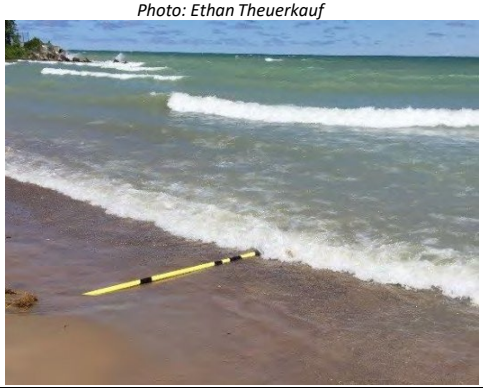
BLUFF AND BEACH FAILURES

Exposed Infrastructure

An old pipe that has been exposed by beach erosion.
Photo: Ethan Theuerkauf



Loss of Vegetation

A sandy bluff has some remaining vegetation mats securing the slope surface. Photo: Wisconsin Shoreline Inventory and Oblique Photo Viewer.

Ground Cracks

Horizontal ground cracks at the top of the bluff that preceded a slope failure. Photo: Gene Clark

Surface Water Drainage Rills or Gullies

Rills on a bluff face caused by surface water drainage down the slope.
Photo: Hannah Paulson

Groundwater Seepage

Evidence of groundwater draining through slope of bluff face.
Photo: Wisconsin Shoreline Inventory and Oblique Photo Viewer

Curved Vegetation

Trees with curved trunks that are concave in the upslope direction. Photo: Adam Bechle

Toe Erosion (Bank)

Toe Erosion on a sandy bank. Photo: Adam Bechle

Toe Erosion (Dune)

Toe erosion on a dune marked by loss of vegetation. Photo: Adam Bechle

Slides or Slumps

A deep slump in sandy, mixed material bluff.
Photo: PA Dept of Env Protection

ROCK BLUFF FAILURES

Fallen Debris, Exposed face

Debris piles and an exposed rock face indicate progressed erosion. *Photo: Wisconsin Shoreline Inventory and Oblique Photo Viewer*

Overhanging Vegetation

Overhanging and fallen trees and cracks in the rock face. show evidence of failure on the bluff top. *Photo: Anne Iwata, Wisconsin Coastal*

Structural Crack

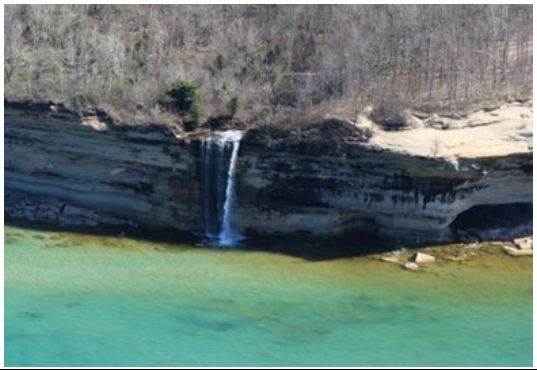
Major cracks indicate a weak point in the rock bluff.
Photo: Wisconsin Shoreline Inventory and Oblique Photo Viewer

Toe Undercutting

The toe of this bluff is starting to be undercut leaving an unsupported overhang. *Photo: Wisconsin Shoreline Inventory and Oblique Photo Viewer.*

Surface Water

Surface water flows over the bluff edge eroding carving out a small channel.
Photo: Michigan Tech, EGLE



Freeze/Thaw Cycles

Water percolates into cracks, freezes, and expands creating instability.
Photo: Wisconsin Shoreline Inventory and Oblique Photo Viewer.

Groundwater Seepage

Darkened areas in the clay cap over the bedrock bluff can indicate slope stability issues. *Photo: Wisconsin Shoreline Inventory and Oblique Photo Viewer.*

Deep Cracks

Major cracks spanning height of the rock face can indicate an imminent failure. *Photo: Wisconsin Shoreline Inventory and Oblique Photo Viewer*

Rockslide

Large fallen rock debris shows evidence of a rock slide.
Photo: Michigan Tech, EGLE

INFRASTRUCTURE FAILURES

Wave Overtopping

Overtopping of this revetment has led to erosion on the back side of the armor stone. *Photo: Adam Bechle*

Revetment Settling

Revetment stone has slid lakeward lowering the crest height.

Photo: Adam Bechle

Unsuitable Materials

Flat pieces of concrete rubble do not interlock well and may be easily moved by strong waves. *Photo: Adam Bechle*

Roadway Washout

A road along Lake Superior is near failure from erosion.

Photo: Rob Peterson

Breakwall washout

Breakwall flooding during high water levels.

Photo: City of Conneaut

Overtopping resulting in a slide

High water overtopped this sea wall triggering an erosion slide.

Photo: Toledo Bend Cabins

Overtopping resulting in scouring

Waves overtop a seawall and scour sediments and washout all vegetation. *Photo: Adam Bechle*

Cracked Seawall

Cracks and separations in the concrete cap of this sea wall.

Photo: Biller Reinhart Engineering

Flanking

The Oak Creek Water Intake Structure with erosion flanking (redcircle).

Photo: Wisconsin Shoreline Inventory and Oblique Photo Viewer