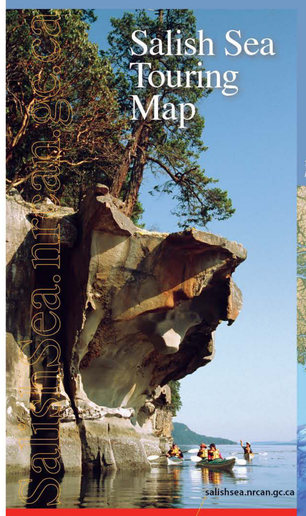
Natural Resources Canada | Ressources naturelles Canada

Salish Sea Touring Map



Canada

THE "SALISH SEA" INCLUDES THE INLAND COASTAL WATERWAYS OF SOUTHERN BRITISH COLUMBIA AND WASHINGTON STATE, INCLUDING THE STRAIT OF GEORGIA, JUAN DE FUCA STRAIT AND PUGET SOUND. THE NAME HONOURS THE COAST SALISH PEOPLES WHO HAVE LIVED IN THE PACIFIC NORTH-WEST FOR MANY THOUSANDS OF YEARS; AND RECOGNIZES THAT FLORA, FAUNA, CLIMATE AND GEOLOGY AREN'T BOUND BY THE BORDERS THAT EXIST BETWEEN COUNTRIES TODAY.

The boundary of the Salish Sea is outlined in the map below.

Klomoks First Nation, Comox, pictured.

Travelling through Seymour Narrows.

Goose Spit in Comox.

Mount Washington is a short drive from Courtenay.

FOLLOW THE FERRY ROUTE FROM THE SHORES OF THE FRASER DELTA, OVER FOOTBALL-FIELD-SIZED SPONGE REEFS, ACROSS ANCIENT FAULT LINES, TO SANDY BEACHES AND WHIRLING TIDAL POOLS FOR A GLIMPSE OF THE MARVELS OF THE SALISH SEA.

SalishSea.nrcan.gc.ca

TAKE A PEEK UNDER THE SALISH SEA: THE REEFS, GIANT SAND DUNES AND DANGEROUS UNDERWATER MOUNTAINS. This map is a guide to some of the fascinating geological and marine points of interest in the Salish Sea region.

This large ecosystem covers 18,000 square kilometres of water, and is home to 7 million people, more than 200 species of fish, 20 different marine mammals, 100 types of birds, and over 3,000 invertebrate species.

It's an area of great natural beauty, an important trade route, and a source of many natural resources. But it's also an area influenced by massive and ongoing geological forces.

Understanding the remarkable geology of the region, through ongoing exploration and research, is vital to the sustainability of the humans, plants and animals that call the Salish Sea their home.

For more information on the science and marine geology of the features in this map, purchase a copy of the Salish Sea GeoTour Guide, or visit **bcgeotours.nrcan.gc.ca** for free information on the Salish Sea area and other regions in British Columbia.

Natural Resources Canada
nrcan-rncan.gc.ca

Geological Survey of Canada
gsc.nrcan.gc.ca

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Thanks to: Phillip Hill, P. Jane Wynne, Audrey Dallimore and Robert Kung.
Written by Kiri Westnedge. Designed by Avril Goodall.
Cover: Kayakers explore the sandstone cliffs of Gabriola Island.
Photo courtesy of Pacific Northwest Expeditions Ltd., seakayakbc.com.

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Vancouver

1 BURRARD INLET SILL

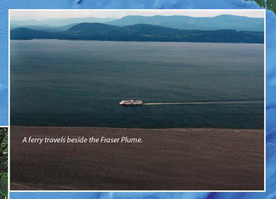
During the last Ice Age, glaciers flowing from the Coast Mountains filled the Salish Sea with almost two kilometres of ice. As the glaciers travelled down British Columbia's inlets, they scoured out deep fjords, and brought huge amounts of rock and silt to the mouth of the inlets. Left behind when the glaciers retreated, the piles of rubble formed giant ridges or *sills*. In Vancouver's harbour, the sill is 15 kilometres long and only 15 metres deep at low tide – a large headache for the captains of cargo and cruise ships!

Burrard Inlet, Vancouver's harbour. PictureBC

Multibeam image showing the Ice Age sill at the entrance to Burrard Inlet.

2 FRASER PLUME

The Fraser River carries a large load of sediment out to the Strait of Georgia, particularly in the spring when the flow of the river is strongest. The sediment is propelled out into the ocean, forming a noticeable plume of light brown coloured water (right). The large area covered by the plume gives us a good idea of the enormous amount of sediment and fresh water that enters the Strait from the river every day.


A ferry travels beside the Fraser Plume.

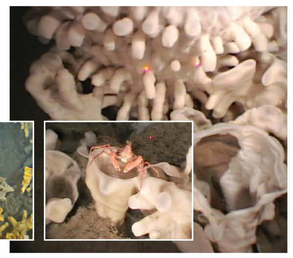
Because the dispersion of river water depends on tidal and wind-driven currents, the shape of the Fraser Plume is constantly changing.

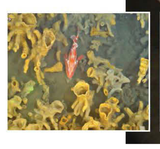
Image courtesy of the Galiano Conservancy Association

Strait of Georgia

3 SPONGE REEFS

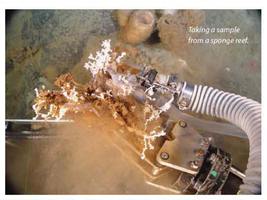
Active Pass Sponge Reefs – Sponges are found worldwide, but the only place they're known to form reefs is on the continental shelf of British Columbia. Scientists think the sponge reef at the eastern entrance to Active Pass is several centuries old. It's as big as several football fields, has individual sponges as tall as four metres high, and is important habitat for juvenile rockfish.

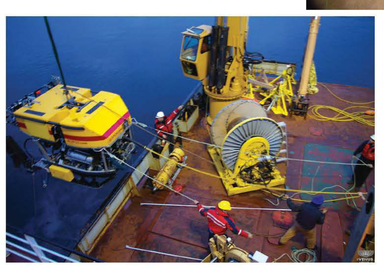




4 VENUS PROJECT

Victoria Experimental Network Under the Sea (VENUS) – VENUS is a seafloor network of cables that provides real time images and information to anyone with an internet connection. Scientists use some of the VENUS data to track the 18-million cubic metres of sand, mud, rock and clay deposited by the Fraser River each year. That's enough to bury downtown Vancouver under six metres of sediment! Most of the sediment accumulates at the mouth of the river, building a steep slope. If the slope fails, it could trigger an underwater landslide and a tsunami. By tracking the deposits, scientists can help port authorities to plan for, and implement measures to reduce the risk of a natural hazard.


Taking a sample from a sponge reef.


Photos courtesy of VENUS: venus.uvic.ca.

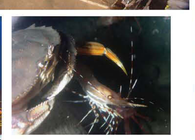


Photo of a Dungeness crab and B.C. Spot Prawn taken by VENUS cameras.

VENUS instruments sit on the seafloor in the Fraser Delta, the Strait of Georgia and the Saanich Inlet, and send data to the VENUS facilities using fibre optic cable.

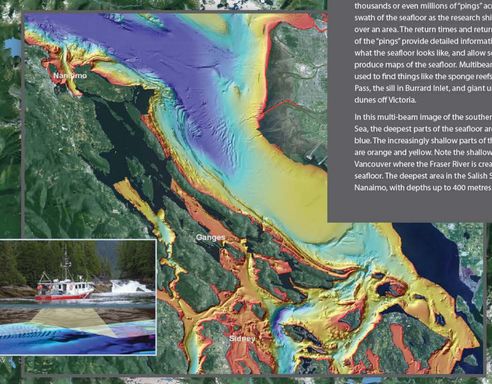
venus.uvic.ca

Salish Sea Touring Map

Seeing the Seafloor

Scientists use multi-beam sonar to get a "picture" of what the seafloor looks like, what it's made of, and to study things like marine habitats and faults in the seafloor. Multi-beam echosounders send thousands or even millions of "pings" across a wide swath of the seafloor as the research ship travels over an area. The return times and returned energy of the "pings" provide detailed information on what the seafloor looks like, and allow scientists to produce maps of the seafloor. Multibeam sonar was used to find things like the sponge reefs in Active Pass, the sill in Burrard Inlet, and giant underwater dunes off Victoria.

In this multi-beam image of the southern Salish Sea, the deepest parts of the seafloor are dark blue. The increasingly shallow parts of the seafloor are orange and yellow. Note the shallow areas off Vancouver where the Fraser River is creating new seafloor. The deepest area in the Salish Sea is off Nanaimo, with depths up to 400 metres.



Savary Island. Photo by Russ Heinl

Sunshine Coast communities.

The Salish Sea is a source of many natural resources, including fish and crustaceans.

Horseshoe Bay Ferry terminal.

Parksville's famous beaches. PhotoBC.

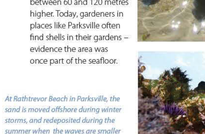
VENUS equipment being deployed. Photo courtesy of VENUS.

City of Vancouver.

Fraser River Delta.

Boundary Bay.

Fraser Valley.


A ferry in Active Pass, viewed from Galiano Island.

Glass sponge in Strait of Georgia

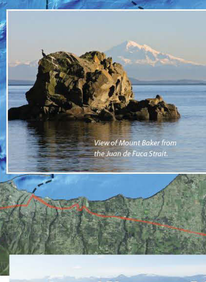
Saltspring Island.

Goldstream Park.

The bottom waters of Saanich Inlet are mostly stagnant and bottom-dwelling creatures can't survive there.

View across Saanich Inlet.

Saanich Inlet.


View of Mount Baker from the Juan de Fuca Strait.

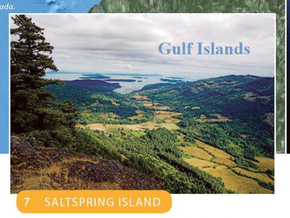
Geologists studying sediment layers in Saanich Inlet.

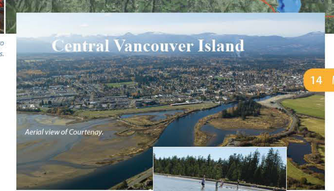
Geologists prepare a freeze core to sample delicate ocean sediments.

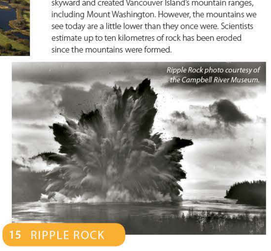
Mammoth tooth

Sidney Spit. Photo by Russ Heinl

Victoria

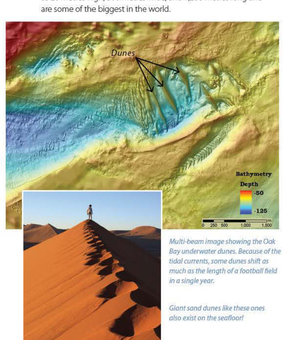

Gulf Islands


Aerial view of Courtenay.


Ripple Rock photo courtesy of the Campbell River Museum.

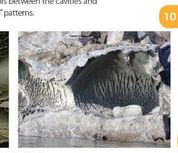
The waters of Skookumchuk Narrows are always a wild ride through the tidal currents, no matter the form of transportation.

Galiano shell midden.

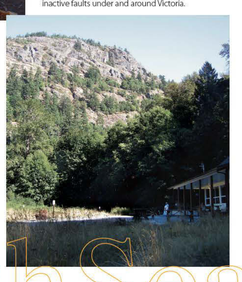

Multi-beam image showing the Oak Bay underwater dunes. Because of the tidal currents, some dunes shift as much as the length of a football field in a single year.

Giant sand dunes like these ones also exist on the seafloor!

Stunning details of the sandstone cliffs of Gabriola Island. Photos courtesy of seakayakbc.com.



James Island from Island View Beach



5 THE EMPRESS HOTEL

Victoria is made up of a number of basins. When glaciers from the last Ice Age retreated, mud and clay were washed down to the centre, creating a soft basin floor. The north wing of the Empress was built on gravel and bedrock, but the south wing was built on softer mud and clay. During construction of the south wing between 1912 and 1915, engineers had to re-level the wing every month. By 1973, the wing had sunk a total of 73 centimetres, although much of the sinking occurred within the first five years.

6 OAK BAY SAND DUNES

Just off the beach at Oak Bay, strong tidal currents have created giant underwater sand dunes. They've been measured as tall as 26 metres high, 300 metres wide, and 1,200 metres long and are some of the biggest in the world.

7 SALTSPRING ISLAND

During the last Ice Age, ice and water eroded the softer sandstone and shale on the Gulf Islands, creating the valleys and bays. The harder, erosion resistant sandstone remained, creating dramatic headlands and ridges.

8 GABRIOLA ISLAND

The Malaspina Galleries at Gabriola Island – and many other sandstone cliffs in the Gulf Islands – have unusual patterns and cavities. Honeycomb weathering requires permeable rock, a source of soluble salt like ocean water, and repeated episodes of wetting and drying. In some places on the sandstone, a type of algae provides a protective barrier, preserving the walls between the cavities and creating the wonderful "honeycomb" patterns.

9 ISLAND VIEW BEACH

The cliff at the southern end of Island View Beach is a wonderful record of the glacial history of the area. The topmost layer in the cliff, about 40 metres high, shows the sea level during the last glacial period, about 13,000 years ago. The layers at the base of the cliff may be as old as 80,000 years old; rare evidence of one of the oldest glacial events on Vancouver Island.

10 JAMES ISLAND

Best viewed from Island View Beach, only half of James Island is still above water. The southern end of James Island is now just a shallow part of the sea-floor. Wind and waves are slowly eroding the glacial sands and gravels, re-depositing them on both sides of the island and in deeper water.

11 SAANICH INLET

For thousands of years, an underwater ridge at the entrance to Saanich Inlet has allowed sediments in the inlet to accumulate undisturbed. These sediments tell scientists many stories, including the history of earthquakes in the area. When earthquakes occur, landslides deposit discrete layers of sediment on the seafloor. Scientists can date the layers to specific periods of time. These sediments show that a very large earthquake occurs in this area about once every 500 years, with many smaller earthquakes in between.

12 MOUNT FINLAYSON

Survey Mountain Fault – Best seen from the Visitor's Centre at Goldstream Park, the exposed cliff of Mount Finlayson is the site of a massive collision between two ancient pieces of the Earth's crust. The upper half of the cliff is older rock that was pushed up over the younger rock, seen at the bottom of the cliff. The crumpled looking area in the middle marks the collision zone. The Survey Mountain Fault is one of many ancient, inactive faults under and around Victoria.

13 PARKSVILLE

When ice from the last Ice Age melted 13,000 years ago, shorelines were between 60 and 120 metres higher. Today, gardeners in places like Parksville often find shells in their gardens – evidence the area was once part of the seafloor.

At Rathtrevor Beach in Parksville, the sand is moved offshore during winter storms, and redeposited during the summer when the waves are smaller and wind is calmer.

14 MOUNT WASHINGTON

Between 45 and 52 million years ago, two pieces of the Earth's crust crashed into the piece of crust Vancouver Island was sitting on. This massive crash thrust ancient rock skyward and created Vancouver Island's mountain ranges, including Mount Washington. However, the mountains we see today are a little lower than they once were. Scientists estimate up to ten kilometres of rock has been eroded since the mountains were formed.

15 RIPPLE ROCK

The twin peaks of this underwater mountain caused many maritime disasters until the top of the mountain was blown off in 1958. At low tide, the mountain was less than three metres below the surface. The explosion displaced 635,000 tons of rock and left the twin peaks a somewhat safer 14 metres below the surface of Seymour Narrows.

16 POWELL LAKE

The "lake" is actually a 300-metre-deep land-locked inlet, cut off by a rocky isthmus. While the top layer is fresh water, samples taken 121 metres below the surface produced salt water. Water at the bottom of the lake is thought to be 10,000 years old.

17 SKOOKUMCHUK NARROWS

Every day 200 billion gallons of seawater rush between Jervis Inlet and Sechelt Inlet, creating some of the fastest moving tidal rapids in North America. The water rushes over a bedrock lip, and the difference in sea level on each side of the lip can exceed two metres, creating spectacular whirlpools and whitewater.

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