



## Understanding Nova Scotia's Coastlines

Sea levels along Nova Scotia have been rising for thousands of years and most shorelines are retreating and migrating landward. Responsible coastal development must account for natural rates and processes of shoreline change to avoid costly damage and adverse alteration to natural shoreline processes.

Natural Resources Canada's (NRCan) research on the effects of sea level rise and storm activity on rates of shoreline change around Nova Scotia (NS) provide a vital resource for effective coastal land-use planning.

### Shoreline Development

Shorelines are dynamic and rates of change are dependent on the shore type and local conditions. Waves, tides and the presence of sea ice vary around the province. Sediment supply (from offshore or the erosion of adjacent shores) determines the stability of a beach or waterfront. When sediment is available, beaches build seaward or broaden; when sediment is limited, beaches erode, migrate landward and in extreme cases disappear.



*Example of a high gravel barrier beach temporarily anchored to islands as it migrates landward on the Eastern shore of Nova Scotia. The barrier beach shelters a large lake and cottages (off the photo) from the sea.*

The most dynamic shores are barrier beaches (beaches with water on both sides) and coastal headlands (composed of a mixture of boulder to clay material called glacial till). In NS, they are favoured sites to build homes and cottages. Unfortunately, both are extremely vulnerable to rising sea level, and over time can experience major cycles of change.

When first exposed to wave action, coastal headlands retreat rapidly (5 to 10 m/year) and form steep cliffs. As boulders fall from the cliff, they protect it from waves and slow the rate of retreat (< 1 m/year). Cliff retreat can stop for many years when a wide beach develops along its base.

The stability of barrier beaches is closely linked to what is happening at the adjacent headlands. Beaches benefit from sand supply from eroding headlands, but beach stability is threatened once the headland is depleted. Barrier beaches experience different types and rates of change depending on their composition, size and shape. Low gravel barrier beaches (< 4 m elevation) can migrate landward up to 10 m/year while higher, more stable barrier beaches often migrate less than 0.6 m/year.

Storm waves can erode or cut down both high and low barrier beaches but they can naturally rebuild as long as there is a sediment supply. High gravel barrier beaches may take several years to rebuild but remain essentially in place; low gravel barrier beaches can rebuild in less than a year, but often in positions farther landward.

Increased construction and shoreline armoring to protect houses threaten the natural capacity of shorelines to buffer inland areas from erosion and flooding. Engineered shore protection structures, such as retaining walls, limit the supply of sediment to beaches.

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## Key Findings

1. As Nova Scotian shorelines are forced landward by rising sea levels, they go through cycles of growth and destruction which vary with each shore type.
2. Similar shore types will experience similar cycles of change but timing can vary greatly depending on local conditions and changes along adjacent shores.
3. Sediment supply to beaches is not unlimited. It is cyclic and dependent on the erosion and breakdown of other shore areas. For people with threatened homes, erosion is worrisome; yet with a rising sea level, some erosion is essential to maintain our beaches.

## Be Aware Before You Build or Buy

- Before buying land or building, investigate and assess the property. What type of shoreline is it? What is its composition? How high or wide is it?
- Shorelines look more stable and beautiful in the summer. Walk the shore in the fall, winter or after storms. Are there signs of instability such as slumping on cliff faces, cuts in the dune line or evidence of seaweed transported over the top of the beach?

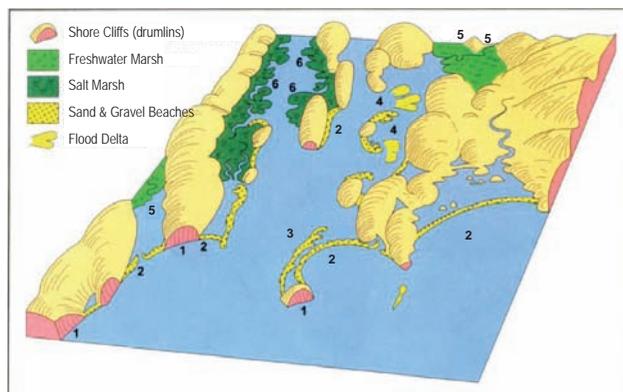


Houses built too close to the shoreline along outer Halifax Harbour are exposed to the sea. Expensive shoreline armoring with large rock was required to protect these homes from damage by waves. Long term maintenance costs for shore armoring will be required as sea level rises.

- Talk with neighbours to learn about typical changes in the shoreline or the history of erosion and flooding.
- Consult with experts to discuss the character and evolution of the shoreline and what the future will bring. Obtain older vertical air photos of the property to examine past shoreline changes.
- Plan a safe setback for your property so that natural shoreline changes do not threaten it over the time you (or your children) plan to use it.

## Making a Difference

NRCan's Geological Survey of Canada – Atlantic (GSC-A) documents the rates and processes of coastal change through a network of monitoring sites along NS shorelines. Twenty years of research and data acquisition, such as interpreted aerial footage of all of NS's shoreline, have made them experts in coastal research. GSC-A researchers routinely provide scientific data and advice on coastal development issues to concerned citizens, communities groups, and federal and provincial agencies.



Shore cliffs (1) provide the anchor and sediment source for building barrier beaches (2), spits (3), tidal flats (4), and marshes (5, 6).



For additional information on Atlantic Canada's coastlines

**COASTWEB:**

[gsc.nrcan.gc.ca/coast/index\\_e.php](http://gsc.nrcan.gc.ca/coast/index_e.php)

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