

# Citizen Science: protecting and restoring the Sound

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## What is happening?

Community members continue to play an important role in monitoring the coastal and marine environment in Átl'ka7tsem/Txwnéwu7ts/Howe Sound, as well as engaging with the public to share their knowledge and encourage participation in activities. This is reflected by the continuation of many previously identified citizen science initiatives, some of which have been running since before 2000, plus the formation of new initiatives. Volunteers in these groups generously spend considerable time taking part in these activities.



Pink salmon spawn in the Stawamus River. (Credit: Bob Turner)

## What is the current status?

Since the release of the Ocean Watch Howe Sound Edition (OWHS) 2017 report, an additional five citizen science groups have been identified. Two began activities in 2019. These included nearshore habitat recovery activities and a marine species identification course for divers. The other three initiatives are not new but are additions to this list since 2017. These included the recording of biodiversity in Skw̱wú7mesh/Squamish, from the ocean to the alpine region; restoration and monitoring of streams in West Vancouver; and the Great Canadian Shoreline Cleanup focused

within Átl'ka7tsem/Txwnéwu7ts/Howe Sound. Additionally, the activities of some groups were separated out to provide a clearer view of the multiple programs they undertake (Table 1).

For many of these groups, education is a key activity within their programs. One example is the Bowen Island Fish and Wildlife Club (BIFWC), which focuses on habitat restoration and monitoring of streams to enhance salmonid populations, as well as operating the Terminal Creek Salmon Hatchery. In addition, the



An example of rubbish collected during shoreline cleanups. (Credit: Ocean Wise)

BIFWC work to educate Nexwlélexwem/Bowen Island children on the importance of protecting wild salmon and their habitats. Working together with local schools, they offer tours of the hatchery and nearby creeks, and additionally help run a “Salmonid in the Classroom” program at the hatchery.

Another example where education is a key component is the Great Canadian Shoreline Cleanup, run through Ocean Wise. Schools, workplaces or communities can get involved by either leading or taking part in a shoreline cleanup. Free curriculum-linked lesson plans are available online for elementary teachers (see Resources).

Citizen science activities are key in gathering large amounts of data, such as bird counts. The Squamish Environment Society (SES) organizes monthly bird counts in addition to facilitating larger-scale bird counts in the region, such as the Christmas Bird Count

(CBC), Breeding Bird Surveys, and the Great Backyard Bird Count (GBBC). During the 2018 GBBC, a record 6,456 species of birds were counted by bird watchers from over 100 countries.<sup>1</sup> This accounts for over half of the known bird species in the world. This number was topped again in 2019, the 22<sup>nd</sup> year of the annual count, with 6,849 total species observed. The GBBC had 22 participants in the Skwxwú7mesh/Squamish region in 2019. The CBC is the longest-running citizen-science project in North America, with December 2019 marking its 120<sup>th</sup> year. It had 24 participants recorded for the Skwxwú7mesh/Squamish region in 2019. These counts all contribute important data to establish trends, spatially and temporally.

The knowledge held by citizen science groups and people living in the area is invaluable in supporting conservation actions that protect Átl'ka7tsem/Txwnéwu7ts/Howe Sound, such as in the creation of the Atl'ka7tsem/Howe Sound Marine Reference Guide.<sup>2</sup>

**Table 1.** Known citizen science activities in Átl'ka7tsem/Txwnéwu7ts/Howe Sound. New initiatives since 2017 are denoted by an asterisk. Initiatives that are new to this list are denoted by two asterisks.

ACTIVITY	ORGANIZATION	LOCATION	MARINE SPECIES	ROLES OF CITIZEN SCIENTISTS AND SCIENTISTS	YEAR PROGRAM STARTED
Christmas Bird Count Lower Howe Sound	Lighthouse Park Preservation Society in collaboration with local birding groups	West Vancouver to Anvil Island to Gibsons	all birds including marine species	Volunteers observe, record and report. Organizers coordinate count, compile and submit results to Audubon Society. Results available online. <a href="https://netapp.audubon.org/CBCObservation/CurrentYear/ResultsByCount.aspx">https://netapp.audubon.org/CBCObservation/CurrentYear/ResultsByCount.aspx</a>	2003
Christmas Bird Count Squamish	Squamish Environmental Society	Squamish area	all birds including marine species	Volunteers observe, record and report. Organizers coordinate count, compile and submit results to Audubon Society available at: <a href="https://www.squamishenvironment.ca/programs/winter-eagle-count/eagle-counts-by-year-by-area/">https://www.squamishenvironment.ca/programs/winter-eagle-count/eagle-counts-by-year-by-area/</a>	1980

ACTIVITY	ORGANIZATION	LOCATION	MARINE SPECIES	ROLES OF CITIZEN SCIENTISTS AND SCIENTISTS	YEAR PROGRAM STARTED
Christmas Bird Count Sunshine Coast	Sunshine Coast Natural History Society	Includes west shore of Howe Sound from Port Mellon to Gibsons	all birds including marine species	Volunteers observe, record, and report. Organizers coordinate count, compile and submit results to Bird Studies Canada (previously, results were submitted to Audubon Society). <a href="https://www.birdscanada.org/volunteer/cbc/index.jsp?targetpg=mapviewer&amp;lang=EN">https://www.birdscanada.org/volunteer/cbc/index.jsp?targetpg=mapviewer&amp;lang=EN</a>	1971
Eagle Count, Brackendale Winter Eagle Festival	Brackendale Art Gallery and Squamish Environmental Society	Lower Squamish River and tributaries	bald eagles	Volunteers observe, record and report. Organizers coordinate count and compile results. <a href="https://www.squamishenvironment.ca/programs/winter-eagle-count/eagle-counts-by-year-by-area/">https://www.squamishenvironment.ca/programs/winter-eagle-count/eagle-counts-by-year-by-area/</a>	1985
Monthly Bird Count Squamish Estuary	Squamish Environmental Society	Squamish estuary	all birds including marine species	Volunteers observe, record, and report to ebird. Results available online: <a href="https://ebird.org/hotspot/L292545?yr=all&amp;m=&amp;rank=mrec">https://ebird.org/hotspot/L292545?yr=all&amp;m=&amp;rank=mrec</a>	1991
Monthly Bird Count Lighthouse Park	Lighthouse Park Preservation Society	Lighthouse Park, West Vancouver and adjacent marine waters	all birds including marine species	Volunteers observe, record, and report to ebird. Organizers coordinate count. <a href="https://ebird.org/hotspot/L292545">https://ebird.org/hotspot/L292545</a>	2004
BC Coastal Waterbird Survey	Birds Studies Canada	Bird count locations throughout Howe Sound, including Bowen Island, Squamish, Porteau Cove, Horseshoe Bay, Woodfibre, and Lighthouse Park	marine/aquatic bird species	Volunteers observe and record details about birds using the habitat, including species, maturity (e.g., juvenile, adult), position (onshore, offshore, nearshore). This data is uploaded to Bird Studies Canada.	1999 (but for specific areas this varies)
Nearshore Habitat Recovery *	Seachange Marine Conservation Society	Howe Sound (also Gulf Islands, Sechelt Inlet, Burrard Inlet)	eelgrass, salmon, forage fish, marine riparian vegetation	Volunteers restore nearshore habitat by participating in eelgrass transplants (harvest, prepare, and replant shoots); removing subtidal debris that covers benthic habitat and shades nearshore plants; and, restoring marine riparian zone by replanting native species along the waterfront.	2017
Annapolis Biodiversity Index Study	Ocean Wise Conservation Association and Artificial Reef Society of BC	Annapolis wreck dive site, Halkett Bay, Gambier Island	invertebrates and fish	Volunteer divers observe, record and report data from personal dives. Temperature logger installed.	2015

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Intertidal Diversity Studies	Coastal Scene Investigation by Dr. Shannon Bard	Tunstall Bay (Bowen Island), Port Mellon and Chaster Beach, Lions Bay, Porteau Cove, Darrel Bay, Britannia Beach, Furry Creek, Whytecliff	Intertidal life	Scientists train volunteers to identify species and conduct surveys. Scientists supervise work.	1990
Marine Species Identification Course *	Ocean Wise Conservation Association – Marine Life Identification for Divers	Taught at Vancouver Aquarium	fish and invertebrates for all B.C. coast	Identification course designed to teach divers about marine species in B.C. waters.	Starting mid-October 2019
Beach & Marine Debris Cleanups **	Ocean Wise Conservation Association Great Canadian Shoreline Cleanup	Various shorelines and marine areas throughout Howe Sound	n/a	Cleanup of marine debris.	1994
Beach Sampling for Forage Fish Spawn	Friends of Forage Fish / BC Shore Spawners Alliance	Gibsons to Langdale, Sunshine Coast	forage fish species	Volunteers collect samples and analyze for presence of forage fish eggs.	2008
Exploratory Dives and Seafloor Technical Assistance	Underwater Council of BC in collaboration with Ocean Wise Conservation Association and Marine Life Sanctuaries Society	Dive sites at Lions Bay, Pam Rocks, Anvil Island, Bowen Island and elsewhere	glass sponges, rockfish	Volunteer divers explore, record and install seafloor monitoring instruments such as temperature loggers.	2013
Howe Sound Sponge Reef Studies	Marine Life Sanctuaries Society of BC	Throughout Howe Sound from Defence Island in north to Passage Island in south	glass sponges, rockfish	Volunteers build deep sea survey equipment, design studies, gather data using bathymetric mapping, drop cameras, depth sounders and seafloor instruments including temperature loggers. Work in collaboration with scientists from Fisheries and Oceans Canada (DFO) and Ocean Wise Conservation Association.	1998

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Glass Sponge Surveys	Ocean Wise Conservation Association	Howe Sound	glass sponges	Volunteer divers photograph and video glass sponge reef/gardens and reference markers during personal dives and submit online. This provides repeated observations of one reef.	2013
Rockfish and Select Invertebrate Surveys	Ocean Wise Conservation Association; Reef Environmental Education Foundation	Howe Sound and worldwide	rockfish, select invertebrates	Volunteer divers take rockfish identification course run by Ocean Wise. Divers observe, record and report data from personal dives.	2015
Rockfish Monitoring	Ocean Wise Conservation Association	Howe Sound and coastal B.C.	rockfish	Volunteer divers observe, record and report rockfish abundance during personal dives. Supplemented by Ocean Wise staff surveys.	2006
Lingcod Egg Mass Survey	Ocean Wise Conservation Association	Howe Sound and B.C. coast wide	lingcod	Volunteer divers observe, record and report rockfish abundance during personal dives.	1994
Herring Spawn Surveys	Squamish Streamkeepers Society	Upper Howe Sound including Squamish Estuary and Woodfibre area	herring	Volunteers map extent and character of herring roe along intertidal zone during herring spawn. Principal surveyor John Buchanan posts results on YouTube <a href="https://www.youtube.com/user/sqecs2/videos">https://www.youtube.com/user/sqecs2/videos</a>	2016
Observing and Documenting Biodiversity **	Biodiversity Squamish	Howe Sound	marine species and birds	Observers take photos; record where and when sightings occurred; and upload to the Squamish Biodiversity iNaturalist App.	2012
Habitat Restoration & Monitoring of Streams **	West Vancouver Streamkeepers	Streams in West Vancouver	salmonids	Volunteers restore habitat and monitor streams for activity.	1990
Habitat Restoration & Monitoring of Streams	Squamish Streamkeepers	Streams in Squamish area	salmonids	Volunteers restore habitat and monitor streams for activity.	2006

ACTIVITY	ORGANIZATION	LOCATION	MARINE SPECIES	ROLES OF CITIZEN SCIENTISTS AND SCIENTISTS	YEAR PROGRAM STARTED
Habitat Restoration & Monitoring of Streams	Bowen Island Fish and Wildlife Club, partnered with Pacific Salmon Foundation, Pacific Streamkeepers Federation, Metro Vancouver Parks, Bowen Island Municipality	Streams on Bowen Island	salmonids	Volunteers restore habitat and monitor streams for activity.	1982
Bowen Island Terminal Creek Hatchery	Bowen Island Fish and Wildlife Club, partnered with DFO Salmon Enhancement Program	Bowen Island	salmonids (chum, coho, pink)	Volunteers prepare, operate, maintain facilities for incubation, rearing, and release of salmon fry. Assist with taking brood stock and eggs.	1982
Creek Temperature Monitoring *	DFO with various Streamkeepers	Various creeks in Howe Sound with salmonid bearing habitat	salmon	Volunteers install, maintain, and collect data.	2019
Salmon Spawning Counts	Squamish Streamkeepers Society	Streams and spawning channels from Furry Creek to Upper Squamish River Valley	salmon (chum, coho, pink)	Volunteers are responsible for specific streams. This includes stream maintenance and enhancement and counts of spawning salmon. Some enumeration by underwater video recording.	2000
Marine Mammal Counts	Pacific Wildlife Foundation with help from Sewell's Marina Sea Safari	Outer Howe Sound	all marine mammals	Sewell's Marina Sea Safari boat-tour guides and guests observe and report wildlife sightings to Pacific Wildlife Foundation	2014
Cetacean Sightings	BC Cetacean Sightings Network, Ocean Wise Conservation Association & DFO	Pacific Coast, including Howe Sound	whale, dolphin, porpoise, turtles	Volunteers observe, record and report via smartphone app (Whale Report), web form, log book or toll-free number.	2000

# What are the potential impacts of climate change on citizen science?

Predicted climate change impacts in Átl'ka7tsem/Txwnéwu7ts/Howe Sound range from increased extreme precipitation events to warmer ocean waters. Such changes will undoubtedly impact the species and habitats monitored by citizen science groups. Data

collected by these groups will support the scientific understanding of changes in habitats and species, and support decisions to protect and adapt to climate change within Átl'ka7tsem/Txwnéwu7ts/Howe Sound.

## What has been done since 2017?

The table below reports on progress made on recommended actions from the previous 2017 article, where identified. Many of these require ongoing action.

2017 ACTION	ACTION TAKEN
<b>INDIVIDUAL AND ORGANIZATION ACTIONS</b>	
Encourage citizen science participation within your company or organization.	Ocean Wise's Great Canadian Shoreline Cleanup frequently organizes local cleanup events for the organization. Information from other organizations is lacking.
<b>GOVERNMENT ACTIONS AND POLICY</b>	
Continue to support and raise awareness of the ongoing citizen science projects within Átl'ka7tsem/Txwnéwu7ts/Howe Sound.	Some citizen science groups partner with government institutes such as DFO. Overall, however, the groups are non-profit organizations and rely on volunteer time and donors/sponsors or external funding to continue their work.
Provide resources needed to enhance and continue local citizen science projects as funding permits.	DFO's Tenderfoot Creek Hatchery supplies the Bowen Island Terminal Creek Hatchery with salmon for their hatchery.

# What can you do?

A detailed overview of recommended actions relating to climate change is included in *The path to zero carbon municipalities* (OWHS 2020). In some cases, no progress was identified on previous recommended actions; these remain listed below. Additional actions marked as **NEW** also follow.



## Individual and Organization Actions:

- Get involved with an ongoing citizen science project in Átl'ka7tsem/Txwnéwu7ts/Howe Sound (Table 1).
- Share your photos and videos of Átl'ka7tsem/Txwnéwu7ts/Howe Sound nature on your favourite social media platform.
- Join NatureWatch ([www.naturewatch.ca](http://www.naturewatch.ca)), a partnership of Nature Canada and the David Suzuki Foundation to engage Canadians in four ongoing citizen science projects: FrogWatch, PlantWatch, IceWatch and WormWatch.
- Donate. Almost all the groups engaged in citizen science projects in Átl'ka7tsem/Txwnéwu7ts/Howe Sound are non-profit groups and projects depend upon donations to continue.
- Learn more about citizen science and how to do it at Citizen Science Central sponsored by Cornell University's Lab of Ornithology: [www.birds.cornell.edu/citscitoolkit/toolkit/steps](http://www.birds.cornell.edu/citscitoolkit/toolkit/steps)
- **NEW** Collaborate across citizen science groups to strengthen advocacy for use of data within decision making.
- **NEW** Create a central hub where members of the community can find all of the ongoing citizen science projects in the region.



## Government Actions and Policy:

- Provide and maintain a central portal of information including; citizen science project listings, data gathering, community training, and a tool-kit for best practices of designing and maintaining citizen science projects.
- Promote closer relationships with stakeholders to citizen science projects in order to facilitate further participation and awareness.
- Increase the use of citizen science data contributing to natural resource and environmental science, natural resource management, and environmental protection and policy making.
- Develop policy to recognize and weigh citizen science, in addition to other scientific evidence and traditional knowledge, submitted for review in the environmental assessment process.
- Invite citizen scientist representation at public engagement events for policies and management to add their voice to input throughout decision-making processes.
- Partner with non-government organizations and other groups to create more citizen science projects on diverse subjects.

# Methods

These citizen science groups were located via personal interactions and communications throughout the Átl'ka7tsem/Txwnéwu7ts/Howe Sound community,

and confirmed by cross-checking websites of groups, where available.

# Resources

This list is not intended to be exhaustive. Omission of a resource does not preclude it from having value.

Lead a school cleanup!

<https://www.shorelinecleanup.ca/school>

# References

<sup>1</sup>The Great Backyard Bird Count. Great Backyard Bird Count Should Be “Finchy” and Fun [Internet]. 2019. Available from: <https://gbbc.birdcount.org/news/2019release/>

<sup>2</sup>Make Way. Átl'ka7tsem/Howe Sound Marine Reference Guide [Internet]. [cited 2019 Aug 1]. Available from: <https://tidscanada.org/project/howe-sound-atlkitsem-marine-reference-guide/>