areas' status preserve biodiversity and support regeneration?
2. How might Marine Protected Areas infringe on the rights of Indigenous people? How could Marine Protected Areas instead recognize and honour the rights of Indigenous peoples?

OBJECTIVES

Students will locate the marine protected areas in Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound, know the purpose of these areas, and think critically about how MPAs preserve biodiversity and support regeneration.

ACTIVITIES

ENGAGE

1. Watch: MPA Network: [Creating a Marine Protected Area Network in British Columbia's Northern Shelf Bioregion](#)
2. Watch: [The National: Rare glass sponge reefs found of BC Coast](#)
3. Read: [Coastal First Nations': Protecting Ocean Cultures and Ecosystems](#)
 - a) Read: [Coastal First Nations: Why Marine Protected Areas](#)
4. Watch: [IUCN Global Standard for Marine Protected Areas](#)

EXPLORE

Discuss the videos above with students. Potential discussion questions:

- Why are glass sponge reefs protected?
- What stakeholders are involved in establishing Marine Protected Areas?
- What potential issues may arise when establishing a Marine Protected Area? What could be done to minimize or solve the problems you identified?

EXPLAIN

- Read the introduction and abstract of the scientific paper: [Blue Carbon in Marine Protected Areas: Part 1 - A Guide to Understanding and Increasing Protection of Blue Carbon](#)
 - Referring to the above article, outline the connections between establishing MPA's in British Columbia and climate change .
 - What would you prioritize when selecting an area to establish a MPA for maximum environmental impact?
- Read the abstract and introduction of the scientific paper: [Strong historical and ongoing indigenous marine governance in the northeast Pacific Ocean: a case study of the Kitasoo/Xai'xais First Nation](#)
 - How would you recommend Indigenous marine governance be incorporated in the selection of MPA sites?
 - What measures can be put into place to ensure that Indigenous communities can continue to exercise their traditional rights within MPA regions? Expand on why it is important for Indigenous communities to exercise their traditional rights.



THOUGHT BOOK

REFLECT

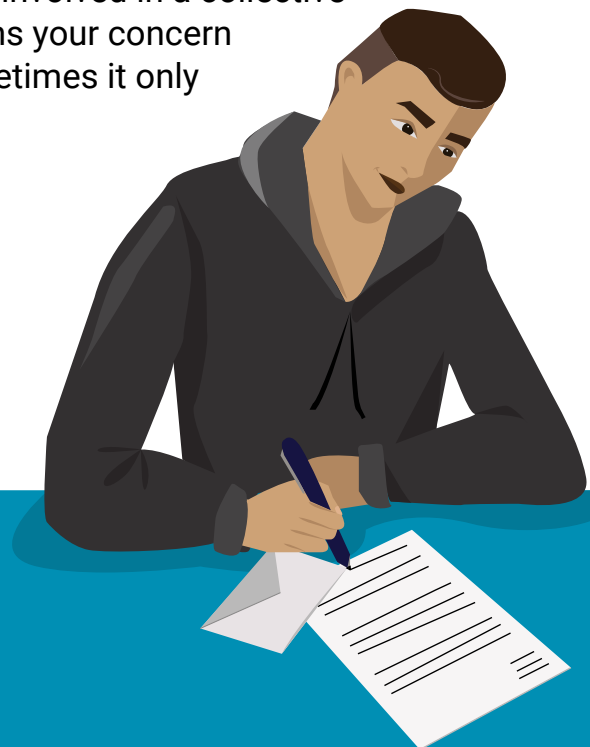
1. In what ways do MPA's support regeneration in ecosystems?
2. How might Marine Protected Areas infringe on the rights of Indigenous people? How could Marine Protected Areas instead recognize and honour the rights of Indigenous peoples?
3. List the possible shortcomings of MPAs and identify solutions to each limitation.

TAKE ACTION

I will write an email to a local politician about conservation or traditional protection for my community.

THE WHY

Politicians, as our representatives, weigh in on decisions that have major impacts on our lives, the environment, and the ecosystems around us. By voicing your concerns directly to your representative, you are participating in democracy and having your voice heard. Major ecological decisions have been swayed by people voicing their concerns to their government officials. Consider getting your friends and family involved in a collective letter writing campaign that shares with politicians your concern about climate change and the environment. Sometimes it only takes a few dozen letters to catch your local politician's attention!



LESSON 8: THE FUTURE OF ÁTL'KA7TSEM/ TXWNEWU7TS/ HOWE SOUND

BACKGROUND

UNESCO Biosphere regions are deemed models for sustainable development. There are presently more than 700 UNESCO Biospheres across 131 countries. Biosphere Regions are notable for their success in building relationships between people and the environment through innovation and sustainable practices.

Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound became Canada's 19th designated UNESCO Biosphere Region in September 2021. It took a year of collaboration to put together a nomination package, one that included the support of all local governments and regional districts governing Howe Sound, Squamish Nation, and the province of B.C. Now an internationally recognized model in sustainability, Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound is responsible for supporting collaboration and engagement locally and internationally. The biosphere is expected to serve three primary functions: conservation and protection of biodiversity, sustainable development, and education, research and monitoring. A governing body ensures that these functions, including the necessary networking and collaboration, are achieved. This governing body will ensure a balanced representation between First Nations, civil society, and government officials.

First Nations have prospered in the region as land stewards and knowledge holders since time immemorial. They are key collaborators in co-creating the vision for Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound, the biosphere, and the future cultural value and holistic use of land and sea.

CRITICAL QUESTIONS

1. How does biosphere status promote the regeneration of an ecosystem?
2. How can I thoughtfully use my voice to advocate for Biosphere protection for an area near me?
3. Considering all Biosphere Regions have three main functions: conservation and protection of biodiversity, sustainable development, and education, research and monitoring. How can you ensure that Indigenous voices are heard throughout these three functions?

ADDITIONAL MATERIALS

- Post-it notes (a few pads) and markers (one/student) for brainstorm session

OBJECTIVES

Learn about Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound's Biosphere designation and what it means, culturally, socially, and environmentally, for these areas.

ACTIVITIES

ENGAGE

1. Watch: [A UNESCO Biosphere Region for Átl'ka7tsem/Howe Sound](#)
2. Watch: [What is a Biosphere Region?](#)
3. Read: [Átl'ka7tsem/Howe Sound UNESCO Biosphere Region: What's Next?](#)
4. Read: [Man and the Biosphere \(MAB\) Programme \(unesco.org\)](#)
5. Read: [Biosphere Reserves as Observatories for Climate Change Adaptation in Southern Africa \(unesco.org\)](#)

EXPLORE

In small groups, do the following future casting exercise.

1. It is 100 years from now and our society has worked together to solve the climate crisis. Imagine Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound, what would this place look like? Compare this vision to how the area is now. Encourage students to either write or draw the present and future versions.
2. Write out the steps it would take to reach this outcome. Consider brainstorming with markers and post-it notes (see this [article](#) or this [video](#) by Ideo.org for inspiration) and then reorganizing your post-its into steps. Arrange your ideas in the order you collectively feel would work out best.

EXPLAIN

Write a report, preparing a thoughtful and evidence-based case for why Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound, or a region near you, should be designated a UNESCO Biosphere Reserve.

Please note: Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound succeeded in receiving this designation in 2021, so imagine that you were charged with making the case in 2020.

To bolster your case, review the material covered across the previous lessons and research what factors are considered when determining whether a region can qualify for the UNESCO Biosphere designation. Visit [this link](#) to learn more about the application process.

Consider relationships with Indigenous communities and decolonization. How will your case conserve and protect traditional use and/or cultural heritage of the area chosen for your Biosphere Region? Furthermore, be sure to discuss the role biospheres play as global observatories for climate change adaptation and mitigation.



THOUGHT BOOK

REFLECT

1. How does biosphere status promote the regeneration of an ecosystem?
2. How can I thoughtfully use my voice to advocate for Biosphere protection for an area near me?
3. Considering all Biosphere Regions have three main responsibilities: conservation and protection of biodiversity, sustainable development, and education, research and monitoring. How can you ensure that Indigenous voices are heard in each of these areas?

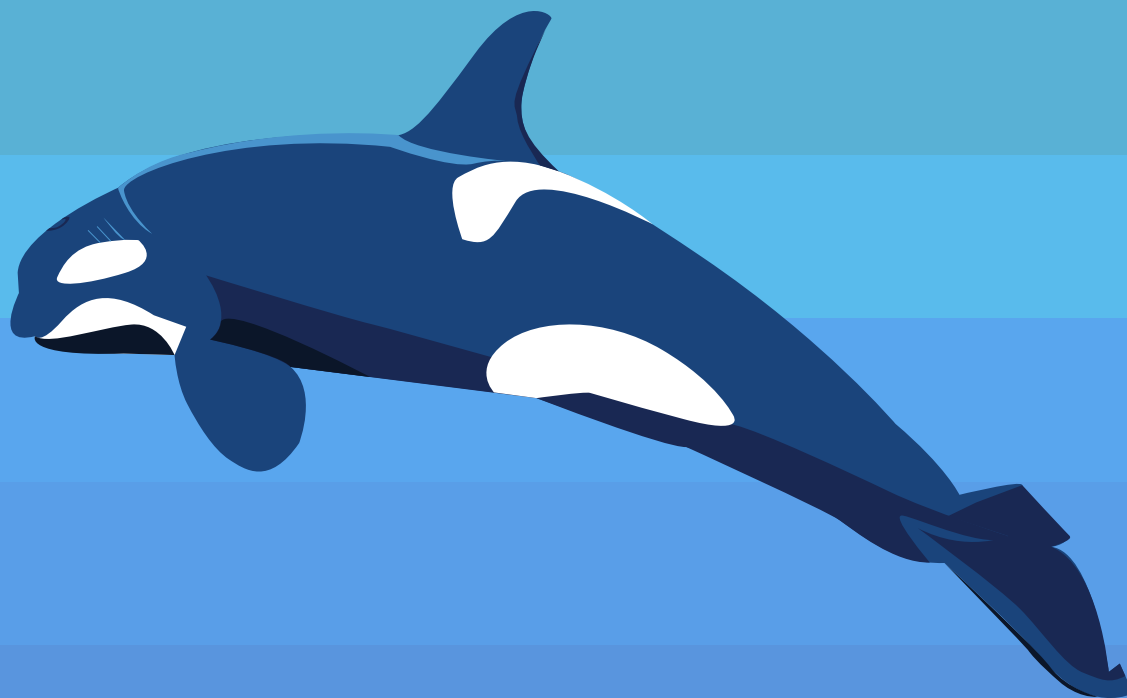
TAKE ACTION

Start a conversation with your peers about the environmental impact of your actions and how to protect green spaces in your area.

THE WHY

In Átl'ka7tsem/ Txwnéwu7ts/ Howe Sound, it was the collaborative work of a diverse group of people that made systemic changes to regenerate both the ecosystem and the relationships between people and the Sound. Movements often start with conversations. Your voice is a powerful tool in creating change, especially when joined with the voices of others.





Waves of Change

This project was undertaken with the financial support of the Government of Canada.

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