

4 Criteria for Designation as a Biosphere Reserve

[Article 4 of the Statutory Framework presents 7 general criteria for an area to be qualified for designation as a biosphere reserve]

In order to qualify for designation as a Biosphere Reserve, in accordance with Article 4 of the Statutory Framework, it is necessary to demonstrate that sufficient lands that are representative of the region are already set aside and appropriately managed for conservation, and that existing and future management regimes in the region support and promote sustainable development for the wellbeing of people, the economy and the environment. The following addresses the ways in which Átl'ka7tsem/Howe Sound meets the criteria for designation in being biogeographically representative, having significant biodiversity values, and demonstrating community commitment to their conservation in tandem with sustainable development.

4.1 Ecological Mosaic

"Encompass a mosaic of ecological systems representative of major biogeographic region(s), including a gradation of human interventions". (The term "major biogeographic region" is not strictly defined but it would be useful to refer to the Udvardy classification).

The rich mosaic of ecological systems found in southwestern BC are among the richest in Canada. This mosaic arises from the region's topographical diversity, with an elevation range from sea level to almost 3,000 metres within a relatively short distance, its close proximity to the moderating effects of the ocean and its location among the most southerly latitudes in the country. These factors together create a dramatic range in climate from Canada's warmest 'mediterranean' climate of warm dry summers and mild wet winters along the coastal lowlands, to the wettest climatic conditions in the country on higher west facing slopes, both contrasting with the extreme cold and heavy snow conditions at the highest elevations.

The AHSBR region incorporates the full scope of this mosaic and is highly representative of the hierarchy of three biogeographic descriptions at the international, national and provincial level. Internationally, the original classification by Udvardy in 1975 places AHSBR in the "temperate needle-leaved forests or woodlands" biome within the Sitkan Biogeographic Province of the Neararctic Realm (Udvardy, 1975). This classification has since been updated in 2001 to the Temperate Coniferous Forests biome (Olsen et al, 2001). Nationally, the region is designated within the Canadian Pacific Maritime Ecozone, while provincially, the region falls within the Pacific Ranges and Lower Mainland ecoregions (Environment Canada, 1995; Demarchi, 2011). Within these ecoregions, AHSBR is intersected by three Ecosections, from largest to smallest:

Southern Pacific Ranges, Eastern Pacific Ranges, and Fraser Lowland (Conservation Data Centre, 2019a).

The Southern Pacific Ranges are comprised of rough, granitic mountains that tower above the Sunshine Coast, Howe Sound and the Fraser Valley. This ecosection is home to expansive fjords that were formed by extensive glaciation and support a complex diversity of terrestrial and marine ecosystems (Demarchi, 2011). The northern periphery of the biosphere region is within the Eastern Pacific Ranges, a rugged, mountainous transitional area that bisects the wet mild coast and the dry cold interior, which can result in periods of heavy snow accumulation during winter due to the interaction between Pacific and Arctic weather systems (Demarchi, 2011). The south-eastern portion of AHSBR overlaps a small area of the Fraser Lowland Ecosection. These lowland areas of West Vancouver contain extensive urban development; however, remnant coniferous forests remain in undeveloped areas (Demarchi, 2011).

This mosaic of ecological systems has been further described using BC's Biogeoclimatic Ecosystem Classification System (BEC). The region contains nine different BEC zones as summarized below (BC Conservation Data Centre 2019a). The high number of BEC units and associated subzones are a result of the diversity and interconnection between macro and microclimates, topography, dominant vegetation species and soil type. The predominant ecosystems found in AHSBR are the Coastal Western Hemlock, Mountain Hemlock and Coastal Mountain-heather Alpine units. More detailed descriptions of these ecological systems are found in sections 11 and 14.

Total area (km²) of the Biogeoclimatic (BEC zones and associated subzones and variants found in the Howe Sound Biosphere Region.

BECCode	BECZone	Subzone/Variant	Area (km ²)
CWHdm	Coastal Western Hemlock	dry mild	584.1
MHmm1	Mountain Hemlock	moist mild 1	439.3
CWHvm2	Coastal Western Hemlock	very wet mild 2	339.6
CWHxm1	Coastal Western Hemlock	very dry mild 1	259.1
CMAunp	Coastal Mountain-heather Alpine	undifferentiated parkland	218.8
CWHvm1	Coastal Western Hemlock	very wet mild 1	130.3
MHmm2	Mountain Hemlock	moist mild 2	79.8
CWHms1	Coastal Western Hemlock	moist submarine 1	79.0
CWHds1	Coastal Western Hemlock	dry submarine 1	57.4

Source: BC Conservation Data Centre 2019b



Seal feeding on anchovy school, photo: B. Turner

4.2 Role in Biological Diversity Conservation

"Be of significance for biological diversity conservation". (This should refer not only to the numbers of endemic or rare species, but may also refer to species on the IUCN Red List or CITES appendices, at the local, regional or global levels, and also to species of global importance, rare habitat types or habitats with unique land use practices (for example traditional grazing or artisanal fishing) favouring the conservation of biological diversity).

It is a marvel that the extensive biodiversity described in this section is in such close proximity to the 2.5 million people of Metro Vancouver. In less than a one-hour drive, urbanites can be in the habitat of grizzly bears and wolves, and witness the feeding on salmon by thousands of bald eagles. Recreational divers can be in the company of Pacific giant octopus, colorful sponges and corals without travelling far from home.

4.2.1 The Significance of Biological Diversity in AHSBR

Within this nationally significant biodiversity are elements of global significance, including large populations of migratory seabirds, high concentrations of wintering bald eagles (see 4.2.1.1), and perhaps most importantly, the recently discovered hexactinellid (glass) sponge reefs and other aggregations.

While dinosaurs roamed the earth, huge glass sponge reefs thrived in prehistoric seas. They were formerly thought to be found only in the 40 million year old fossil record, leaving only giant fossil cliffs behind that stretch across parts of Portugal, Spain, France and Germany, and across Eastern Europe to

Romania. Then in 1987, Canadian scientists discovered 9,000 year-old living glass sponge reefs on the Pacific Coast of Canada. Glass sponges are some of the oldest and simplest animals on earth. They don't have eyes or even a stomach, yet they do some amazing things. Glass sponges build intricate skeletons out of silica glass that provide many other animals with a home, and they filter vast quantities of bacteria from seawater (CPAWS, 2019).

Finding new, living reefs is significant on a global scale which is why the glass sponge reefs in Hecate Strait and Queen Charlotte Sound have been placed on Canada's tentative list for World Heritage Site (Parks Canada, 2017). A number of glass sponge reefs have been discovered by government scientists on Canada's Pacific coast since 2004, and were first discovered in Howe Sound also in 2004 by a local diver who had been diving and studying the underwater life of Howe Sound for decades. The reefs were subsequently ground-truthed by Fisheries and Oceans Canada Science staff in 2012 (DFO, 2018). Since 2015, a total of eleven glass sponge reefs have been legally protected under the Fisheries Act as Glass Sponge Reef Marine Refuges which prohibits any form of bottom-contact recreational and commercial fishing, and Indigenous fishing for food, social and ceremonial purposes. These fisheries restrictions are in portions of both the Core and Buffer Marine Areas identified in the proposed biosphere zoning map.

Further protections are being considered for nine remaining marine areas in Howe Sound that are currently being assessed for ecological significance and that may contain glass sponge reefs (DFO, 2019a).

Species richness indices are a measure of the biodiversity of a region or habitat, usually according to the total number of species present, but they can also measure such parameters as species richness, evenness and dominance (Morris et al, 2014). A number of surveys and tools have been conducted or applied in Howe Sound that provide a qualitative and quantitative assessment of certain elements of the marine and terrestrial ecosystem writ large, and these include, for example, the Cumulative Effects Assessment using a number of important indicators to improve forest management and biodiversity conservation (see Section 12.2), the application of the Ocean Health Index to identify priorities for future marine management, the marine assessment work that led to the protection of the glass sponge reefs, and numerous other intertidal and sub-tidal surveys that have been conducted in the Squamish estuary. To the best of our knowledge, a systematic assessment of biodiversity in AHSBR using such a species richness index has not been undertaken. However, as discussed in the following sections, more qualitative assessments clearly point to the extraordinary and globally significant biodiversity of the BC coast, both terrestrial and marine, and to the AHSBR having among the highest biodiversity levels in the province.

A number of terrestrial and marine species of flora and fauna in the Átl'ka7tsem/Howe Sound region have been assessed by the provincial and federal governments for their relative abundance or rarity and at-risk status at the provincial and national levels. These are described below, categorized as Wildlife; Forests, Plants, Lichen/Fungi and Plant Communities; and Marine.

4.2.1.1 Wildlife

The mountainous coastal ecosystems of Howe Sound support a high diversity of terrestrial wildlife species, among the highest in Canada, primarily due to the spatial heterogeneity of the Pacific Ranges. Approximately 721 native terrestrial animal species potentially occur in the Howe Sound region: 14 amphibian species, 10 reptile species, 249 bird species, 61 mammal species, and at least 387 invertebrate species, including arachnids, gastropods, and insects. Invertebrates are the most diverse group, which is not surprising as they are the most dominant life form on the planet. Bird diversity is the second highest among all groups, followed by mammals, amphibians and reptiles, respectively. A large number of BC's amphibian species reside in the AHSBR region, largely due to the favourable climates found in the southwest section

of the province. A comprehensive inventory list of wildlife species found or potentially occurring in AHSBR and their conservation status is available in Appendix A.

Átl'ka7tsem/Howe Sound is a very significant area for this wide range of species and, as a Biosphere Reserve, would play an important, even global, role in the conservation of this biological diversity. Diversity is especially high for birds, as indicated by both the Squamish River estuary and English Bay-Burrard Inlet-Howe Sound being identified internationally as Important Bird and Biodiversity Areas (IBAs) (Bird Studies Canada 2019a, 2019b). The Squamish River Area is globally significant for the number of bald eagles that congregate there each winter (Bird Studies Canada 2019a). A number of bird species recorded in the Biosphere region are migrants, which highlights the importance of Howe Sound and the Squamish Valley as migration corridors. The English Bay-Burrard Inlet-Howe Sound IBA supports significant populations of diving ducks, dabbling ducks, cormorants, gulls and shorebirds. Also, the Christie Island Migratory Bird Sanctuary, located between Gambier and Anvil Islands, is the only site in Greater Vancouver where marine birds nest, including pelagic cormorants and double-crested cormorants (Rodway et al. 2016).

Numerous at-risk wildlife species utilize habitats found in the Howe Sound region. Species at risk of extinction are designated at both federal and provincial levels. A species initially proposed as at-risk is first assessed by the federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and subsequently assigned a risk status: Not At Risk (reviewed and found to be not at risk); Data-deficient (lacking sufficient scientific study); Special Concern (may become threatened or endangered due to known factors); Threatened (likely to become endangered if factors not addressed); Endangered (face extirpation or extinction); Extirpated (no longer exist in the wild in Canada); and Extinct. At-risk species are then considered by the Minister of Environment and Climate Change for inclusion on Schedule 1 of the federal *Species at Risk Act (SARA)*, which conveys legal protection to species and their critical habitat. Furthermore, a detailed recovery strategy or management plan is required for these species. *SARA* Schedules 2 and 3 include species classified as Endangered/Threatened and Special Concern, respectively, but are awaiting reassessment by COSEWIC before being listed as Schedule 1.

COSEWIC lists 30 species found or potentially occurring in Átl'ka7tsem/Howe Sound as Not At-Risk, whereas 42 are listed



at a higher level of risk including Extirpated, Endangered, Threatened, or Special Concern (Table 1). Of those 42 species, 39 are included on SARA Schedule 1, and thus are legally protected species in Canada. Not all species found in the region have been reviewed or are under consideration for review, so the number of Not At-Risk species is potentially low due to lack of sufficient data and study effort. At-risk species that occur or potentially occur in Átl'ka7tsem/Howe Sound with finalized recovery strategies include wolverine, Pacific water shrew and marbled murrelet. Species with proposed recovery strategies include little brown myotis and common nighthawk.

Table 1. The number of federally reviewed and designated species (COSEWIC and SARA) found in Átl'ka7tsem/Howe Sound, including potentially occurring species.

COSEWIC Designation	Total Species	SARA Designation	Total Species
Extirpated	2	Schedule 1, Extirpated	2
Endangered	10	Schedule 1, Endangered	8
Threatened	10	Schedule 1, Threatened	10
Special Concern	20	Schedule 1, Special Concern	19
Not At-Risk	30		
Total	72	Total	39

Source: BC Conservation Data Centre 2019b

At the provincial or subnational level, the BC Conservation Data Centre (CDC) calculates and assigns a species Conservation Status Rank based upon their rarity, threats, and any known population trends. A summary of conservation status ranks for the species found in or potentially occurring in AHSBR is presented in Table 2. Four species are presumed or possibly extirpated, 26 are considered critically imperiled or imperiled, 71 are considered vulnerable, and 505 are considered apparently secure or secure. Thirty-five species were unrankable as of 2019 due to a lack of information or conflicting information about their status or trends (NatureServe 2019).

Table 2. The number of provincially reviewed and designated conservation status for species found in Átl'ka7tsem/Howe Sound, including potentially occurring species

Provincial Status	Total Species Ranks
Presumed Extirpated or Possibly Extirpated	4
Critically Imperiled or Imperiled	26
Vulnerable	71
Apparently Secure or Secure	505
Unrankable	35
Not ranked	123
Total	764

Source: BC Conservation Data Centre 2019b

Átl'ka7tsem/Howe Sound has a diversity of habitats available to wildlife that span marine, freshwater aquatic, riparian, and terrestrial landscapes. Four species that exemplify the range of habitat available in the Átl'ka7tsem/Howe Sound that allow wildlife to meet their life requisites are: marbled murrelet, grizzly bear, Roosevelt elk and Pacific water shrew.

Marbled murrelet is listed as Threatened and multiple old-growth forest areas in the Biosphere region have been designated as critical habitat (Environment Canada 2014). This resident bird species has a unique life history, requiring old-growth forest for nesting (designated as critical habitat), as well as marine habitat for foraging. This species' recovery plan indicates that Átl'ka7tsem/Howe Sound is at moderate risk of exceeding the nesting habitat depletion threshold by 2032. While the region features nearly 4,000 hectares of nesting habitat, less than 500 hectares are currently protected (Environment Canada, 2014).

As an indicator species, grizzly bear are ecologically important and provide information for conservation planning and decision-making. Grizzly bear also provide viewing opportunities for eco-tourism, and is an important aspect of First Nations culture, including harvesting practices (COSEWIC, 2012). Distribution of grizzly bear has contracted to the northwestern extent of the species' range with extant populations existing in Alaska, British Columbia, and the northwestern United States (COSEWIC, 2012). Grizzly bear have been extirpated from much of their historic range and continue to be threatened due to anthropogenic disturbance (i.e., habitat loss, alteration, and fragmentation, human-wildlife conflict, harvesting and poaching). The species has been designated of Special Concern federally and provincially (COSEWIC, 2012; BC Environment, 2012). Átl'ka7tsem/Howe Sound has two grizzly bear Population Units, the Squamish-Lillooet and Garibaldi-Pitt, that support an estimated 61 individuals. Habitats within the population units have a high capability of supporting grizzly bears due to the salmon-bearing Squamish River system and the surrounding vegetated landscape (COSEWIC, 2012; BC Environment, 2012).

Provincially, Roosevelt elk are listed of Special Concern. Factors limiting Roosevelt elk include overharvesting, habitat change (decrease in quality and quantity), linear disturbance and predation (BC Conservation Data Centre, 2017; FLNRORD, 2015). Átl'ka7tsem/Howe Sound supports approximately 260 elk comprised of five Elk Population Units (EPUs) found to the northeast of Howe Sound (FLNRORD, 2015). The stable, stable-to-increasing, or increasing trend of these populations is largely due to the translocation programs that have

occurred in the area since 1933 (FLNRORD, 2015).

In addition to the fauna noted above, critical habitat occurs within the Biosphere region for Pacific water shrew. Riparian habitats that are suitable for the Pacific water shrew are declining in their range and this species is severely affected by habitat fragmentation, thus the need for federally designated



Grizzly bear on Squamish River sandbar, photo: J. Buchanan

critical habitat (COSEWIC, 2006).

4.2.1.2 Forests, Plants, Lichen/Fungi and Plant Communities

A comprehensive list of all vascular, non-vascular and lichen/fungi species recorded within Átl'ka7tsem/Howe Sound, including forest trees and understory plants, is found in Appendix C. Total species of plants (including subspecies and varieties) found within the Biosphere region are as follows: 727 species of vascular plants, 485 species of non-vascular plants, and 749 species of lichen/fungi that historically or presently occur.

At the federal level, only nine species in the Átl'ka7tsem/Howe Sound have been reviewed or designated by COSEWIC (Table 3). Seven species are listed at a higher level of risk such as Endangered, Threatened or Special Concern, including four vascular plant species, two non-vascular plant species, and one species of fungi. One species of diminutive lichenized fungi, frosted glasswhiskers, is considered Data Deficient.

Table 3. The number of federally reviewed and designated species (COSEWIC) found in Átl'ka7tsem/Howe Sound

Species Group			
COSEWIC designation	Vasc.	Non. Vasc.	Lichen/Fungi
Extirpated	0	0	0
Endangered	2	2	0
Threatened	1	0	0
Special Concern	1	0	1
Not At-Risk	1	0	0
Data Deficient	0	0	1
Total	5	2	2

Source: BC Conservation Data Centre 2019b

A summary of provincial conservation status for the species found in the Biosphere region is in Table 4. The majority of species are apparently secure; however, a large number of lichen/fungi species have not been ranked. Two species of non-vascular plants are believed to be extirpated, 21 species are critically imperiled or imperiled (6 vascular plants, 13 non-vascular, and 2 lichen/fungi), 142 species are vulnerable (43 vascular plants, 86 non-vascular plants, and 13 lichen/fungi) and 1063 species are apparently secure or secure (634 vascular plants, 310 non-vascular plants and 119 lichen/fungi). Six species were considered unrankable due to lack of information (2 vascular plants, 4 non-vascular plants).

Table 4. The number of provincially reviewed and designated conservation status ranks for vascular and non-vascular plants and lichen/fungi species found in Átl'ka7tsem/Howe Sound

Species Group			
Provincial Status	Vascular Plants	Non Vascular Plants	Lichen/Fungi
Presumed Extirpated or Possibly Extirpated	0	2	0
Critically Imperiled or Imperiled	6	13	2
Vulnerable	43	86	13
Apparently Secure or Secure	634	310	119
Unrankable	2	4	0
Not Ranked	44	70	613

Source: BC Conservation Data Centre 2019

Four plant communities identified within AHSBR have been provincially designated at a high level of risk (Table 5). These include three highbench forested floodplain communities: Sitka spruce/salmonberry (Dry), Sitka spruce/salmonberry (Very Dry Maritime) and Sitka spruce/salmonberry (Very Wet Maritime), and one mature growth coniferous community: western hemlock–Douglas-fir/ electrified cat's-tail moss (Dry Submaritime 1).



Pink salmon, photo: B. Turner

Table 5. Provincially reviewed and designated conservation status for at-risk plant communities found in the Howe Sound Biosphere Region

Scientific Names	Common Names	Provincial Status
Picea sitchensis / Rubus spectabilis Dry	Sitka spruce / salmonberry Dry	Critically Imperiled or Imperiled
Picea sitchensis / Rubus spectabilis Very Dry Maritime	Sitka spruce / salmonberry Very Dry Maritime	Critically Imperiled or Imperiled
Picea sitchensis / Rubus spectabilis Very Wet Maritime	Sitka spruce / salmonberry Very Wet Maritime	Critically Imperiled or Imperiled
Tsuga heterophylla - Pseudotsuga menziesii / Rhytidiadelphus triquetrus Dry Submaritime 1	Western hemlock - Douglas-fir / electrified cat's-tail moss Dry Submaritime 1	Vulnerable

Source: BC Conservation Data Centre 2019b on

4.2.1.3 Marine

Canada’s west coast is exceedingly rich in marine species compared to other temperate regions of the world. This diversity includes 6,555 species of invertebrates, 400 fishes, 300 species of sponges, 68 species of sea stars, 600 amphipod crustaceans, 75 species of anenomes, 478 species of polychaete sea worms, and 111 species of nudibranchs, among more (Austin, 2015; Lambert, 2017). Not only is biodiversity high, the marine biota of British Columbia can boast the largest chiton, the largest octopus, the largest sea slug, the heaviest sea star and the biggest barnacle in the world (Lambert, 2017).

Of these species, the Salish Sea, of which Átl'ka7tsem/Howe Sound is part, supports approximately 3,000 species of marine life. The Sound itself has more than 650 species of fish and invertebrates and has been described as “... the most biologically diverse region on the South coast of British Columbia” (Dennison, 2012). The diversity of marine life is due, in large measure, to the array of different marine habitats found throughout the Sound, including near shore, benthic and pelagic habitats. As noted above in Section 4.2.1, the recent discovery of the hexactinellid (glass) sponge reefs in Howe Sound is an exciting addition to this impressive list of species. A comprehensive list of all marine species recorded within Átl'ka7tsem/Howe Sound is found in Appendix B.

A total of 27 marine species have been assessed by COSEWIC for their at-risk status, and as illustrated in Table 6 below, 19 species of fish, 7 species of marine mammal and one species of invertebrate have been listed as either endangered, threatened or of special concern under COSEWIC, with some not yet listed on Schedule 1 on SARA.

Table 6. Federally and provincially reviewed and designated conservation status for at-risk marine species found in the Átl'ka7tsem/Howe Sound

Taxa	Common Name	Scientific Name	COSEWIC	SARA
Fish	Canary Rockfish	Sebastes pinniger	Threatened	No Status
Fish	Quillback Rockfish	Sebastes maliger	Threatened	No Status
Fish	North Pacific Spiny Dogfish	Squalus suckleyi	Special Concern	No Status
Fish	Yelloweye Rockfish	Sebastes ruberrimus	Special Concern	Special Concern
Mollusc	Olympia Oyster	Ostrea lurida	Special Concern	Special Concern
Fish	Bluntnose Sixgill Shark	Hexanchus griseus	Special Concern	Special Concern
Mammals	Grey Whale	Eschrichtius robustus	Special Concern	Special Concern
Mammals	Harbour Porpoise	Phocoena phocoena vomerina	Special Concern	Special Concern
Mammals	Humpback Whale Northern Resident	Megaptera novaeangliae	Special Concern	Threatened
Mammals	Killer Whale Northern Resident	Orcinus orca	Threatened	Threatened
Mammals	Killer Whale Southern Resident	Orcinus orca	Endangered	Endangered
Mammals	Killer Whale Transient	Orcinus orca	Threatened	Threatened
Mammals	Steller Sea Lion	Eumetopias jubatus	Special Concern	Special Concern
Fish	Bocaccio Rockfish	Sebastes paucispinis	Threatened	No Status*
Mollusc	Northern Abalone	Haliotis kamtschatkana	Endangered	Endangered
Fish	Basking Shark	Cetorhinus maximus	Endangered	Endangered
Fish	Yellowmouth	Sebastes reedi	Threatened	No Status
Fish	Darkblotched Rockfish	Sebastes crameri	Special Concern	No Status
Fish	Eulachon	Thaleichthys pacificus	Endangered	No Status*
Fish	Longspine Thornyhead	Sebastolobus altivelis	Special Concern	Special Concern
Fish	Rougheye Rockfish Type I	Sebastes sp. type I	Special Concern	Special Concern
Fish	Rougheye Rockfish Type II	Sebastes sp. type II	Special Concern	Special Concern
Fish	Tope	Galeorhinus galeus	Special Concern	Special Concern
Fish	Coho Salmon	Oncorhynchus kisutch (Interior Fraser River populations)	Threatened	No Status
Fish	Chinook Salmon	Oncorhynchus tshawytscha(Upper, middle & lower Fraser River populations)	Endangered	No Status
Fish	Sockeye Salmon	Oncorhynchus nerca (migrating from Cultis Lake & Harrison river to Howe Sound-see notes 2&3)	Endangered / Special Concern	No Status
Fish	Steelhead	Oncorhynchus mykiss irideus (Thompson,Chilkotin,Fraser River populations)	Endangered	No Status
Fish	Cutthroat	Oncorhynchus clarkii lewisi	Special concern	Special Concern
Note 2: Beamish R.J. 2010, Late ocean entry of sea type sockeye salmon from the Harrison River in the Fraser River drainage results in improved productivity. NPAFC Doc. 1283. 30 pp.				
Note 3: Welch et al can. J. Fish. Aqu. Sci. 2009: Freshwater and marine migration and survival of endangered Cultus Lake sockeye salmon (Oncorhynchus nerka) smolts using a large-scale acoustic telemetry array.				
Mammals	Fin Whale	Balaenoptera physalus	Threatened	Threatened**

Source: Howe Sound Research and Conservation, Ocean Wise, Vancouver, BC, Canada

<https://www.canada.ca/en/environment-climate-change/services/>

* Previously ** Potentially

4.3 Demonstration of Sustainable Development

“Provide an opportunity to explore and demonstrate approaches to sustainable development on a regional scale”. (Describe in general terms the potential of the area to serve as a site of excellence for promoting the sustainable development of its region (or “eco-region”).

The AHSBR region is a complex assembly of Public lands, private lands, rural areas, incorporated municipalities and unincorporated communities that require an equally complex set of plans, procedures and tools, to effect sustainable development over the region’s land base and marine environments. A key objective of the AHSBRI is to support the development of a comprehensive land and marine use plan for the entire region that incorporates these sustainable tourism development plans by providing logistic support as described in Sections 3 and 17.

The Principles of Cooperation among AHSBRI’s partners, generated by the Howe Sound Community Forum and the Principles of Sustainability in B.C.’s Land Use Charter, serve as congealing forces that commit all levels of government, First Nations and non-government organizations to the common pursuit of sustainable development throughout the region. The Principles of Cooperation document, signed by all local governments and Squamish Nation in 2002, emphasize the need for a collective forum of local governments and First Nations, for a common vision and for regular communication in an atmosphere of shared values and transparency (Appendix G).

The AHSBR Roundtable, as described in Section 17, will bring accountability to the region’s commitment towards sustainable tourism and other economic growth through existing planning documents and tools.

Many travel publications promote features in the region as desirable destinations for tourism and recreation. Destination BC’s Strategic Marketing plans for the Sunshine Coast and Sea to Sky areas, developed with Aboriginal Tourism, set out strategic themes and opportunities for the region. The vision is:

“Vibrant, diverse, and authentic, the Sea-to-Sky Corridor pairs a year-round sustainable and prosperous tourism management model with being the most sought after destination for world class nature-based outdoor recreation and thriving cultural experiences”

(Destination BC, 2019)

The plans pair specific motivating experiences identified for destination development with features found in the region. Seven destination development goals have been identified to support the vision, two of the three specifically:

“Increase resident and community prosperity through sustainable tourism growth and improve visitor use of the natural and cultural heritage in a respectful, sustainable manner”

(Destination BC, 2019)

Within the eight development themes of Destination BC’s Sea to Sky Marketing strategic plan is support for the Howe Sound Biosphere Region Initiative under the strategic theme for Stewardship and Social Commitment (Destination BC, 2019). The themes identify the potential of the region to serve as a site of excellence for promoting sustainable development as an eco-region.

The Xay Temixw Land Use Plan - see Section 3.1.3

The Sea-to-Sky Land and Resource Management Plan -

The foundation for sustainable development on Public lands in much of the AHSBR rests in the Sea-to-Sky Land and Resource Management Plan (LRMP) prepared for the region in 2008, as described in Section 15.1. The purpose of the Sea-to-Sky LRMP is “to provide greater certainty for local economic development and the long-term sustainability of ecological, social and cultural values” (Government of British Columbia, 2008). The LRMP plan area includes approximately 74% of the AHSBR region and is therefore fundamental to realizing sustainable development goals in Átl'ka7tsem/Howe Sound.

The LRMP provides two levels of direction for the management of natural resources on Public land in the region, including overarching general management direction for a range of land and resource values that



Octopus eye, photo: A. Taylor

apply throughout the Sea-to-Sky region, and more area-specific direction with goals and objectives for the various land use zones and activities identified. The land and resource values include, for example, access, cultural heritage values, forest health, recreation and wildlife biodiversity, whereas specific land use zones include those areas where all resource activities are permitted to more restrictive zones such as 'wildlands' and protected areas. Of particular importance to Át'l'ka7sem/Howe Sound is the 'Frontcountry Zone' that encompasses most of the Public land adjacent to the proposed Biosphere Region's Core Areas. As discussed, these Frontcountry Zone lands form a strong foundation for the proposed Buffer Zones adjacent to the Core Areas.

The LRMP also provides processes for consulting with all stakeholders and resolving land use issues (Government of British Columbia, 2008). The plan's collaboration and consultation processes earned the 2009 Sustainability Award for Improved Decision-Making from the Fraser Basin Council, itself a collaborative organization among all levels of government dedicated to advancing sustainability throughout the region (FBC, 2019). The LRMP is particularly recognized for the extent to which it meets the needs of the region's populations while respecting Aboriginal rights and title (Gritanni-Livingston, 2009).

Landscape Unit Planning - The direction of the LRMP and, more generally, of BC's *Forest Practices Code* for Public land is, in turn, implemented through the development of Landscape Unit Plans for forest management that take an integrated approach to resource management incorporating other resource values. A priority in

Landscape Unit planning is to develop legally binding objectives for landscape level biodiversity values, including old growth forests, and their role in providing wildlife habitat and other ecosystem services such as the protection of water supply and quality and the preservation of other associated natural resource values, including species at risk (FLNRORD, 2003). In AHSBR, there are a total of six Landscape Unit Plans (LUPs) regulating forest land use, including those areas of Public land not included in the Sea-to-Sky LRMP (Lower Squamish, East Howe and portions of Mamquam, Chapman, Fraser Valley South and Seymour-Capilano).

Private Lands, Municipalities and the Howe Sound

Islands - Beyond Public lands where lands are privately owned, the LRMP and Landscape Unit plans do not apply. The use of private land is regulated by local governments in accordance with their authorities under the *Local Government Act* and the *Community Charter*.

11 SUSTAINABLE CITIES AND COMMUNITIES



Sustainable cities and communities

As discussed in sections 9 and 10, the local and regional governments within AHSBR have all prepared Official Community Plans (OCPs) and, in some cases Regional Growth Strategies, to incorporate and implement the principles of sustainable development within their respective boundaries.

The OCP for the Municipality of Bowen Island, for example, is entitled “Towards a Sustainable Future” and approaches all aspects of municipal governance from that perspective (Bowen Island Municipality, 2016). Similarly, a regional growth strategy is intended to “promote human settlement that is socially, economically, and environmentally healthy and that makes efficient use of public facilities and services, land and other resources (SLRD, 2008).” The Squamish-Lillooet Regional District’s Regional Growth Strategy, for example, is a collaboration of all member local governments to promote “... development and services which are sustainable, recognizing a long term responsibility for the quality of life for future generations” (SLRD, 2008).

The jurisdiction for land use planning on all the Howe Sound islands is exclusively that of the Islands Trust. The Islands Trust is a federation of local governments, whose mandate places a clear priority on sustainability: “to preserve and protect the trust area and its unique amenities and environment for the benefit of residents of the trust area and the province...” (Islands Trust, 2019). The Trust’s main goals are to: “foster the preservation and protection of the Trust Area’s ecosystems; ensure that human activity and the scale, rate and type of development...are compatible with maintenance of Trust area ecosystems; and sustain island character and healthy communities” (Islands Trust, 2019). The Islands Trust mandate and goals are implemented through the development of OCPs and land use bylaws for each island or group of islands.

Throughout the AHSBR, regardless of land ownership and jurisdiction, a number of tools have been developed to assist all levels of government, First Nations and non-government organizations achieve or promote sustainable development. The tools specific to Howe Sound region, as described in Section 3.1.3, complement the planning tools available within the various levels of government. The Marine Reference Guide (MRG) is currently being developed under the leadership of First Nations and local governments to support decision makers, marine spatial planners and marine economic sectors to ensure that marine environmental health, sustainable economic development and community development can co-exist (MRG, 2018). The intent of the MRG is to support integrated marine management by providing a unified marine information resource for marine spatial planning and decision-making by all governments, sectors

and communities. This project is being undertaken in collaboration with the Átl'ka7tsem/Howe Sound Marine Conservation Analysis. This conservation analysis of Átl'ka7tsem/Howe Sound’s marine environment uses a Geographic Information System (GIS) to compile more than 140 layers of marine data, ranging from habitats such as eelgrass or estuaries, to species’ distributions such as the sponge reefs, to a host of socio-economic information such as shipping routes, marinas and fishing areas. Through computer modeling software known as Marxan, the analysis can reveal where the marine biodiversity hotspots are and where future management needs to be directed to protect and conserve the 34 high priority areas for conservation already identified (DSF, 2019).

The Cumulative Effects Framework (CEF) in Howe Sound is the first assessment of its kind on BC’s south coast region, and the AHSBR boundary aligns with the boundary of this study. The project is the direct result of concerns expressed by local governments and stakeholders about the potential for cumulative effects of numerous land and resource developments being undertaken and proposed in the AHSBR region, and the need to consider all of Átl'ka7tsem/Howe Sound and its watersheds as a single ecological entity. The CEF will help with the implementation of a coordinated, multi-sector approach to assessment and managing cumulative effects, and of a long-term monitoring program to identify key trend information (FLNRORD, 2019).

BC and many of AHSBR’s partners have demonstrated their commitment to sustainable development in Átl'ka7tsem/Howe Sound through their ongoing collaboration, leadership and participation in a number of land and sea use planning initiatives and the application of specific analytical tools as described above and in Section 15. However, critical to the success and achievement of the Province’s destination development plan goals, the roll out of the strategic plans must be done in a coordinated way as noted in the plan as one of the development themes: “Interaction of development themes and motivating experiences: For any destination development strategy to achieve its goals, there must be coordinated interaction with the other components of the tourism process.”

HSBRIS will contribute to the roll out of success of the strategic plans working with various tourism and recreation sector stakeholders.

4.4 Biosphere Reserve Size

"Have an appropriate size to serve the three functions of biosphere reserves" (This refers more particularly to (a) the surface area required to meet the long term conservation objectives of the core area(s) and the Buffer Zone(s) and (b) the availability of areas suitable for working with local communities in testing and demonstrating sustainable uses of natural resource.)

The total area of AHSBR is 218,723 hectares, with combined terrestrial and marine Core Areas of 42,378 ha, or 19% of the total area, and a combined terrestrial and marine Buffer Zone of 30,371 ha or almost 14% of the total area. Given the large size of this Biosphere Reserve, and the fact that a total of 33% of the reserve is within the combined terrestrial and marine Core Areas and Buffer Zones, and an additional 4,161 ha in the Transition Area are also protected or in conservation lands, there is every confidence that the AHSBR is large enough and has an effective zoning configuration to meet the long-term conservation objectives while also working with local communities and stakeholders to demonstrate sustainable development.

4.5 Through appropriate zonation

(a) a legally constituted core area or areas devoted to long term protection, according to the conservation objectives of the biosphere reserve, and of sufficient size to meet these objectives". (Describe the core area(s) briefly, indicating their legal status, their size, the main conservation objectives).

Areas of Core, Buffer and Transition Zones within AHSBR

Zone	Terrestrial Area (ha)/%	Marine Area (ha)/%	Total Area (ha)/%
Area of Core	42,218 - 23%	160 - .475%	42,378 - 19%
Area of Buffer	28,461 - 16%	1,910 - 5.46%	30,371 - 14%
Area of Transition	113,056 - 62%	32,918 - 94%	145,974 - 67%
Total	183,735 - 84%	34,988 - 16%	218,723

4.5.1 Core Areas

A combined total of 42,218 ha of high elevation forests and alpine areas and 160 ha of marine area are proposed as the Core Areas of the AHSBR. As described in Section 7, the terrestrial Core Areas reflect the vast mountain wilderness available in the region which, while providing an exceptional resource for recreationists seeking isolation and a wilderness experience, also provide a number of important ecological functions that serve both the protected areas themselves and the entire AHSBR area. Many of these functions are addressed in 4.5.3(d) in terms of how the terrestrial and marine Core, Buffer and Transition zones interact with each other, especially with respect to water production, but there are many other critical functions including enhancing air quality, providing vast and highly connected expanses of habitat for a wide variety of wildlife, and ensuring a permanent wild and scenic backdrop for the region's tourism industry. These terrestrial parks extend well beyond the boundaries of AHSBR and collectively include another 212,000 ha of adjacent protected areas.

The low to mid-elevation terrestrial environments below these high elevation Core Areas are also well represented in the network of protected areas distributed throughout the Buffer and Transition zones. As described in 4.5.2, these protected areas include a number of provincial parks, ecological reserves, wildlife management areas and specially managed Public forest lands encompassing over 28,000 ha. While not included as Core Areas, these areas protect numerous representative examples of the various ecosystems and habitat types that typify these lower elevation areas.

Garibaldi Provincial Park was established in 1927 to protect alpine meadows and unique volcanic features, represent of what is known as the Rugged Pacific Ranges Regional Landscape. This vast mountain park contains iconic features – the volcanoes of Mount Garibaldi, Black Tusk, and The Table; the azure waters of Garibaldi Lake; and alpine meadows famous for their wildflowers. This western portion of the park is managed as a Natural Environment Zone with “the objective of this zone to protect scenic values and provide for backcountry recreation opportunities in a largely undisturbed natural environment” (BC Parks, 2019). Recently in 2019, BC purchased an additional 5.6 hectares of land to expand the park in order to protect ecologically sensitive areas, promote biodiversity and enhance recreation opportunities (BC Parks, 2019).

Pinecone-Burke Provincial Park is part of the Lower Mainland Nature Legacy initiative established in 1995. It protects the western shore of Pitt Lake outside of AHSBR, the largest fresh water tidal lake in North America. It is a wilderness area protecting old-growth forests, numerous alpine lakes, rugged terrain and remnant icefields. Widgeon Slough is the largest freshwater marsh in southwestern BC and Widgeon Lake is largest hanging lake in Greater Vancouver’s north shore mountains. The portion of the park within AHSBR boundary is contiguous with Garibaldi Provincial Park. A management plan for the park is in development with the Katzi First Nation (BC Parks, 2019).

Tantalus Provincial Park and the adjoining *Este-Tiwilh*/Sigurd Creek Conservancy protect the higher elevation reaches of the very rugged Tantalus Range. The Tantalus Range rises to almost 3,000 metres from the Squamish River, its estuary and the ocean to glacier-clad summits just west of Squamish. Tantalus offers “exceptional mountaineering as well as landscape viewing, hiking, and fishing in a wilderness setting. The old-growth coastal forest ecosystem is managed to maintain important wildlife and vegetation values” (BC Parks, 2012). Conservation objectives for Tantalus and the *Este-Tiwilh*/Sigurd Creek Conservancy are managed jointly with two other contiguous protected areas along the Squamish River, Brackendale Eagles Provincial Park and Baynes Island Ecological Reserve (BC Parks, 2012).

Tetrahedron Provincial Park is part of the Lower Mainland Nature Legacy initiative and was established in 1997. The park protects mid-elevation forests and mountain peaks from 900 to 1,800 metres elevation and straddles the western boundary of AHSBR. The park protects a wide range of landscapes, including mountain peaks, lakes, streams and wetlands, and a community watershed, and is managed to retain its wilderness character.

Cypress Provincial Park was established in 1975 and straddles the AHSBR boundary along its mountainous south-east corner above West Vancouver. The park is adjacent to the 60,000 ha Greater Vancouver Watershed lands. The park is part of the towering North Shore Mountains that form a backdrop to Metro Vancouver and have beckoned outdoor recreationists for many years. The park protects high elevation old growth forests, lakes and wetlands as well as hosting a controlled commercial alpine and Nordic ski area, and access road. Within the boundaries of the AHSBR, the park continues along the ridge of the famous Lion peaks, that provide backcountry access along the Howe Sound Crest Trail to Mt. Brunswick (BC Parks, 2019a).

BC’s ancient glass sponge reefs are a globally unique and fragile ecosystem that provide important habitat for many marine species. In 2015 and 2019 Fisheries and Oceans Canada created ten Glass Sponge Reef Marine Refuges in Howe Sound, that protect a total of eleven glass sponge reef aggregations. These Refuges have been selected as the Core Areas in AHSBR’s marine environment.

Terrestrial Core Areas

Terrestrial Core Area	Area of Park within Biosphere Region (ha)	Total Park Area (ha)	IUCN Category	Management Plan
Garibaldi Provincial Park	23,018	194,676	II	1990
Tantalus Provincial Park	10,809	11,351	Ib	2012
Pinecone Burke Provincial Park	2,612	38,000	II	In development
Tetrahedron Provincial Park	2,035	6,000	II	1997
Cypress Provincial Park	2,605	3,012	II	1997
Este-Tiwilh/Sigurd Creek Conservancy	1,139	1,112	II	2012
Total Areas	42,218	254,151	---	---

Marine Core Areas

BC's ancient glass sponge reefs are a globally unique ecosystem that provide important habitat for many marine species including spot prawns, rockfish, herring, halibut and sharks. The eleven glass sponge reefs within ten marine refuges selected as Core Areas in the marine environment are contiguous with the areas of protection put in place by Fisheries and Oceans Canada following extensive research and consultations with First Nations and stakeholders. The first two reefs were protected in 2015 followed by a further eight in 2019. The marine extension to Halkett Bay was for the sole purpose of protecting the Halkett Point Glass Sponge Reef.

Type of Protected Area	Total Area (ha)	% of total marine area	Zone	Restrictions	Regulatory Authority
Sponge Reef Closure Areas (11 aggregations)	160	.475%	Core	No bottom contact fishing activities	Fisheries & Oceans Canada

4.5.2 Buffer Zones

(b) a Buffer Zone or zones clearly identified and surrounding or contiguous to the core area or areas, where only activities compatible with the conservation objectives can take place". (Describe briefly the Buffer Zones(s), their legal status, their size, and the activities which are ongoing and planned there).

Areas compatible with the conservation objectives extend beyond borders of the Core Areas. Terrestrially, the proposed AHSBR Buffer Zones include mostly Public land that is immediately adjacent to and contiguous with the six Core Areas. Much of the high elevation lands adjacent to the Core Areas are highly constrained and are managed under a combination of legal designations identified as "Protected Areas" and "Resource Exclusion Areas" under the *Parks Act* and *Forest and Range Practices Act*, the *Land Act* or the *Environment and Land Use Act*. They include parks, conservancies, culturally significant areas, Wildlife Management and Habitat Areas, Ungulate Winter Ranges, Old Growth Management Areas, Wildland Areas or areas with visual quality objectives under the Government Actions Regulation (see Section 4.3). This combination of protected areas, resource exclusion areas, and the overlapping Frontcountry Area zoning and Scenic Area provide more benefit than simply buffering a Core Area, they provide protection of important wildlife and sensitive ecosystems beyond and throughout the proposed Biosphere Reserve area and meet MAB's requirement that the Buffer Zone permit only activities compatible with the conservation objectives of the Biosphere Reserve.

Areas to note include The Skwelwil'em/Squamish Estuary Wildlife Management Area (WMA) encompasses 673 ha of the largest and most productive estuarine ecosystem in Howe Sound. It provides wintering, migration, feeding and/or breeding habitats for waterfowl and shore birds, as well as raptors, passerines and other species. Together with Brackendale Eagles Provincial Park and Baynes Island Ecological Reserve, the area attracts globally

significant congregation of bald eagles and was consequently designated an International Bird and Biodiversity Area (IBA). It is also a feeding, spawning and rearing ground for a variety of fish species, including provincially significant species such as eulachon, steelhead and salmon. The estuary also provides good habitat for a number of mammal species including blacktail deer and black bear (BC Environment, 2007).

Municipal lands adjacent to the Core Areas are zoned for the expressed purpose of protecting the natural environment and providing for limited recreation use.

Land Designations and Management within the Buffer Zone

Terrestrial Buffer Area	Habitat features	IUCN Category	Area (ha)	Management Plan
Provincial Parks				
Alice Lake Provincial Park	Lakes, forest	II	412	2003
Brackendale Eagles Provincial Park	River, floodplain forests, eagle and salmon habitat	IV	764	2012
Stawamus Chief Provincial Park	Rock bluffs, forest	III	530	1997
Shannon Falls Provincial Park	Stream, falls, riparian	III	91	1985
Murrin Provincial Park	Lake, rock bluffs	Possibly OECM	32	1981
Apodaca Provincial Park	Rocky knoll, unique plant communities, tidal	II	8	1954
Plumper Cove Marine Provincial Park	Beach, forest	II	33	1960
Porteau Cove Provincial Park	Beach, forest	II	6	1981
Halkett Bay Marine Provincial Park	Rocky Tidal Coastline, forest	II	293	1988
Provincial Ecological Reserves				
Bowen Island Ecological Reserve	Flora, fauna, forest		400	1973
Baynes Island ER	River, island	II	45	2012
Wildlife Management Areas				
Skwelwil'em Squamish Estuary WMA	Estuary	IV	623	2007
Municipal Parks				
Nelson Canyon	Old-growth forest, creek		92	2014
Whyte Lake	Wetlands, lakes, old-growth forest		65	2014
Buffer - Provincial Protected Area				
Stawamus Chief	Rock bluffs , forest		2	1997
Sub-total of Protected Areas			3,396	
500 Meters Adjacent to Core Areas				
High elevation areas lacking commercial forest	Alpine, subalpine forest		4,267	
Resource Exclusion Areas				
Wildlands	Alpine, subalpine forest		4,685	
Wildlife Habitat Areas	Riparian, wetlands, forest		1,995	
Ungulate Winter Range Areas	Riparian, wetlands, forest		7,272	
Old Growth Management Areas	Forest		6,414	
Mineral Reserve (no mining activity)	Forest		432	
Sub-total area in Resource Exclusion Areas			20,798	
Total Area			28,461	

Marine Buffer Zones

Throughout the Marine area are various protection measures by Fisheries and Oceans Canada in place to protect fish and fish habitat. Surrounding the glass sponge reef edges is an additional 150 meters of area that lies within the Glass Sponge Reef Marine Refuges, as described in 4.5.1. This precautionary measure was taken due to uncertainty regarding the accuracy of fishing gear deployment and the possible impacts of sediment plumes caused by gear placement near the reefs in order to avoid possible impacts of sediment plumes caused by fishing gear placement near the delicate reefs. Five of the Glass Sponge Reef Marine Refuges are within Rockfish Conservation Areas (RCAs). RCA's prohibit the following methods: commercial and recreational hook-and-line, commercial shrimp and groundfish trawl, commercial sablefish trap, and recreational spearfishing. The conservation objectives of the glass sponge reef marine refuges and RCAs are to protect the fragile glass sponge reefs and inshore rockfish and their habitat, respectively.

BC is legally responsible for the seabed, while Fisheries and Oceans Canada and Transport Canada have legal responsibility for activities taking place below the high water mark throughout the marine environment. Fishing and harvesting activities in these marine Buffer Zones are limited, with numerous closures in effect.

Type of Protected Area	Total Area (ha)	% of total marine area	Zone	Restrictions	Regulatory Authority
Glass Sponge Reef Marine Refuges	705	.21%	Buffer	All bottom-contact fishing activities, including prawn trap, crab trap, shrimp and groundfish trawl, groundfish hook and line, and the use of downrigger gear on recreational salmon troll in several reefs.	Fisheries & Oceans Canada
Rockfish Conservation Areas, (11 discrete RCAs)	1,205 (5 of 10 RCA's)	3.4%	Buffer	Prohibited fisheries in Rockfish Conservation Areas include commercial and recreational hook-and-line, commercial shrimp and groundfish trawl, commercial sablefish trap, and recreational spearfishing. FSC fishing is permitted.	Fisheries & Oceans Canada

4.5.3 Transition Areas

(c) an outer Transition Area where sustainable resource management practices are promoted and developed. (The Seville Strategy gave increased emphasis to the Transition Area since this is the area where the key issues on environment and development of a given region are to be addressed. Describe briefly the Transition Area(s), the types of questions to be addressed there in the near and the longer terms. The Madrid Action Plan states that the outer boundary should be defined through stakeholder consultation).

As required by the Madrid Action Plan, the proposed outer boundary of AHSBR was one of a number proposals presented to stakeholders and Squamish Nation. The proposed boundary selected was a logical choice arrived at by consensus as it follows the boundary of the Cumulative Effects Assessment project conducted by BC which was also done in consultation with local governments and First Nations. It also aligns with other maps defining the entrance to Howe Sound.

AHSBR's terrestrial Transition Area is a combination of public lands, private lands and First Nations Reserves, incorporated municipalities and unincorporated communities. Much of the land within the Transition Zone has been restored or is managed in a way that supports a healthy eco-system, particularly in the Squamish Valley where restoration work has resulted in the recovery of fish and many other species.

Generally speaking, the public lands are located at mid to high elevations and are predominantly forested and designated as within the Timber Harvesting Land Base (THLB). Within the THLB strong measures are in place to ensure sustainability in forest management activities. Specific regulations that must be followed by harvestings operators set numerous objectives and targets to protect the environment including for biodiversity, riparian, visual and cultural heritage values and to protect the community water supply.

Due to the topographical imperative of the region, all settlements, both urban and rural, are located on the coastal edge adjacent to the shoreline of the fjord in the Transition Zone, below the high elevation Core areas and the mid-elevation Buffer Zone. This lowland fringe also accommodates the entire transportation infrastructure and hence the vast majority of the social and economic activities within AHSBR.

The marine area of Howe Sound represents 16% of the entire area of AHSBR, the vast majority of which is within the Transition Zone. While significant conservation measures are in place through the Fisheries Act to protect the eight species of cetaceans and pinnipeds found in the Sound, the globally significant glass sponge reefs and the many recovering species of fish and invertebrates, the past century and a half of industrialization continues to leave a legacy of diminished biodiversity that only recently has given hopeful signs of recovery. Increased protection efforts over the past decade could herald a new beginning for Howe Sound with further conservation measures being contemplated, not only for glass sponges and rocky reefs but through a more holistic approach to include the full representation of marine environments in the Sound, from estuaries to deep pelagic waters. Such an approach would require full integration with the planned sustainability of the numerous ongoing and potential future activities in the Sound including a limited commercial fishery, coastal industry, a variety of recreational activities and shipping routes for ferries and commercial vessels.

There are many legislative and planning tools in place within the Transition Area to effect resource conservation

and sustainable resource management, as described in Section 4.3. Going forward, there are several key questions that these measures will face, many of which are ongoing and, no doubt, include others that will emerge in the coming years:

- **Given the fundamental importance of forestry to the region, how can future forestry practices continue to sustain economic viability while maintaining visual quality, protecting outdoor recreation and tourism values and water production and quality?**
- **How can the maintenance of a sustainable economy serve Reconciliation efforts between BC and the Squamish Nation and address specific issues important to the Nation including access to economic opportunities, housing and rejuvenation of the *Skwxwú7mesh sníchim* language?**
- **How can the Biosphere Region help address current and future issues related to climate change, including sea level rise, ocean acidification, wild fire and drought?**
- **How can the Biosphere Region help local communities and municipalities cope with the pressures of population rise and increased development, and the host of environmental and social issues that arise with them?**
- **How can the management of the marine environment maintain or enhance the pace of recovery in the health of the marine ecosystem while continuing to accommodate existing and evolving levels of economic activity?**

HSBRIS and its partners will place considerable focus in their deliberations and public consultations to address these and other questions related to the long-term security of the Region's environmental, economic and social fabrics. The requirement for extensive consultation vested in the relevant legislation and policy instruments will ensure a robust consultation process at all levels of planning and administration.

(d) Please provide some additional information about the interaction between the three areas)

The snow covered peaks and surrounding forests of the Core Area watersheds are managed to protect a number of important values that directly affect the adjacent lower elevation lands, especially the waters that flow down through the Buffer Zones and Transition Areas into



View of Squamish River plume in inner Howe Sound, photo: B. Turner

Howe Sound. This water source is of critical importance for community water supplies, for nurturing the limited lowland agricultural land and for enhancing wetlands, streams and lakes and the habitats they provide for a variety of floral and faunal species. These waters provide nutrients for the marine environments they flow into and critical spawning habitat for several species of anadromous fish. The Squamish River is the source of 90% of the fresh water in Howe Sound providing important exchanges with deep seawater.

In terms of human use, the terrestrial Core and Buffer Zoned areas are heavily forested and are managed to conserve natural resources, especially in the Protected Areas and the Resource Exclusion Areas. Recreation use is limited and managed to ensure recreation and conservation objectives are met.

In the marine environment, most of the protected glass sponge reefs are at or exceed depths accessible only by deep sea professional divers. The protection from bottomcontact fishing plus the protections of the Rockfish Conservation areas prohibiting hook and line fishing support accidental damage from uses in the Transition Zone.

4.6 Organizational Arrangements

(should be provided for the involvement and participation of a suitable range of inter alia public authorities, local communities and private interests in the design and the carrying out of the functions of

a biosphere reserve).

The range of organizational arrangements already in place, and those envisioned for the future, to implement the functions of a Biosphere Reserve vary from NGO-led initiatives, to more institutionalized arrangements within and among local and provincial government agencies with specific management authorities. There are many collaborative and co-management arrangements in place between NGOs, governments and First Nations. HSBRI's role is to encourage and develop collaboration among the various agencies and organizations.

4.6.1 Arrangements in Place or Foreseen

(Describe involvement of public and/or private stakeholders in support of the activities of the biosphere reserve in core, buffer and Transition Areas (such as agreements, protocols, letters of intent, protected areas) plans).

The Howe Sound Community Forum (HSCF) has been active in the region for the past 20 years. The purpose is to provide a forum for senior governments, local governments and First Nations discussion about maintaining and enhancing the economic, environmental, cultural and social well being of the Howe Sound region for the benefit of present and future generations.

The HSCF is not a decision-making body but enhances collective action among senior governments, local governments, and First Nations. Over the past 20 years, advocacy for comprehensive planning, marine protection, and other policy initiatives have resulted in actions taken by various levels of government. This assembly of local and provincial government agencies, First Nations and NGOs are committed to the Principles for Cooperation (see Appendix G). The members share information, discuss strategies for addressing common environmental and socio-economic issues, and collaborate toward sustainable solutions. The HSCF has been instrumental in facilitating the creation of HSBRS and this nomination to UNESCO for the establishment of a Biosphere Reserve. Members of the HSCF have provided letters of support for the AHSBR Initiative. (see Appendix E)

Participants in the AHSBR Roundtables, as described in Section 17, include a broader and more diverse representation of the region that support the objectives of the UNESCO framework and are committed to the AHSBR and HSBRS Guiding Principles. The AHSBR Roundtable complements the HSCF and will serve to further support activities in the region. Some of the many agreements, protocols, and co-management plans respecting the management of the core, buffer, and transition zones are referenced in section 17.1.4.

HSBRIS' role is to support and monitor the application of the many current and future protocols and arrangements that exist between agencies, First Nations and governments.

4.6.2 Cultural and Social Impact Assessments

Have any cultural and social impact assessments been conducted, or similar tools and guidelines been used? (e.g. Convention on Biological Diversity (CBD)'s Akwé: Kon guidelines; Free, Prior, and Informed Consent guidelines, Biocultural Community Protocols, etc.). (UNESCO's Programme on Man and the Biosphere (MAB) encourages biosphere reserves to consider and respect indigenous and customary rights through programmes or tools, in accordance with the United Nations Declaration on the Rights of Indigenous Peoples (http://www.un.org/esa/socdev/unpfii/documents/DRIPS_en.pdf when relevant and appropriate)).

To date, there have been no formal social or cultural impact assessments conducted specifically regarding First Nations in the AHSBR region, but the completion of Canada's Truth and Reconciliation Commission's report in 2015 is an assessment of social and cultural conditions affecting all First Nations People in Canada over the past century. Further, with Canada's formal adoption of UNDRIP

a year later in 2016, there is an enhanced recognition of basic human rights for all First Nations Peoples in Canada, as already recognized in Section 35 of the Canadian Constitution, including rights to self determination, language, equality and land, among others.

The adoption of the Commission's report and of UNDRIP has accelerated the pace at which Canada is moving forward with reconciliation with Indigenous people. The report has made a number of specific recommendations with respect to such social issues as child welfare, education, language and culture, health and justice, and identified a number of priority actions to pursue on the journey toward reconciliation, including improved recognition of First Nations rights and title.

In 1993, under the British Columbia Treaty process, the Squamish Nation officially began to negotiate aboriginal title to those lands and waters that constitute Squamish Nation traditional territory, rights to the resources of Squamish Nation traditional lands and waters, and the Squamish Nation inherent right to self-determination. The claim is currently at Stage Three of a six stage process (Squamish Nation, 2019).

BC and the Squamish Nation have worked for over a decade in the spirit of reconciliation through improved land use planning policy, government-to-government discussions and land use agreements, as occurred in the 2008 completion of the Sea-to-Sky Land and Resource Management Plan (LRMP) (which incorporates 74% of the AHSBR region). The plan and its accompanying Land Use Agreement with BC in 2007 identifies and protects a number of culturally significant areas as Wild Spirit Places, Conservancies and Wildlands, as well as other Cultural Management Areas and Sites, the use of which must protect First Nations values and ecological integrity. More recently, a 2012 agreement regarding the cooperative management of Este-tilwilh/Sigurd Creek Conservancy, Brackendale Eagles and Tantalus provincial parks and Baynes Island Ecological Reserve is in the process of implementation, and a similar cooperative management agreement is underway for Pinecone-Burke Provincial Park.

The Squamish Nation has developed and is now implementing its own independent assessment process for major projects proposed in its territory, known as the Squamish Nation Process. The 2015 "Squamish Nation Process, Getting to Consent" (Ratcliffe and Company 2015) outlines the background, what it is and how it may ultimately lead to the reconciliation of Crown and Squamish Nation decisions on major project proposals in Squamish territory.

More and more, organizations are adopting the understanding of applying an Indigenous Lens to their programs. Principles that all learning is grounded in understanding the connected relationship of language, land and culture. School District 48, Sea to Sky, is doing an exemplary job at integrating Indigenous learning, approaches and cultural components into the curriculum, a method to be emulated by other districts in B.C. and across Canada. The public and independent schools in the area are implementing curriculum and practices that pay homage to the heritage of the land and its original peoples – something that benefits Indigenous students but also non-Indigenous ones, according to educators. These changes have helped spike Aboriginal graduation rates, which some years recently has reached 100%, There are still challenges, but more commitments are being made. (Johnson, Feb 2020)

4.7 Mechanisms for Implementation

Does the proposed biosphere reserve have: (a) "mechanisms to manage human use and activities in the Buffer Zone or Zones"? If yes, describe. If not, describe what is planned

As discussed above in Section 4.5, the high elevation lands in the terrestrial Buffer Zones are excluded from, or have limited access for, resource activities such as forest harvesting, mining or large-scale hydro-electric development. They have been created for the expressed purpose of protecting biodiversity or because they lack harvestable resources due to high elevation.

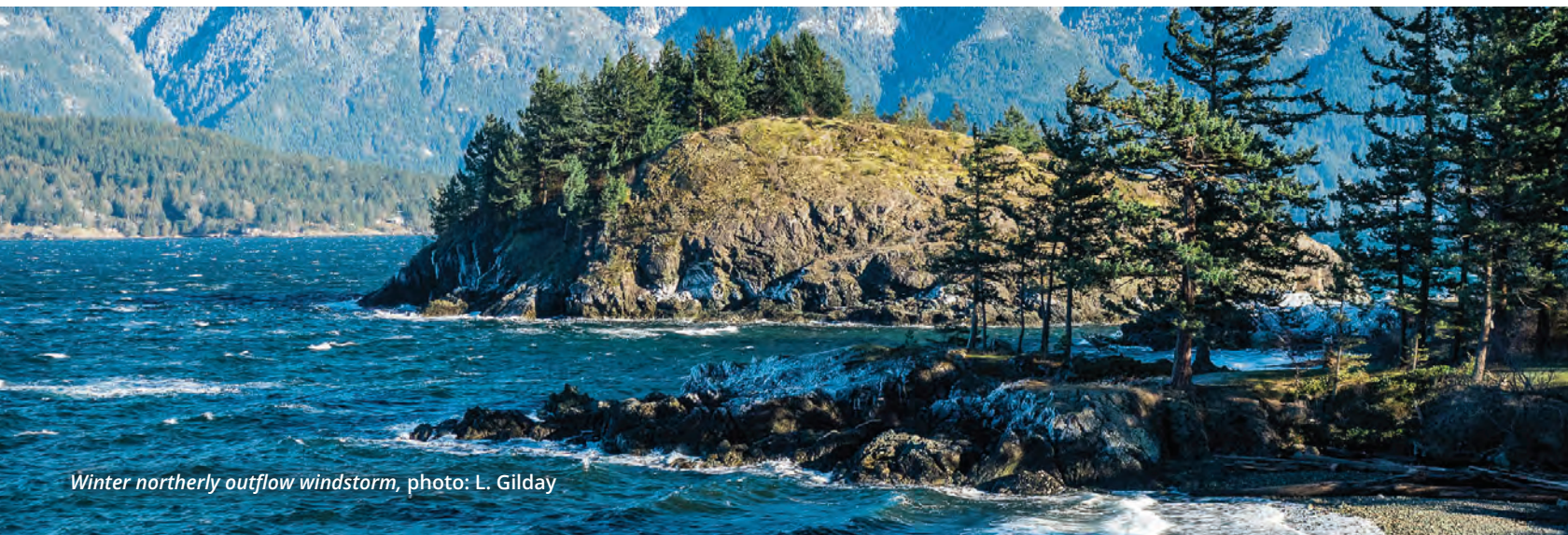
The remaining lands in the Buffer Zone lie outside the Timber Harvesting Land Base (THLB). Even though these lands are still potentially available for timber harvesting and other resource activity, they are generally considered to be physically or economically inoperable from a forest harvesting perspective due primarily to steep slopes, soil sensitivity and/or economic viability (Ministry of Forests and Range, 2008).

The wide range of resource activities on these lands, including forest harvesting, outdoor recreation, wildlife management and hunting, is managed by FLNRORD, the province's land and forest management agency, in accordance with several operational plans as mentioned in Section 4.3.2, in particular, the Forest Stewardship plans and the Landscape Unit plans that incorporate specific rules and conditions, including inter-agency referrals, for those proposing land use activity. Most of the lands are also managed under the guidance of the Sea to Sky LRMP and *Xay Temiewx* Plan so use of these Buffer Zone lands is clearly defined and co-managed with First Nations.

Fishing activities within the marine Buffer Zones are managed by Fisheries and Oceans Canada in cooperation with members of the public who help enforce the fishing regulations by calling Observe, Record and Reporting line which triggers investigation by Conservation and Protection officers. Various NGO's provide support to Fisheries and Oceans Canada through monitoring and reporting on changes and activities in the marine area. Management plans are created in cooperation with BC Parks for enhancing protection of the important conservation values.

(b) a management plan or policy for the area as a biosphere reserve"? If yes, describe. If not, state how such a plan or policy will be developed, and the timeframe. (If the proposed area coincides with one or more existing protected natural area(s), describe how the management plan of the proposed biosphere reserve will be complementary to the management plan of the protected area(s)).

As yet, there is no single management plan for the proposed Biosphere Reserve. An objective of HSBRS is for there to be a comprehensive and holistic land and marine use plan for the entire AHSBR region (see Section 13). AHSBR Roundtable provide a forum for considering management plans and actions that support a comprehensive plan. With representatives from various sector stakeholders, land authorities and First Nations participating in the AHSBR Roundtable, updating existing



Winter northerly outflow windstorm, photo: L. Gilday

management plans would be influenced towards the objectives of the Biosphere Reserve. In any planning for the region, referrals to HSBRI would be expected. The long term strategic plan for AHSBR will be developed with contributions from the AHSBR Roundtable participants taking into considering the existing plans and identifying the gaps and opportunities.

HSBRI participates as advisors to various committees and groups that are considering plans for the region. For example, the current management planning for Squamish community forest adjacent to the Garibaldi Provincial Park is complemented by the intentions to buffer core protected areas within the Biosphere Reserve (see Section 15.4.1).

(c) A designated authority or mechanism to implement this policy or plan?"

HSBRI is responsible for the strategic plan and management towards the objectives as described in Sections 3.3 and 17. There is no single authority responsible for the preparation and implementation the management plan for the Biosphere Reserve. The governance model for AHSBRI calls for a collaborative effort among its government, NGO and First Nations partners to undertake this task.

(d) Programmes for research, monitoring, education and training?" If yes, describe. If not, describe what is planned.

As described in Sections 3.3.4 and 16.1, there is a great deal of research and monitoring already taking place in AHSBR. For example, the Squamish River estuary has been undergoing restoration work over the past 20 years and ongoing projects continue to improve fish access. Newly discovered glass sponge reefs are being ground-truthed by Fisheries and Oceans Canada in the hope of future protection and restoration projects continue for stream-keeping and eelgrass mapping.

With its growing population and wealth of natural resources located on Metro Vancouver's doorstep, the region is, and will continue to be, a place for learning and discovery that is highly attractive to a wide array of government and university researchers and NGO groups as well as youth camps and field schools. The universities with active research programs in the region include the University of British Columbia, Simon Fraser University, BC Institute of Technology, Quest University and Capilano University. The First Nations contribution to learning and discovery is also highly significant, including the Squamish Nation's cultural journey programs that continue to connect youth to the traditions and language of their people.

Capilano University has signed a Letter of Engagement with HSBRI that provides a statement of intent and commitment focused on exploring novel educational opportunities,

specifically place-based learning and applied research in addition to a field school in the region, and also helping to identify sources of funding to support these initiatives. In line with its Vision 2030 the letter affirms the University's commitment to sustainability and to the local First Nations with respect to the Truth and Reconciliation Report's Call to Action and the UN's Declaration on the Rights of Indigenous Peoples.

The current HSBRI Board of Directors has engaged with Dr. David Zandvliet, Director of the Institute of Environmental Learning based at Simon Fraser University and the recently appointed UNESCO Chair of Biocultural Diversity Education, on a plan for ongoing collaboration. The Institute has as its mission the creation of a vibrant, active research and education network with the overarching goal a sustainable future for BC. It involves partnerships with researchers, educators, and government stakeholders as well as First Nations, industry and NGOs. It aims to facilitate education and action-oriented research around environmental learning and sustainability and has been chartered by the United Nations as a Regional Centre for Expertise on Education for Sustainable Development representing BC and the North Cascades. One member of the HSBRI Board has been invited to participate in the Institute for Environmental Learning's Advisory Council and Dr Zandvliet has been invited to join the HSBRI Working Group. Plans are underway to collaborate on the delivery of the Vancouver Ocean Literacy-focused Field School scheduled for May and June 2021. Discussions have also commenced on potential contributions to several Simon Fraser University Faculty of Education courses related to environmental education. Discussions also have placed priority on exploring funding opportunities that would leverage the strengths of HSBRI and the Institute of Environmental Learning focusing on place-based curriculum centered on Howe Sound.

Developing education programs about the UNESCO Biosphere Region program will be an important role for HSBRI. Through networking with other members of the World Network of Biosphere Reserves and the Canadian Network of Biosphere Reserves HSBRI will share and further extend its work on biodiversity conservation, sustainable development and Reconciliation; it will also communicate the outcomes of this work to both residents and visitors to the region on a regular basis. For many millennia First Nations have demonstrated the tremendous power of telling stories about harmonious human interactions with nature, noting how inextricably intertwined they are. A priority for HSBRI is partnering with groups specializing in the arts to enhance the communication process through using the powerful and effective medium of storytelling to convey the region's science on an emotional level.