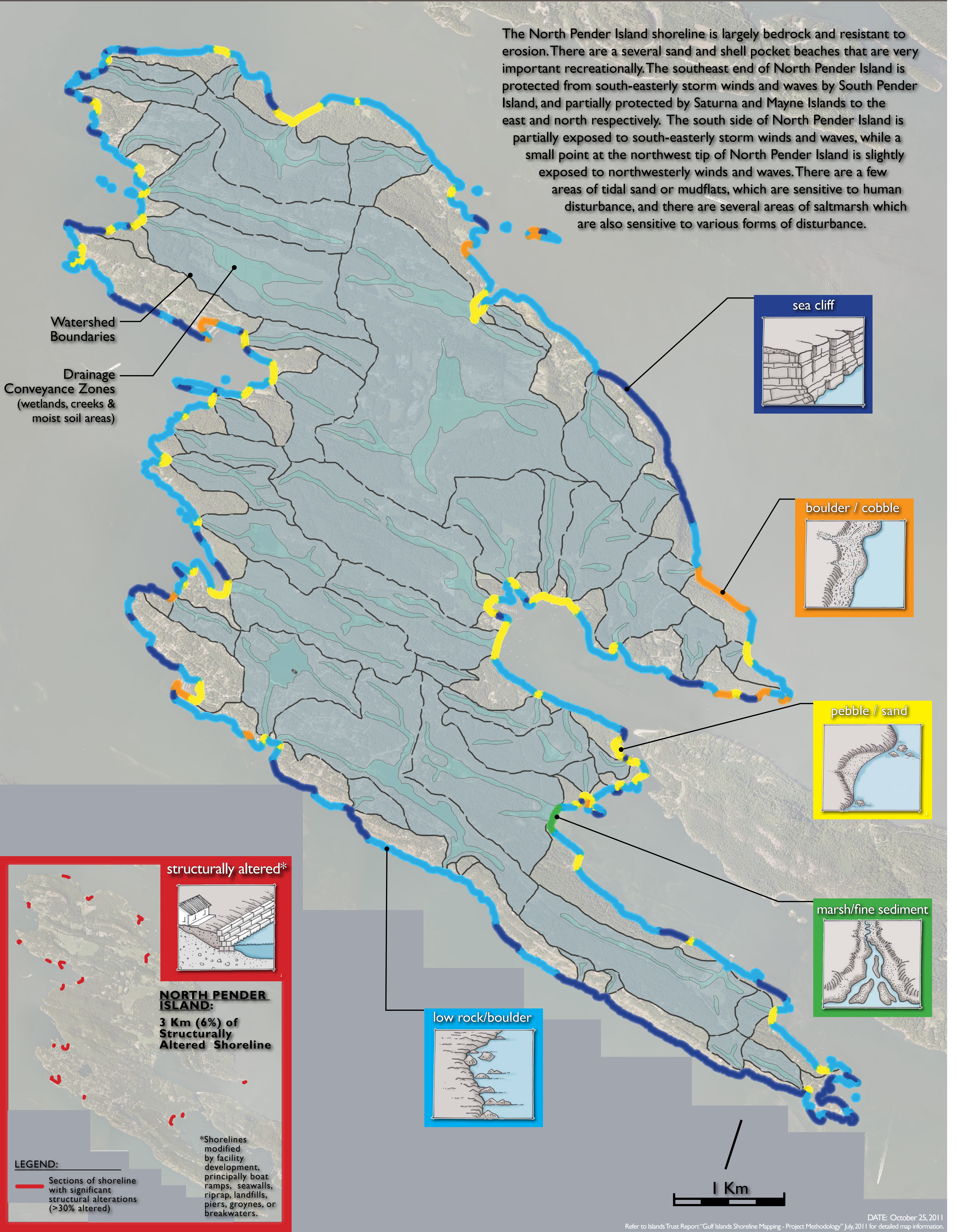


NORTH PENDER Is.

MAP 1 of 3: Distribution of Shoreline Types

The North Pender Island shoreline is largely bedrock and resistant to erosion. There are a several sand and shell pocket beaches that are very important recreationally. The southeast end of North Pender Island is protected from south-easterly storm winds and waves by South Pender Island, and partially protected by Saturna and Mayne Islands to the east and north respectively. The south side of North Pender Island is partially exposed to south-easterly storm winds and waves, while a small point at the northwest tip of North Pender Island is slightly exposed to northwesterly winds and waves. There are a few areas of tidal sand or mudflats, which are sensitive to human disturbance, and there are several areas of saltmarsh which are also sensitive to various forms of disturbance.



SEA CLIFF

- rocky shore with steep slopes
- 27% of shoreline (13.3 Km)

Rock (Hard) Shorelines

LOW ROCK/BOULDER

- rocky shore with low slopes
- 53% of shoreline (26.5 Km)

Rock (Hard) Shorelines

BLUFF

- moderate to high slopes of sediment (often eroding)
- North Pender Island has no bluff shores

Sediment (Soft) Shorelines

BOULDER/COBBLE

- boulder - cobble cover on beach (often eroding)
- 4% of shoreline (2.1 Km)

Sediment (Soft) Shorelines

PEBBLE/SAND

- stable or pebble-sand (or shell) beaches (may be eroding where sediment supply is interrupted).
- 15% of shoreline (7.8 Km)

Sediment (Soft) Shorelines

MARSH/FINE SEDIMENT

- low energy shorelines with sediment inputs from watersheds nearby
- 0.6% of shoreline (0.3 Km)

Sediment (Soft) Shorelines

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. Any attempt to understand the islands, including discussions about land use planning, must 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.

NORTH PENDER 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 remains the controlling force along the island's perimeter. The strength of this 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

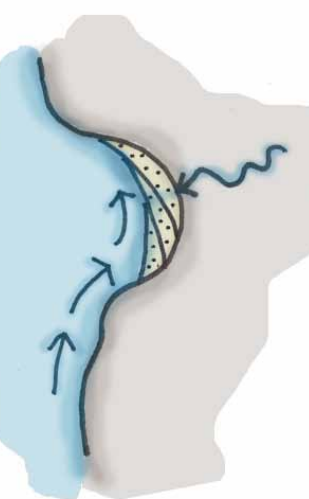
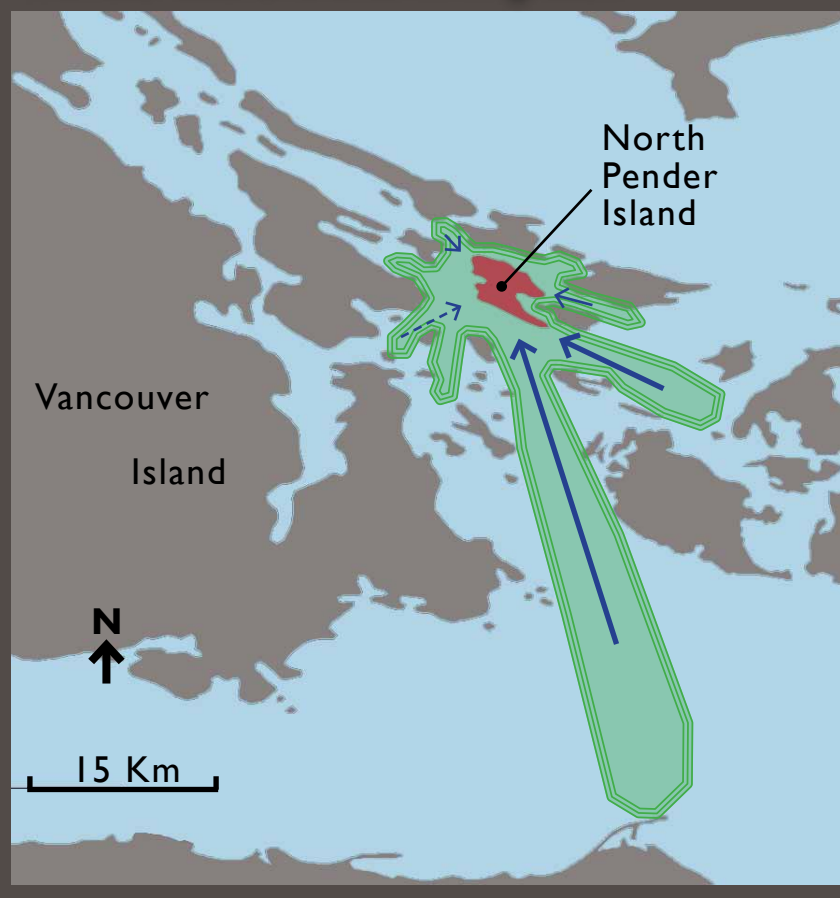
Making Sense of the Energy Systems:

The coloured shorelines on this map indicate that for North Pender Island, the highest wave exposures occur on the south side of the island. The arrows indicate that the predominant wave energy system flow direction is from south to north.

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 represent 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 south shore of North Pender Island has a long fetch relative to other North Pender Island shorelines, and our region receives strong storm winds from the southeast – this combination of factors results in the south facing beaches 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, but the majority of strong winds and storms come from the southeast. For North Pender Island, this means that the dominant sediment movement (relatively little sediment exists on the North Pender Shoreline because it is predominantly rocky) direction is northward, driven by the south-easterly storms.

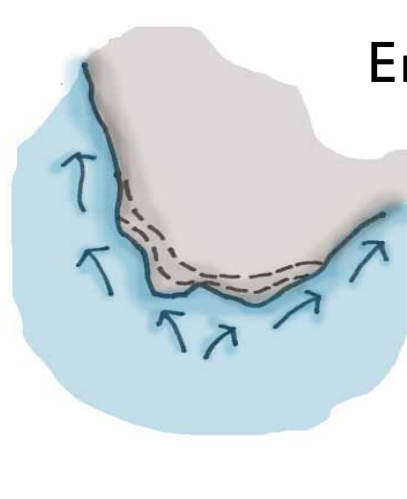
Wave Fetch & Energy:

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 North Pender Island is shown in green.



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

DATE: October 25, 2011
Refer to Islands Trust Report "Gulf Islands Shoreline Mapping - Project Methodology" July, 2011 for detailed map information.

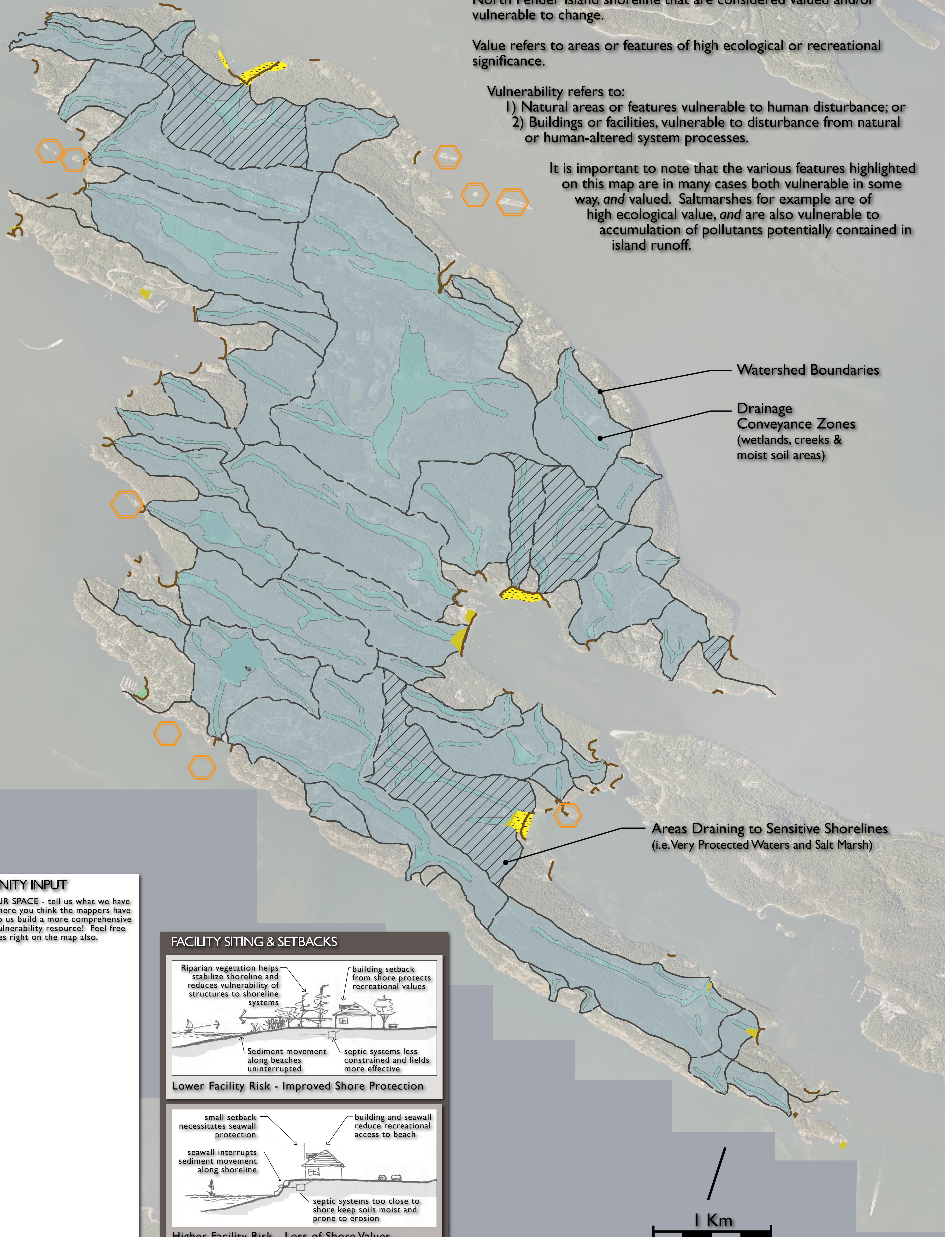
This map is intended to give a general impression of areas along the North Pender Island shoreline that are considered valued and/or vulnerable to change.

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.



Watershed Boundaries

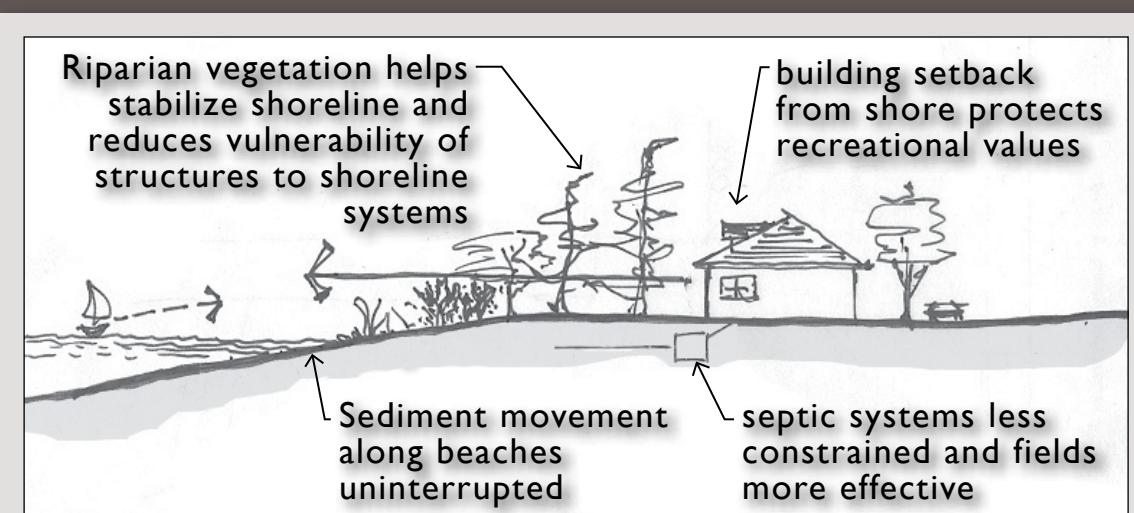
Drainage Conveyance Zones (wetlands, creeks & moist soil areas)

Areas Draining to Sensitive Shorelines (i.e. Very Protected Waters and Salt Marsh)

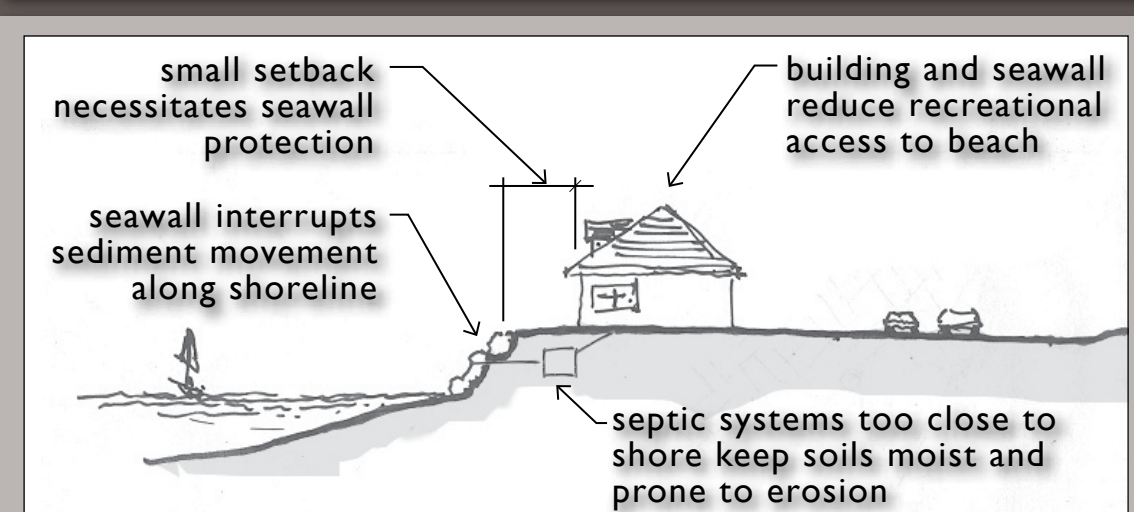
COMMUNITY INPUT

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

1 Km

DATE: October 26, 2011

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

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