COASTAL IMPACTS UNDER A CHANGING CLIMATE, PRINCE EDWARD ISLAND

Coasts are important for marine and terrestrial species and are essential areas for fisheries and recreation. Coastal areas in PEI consist of estuaries, beaches, dunes, wetlands and intertidal and nearshore zones. Coastal infrastructure is crucial for transportation, trade and tourism, and supports the livelihood of many coastal communities.
Prince Edward Island predominantly consists of farming and fishing communities. The many beaches and coastlines are an attraction for tourism. PEI's park landscapes consist of low cliffs of sandstone and sandy beaches backed by coastal dunes. The coast of PEI is highly indented because of long-term sea-level rise that has caused back flooding of river valleys to form extended estuaries.

Throughout the southern Gulf of St. Lawrence, the combination of rising sea level, increased human utilization of the coast for residential, and tourism purposes, and limited offshore winter ice conditions have resulted in accelerated erosion and degradation of the dunes and coastline. At Cascumpec Bay, erosion between 1974 and 2004 caused coastal retreat of 115 m, a rate of 3.8 m per year.

Along the Gulf of St. Lawrence coast, sediment is moved parallel to the shoreline to create spits, barrier islands, and sandy beaches. These landforms protect the bays behind them from storm activity. Rising sea level, increased storm action, and less winter sea ice cover allow coastal erosion to progress. Lighthouses and wharves are subject to damage. Strom washovers breach the barrier islands, transporting sediment into the bays behind. Aquaculture can be affected as a result.

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Ongoing coastal erosion can be measured by the steady loss of fences and the retreat of soft sediment bluffs. In some areas of western PEI, erosion rates have exceeded 50 cm per year. Erosion of glacial deposits and bedrock tends to remove segments of the coastline during individual storm events, rather than gradually. Loss of land along the coast restricts building, and use and enjoyment of the shoreline. In many areas, the only alternatives are expensive protection measures, or retreat from the edge of the cliff.

In coastal waters, including those used for aquaculture), summer decreases in rainfall over land would result in diminished flow of river systems. In estuaries, low flow events during the summer currently result in enhanced salt water wedge intrusions, raising salinity. Lowered velocity and reduced influx of rivers facilitates the spread of sea lettuce which acts to increase eutophy, rendering estuaries both less suitable for shellfish or finfish aquaculture and less attractive to residents and tourists. The increased extent of sea lettuce in Cascumpec and Tracadie Bays observed between 1990 and 2006 is the result of diminished freshwater influx, reduced circulation of the estuaries, and addition of fertilizers from agricultural areas. Any changes in agricultural practice that entail more irrigation and fertilizer use will increase the likelihood of sea lettuce expansion.

In PEI, more than 80 percent of the coastlines have been identified as moderately to highly sensitive to sea level rise. Highly sensitive areas include the entire north shore of PEI and parts of the urban centre of Charlottetown. Since 1911, in Charlottetown, sea level has risen about 32 cm. Accelerated by climate change, this could create substantial problems for urban infrastructure. Currently, sea level is rising at about 3 mm each year.

Along the Gulf of St. Lawrence and Northumberland Strait coastlines, the most common form of slope failure in bedrock results from frost action coupled with marine undercutting induced by rising sea level. Erosion of bedrock cliffs has exceeded 80 cm in a single year at several locations, including Cape Kildare, Cape Gage, and Panmure Island. Erosion of bedrock-supported cliffs is also evident at East Point, High Bank, Point Prim, Fort Amherst National Historic Site, MacCallums Point, Cap Egmont, Cabot Beach Provincial Park, and Cape Tryon. Although monitoring of coastal cliffs is relatively limited, the potential scale and extent of coastal erosion of bedrock shores in PEI indicates that much more extensive research is desirable

Coastal erosion will also affect coastal dunes. Disturbance to sand by natural and human erosion negatively impacts beach health.

Appropriate adaptation to climate change will be critical to reducing the magnitude and extent of potential impacts to coastal areas. Existing techniques and technologies used to control water level changes in the past can continue to be used. In addition to the use of seawalls, there has also been an increase in "soft measures" such as beach nourishment and wetland restoration and creation, since these measures are more flexible. Soft protection can enhance the natural resilience of the coastal zone and is generally less expensive than hard protection.
The most appropriate adaptation measure will depend on the conditions at the specific site of concern. In PEI, potential adaptation strategies include identification and monitoring of hazards, managed retreat or avoidance, and improved public education and awareness. Adaptation measures could include enhancing natural resilience through dune rehabilitation, and soft protection such as sand storage and beach nourishment. Recently, efforts have begun to stabilize the dunes, by planting vegetation, and attempting to restrict human use of boardwalks. Overall, a range of adaptation strategies will be needed in PEI that includes stakeholder participation. Adaptation options for coastal management are most effective when incorporated with policies in other areas, such as land-use plans and disaster mitigation.