

KEATS ISLAND

MAP 1 of 3: Distribution of Shoreline Types

The Keats Island shoreline is largely rock-controlled and resistant to erosion, except for some sections of cobble and sand shoreline where either the backshore is comprised of unconsolidated materials, or sediment has collected in depositional pocket beach environments. The south side of Keats Island is protected on the southwest and south side by Bowen Island as well as a group of small islands (ie: Popham, Hermit and Pasley Islands) that effectively break up storm-generated waves moving across Georgia Strait. The northeast side of Keats Island is exposed to northeasterly outflow winds that flow down Howe Sound, but again largely protected from storm waves by Gambier Island. So although Keats Island is located at the mouth of Howe Sound, the shoreline is a relatively low-energy shoreline from a wave and sediment movement perspective. However, wind is likely a significant factor affecting both the north and south shorelines.



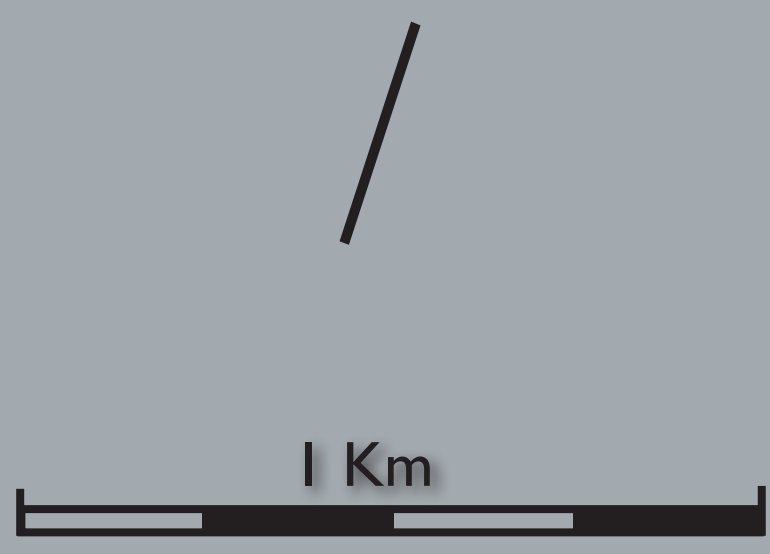
structurally altered*

*Shorelines modified by facility development, principally boat ramps, seawalls, riprap, landfills, dykes, piers, groynes, or breakwaters.

LEGEND:

- Sections of shoreline with significant structural alterations (>30% altered)

KEATS ISLAND:
1.5 Km (9%)
Structurally Altered Shoreline



DATE: February 21, 2013
Refer to Islands Trust Report "Gulf Islands Shoreline Mapping - Project Methodology" July, 2011 for detailed map information.

SEA CLIFF	LOW ROCK/BOULDER	BLUFF	BOULDER/COBBLE	PEBBLE/SAND	MARSH/FINE SEDIMENT
<ul style="list-style-type: none"> rocky shore with steep slopes 3% of shoreline (1.6 Km) 	<ul style="list-style-type: none"> rocky shore with low slopes 35% of shoreline (18 Km) 	<ul style="list-style-type: none"> moderate to high slopes of sediment (often eroding) 9% of shoreline (4.6 Km) 	<ul style="list-style-type: none"> boulder - cobble cover on beach (often indicates eroding shoreline) 29% of shoreline (14.7 Km) 	<ul style="list-style-type: none"> stable or accreting pebble-sand (or shell) beaches (may be eroding where sediment supply is interrupted) 18% of shoreline (9 Km) 	<ul style="list-style-type: none"> low energy shorelines with sediment inputs from watersheds nearby 5% of shoreline (2.8 Km)
Rock (Hard) Shorelines			Sediment (Soft) Shorelines		

KEATS ISLAND

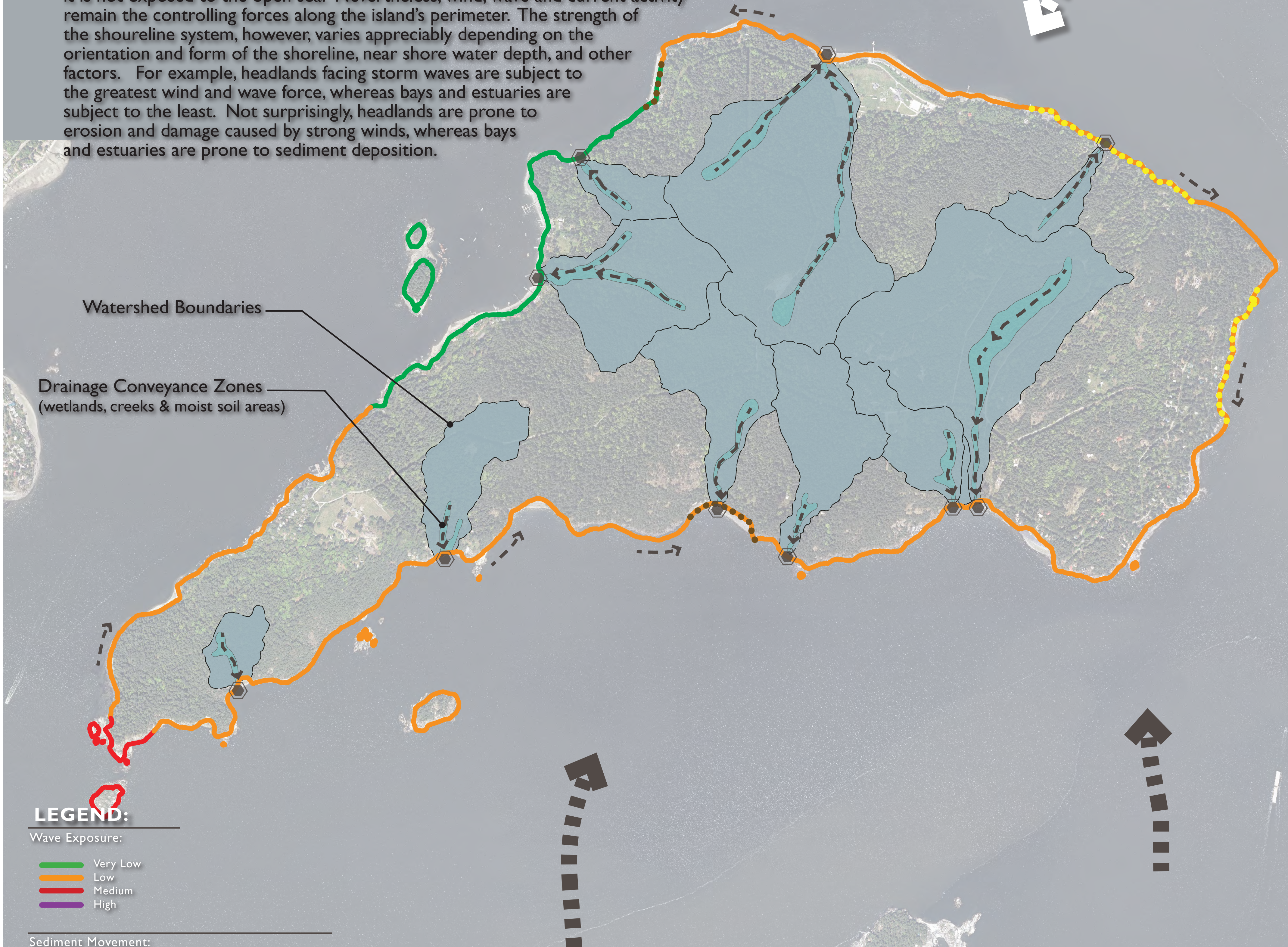
MAP 2 of 3: Energy & Sediment Movement

ISLAND ENVIRONMENTS are shaped by two primary or formative systems:

- 1) watershed systems; and
- 2) longshore systems.

Watersheds are driven by runoff, and longshore systems are driven by waves and ocean currents. Attempts to understand island shoreline systems, including discussions about land use planning, should be framed by these systems. Within this framework all other systems (natural systems like forests, wetlands, eelgrass beds, etc. and human systems like roads, buildings, etc) are organized and structured.

KEATS ISLAND belongs to a class of sea coast known as sheltered shoreline because it is not exposed to the open sea. Nevertheless, wind, wave and current activity remain the controlling forces along the island's perimeter. The strength of the shoreline system, however, varies appreciably depending on the orientation and form of the shoreline, near shore water depth, and other factors. For example, headlands facing storm waves are subject to the greatest wind and wave force, whereas bays and estuaries are subject to the least. Not surprisingly, headlands are prone to erosion and damage caused by strong winds, whereas bays and estuaries are prone to sediment deposition.



LEGEND:

Wave Exposure:

- Very Low
- Low
- Medium
- High

Sediment Movement:

- Accretion Shorelines (adding sediment)
- Erosion Shorelines (losing sediment)
- Watershed Sediment Inputs to Shoreline System
- Localized Sediment Movement Direction (Small Scale)
- Predominant Direction of Wave Energy

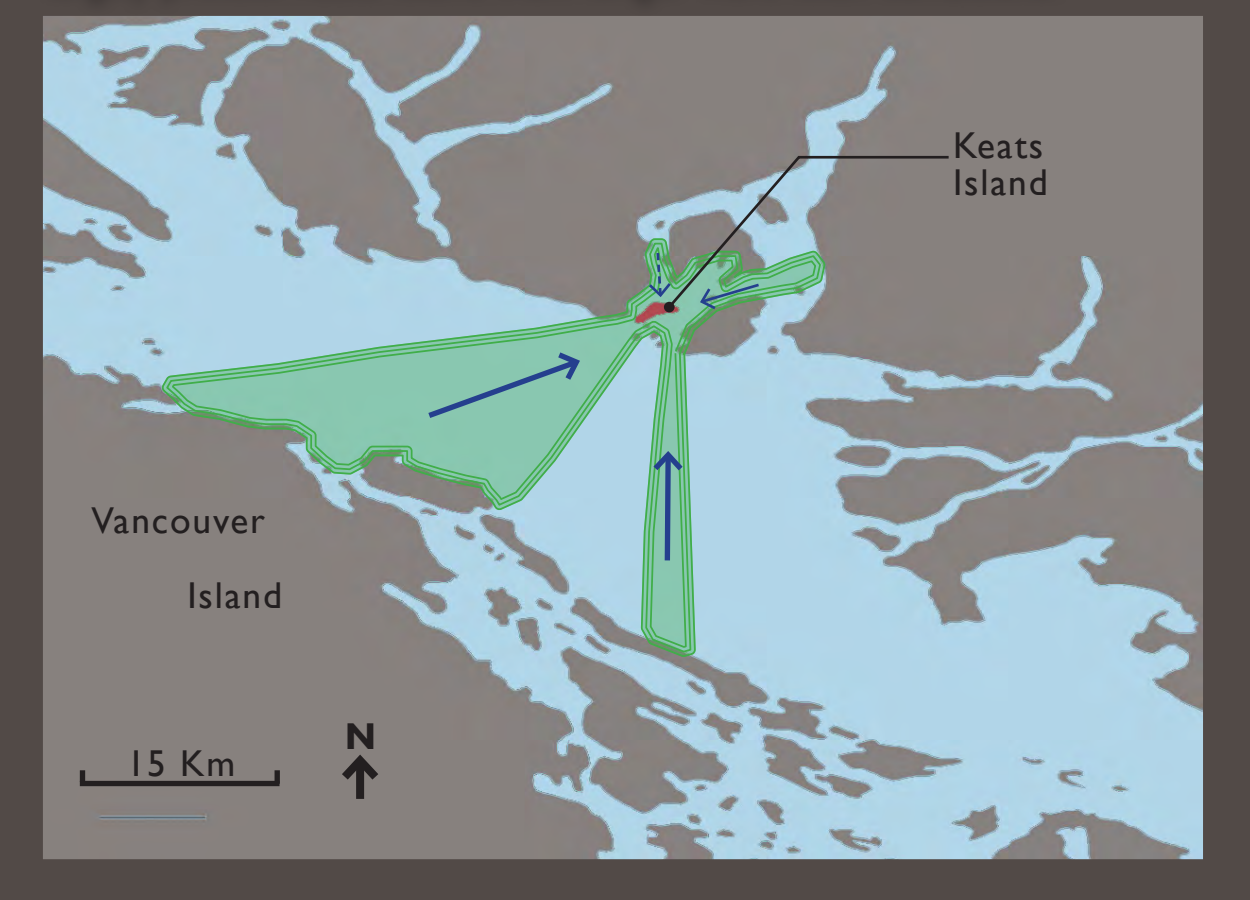
Making Sense of the Energy Systems:

The coloured shorelines on this map indicate that for Keats Island, the highest wave exposures occur on the southeast side and southwest tip of the island, as well as the northern shoreline. Sediment flow direction is difficult to decipher for this island, but largely reflects wind exposure characteristics.

Despite the consistency between exposure rating and sediment flow direction for this island, it is important to note that wave exposure and the predominant energy flow direction are measuring two very different effects. Wave exposure is a function of wave fetch (as described in the inset to the right) and wind strength from a given direction. The southwest tip of Keats Island has a long fetch relative to other Keats Islands shorelines, and our region receives strong storm winds from the south – this combination of factors results in southwest tip of the island having a high wave exposure rating. Predominant energy flow direction on the other hand, is the cumulative effect of storms over time. Our region receives some winter outflow winds from the north, and also strong winter winds and storms come from the south. For Keats Island, its exposure to northeast outflow winds flowing out of Howe Sound means that the dominant sediment movement direction is complex, driven by both northeast outflow winds and storms from the south.

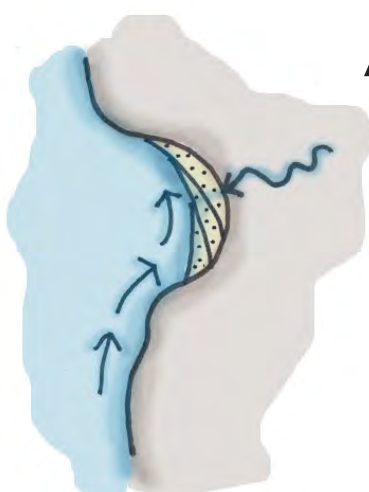
Wave Fetch & Energy:

Waves are generated by wind. Wave fetch is the distance over which wind can push water to generate waves - generally, the longer the fetch, the larger the waves. In the diagram below, the wave fetch for Keats Island is shown in green. Gambier Island, Bowen Island, the Gibsons Headland and the Popham/Pasley/Hermit/Worlcombe group of islands largely protect Keats Island from longer wave fetch conditions.



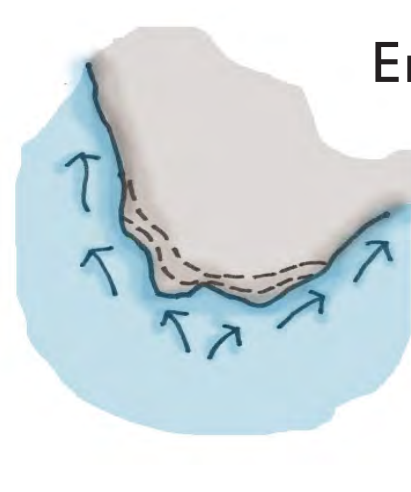
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Accretion Shorelines:

Sediment accumulation (accretion) is typically associated with lower energy environments along the shorelines. Accretion features include sandy beaches, beach berms, pocket beaches or storm berms, and are often high value recreation features or wildlife habitats.



Erosion Shorelines:

Eroding shorelines are typically associated with higher energy environments along the shorelines, like headlands, high exposure sediment shorelines or points of land. Eroding shorelines feed the sediment transport system and halting erosion can have severe impacts on the shoreline sediment movement system and 'downstream' beaches. Adequate setbacks for buildings and facilities are critical.



Trees and vegetation damaged or shaped by the wind along shorelines are good indicators of high wind exposure. Caution should be exercised when siting buildings and facilities in these locations to ensure they are adequately set back from the shoreline.

Wave Exposure & the Sediment System

Wind Exposure & Buildings

KEATS ISLAND

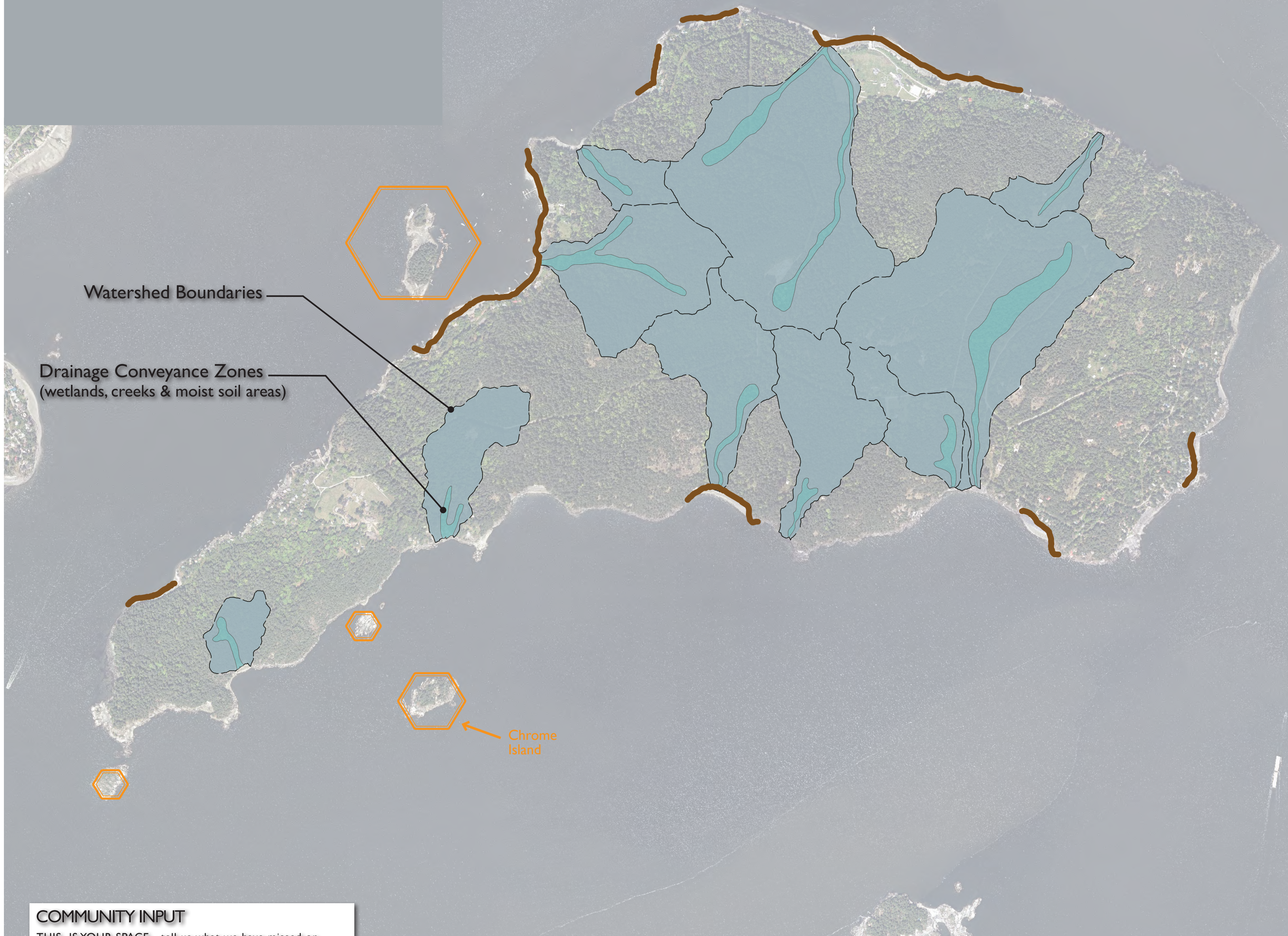
MAP 3 of 3: Shoreline Values & Vulnerability

This map is intended to give a general impression of areas along the Keats Island shoreline that are considered valued and/or vulnerable to change. Value refers to areas or features of high ecological or recreational significance.

Vulnerability refers to:

- 1) Natural areas or features vulnerable to human disturbance; or
- 2) Buildings or facilities, vulnerable to disturbance from natural or human-altered system processes.

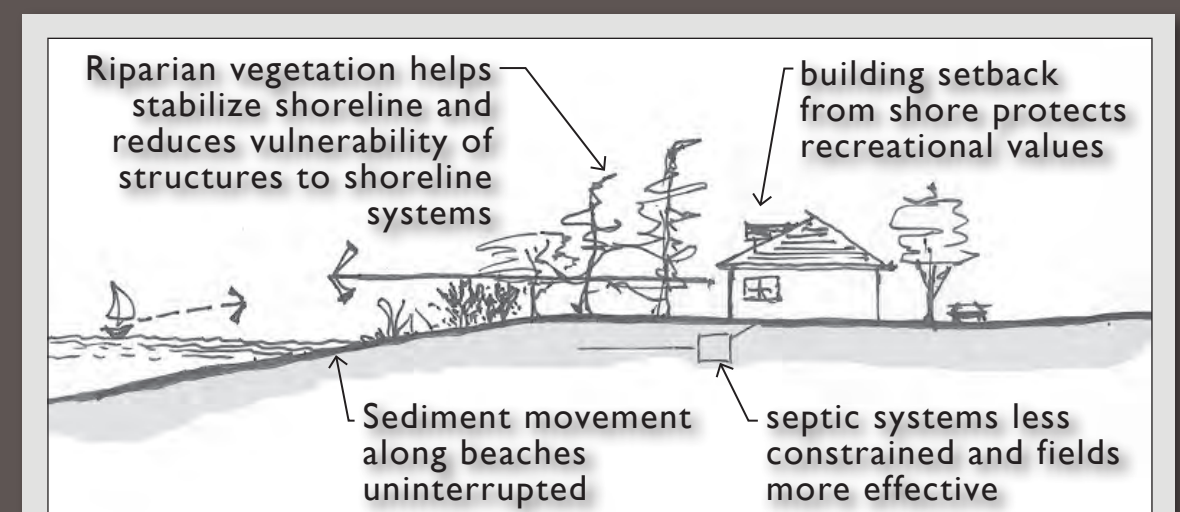
It is important to note that the various features highlighted on this map are in many cases both vulnerable in some way, *and* valued. Saltmarshes for example are of high ecological value, *and* are also vulnerable to accumulation of pollutants potentially contained in island runoff.



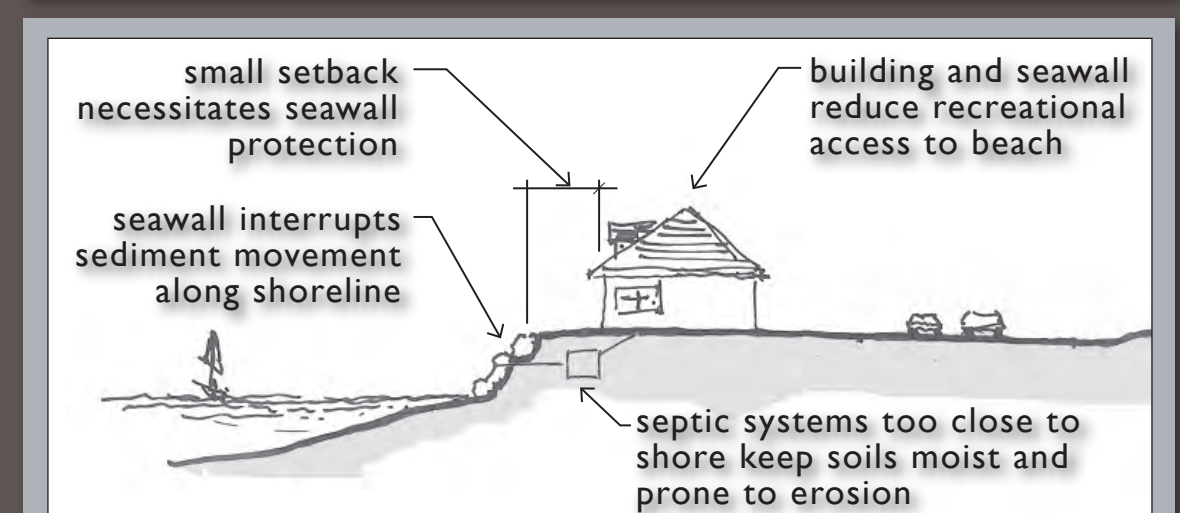
COMMUNITY INPUT

THIS IS YOUR SPACE - tell us what we have missed or where you think the mappers have erred to help us build a more comprehensive values and vulnerability resource! Feel free to make notes right on the map also.

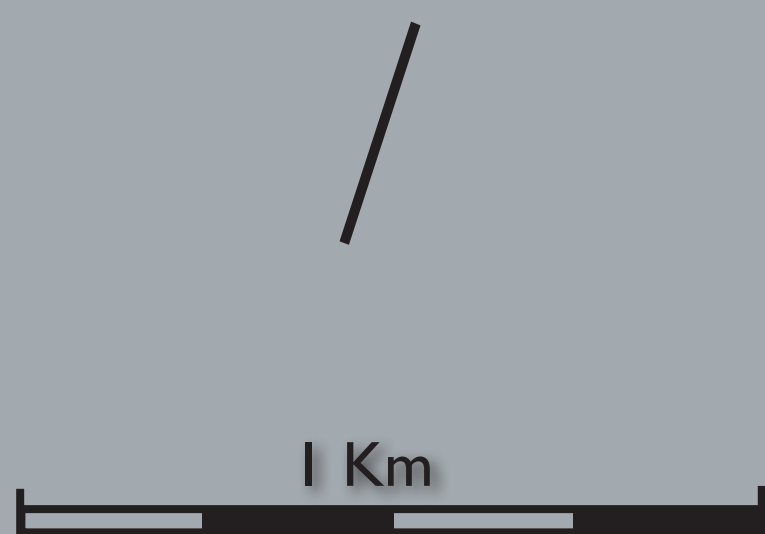
FACILITY SITING & SETBACKS



Lower Facility Risk - Improved Shore Protection



Higher Facility Risk - Loss of Shore Values



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LOW LYING AREAS

- Areas 0-4 m in elevation above existing Mean Sea Level and greater than 50 m of width from the shore are mapped as 'vulnerable' to sea level rise.

Current BC Provincial Government guidelines suggest up to 1 metre of sea level rise over the next 100 years (www.env.gov.bc.ca). Sea level rise may cause increased shoreline vulnerability to land-based activities by causing such effects as increased flooding in low lying areas or softening of sediment shorelines and increased shoreline erosion. These effects could be further exacerbated by storm surges and changing climatic conditions.

SOFT SHORELINES

- Sediment shorelines are typically associated with high recreational values and high ecological values (pocket beaches, estuaries, etc).

VERY PROTECTED WATERS

- Shorelines highly protected from wave exposure
- Poor water circulation increases vulnerability to water pollution

SALT MARSH

- Valued ecological features
- Vulnerable to pollution from land-based activities

ISLETS

- Often important ecologically, islets can be vulnerable to disturbance from recreational users

Areas of High Ecological or Recreational Significance