

Howe Sound/Atl'kitsem marine conservation assessment

Project Team



DAVID SUZUKI
FOUNDATION
One nature.



COASTAL OCEAN
RESEARCH INSTITUTE
AN OCEAN WISE INITIATIVE

Supporters

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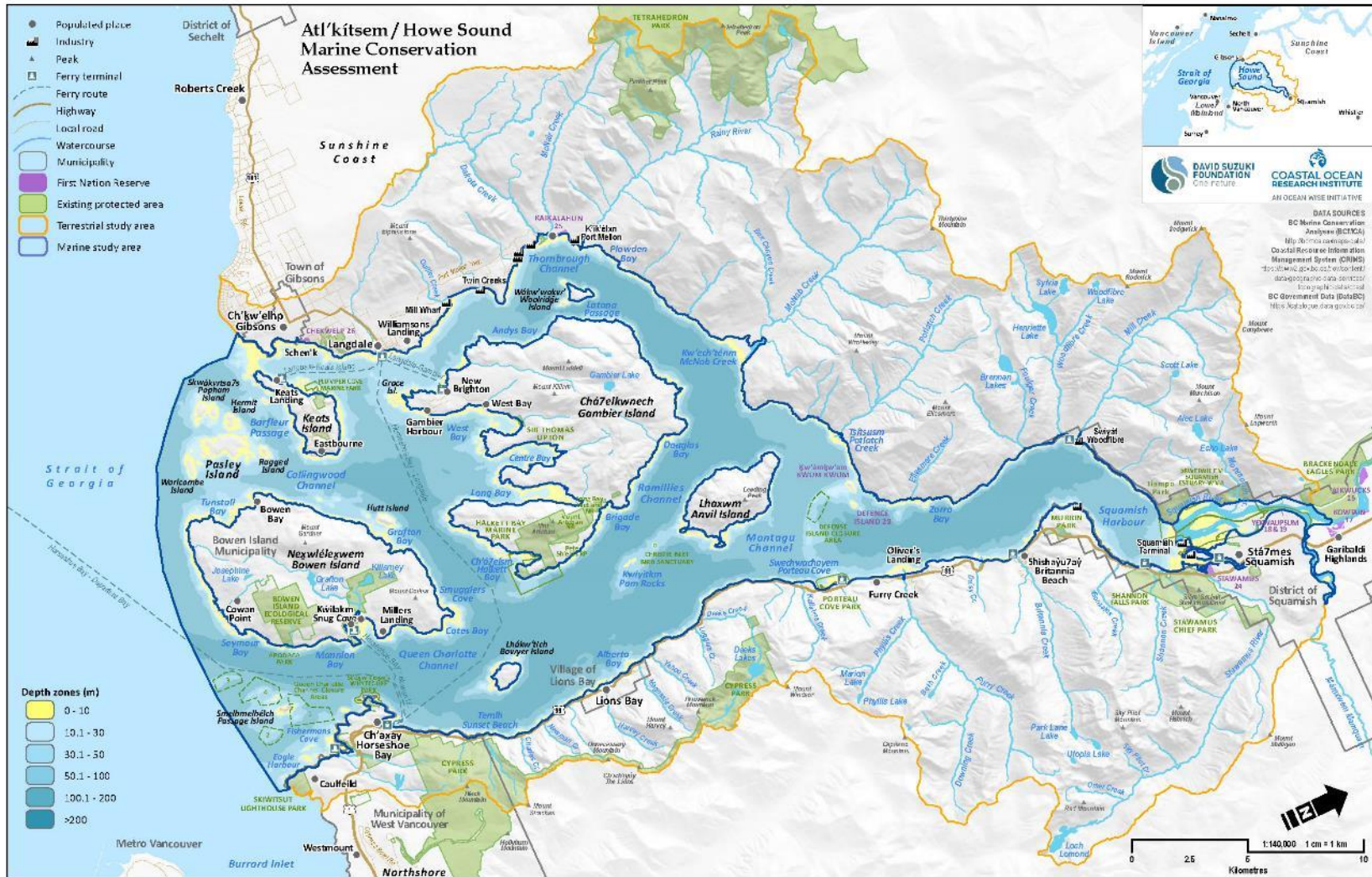


Project Goal

Define a path for improving/maintaining the ecological health of the Howe Sound marine environment

Project Objectives:

- 1. Bring together existing research and data for Howe Sound**
- 2. Identify areas of priority conservation**
- 3. Establish online map to guide action**

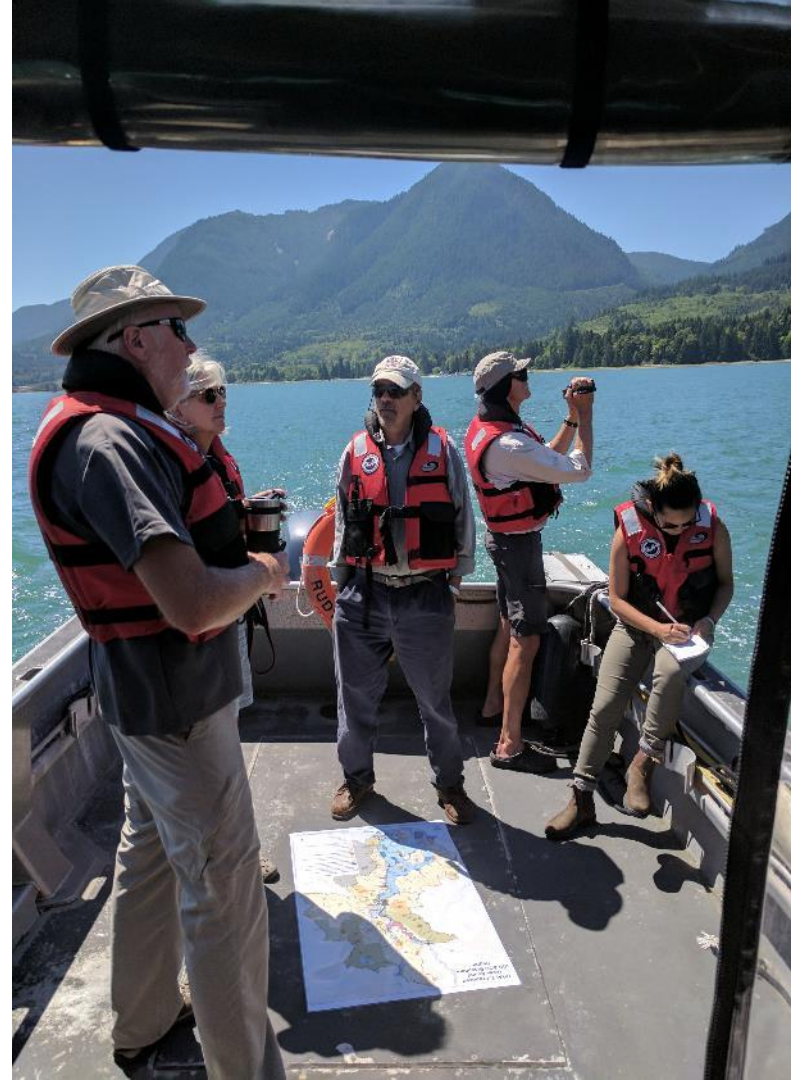


DATA SOURCES

- BC Marine Conservation Assessment (BCMAC)
- BC Marine Conservation Assessment Coastal Resource Information Management System (CRIMS)
- BC Government Data (DataBC)

Project Activities

- Field trips, interviews
- Partner with Squamish First Nation to assess and document cultural data
- Science forum
- Collate data into spatial data layers
- Conduct conservation analysis (values/threats/priorities/designations)
- Produce an interactive online map



Spatial data layers

Ecological:

- forage fish
- eelgrass
- glass sponge reefs
- bird colonies and distributions
- harbour seal haulouts
- clam beds
- herring spawning sites
- critical habitat for fish and invert sp.
- marine mammals

Physical:

- shoreline classifications
- watershed rivers and streams
- bathymetry
- coastal vulnerability and shoreline sensitivity
- geological periods of rocks

Human-use:

- diving spots and ship wrecks
- ferry terminals
- anchorages & moorings, docks
- industrial centres
- recreational fishing areas
- forestry tenures and log storage
- crown tenures (residential, industrial, commercial)
- municipalities
- land use zoning & bylaws (incl marine conservation zones)

Area designations:

- focal areas
- existing protection (RCAs, parks, fisheries closures)
- protected land areas (nature reserves)

Our conservation assessment process

1. Identify diversity of values associated with Howe Sound's marine environment
 - a) Ecological
 - b) Economic
 - c) Cultural
 - d) Social
2. Map data associated with diversity of values
 - a) Existing spatial data
 - b) Local ecological knowledge
 - c) Traditional ecological knowledge
 - d) Other (non-spatial data etc.)



Our conservation assessment process

3. Review, define, identify

- a) Threats and areas of conflict
- b) Priority areas
- c) Priority activities
- d) Integrated assessment



Our conservation assessment process

4. Recommend appropriate management activities

a) Legal tools

b) Stewardship

c) Protection

d) Multi-stakeholder roundtables

5. Motivate Stakeholders to Implement recommendations



GROUP	CONSERVATION FEATURE	TOTAL AREA (m2)	TARGET %	TARGET (m2)	Penalty Factor
FISH	Forage fish	1,436,219	80%	1,148,975	7
	Herring spawning	2,539,418	80%	2,031,534	7
	High rugosity	139,280,229	70%	97,496,160	6
	Tidal current	119,431,516	60%	71,658,910	5
	Streams	349,592	70%	244,714	6
	Chinook salmon	7,818,516	70%	5,472,961	3
	Vertical cliff	3,643,695	70%	2,550,587	5
	Beach survey	1,742,924	70%	1,220,047	2
INVERTEBRATES	Sponge reef	12,454,987	88%	10,960,389	7
	Sponge garden	3,980,262	60%	2,388,157	5
	Mud flat	1,498,244	75%	1,123,683	6
	Sandy intertidal	1,671,806	80%	1,337,445	6
MARINE BIRDS	Shorebird staging	6,569,104	75%	4,926,828	6
	Listed bird species	88,022,853	65%	57,214,854	3
	WH Grebe	19,862,652	80%	15,890,122	3
	BDP Cormorant	55,686,934	80%	44,549,547	3
	Barrows Goldeneye	31,062,730	60%	18,637,638	3
	Marbled murrelet	20,093,650	80%	16,074,920	2
	GB Heron	14,738,013	70%	10,316,609	2
	Peregrine Falcon	3,063,233	60%	1,837,940	1
Bald eagle	17,875,198	70%	12,512,639	3	
MARINE MAMMALS	Harbour seal	260,408	80%	208,326	6
	Harbour porpoise	40,312,688	60%	24,187,613	2
	NAR Otter	14,101,982	50%	7,050,991	1
	American mink	9,900,264	50%	4,950,132	1
MARINE PLANTS	Eelgrass	977,577	75%	733,183	7
	Estuaries	1,152,238	90%	1,037,014	7
	Nearshore	25,567,764	60%	15,340,658	1

Very high	7
High	6
Moderate to high	5
Moderate	4
Moderate to Low	3
Low	2
Very Low	1

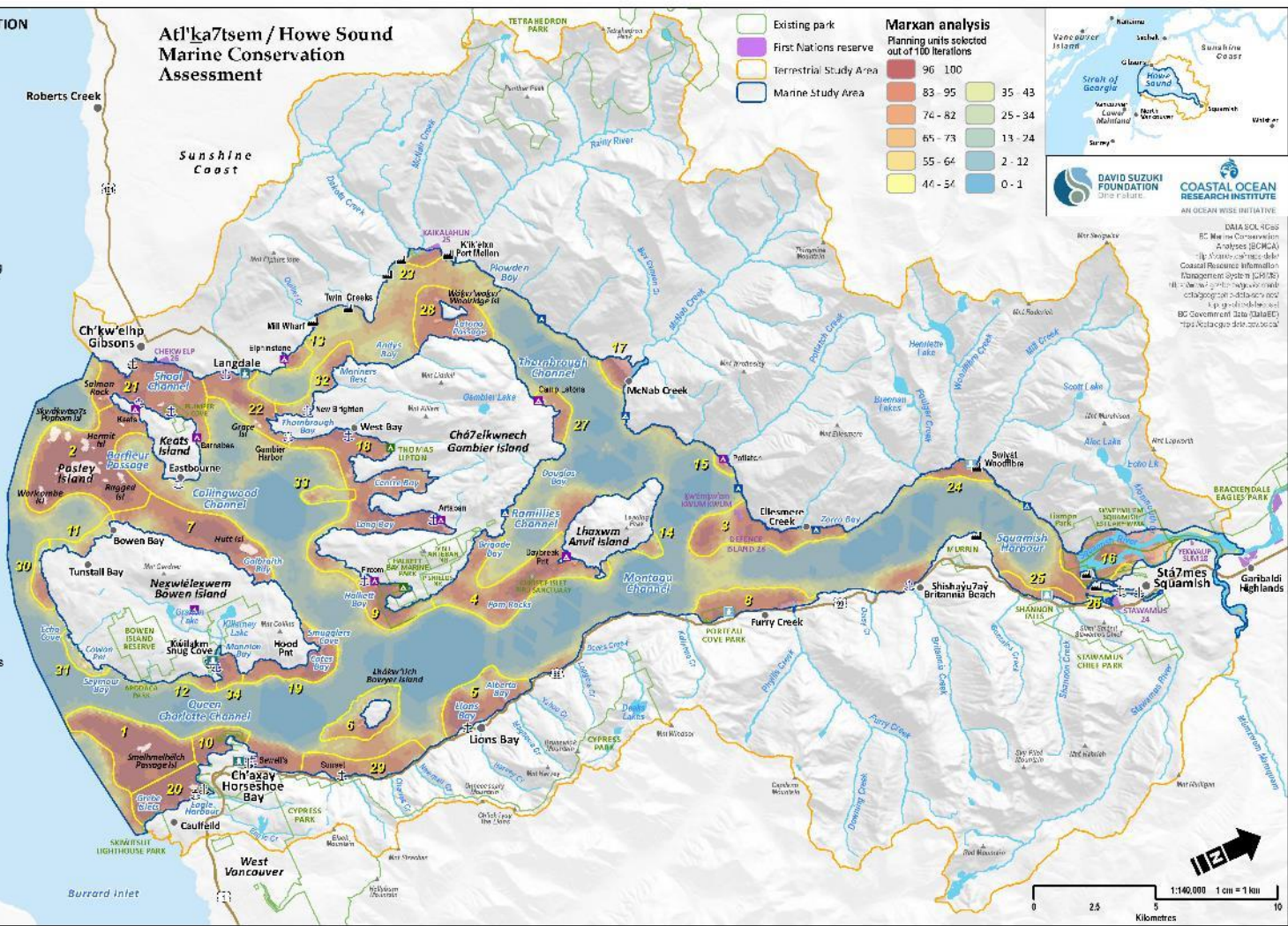
PRIORITY CONSERVATION AREAS (PCAs)



- 1 Passage Island
- 2 Pasley Islands
- 3 Defence Islands
- 4 Pam Rocks
- 5 Lions Bay
- 6 Bowyer Island
- 7 Hutt Island
- 8 Porteau Cove
- 9 Halkett Bay
- 10 Whytediff Park
- 11 Tunstall Bay
- 12 Dorman Point
- 13 Williams Landing
- 14 Anvil Island East
- 15 Potlach Creek

- 16 Squamish Estuary
- 17 McNab Estuary
- 18 South Gambier Bays
- 19 Hood Point
- 20 Grebe Islets
- 21 Shoal Channel
- 22 Langdale
- 23 Dakota Estuary
- 24 Woodfibre Creek
- 25 Darrell Bay
- 26 Slawamish Estuary
- 27 Ekins Point
- 28 Woolridge Island
- 29 Sunset Beach
- 30 Cape Roger Curtis
- 31 Cowan Point
- 32 Manners Rest
- 33 Camelo Point
- 34 Mannion Bay

**Atl'ka7sem / Howe Sound
Marine Conservation
Assessment**



- Existing park
- First Nations reserve
- Terrestrial Study Area
- Marine Study Area

Marxan analysis

Planning units selected out of 100 iterations

	96 - 100		35 - 43
	83 - 95		25 - 34
	74 - 82		13 - 24
	65 - 73		2 - 12
	55 - 64		0 - 1
	44 - 54		0 - 1



DATA SOURCES
 BC Marine Conservation Assessment (BCMA)
 British Columbia Coastal Resilience Information Management System (BC-CRIMS)
 BC Government Data Catalogue
 BC Coastal Data Catalogue
 BC Coastal Data Catalogue



PRIORITY CONSERVATION AREA CATEGORIES

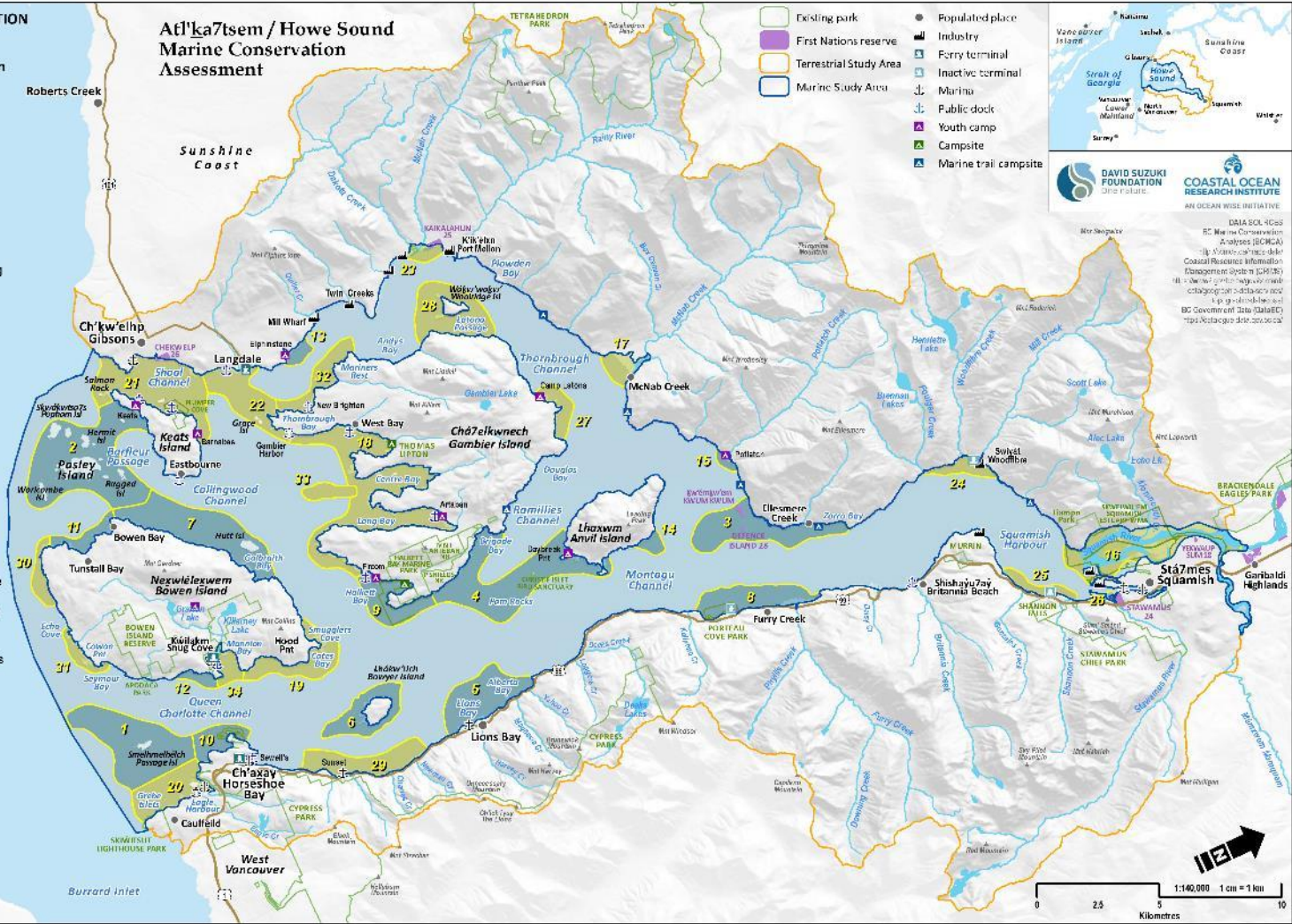
BLUE - Promote marine protection

- 1 Passage Island
- 2 Pasley Islands
- 3 Defence Islands
- 4 Pam Rocks
- 5 Lions Bay
- 6 Bowyer Island
- 7 Hutt Island
- 8 Porteau Cove
- 9 Halkett Bay
- 10 Whytediff Park
- 11 Tunstall Bay
- 12 Doman Point
- 13 Williamsons Landing
- 14 Anvil Island East
- 15 Pottlach Creek

GREEN - Promote management and stewardship

- 16 Squamish Estuary
- 17 McNab Estuary
- 18 South Gambier Bays
- 19 Hood Point
- 20 Grebe Islets
- 21 Shoal Channel
- 22 Langdale
- 23 Dakota Estuary
- 24 Woodfibre Creek
- 25 Darrell Bay
- 26 Slawamish Estuary
- 27 Ekins Point
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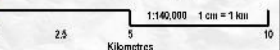
Atl'ka7sem / Howe Sound Marine Conservation Assessment

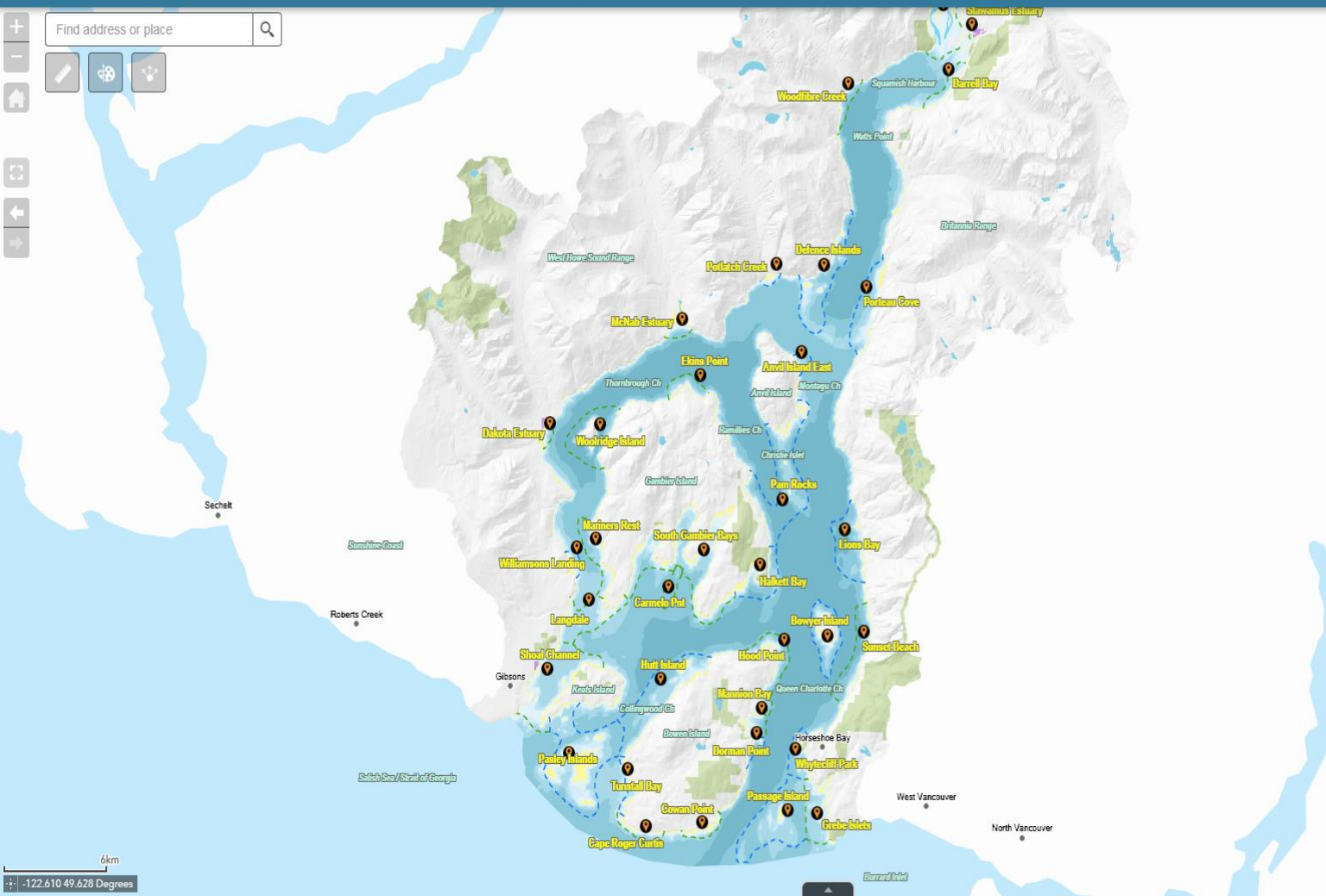


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DATA SOURCES:
BC Marine Conservation Analysis (BCMCA)
BC Strategic Information Coastal Resources Information Management System (SICRIMS)
BC Government Data Catalogue
BC Government Data Catalogue
BC Government Data Catalogue





About

Welcome to the Atlat'ka7tsem/Howe Sound Marine Conservation Assessment's online map! Here you will find scientific and local knowledge data layers that reflect this region's unique and treasured marine ecology. Also found in the map are pop-ups that describe the conservation needs and opportunities of specific areas in the Sound, and actions that you can take to help protect and restore marine ecosystem health.

This project was led by a collaborative partnership between [Ocean Wise](#) and the [David Suzuki Foundation](#), with the support of the Sitka Foundation and the Gordon and Betty Moore Foundation to whom we are extremely grateful.

The project team used Marxan, a decision support tool used in conservation planning, to help identify candidate Priority Conservation Areas (PCAs). Information in the "Priority Areas" link summarizes methods, conservation targets and data layers included to identify areas of high ecological value.

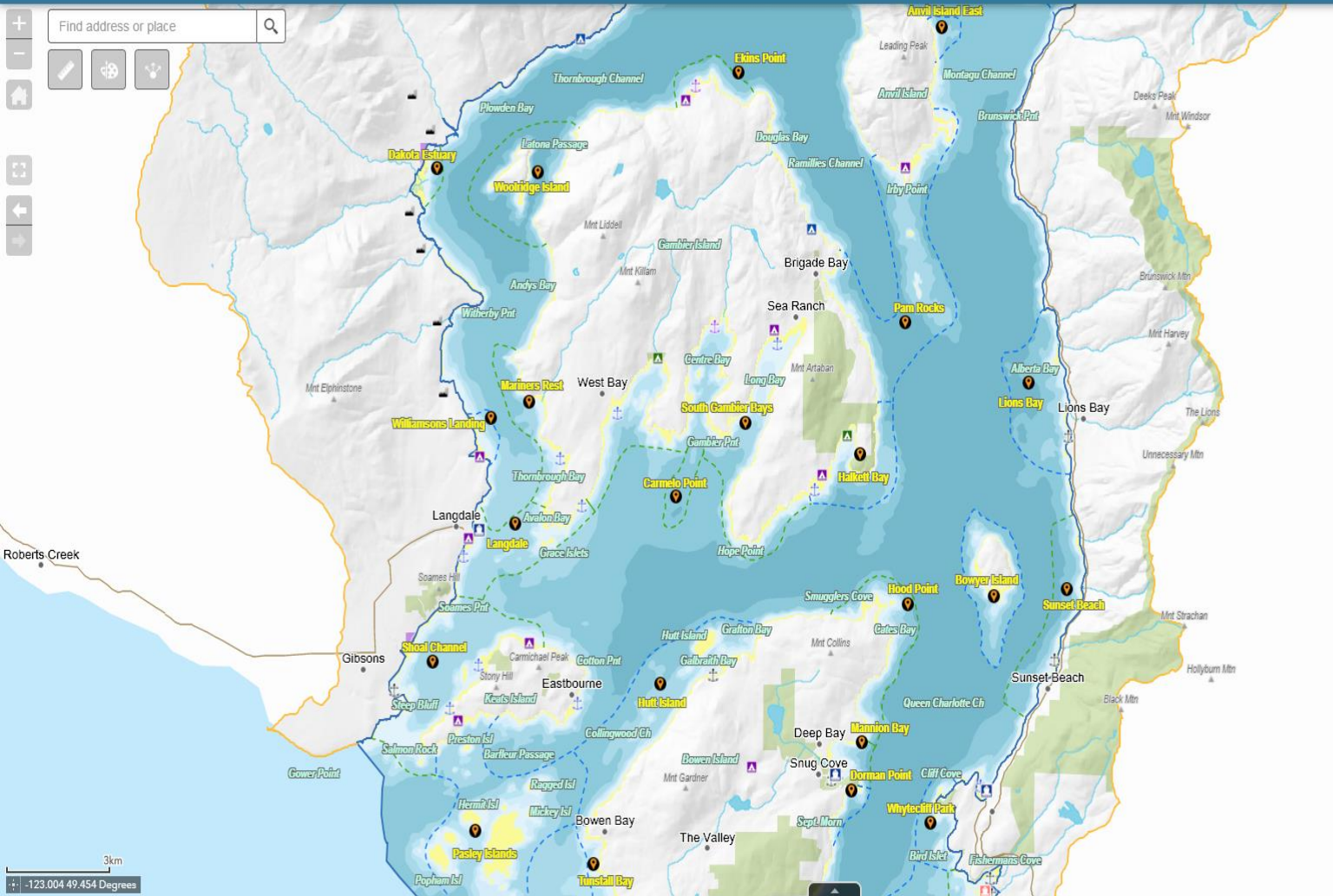
We would also like to thank the Atlat'ka7tsem/Howe Sound community members and the Squamish First Nation who participated in gathering, workshoping, and reviewing the knowledge and data that comprise this resource. Your support means that this map includes and reflects the local knowledge that is so important to painting a full picture of marine ecological health and conservation in Atlat'ka7tsem/Howe Sound.



Product version: Web AppBuilder for ArcGIS (Developer Edition) 2.9
Kernel version: 2.9

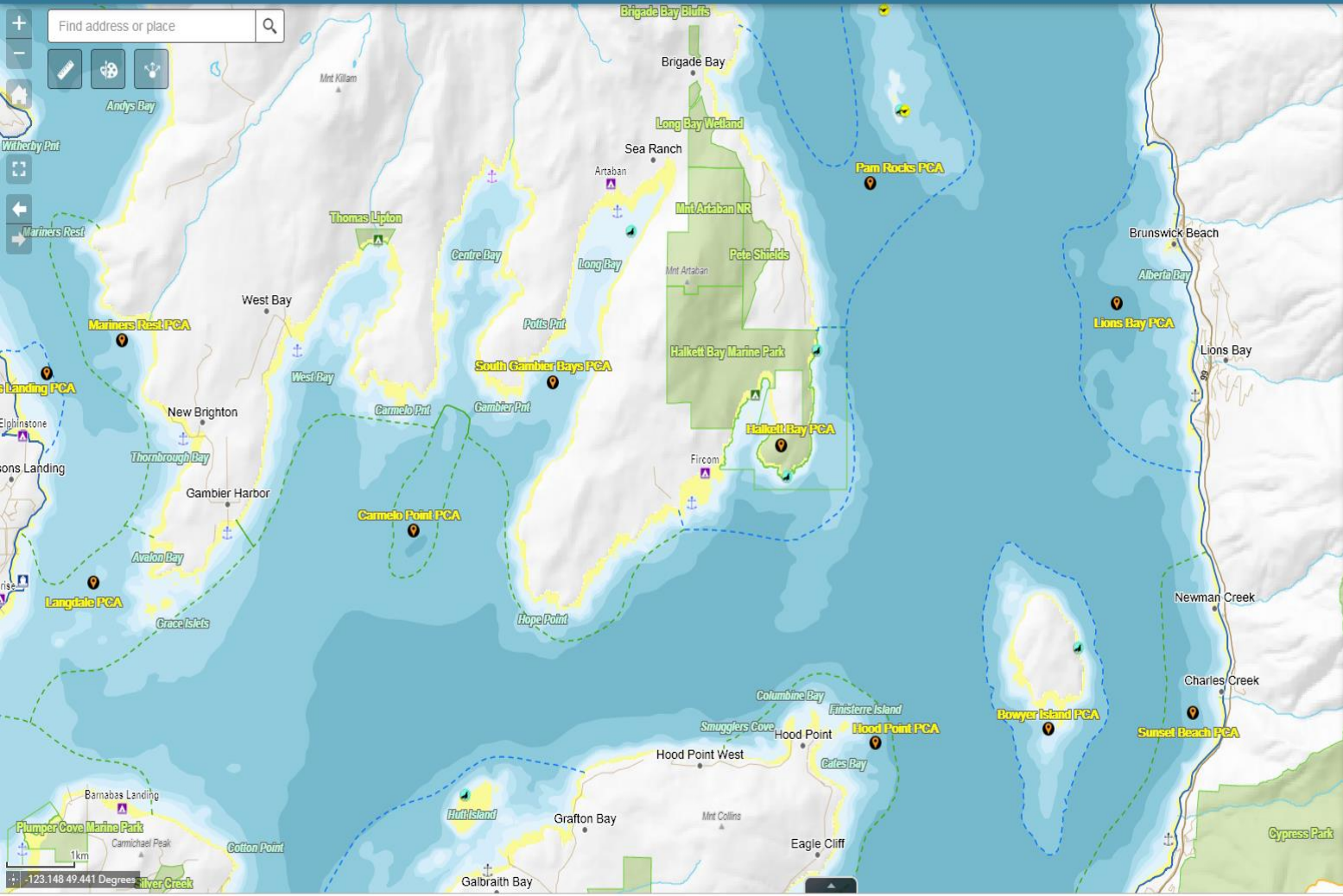
Find address or place

Map navigation controls: zoom in (+), zoom out (-), home, full screen, pan, zoom reset



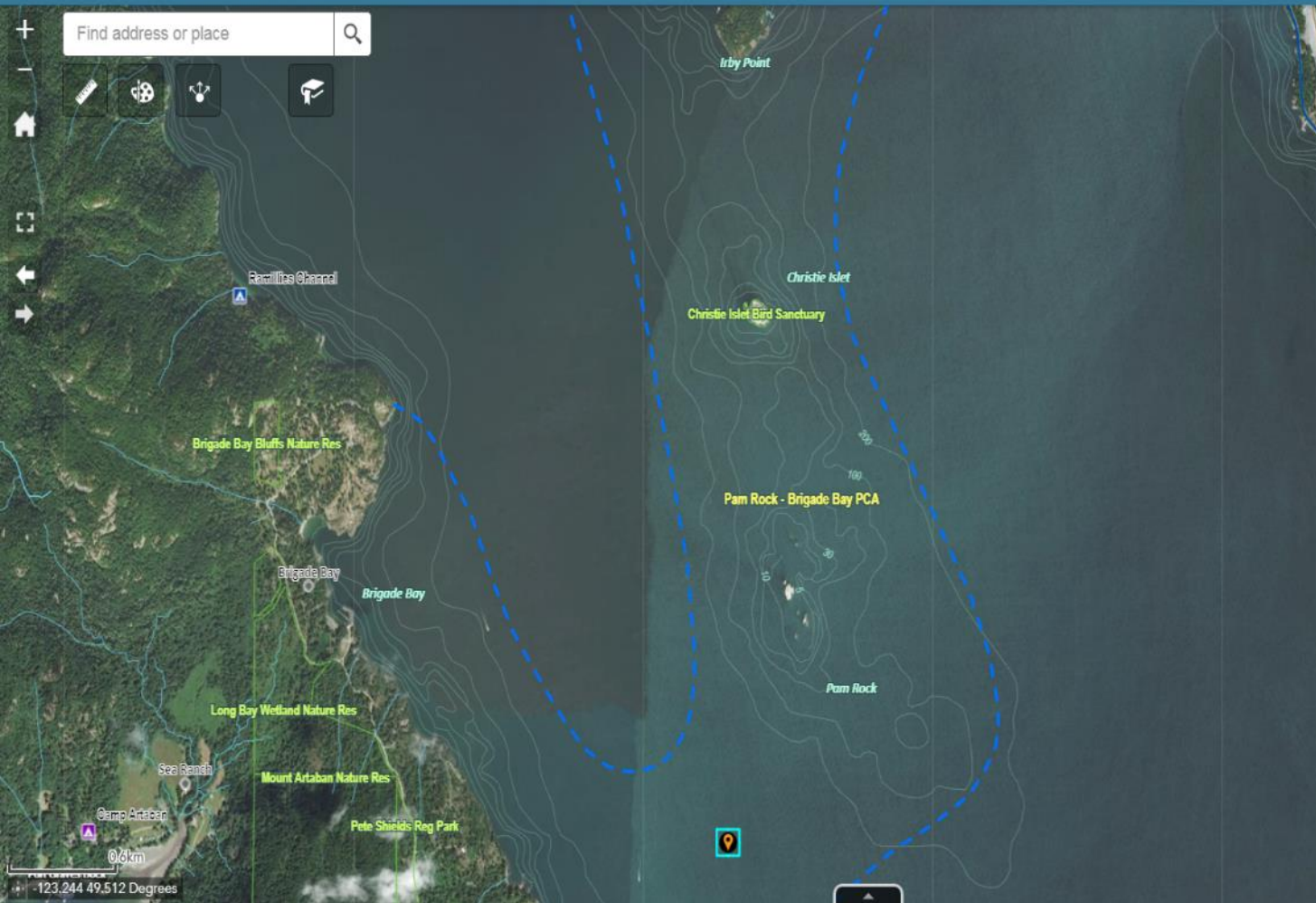
Legend

- Town**
 - Town
- Industry**
 - Industry
- Ferry terminal**
 - ⚓ Ferry terminal (active)
 - ⚓ Ferry terminal (inactive)
 - ⚓ Harbour ferry
- Peak**
 - ▲ Peak
- Camp**
 - ⛺ Youth camp
 - ⛺ Campsite
 - ⛺ Marine trail campsite
- Marina**
 - ⚓ Marina
 - ⚓ Outstation
 - ⚓ Public dock
- Study areas**
 - Marine Study Area
 - Terrestrial Study Area
- Priority Conservation Areas (Categories)**
 - - - BLUE - Promote marine protection
 - - - GREEN - Promote management and stewardship
- Highway**
 - Highway
- Lake**
 - Lake



Legend

- Peak**
 - ▲
- Camp**
 - ▲ Youth camp
 - ▲ Campsite
 - ▲ Marine trail campsite
- Marina**
 - ⚓ Marina
 - ⚓ Outstation
 - ⚓ Public dock
- Birds colony**
 - 🐦
- Harbour seal haulout**
 - 🦏
- Study areas**
 - Marine Study Area
 - Terrestrial Study Area
- Priority Conservation Areas (Categories)**
 - BLUE - Promote marine protection
 - GREEN - Promote management and stewardship
- First Nation reserve**
 - ▭
- Protected area**
 - ▭
- Highway**
 -



Feature Detail

(1 of 2)

[Clear](#)[Zoom to](#) [Clear Selected](#)

Pam Rocks - Brigade Bay



(Video credit: Bob Turner)

Waters around Pam Rocks are a superb example of rocky reef habitat in Howe Sound. Imagine rockfish, lingcod, seals and sea lions swimming above a colourful variety of crab, starfish, feather stars and giant Pacific octopus, with anemones and sponges cling to the rocky substrate. The rocky intertidal and subtidal surfaces around Pam Rocks and Christie Islet are excellent habitat for this rich biodiversity. There's also a good chance you'll see full grown humans in scuba gear silently bubble

through the multitude of colours and creatures along the rocky reefs, drawn by the excellent diving conditions that start in the shallows and extend beyond divers' range.



Find address or place



Feature Detail

(1 of 1) [Clear](#)

Zoom to [...](#)

Lions Bay

Priority Conservation Area



(Video credit: Bob Turner)

Most Vancouver residents drive past Lions Bay on their way to Whistler without much thought, but just below the highway, you'll find a shoreline with half-dozen creeks spilling fresh water, nutrients and soils into the intertidal zone.

The sandy intertidal zone with freshwater "seepage" in Lions Bay makes ideal spawning habitat for forage fish like sand lance and surf smelts, which lay their eggs in early November and December. Tides and currents then disperse the sand lance larvae through nearby waters.

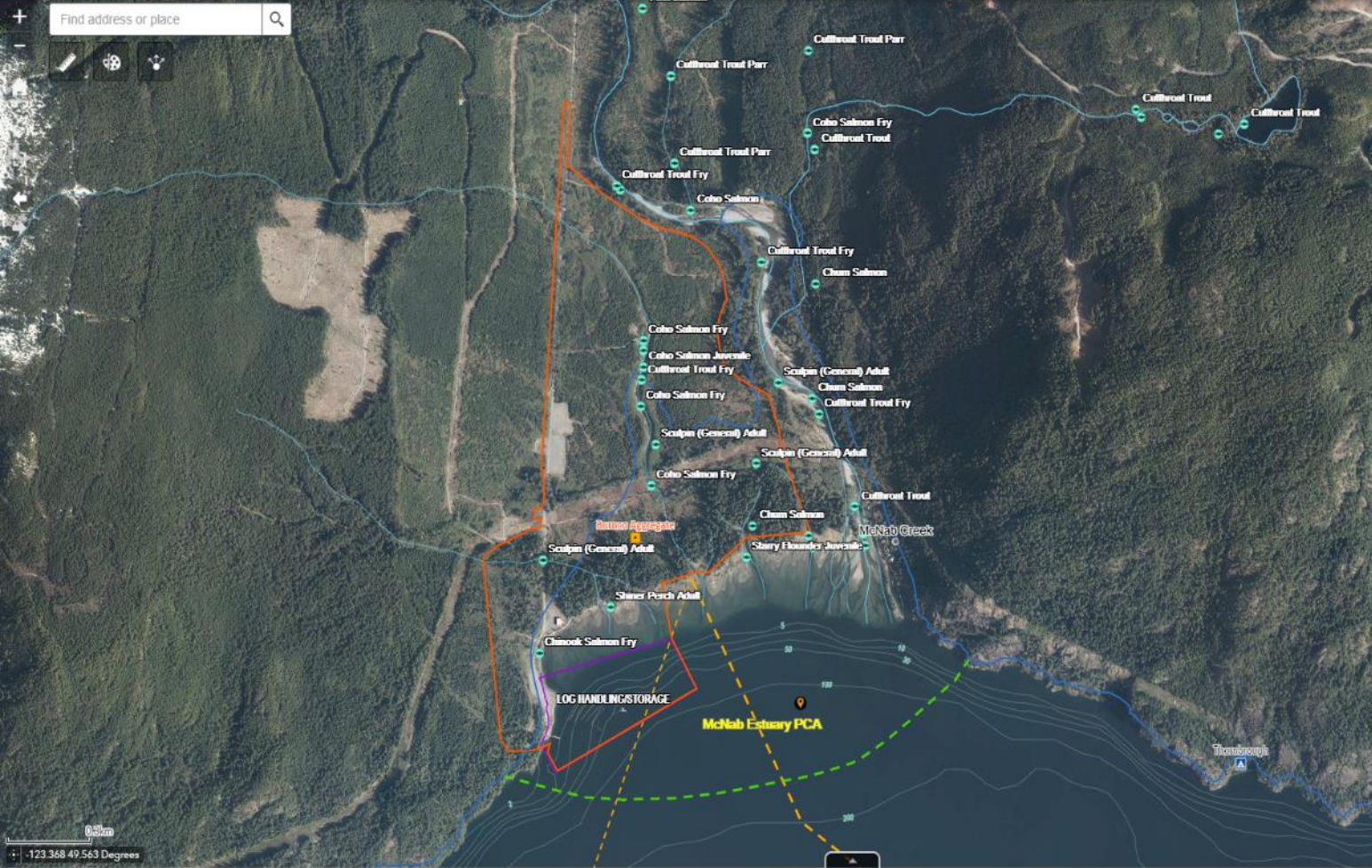
Lions Bay is also home to glass sponge reefs, with scientists investigating two new sites.



(Photo credit: Giffey)

Find address or place

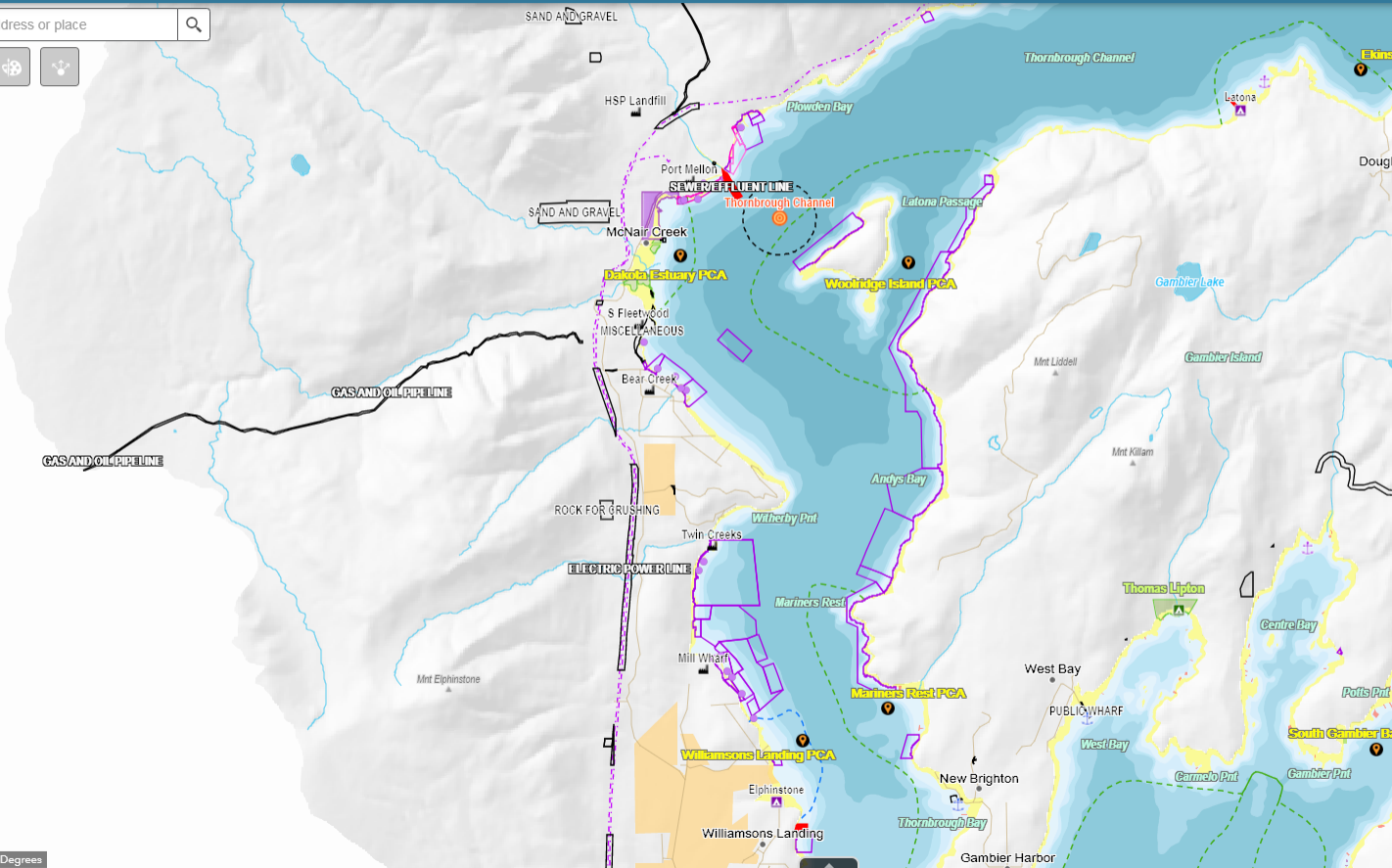
Map navigation controls: Zoom in (+), Zoom out (-), Home, Full Screen, Print, etc.



Legend

- Fish observation: Green dot
- Harbour seal haulout: Green dot with seal icon
- Study areas:
 - Marine Study Area: Blue line
 - Terrestrial Study Area: Yellow line
- Effects assessment footprint: Orange outline
- Crown tenure (industrial):
 - Heavy: Pink square
 - Light: Light pink square
 - Log handling/storage: Purple square
 - Miscellaneous: Yellow square
- Fishing closure (coordinates): Grey dot
- Fishing closure: Square with diagonal lines
- Priority Conservation Areas (Categories):
 - BLUE - Promote marine protection: Blue dashed line
 - GREEN - Promote management and stewardship: Green dashed line
- First Nation reserve: Purple square

Find address or place



Legend

- Sewer effluent line
- Campsite
- Marine trail campsite

Marina

- Marina
- Outstation
- Public dock

Disposal at sea site

- Disposal at sea site

Disposal at sea site (area)

- Disposal at sea site (area)

Sewer effluent line

- Private dock (industrial)

Attraction

- Attraction

Birds colony

- Birds colony

Harbour seal haulout

- Harbour seal haulout

Crown tenure (industrial)

- Heavy
- Light
- Log handling/storage
- Miscellaneous

Crown tenure (infrastructure)

- Crown tenure (infrastructure)

[Show all](#)

Passage Island PCA

CATEGORY BLUE - Advocate for marine protection.

1 of 34 934ha

Horseshoe Bay - Departure Bay



FEATURE DISTRIBUTION within Priority Conservation Areas (PCAs)

PCA size	934 ha
Portion of study area	2.5 %
Contribution to PCA total	6.9 %
Contribution to PCA category	13.5 %
Overlap with RCA	22.1 %

Contribution to known distribution in Howe Sound based on available data

MARINE FISH

Forage fish	0 %
Herring spawning	0 %
High rugosity	3.9 %
Tidal current	0.3 %
Fresh water inflow	0 %
Vertical cliff	0 %

INVERTEBRATES

Glass sponge reef	34.3 %
Sponge garden	0 %
Sandy intertidal	0 %

MARINE BIRDS

Shorebird staging	2.5 %
Listed species	6.2 %
Barrows Goldeneye	0 %
Marbled murrelet	2.5 %
Great Blue Heron	0 %

MARINE MAMMALS

Harbour seal	0 %
River Otter	0 %

MARINE PLANTS

Eelgrass	1.3 %
Estuary / creek mouth	0 %

DEPTH ZONES

Metres (m)	% of PCA
25 - 0	1
-2 to -5	1
-5 to -10	1
-10 to -30	2
-30 to -50	6
-50 to -100	39
-100 to -200	49
> -200	0



Populated place	Marina	Private dock	FAO Application	Major Project Inventory	Marine study area	Recreation site	Estuary/creekmouth	Glass sponge reefs
Industry	Outstation	Industrial dock	Youth camp	Ferry route	Rockfish conservation area	First Nation Reserve	Closure area	Confirmed
Ferry terminal	Public dock	Recreation anchorage	Campsite	Forage fish	Existing protected area	Log storage tenure	Investigation	Herring spawning
Boat launches	Diving site	Recreation moorage	Marine trail campsite	Bathymetry contour (m)	Recreation trail	Sand cobble beach	Tidal grass	Lighthouse
Ship wreck	Attraction	Harbour seal haulout	Bird colony					

PRIORITY CONSERVATION AREAS

CATEGORIES

- BLUE - Advocate for marine protection
- GREEN - Promote management and stewardship

Pasley Island Group PCA

CATEGORY BLUE - Advocate for marine protection

2 of 34 1404ha



FEATURE DISTRIBUTION within Priority Conservation Areas (PCAs)

PCA size	1404 ha
Portion of study area	3.7 %
Contribution to PCA total	10.3 %
Contribution to PCA category	20.3%
Overlap with RCA	56.4 %
Contribution to known distribution in Howe Sound based on available data	

MARINE FISH

Forage fish	0.6 %
Herring spawning	2.7 %
High rugosity	6.9 %
Tidal current	8.8 %
Fresh water inflow	0 %
Vertical cliff	0.2 %

INVERTEBRATES

Glass sponge reef	0 %
Sponge garden	0 %
Sandy intertidal	5 %

MARINE BIRDS

Shorebird staging	26 %
Listed species	12.9 %
Barrows Goldeneye	18.3 %
Marbled murrelet	28 %
Great Blue Heron	4.5 %

MARINE MAMMALS

Harbour seal	45.1 %
River Otter	0 %

MARINE PLANTS

Eelgrass	20.5 %
Estuary / creek mouth	0 %

DEPTH ZONES

Metres (m)	% of PCA
25 - 0	14
-2 to -5	6
-5 to -10	4
-10 to -30	6
-30 to -50	15
-50 to -100	11
-100 to -200	27
> -200	0



Populated place	Marine	Private dock	FAO Application	Major Project Inventory	Marine study area	Recreation site	Estuary/creekmouth	Glass sponge reefs
Industry	Outstation	Industrial dock	Youth camp	Ferry route	Rockfish conservation area	First Nation Reserve	Closure area	Confirmed
Ferry terminal	Public dock	Recreation anchorage	Campsite	Forage fish	Existing protected area	Log storage tenure	Investigation	PRIORITY CONSERVATION AREAS
Boat launches	Diving site	Recreation moorage	Marine trail campsite	Bathymetry contour (m)	Recreation trail	Sand cobble beach	Herring spawning	Eelgrass
Ship wreck	Attraction	Harbour seal haulout	Bird colony					

Pam Rocks - Brigade Bay PCA

CATEGORY BLUE - Advocate for marine protection
4 of 347 Aitaban 1047ha



Populated place	Marina	Private dock	FAO Application	Major Project Inventory	Marine study area	Recreation site	Estuary/creekmouth	Glass sponge reefs
Industry	Outstation	Industrial dock	Youth camp	Ferry route	Rockfish conservation area	First Nation Reserve	Sand cobble beach	Closure area
Ferry terminal	Public dock	Recreation anchorage	Campsite	Forage fish	Existing protected area	Log storage tenure	Herring spawning	Confirmed
Boat launches	Diving site	Recreation moorage	Marine trail campsite	Bathymetry contour (m)	Recreation trail	Tidal grass	Investigation	Investigation
Ship wreck	Attraction	Harbour seal haulout	Bird colony					

FEATURE DISTRIBUTION within Priority Conservation Areas (PCAs)

PCA size	1047 ha
Portion of study area	2.8 %
Contribution to PCA total	7.7 %
Contribution to PCA category	15.1%
Overlap with RCA	50.9 %
Contribution to known distribution in Howe Sound based on available data	
MARINE FISH	
Forage fish	7.1 %
Herring spawning	0 %
High rugosity	4.8 %
Tidal current	1 %
Fresh water inflow	1.4 %
Vertical cliff	8.7 %
INVERTEBRATES	
Glass sponge reef	3 %
Sponge garden	0 %
Sandy intertidal	6 %
MARINE BIRDS	
Shorebird staging	4 %
Listed species	6.9 %
Barrows Goldeneye	8.8 %
Marbled murrelet	11.6 %
Great Blue Heron	4 %
MARINE MAMMALS	
Harbour seal	14.8 %
River Otter	24.2 %
MARINE PLANTS	
Eelgrass	1.1 %
Estuary / creek mouth	0 %
DEPTH ZONES	
Metres (m)	% of PCA
25 - 0	6
-2 to -5	3
-5 to -10	3
-10 to -30	4
-30 to -50	4
-50 to -100	23
-100 to -200	25
> -200	30

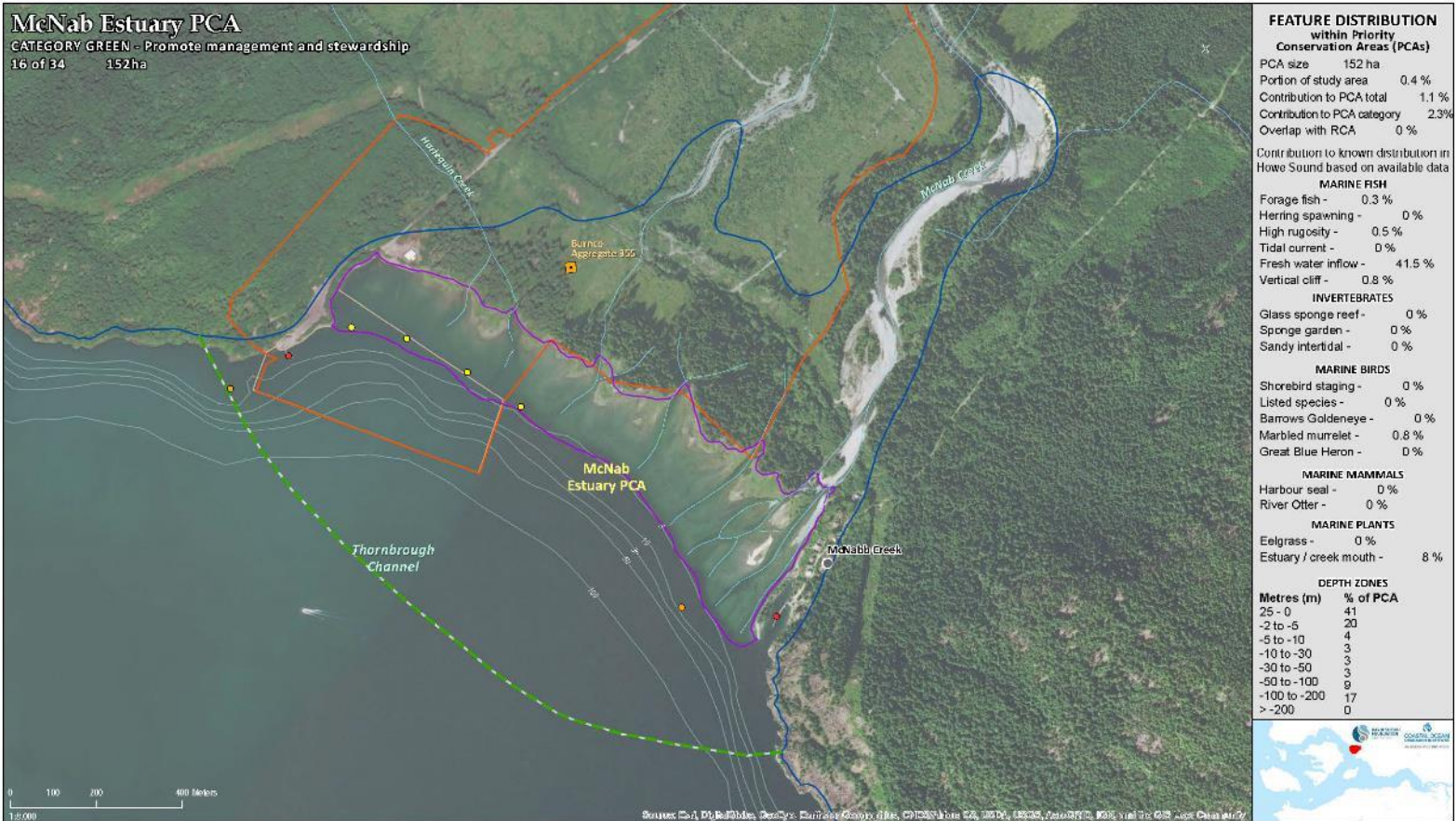


Source: BC Hydro, BC Parks, Coastal Features Inventory, Christie Islet Migratory Bird Sanctuary, USGS, USGS, Aerial Photography, ICA, and the Q.S. New Channel.

McNab Estuary PCA

CATEGORY GREEN - Promote management and stewardship

16 of 34 152ha



FEATURE DISTRIBUTION within Priority Conservation Areas (PCAs)

PCA size	152 ha
Portion of study area	0.4 %
Contribution to PCA total	1.1 %
Contribution to PCA category	2.3%
Overlap with RCA	0 %

Contribution to known distribution in Howe Sound based on available data

MARINE FISH

Forage fish	0.3 %
Herring spawning	0 %
High rugosity	0.5 %
Tidal current	0 %
Fresh water inflow	41.5 %
Vertical cliff	0.8 %

INVERTEBRATES

Glass sponge reef	0 %
Sponge garden	0 %
Sandy intertidal	0 %

MARINE BIRDS

Shorebird staging	0 %
Listed species	0 %
Barrows Goldeneye	0 %
Marbled murrelet	0.8 %
Great Blue Heron	0 %

MARINE MAMMALS

Harbour seal	0 %
River Otter	0 %

MARINE PLANTS

Eelgrass	0 %
Estuary / creek mouth	8 %

DEPTH ZONES

Metres (m)	% of PCA
25 - 0	41
-2 to -5	20
-5 to -10	4
-10 to -30	3
-30 to -50	3
-50 to -100	9
-100 to -200	17
> -200	0



Populated place	Marina	Private dock	EAD Application	Major Project Inventory	Marine study area	Recreation site	Glass sponge reefs	PRIORITY CONSERVATION AREAS CATEGORIES BLUE - Advocate for marine protection GREEN - Promote management and stewardship
Industry	Outcasion	Industrial dock	Youth camp	Ferry route	Rockfish conservation area	First Nation Reserve	Confirmed	
Ferry terminal	Public dock	Recreation anchorage	Campsite	Forage fish	Existing protected area	Log storage tenure	Investigation	
Boat launches	Diving site	Attraction	Marine trail campsite	Bathymetry contour (m)	Recreation trail	Estuary/creekmouth	Open areas	
Ship wreck	Harbour seal haulout		Bird colony			Sand cobble beach	Herring spawning	
						Eel grass		

Whytecliff - Batchelor Cove PCA

CATEGORY GREEN - Promote management and stewardship

19 of 34 208ha



FEATURE DISTRIBUTION within Priority Conservation Areas (PCAs)

PCA size	208 ha
Portion of study area	0.6 %
Contribution to PCA total	1.5 %
Contribution to PCA category	3.1%
Overlap with RCA	56.4 %

Contribution to known distribution in Howe Sound based on available data

MARINE FISH

Forage fish	0 %
Herring spawning	0 %
High rugosity	1.3 %
Tidal current	1 %
Fresh water inflow	0 %
Vertical cliff	2.9 %

INVERTEBRATES

Glass sponge reef	0 %
Sponge garden	1.5 %
Sandy intertidal	2.2 %

MARINE BIRDS

Shorebird staging	0.7 %
Listed species	1.7 %
Barrows Goldeneye	0 %
Marbled murrelet	0 %
Great Blue Heron	2.3 %

MARINE MAMMALS

Harbour seal	4.5 %
River Otter	0 %

MARINE PLANTS

Eelgrass	0 %
Estuary / creek mouth	0 %

DEPTH ZONES

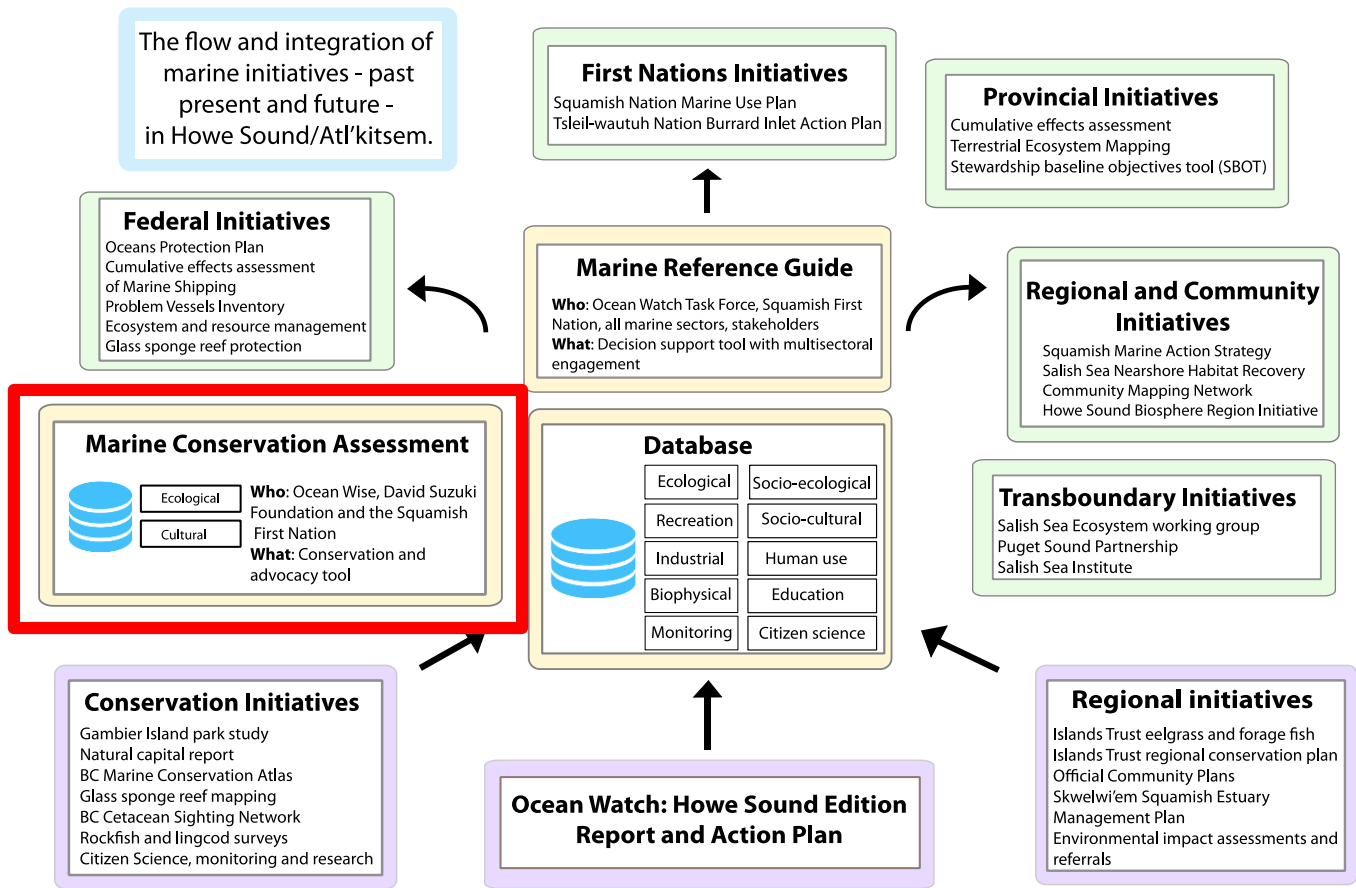
Metres (m)	% of PCA
25 - 0	11
-2 to -5	2
-5 to -10	8
-10 to -30	6
-30 to -50	7
-50 to -100	15
-100 to -200	33
> -200	9



Populated place	Marina	Private dock	EAD Application	Major Project Inventory	Marine study area	Recreation site	Glass sponge reefs	PRIORITY CONSERVATION AREAS CATEGORIES BLUE - Advocate for marine protection GREEN - Promote management and stewardship
Industry	Outcasion	Industrial dock	Youth camp	Ferry route	Rockfish conservation area	First Nation Reserve	Confirmed	
Ferry terminal	Public dock	Recreation anchorage	Campsite	Forage fish	Existing protected area	Log storage tenure	Investigation	
Boat launches	Diving site	Recreation moorage	Marine trail campsite	Bathymetry contour (m)	Esuary/creek mouth	Sand cobble beach	Herring spawning	
Ship wreck	Attraction	Herbous seal haulout	Recreation trail	Eel grass	Eel grass	Eel grass	Eel grass	
Bird colony								

Map viewer url:

www.howesoundconservation.ca



Graphic created by Fiona Beaty (fionabeaty93@gmail.com)

Version 17: Sept 17, 2018

Please note that this is an ongoing, iterative graphic and is not meant to omit or exclude any initiatives - if you have comments or additions that you would like to see integrated into it please contact Fiona.