Portland East Quadrangle, Maine

Coastal bluff mapping by

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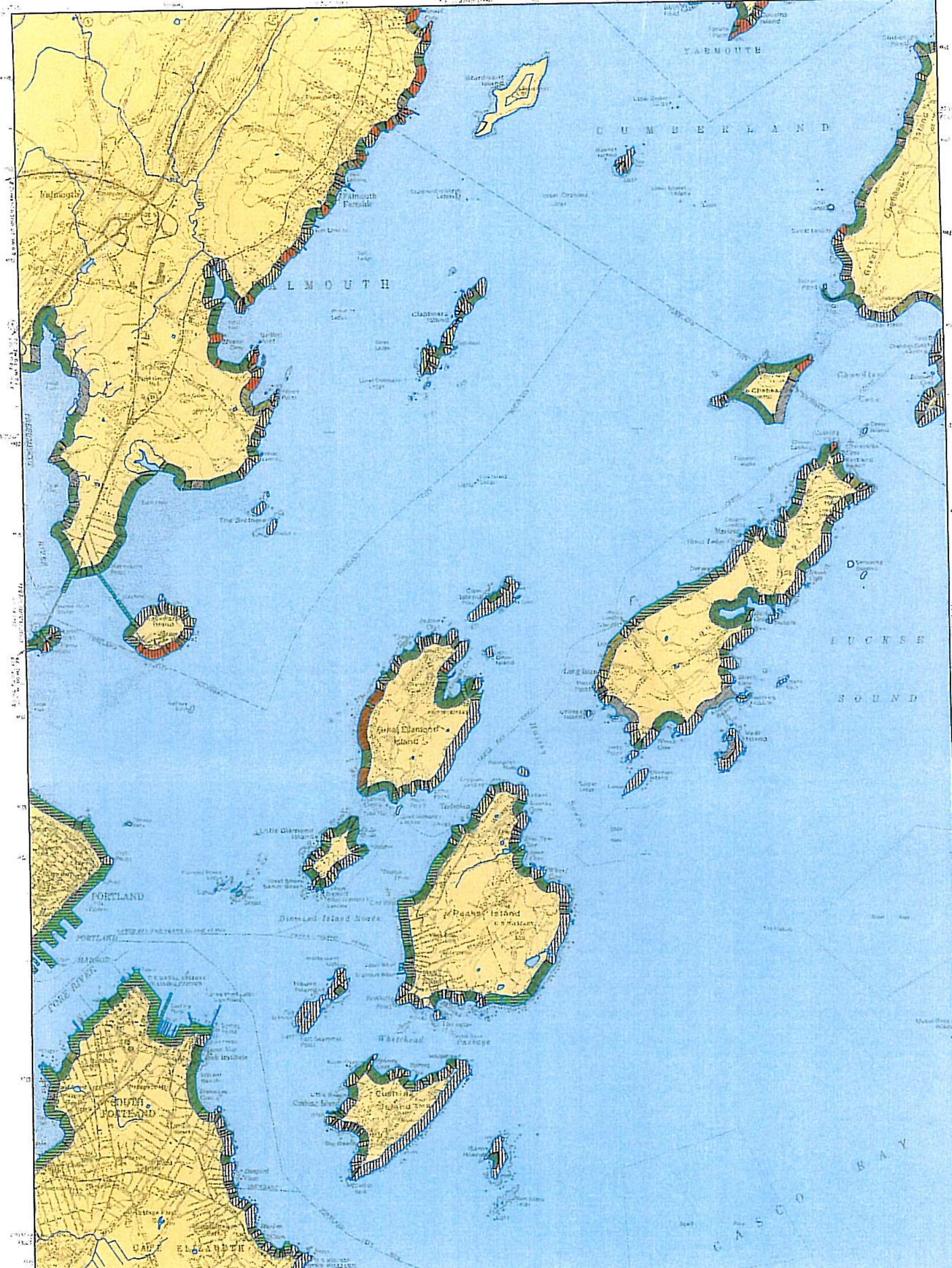
Coastal Bluffs



DATA COLLECTION AND COMPILATION

Field work for this map was done by Marita Bryant in 1991. Compilation of field data into the classification scheme used on this map was made by Walter A. Barnhardt.

Quadrangle Location

SCALE 1 : 24,000

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET

TRUE NORTH

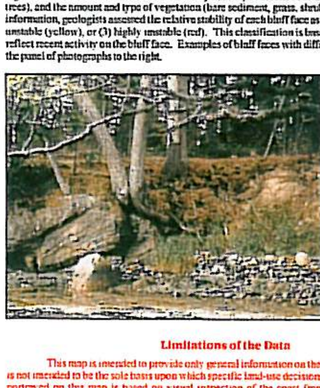
	Yarmouth	Freeport
Portland West	This Map	South Harpswell
Prouts Neck	Cape Elizabeth	

Topographic base from U.S. Geological Survey Portland East quadrangle, scale 1:24,000 using standard U.S. Geological Survey topographic map symbols.

Index at left shows adjacent maps in this series.

Classification and Mapping of Maine's Coastal Bluffs

Geologists classified the coastal bluffs on this quadrangle map by observing the shoreline from small boats. They assigned one of the following categories to the type of shoreline seen below the high tide line: (1) ledge (exposed bedrock outcrops); (2) armored (seawall, riprap, gabion, bulkhead, etc.); (3) salt marsh; or (4) beach, mud flat, or other loose sediment. Ruled patterns on the map indicate the shoreline type. Gray areas on the map indicate segments of the shoreline without significant coastal bluffs. Where significant bluffs were present, geologists noted various characteristics of the bluff face such as the slope of the bluff (steep to gentle), features on the bluff face indicating recent movement of material down the slope (slumped blocks of sediment, landslide scars, fallen trees), and the amount and type of vegetation (bare sediment, grass, shrubs, mature trees). From this information, geologists assessed the relative stability of each bluff face as being (1) stable (green), (2) unstable (yellow), or (3) highly unstable (red). This classification is based on observed features that reflect recent activity on the bluff face. Examples of bluff faces with different stabilities are shown in the panel of photographs to the right.



Map Resolution

Since these are regional maps, some shores mapped as stable may contain small areas that are unstable. A bluff, too small to appear on the map, is shown in the photo. This bluff exhibits the characteristics of an unstable bluff: curved tree trunks, exposed roots, and bare ground on a steep slope. It is an area to be concerned about on a local scale. However, this degree of detail is not shown on the map above.

Limitations of the Data

This map is intended to provide only general information on the overall stability of bluffs. It is not intended to be the sole basis upon which specific land-use decisions are made. The information portrayed on this map is based on visual inspection of the coast from offshore, and parts of the shoreline may have changed slightly since the field work was completed. Because of the map scale, shoreline characteristics are generalized into 150-foot segments. It is important to realize that the bluff classification only shows the average stability inferred for each section of the shoreline (see Map Resolution section above). For an evaluation of specific shoreline erosion risks, landslide potential, or historical trends, certified geologists or geotechnical engineers should conduct site-specific studies.

Classification of Coastal Bluffs

SHORELINE TYPE				BLUFF FACE
Ledge	Armored	Salt marsh	Beach / flat	
				Highly unstable
				Unstable
				Stable
				NO BLUFF

Note: The classification of the bluff is indicated by a colored, patterned band extending landward from the shoreline (dark blue line). The width of the band is NOT related to the width of the bluff. Stability rank refers to RECENT bluff face activity.

Shoreline Type	Description of Shoreline at or Below the High-Tide Line
Ledge	Greater than 50% bedrock. May include minor accumulations of sediment that occur in small coves or other sheltered areas (see photo at left).
Armored	Consists of riprap, seawalls, groins, jetties, and other engineered structures. Condition of armor may indicate degree of stability of bluff face.
Salt marsh	Mostly to fully vegetated salt marsh with minor tidal flat environments. May include small rocky outcrops.
Beach / flat	Sediment, ranging in texture from mud (tidal flats) to cobbles (gravel beaches). May include small rocky outcrops or small patches of vegetation.

Bluff Face	Typical Characteristics of Bluff Face (above high-tide line)
Highly unstable	Near vertical or very steep bluff with little vegetation and common exposure of bare sediment. Fallen trees and displaced blocks of sediment common on bluff face and at base of bluff.
Unstable	Steep to gently sloping bluff mostly covered by shrubs with a few bare spots. Bent and tilting trees may be present.
Stable	Gently sloping bluff with continuous cover of grass, shrubs or mature trees. Relatively wide zone of ledge or sediment occurs at the base of the bluff.
No bluff	Broad, gently sloping vegetated land or bare ledge with less than three feet of sediment cover.
Not Mapped	Some portions of the shoreline have not been mapped for bluff type.

Shoreline Processes and Bluff Hazards

Bluffs are formed in a dynamic coastal environment by terrestrial and marine processes. Bluff erosion is part of a natural cycle with consequences for the land below and above the bluff. Fine-grained silt and clay eroded from bluffs may be deposited on mud flats or salt marshes which help reduce wave energy at the base of a bluff and slow the overall rate of bluff erosion. Coarse-grained sediments, such as sand and gravel, eroded from bluffs become part of a beach at the base of the bluff and help stabilize the shoreline position. Transfer of sediment from the land to the sea is natural and sometimes essential to sustain beaches, flats, or salt marshes.

Bluff erosion can result in a landward shift of the top edge of the bluff. This shoreline change is a natural process that, by itself, is not a coastal hazard. Only when erosion threatens something of value, such as a building near the bluff edge, does bluff retreat become a hazard. Understanding local erosion rates can help determine the severity, and perhaps longevity, of coastal development along a bluff edge.

Coastal bluffs erode episodically. Some bluffs may not change much over many years, even though there are steep banks along the shore. Bluffs may not lose much ground in any one year. Instead, the bluff may slump a large amount of sediment once every few years. The bluff erosion rate will vary from year to year, much like the weather. A long-term average erosion rate is the most meaningful measure of the bluff retreat rate. The hazard to development on or above the bluff can be better evaluated using long-term erosion rates. Once the risk is evaluated, then appropriate solutions to reduce the risk can be considered and balanced with cost and environmental consequences.

Landslide Risk

This map of Coastal Bluffs describes the processes and stability of the *face* of a bluff. A companion map, Coastal Landslide Hazards, describes the *internal* stability of sediment bluffs and their potential to rapidly move large amounts of land downslope under the influence of gravity. In general, landslide-prone bluffs have (a) high and steep faces, (b) clay sediment, (c) erosion near the high-tide line, and (d) a high ground water table. As with processes on the bluff face, landslide movement is episodic. To determine the risk of a landslide, a site-specific study of the geology and strength characteristics of the bluff should be made by certified geologists or geotechnical engineers.

A 1996 landslide in Rockland Harbor (photo below) occurred in an area where the bluff face is classified as unstable. In addition, the bluff had all the characteristics (a-d) listed above. This fact emphasizes that the map above does not indicate sites with a potential for catastrophic landslides. Additional factors need to be considered beyond the appearance of the bluff face and type of shoreline below the bluff. Maps of topography, surficial sediments, and Coastal Landslide Hazards are available from the Maine Geological Survey to help assess the landslide potential in an area.