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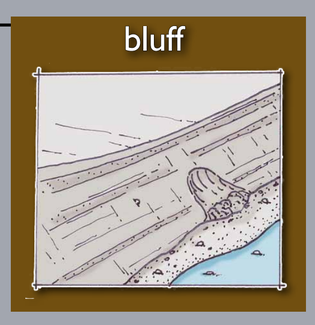
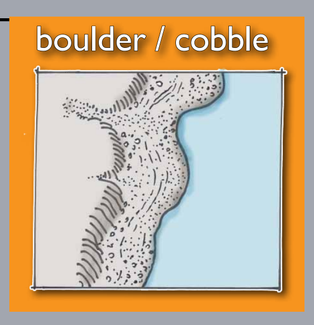
MAP 1 of 3: Distribution of Shoreline Types

The Denman Island shoreline has three main morphologies: low rock/boulder or wave-cut platforms resistant to erosion, boulder/cobble lag deposits from eroding unconsolidated shorelines and sand/pebble/shell hash bars and tidal flats from re-worked fine sediments. The southeast side of Denman Island is exposed to southeasterly storm wind and waves, and the northeast side of Denman Island is exposed to northwesterly winds and waves.

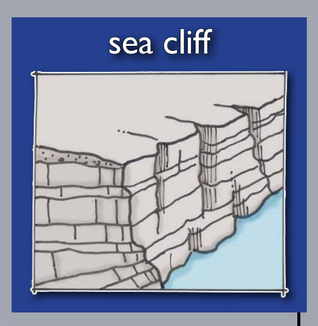
Significant areas of fine sediments, mudflats, or protected estuaries of low water circulation are present on the Denman shoreline, including Sandy Island and Seal Islets in the sand bar/wave-cut platform complex off the northern tip of the island. There are lag deposits of boulder/cobble just below the high waterline from eroding unconsolidated shorelines on both east and west sides of the north section of Denman Island. There are also several areas of saltmarsh, and a bluff that serves as a critical source of sediment for the fine sediment shorelines, to the north of the island.

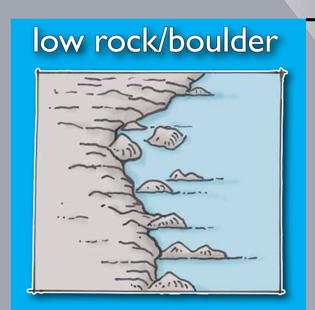


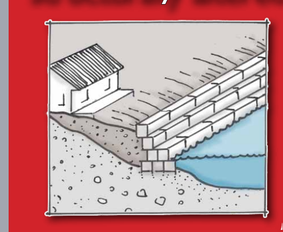


Watershed Boundaries

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







DENMAN ISLAND:

1 Km (2%) of Structurally Altered Shoreline

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

LEGEND:

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

1 Km

DATE: October 14, 2011

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

SEA CLIFF
- rocky shore with steep slopes
- 3% of shoreline (1.6 Km)

LOW ROCK/BOULDER
- rocky shore with low slopes
- 35% of shoreline (18 Km)

BLUFF
- moderate to high slopes of sediment (often eroding)
- 9% of shoreline (4.6 Km)

BOULDER/COBBLE
- boulder - cobble cover on beach (often indicates eroding shoreline)
- 29% of shoreline (14.7 Km)

PEBBLE/SAND
- stable or accreting pebble-sand (or shell) beaches (may be eroding where sediment supply is interrupted).
- 18% of shoreline (9 Km)

MARSH/FINE SEDIMENT
- low energy shorelines with sediment inputs from watersheds nearby
- 5% of shoreline (2.8 Km)

Rock (Hard) Shorelines

Sediment (Soft) Shorelines

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MAP 2 of 3: Energy & Sediment Movement

ISLAND ENVIRONMENTS are shaped by two primary or formative systems:

1) watershed systems; and
2) longshore systems.

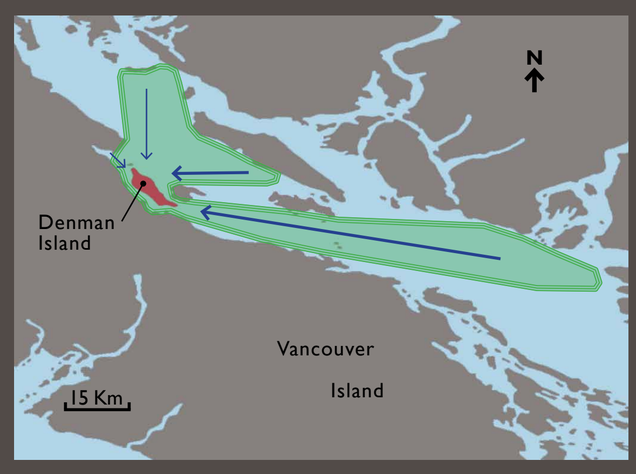
Watersheds are driven by runoff, and longshore systems are driven by waves and ocean currents. Any attempt to understand the islands, including discussions about land use planning, must be framed by these systems. Within this framework all other systems (natural systems like forests, wetlands, eelgrass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

DENMAN ISLAND belongs to a class of sea coast know 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.

SEASONAL NORTH WESTERLY WAVES

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 Thetis Island is shown in green.



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

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

Watershed Boundaries

1 Km

Making Sense of the Energy Systems:

The coloured shorelines on this map indicate that for Denman Island, the highest wave exposures occur on the southeast 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 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 southeast shore of Denman Island has a long fetch relative to other Denman Islands shorelines, and our region receives strong storm winds from the south – this combination of factors results in southeast 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 Denman Island, this means that the dominant sediment movement (relatively little sediment exists on the Denman Shoreline because it is predominantly rocky) direction is northward, driven by the south-easterly storms.

DATE: October 14, 2011

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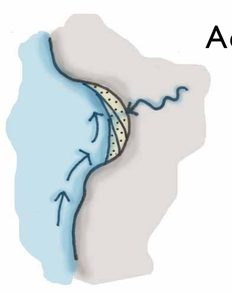
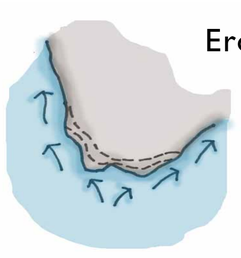


Accretion Shorelines:

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.

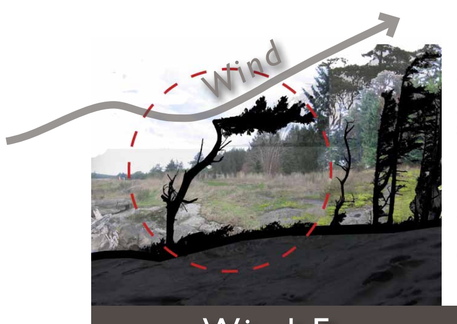


Erosion Shorelines:

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.

Wave Exposure & the Sediment System



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.

Wind Exposure & Buildings

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MAP 3 of 3: Shoreline Values & Vulnerability

This map is intended to give a general impression of areas along the Denman 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.

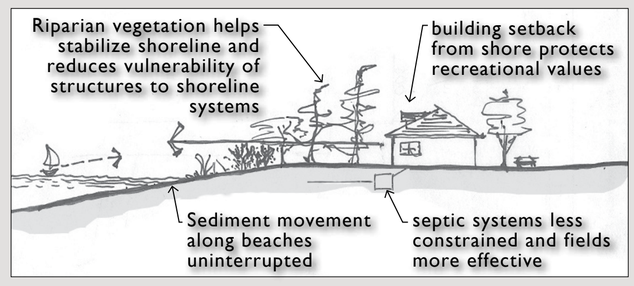
It is important to note that the various features highlighted on this map are in many cases both vulnerable in some way, *and* valued. Saltmarshes for example are of high ecological value, *and* are also vulnerable to accumulation of pollutants potentially contained in island runoff.

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

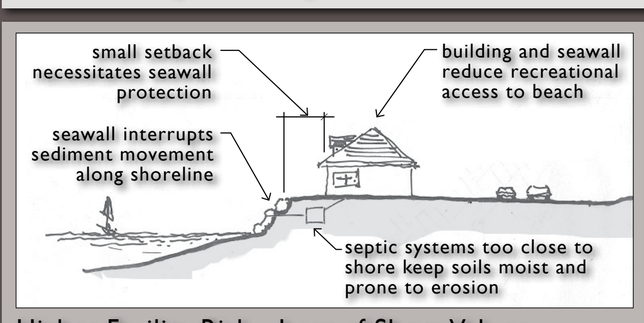
Watershed Boundaries

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

FACILITY SITING & SETBACKS



Lower Facility Risk - Improved Shore Protection



Higher Facility Risk - Loss of Shore Values

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.

1 Km

Chrome Island

DATE: October 14, 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

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