Cape Elizabeth Quadrangle, Maine

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Maine Coastal Program

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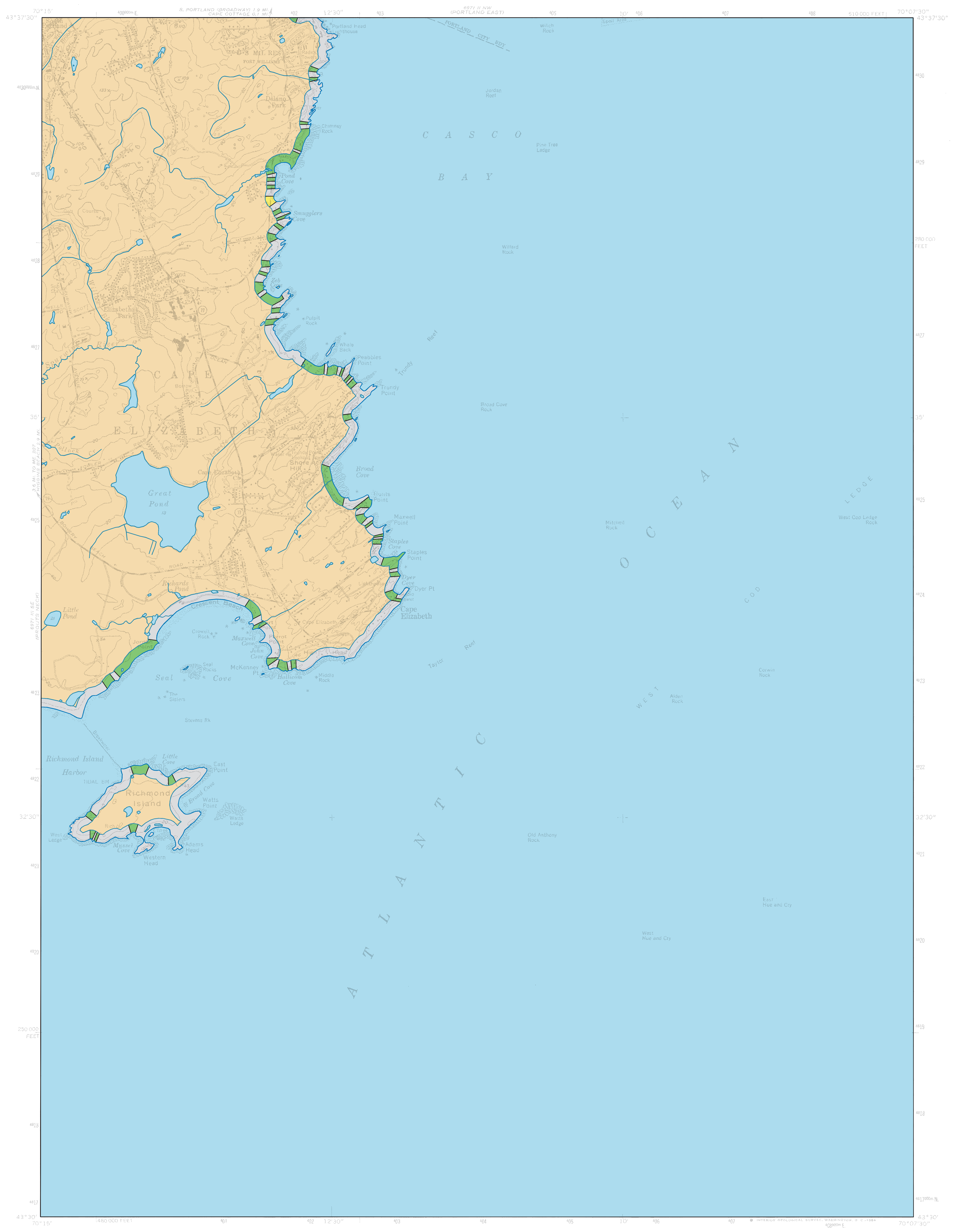
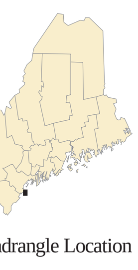
Coastal Landslide Hazards



Data Collection and Compilation - Analysis of aerial photographs, topographic and surficial materials maps was done by Jason N. Wiest and Stephen M. Dickson. GIS compilation of bluff and landslide data was by Jason N. Wiest and Susan S. Tolman. Field and historical landslide investigations to produce Landslide Sites and Landslide Risk Areas were conducted by Irwin D. Novak, Stephen M. Dickson, Joseph T. Kelley, Jason N. Wiest, Daniel F. Belknap, Rebecca V. Smith, Henry N. Berry IV, Daniel B. Locke, Robert G. Marvinney, Richard T. Reynolds, Andrews L. Tolman, Thomas C. Sanford, and others in previous publications. Landslide Potential Areas, Low Coastal Bluffs, and Non-Bluff Shoreline category observations from small boats were made by the authors of the corresponding MGS Coastal Bluff Map with additional analysis by Jason N. Wiest and Stephen M. Dickson.



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

Portland West	Portland East	South Harpswell
Prouts Neck	This Map	
Biddeford Pool		

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

Index at left shows adjacent maps in this series.

Coastal Bluffs: On this map, a bluff is defined as a steep shoreline slope formed in sediment (loose material such as clay, silt, sand, and gravel) that has three feet or more of vertical elevation just above the high-tide line. Cliffs or slopes in bedrock (ledge) surfaces are not sedimentary bluffs and are not subject to significant erosion in a century or more, although some may experience rockfalls. Beaches and dunes do not form bluffs, except along the seaward dune edge as a result of erosion. This map does NOT identify erosion trends on beaches or sand dunes.

Note: The landslide hazard classification is indicated by a colored, patterned band extending landward from the shoreline (dark blue line). The width of the band does NOT indicate the distance inland that a landslide may occur. This distance is difficult to predict and will vary from site to site. The colored buffer is for illustration purposes only. Due to variations in coastal geology, not all units in the explanation below will appear on this map.

Landslide Site - Location of known or interpreted coastal landslide. Includes historically recorded landslides and slides interpreted from air photos.

Landslide Risk Area - Earth features indicate conditions that may be suitable for a landslide to occur. Features often include a steep or arcuate scarp, slump blocks, sediment lobes, or uneven land surfaces. Bluff sediments are usually muddy and twenty feet or more in thickness.

Potential Landslide Area - Shoreline with a sedimentary coastal bluff twenty or more feet high. These bluff areas have not had field investigations that are necessary to evaluate the risk of a landslide. However, some similar high coastal bluffs have experienced landslides.

Low Coastal Bluff - Shoreline with a sedimentary coastal bluff that has less than twenty feet of relief immediately adjacent to the shoreline. Some bluffs over twenty feet in height are included in this map unit if the bluff face is not steep. In general, low coastal bluffs are not at risk of failing in the form of a landslide.

Non-Bluff Shoreline - Coastal areas without extensive sedimentary bluffs. Corresponds to the no-bluff unit on MGS Coastal Bluff Maps.

Unmapped Shoreline - These sites generally are in the inland reaches of estuaries or beyond the scope of the field effort in this region.

Who to Contact for More Information

It is important to realize that the coast of Maine is constantly being eroded. Coastal bluffs that show no evidence of erosion today may be endangered in the future as rising sea level continues to erode sediments at the base of a bluff. If you are concerned about ground movement on a coastal bluff, contact the Maine Geological Survey for more information helpful in evaluating the characteristics of coastal property. In addition to this landslide hazard map, a companion map series entitled "**Coastal Bluffs**" describes the stability and characteristics of Maine's shoreline. Maps showing topography, sediment composition, ground-water characteristics, and bedrock are also available in many areas. Survey geologists will explain the content of each of these maps.

If you find indications of ground movement on your coastal bluff, you may want a professional geologist or engineer to investigate your property. To reduce the risk of a landslide, these professionals may recommend re-sloping the bluff face, diverting water flow, armoring the toe of the bluff, or planting erosion-resistant vegetation.

Building or engineering on Maine's coastal bluffs are subject to the Natural Resources Protection Act and the Mandatory Shoreland Zoning Act. Permits from the Department of Environmental Protection may be required for any bluff modifications. Local Town Code Enforcement Officers will give advice on local requirements.

Maine Geological Survey
Information available: maps showing landslide hazards, coastal bluffs, surficial geology, surficial materials, ground-water, bedrock, USGS topographic maps; geologists explain maps and coastal processes
Contact: Maine Geological Survey at address shown in title block, or visit the MGS website and search your location.

Geological Consultants
Information available: studies of specific property: ground-water studies, soil mechanics, coring of bluff, mapping of site, risk analysis, recommendations about hazard reduction and slope remediation
Contact: consult local yellow pages under geologists or environmental services

Engineers
Information available: plans to reduce hazard, ground-water diversion, shoreline engineering, slope alteration, soil mechanics, risk analysis
Contact: consult local yellow pages under engineers - environmental or environmental services

Maine Department of Environmental Protection
Information available: information on state laws including the Natural Resources Protection Act, Shoreland Zoning, and the permit process
Contact: on the internet: http://www.maine.gov/dep/blwq/
phone: 888-769-1137 or 207-941-4570

Town Code Enforcement Officers
Information available: provide advice on Shoreland Zoning and other municipal requirements
Contact: local town office or
http://www.maine.gov/portal/living/cities/index.html

Related Maps

Bryant, M., Barnhardt, W. A., Dickson, S. M., and Kelley, J. T., 1998, Coastal bluffs in the Cape Elizabeth quadrangle, Maine: Maine Geological Survey, Open-File Map 98-97.

Clinch, J. M., and Thompson, W. B., 1999, Surficial geology of the Cape Elizabeth quadrangle, Maine: Maine Geological Survey, Open-File Map 99-80.

Clinch, J. M., and Thompson, W. B., 1999, Surficial materials of the Cape Elizabeth quadrangle, Maine: Maine Geological Survey, Open-File Map 99-42.

Other Sources of Information

American Planning Association, Landslide hazards and planning:
http://www.planning.org/landslides/docs/main.html

Amos, J., and Sandford, T. C., 1987, Landslides in the Presumpscot Formation: An engineering study: Maine Geological Survey, Open-File Report 87-4, 68 p.

Berry, H. N., IV, and others, 1996, The April 1996 Rockland landslide: Maine Geological Survey, Open-File Report 96-18, 55 p.

Devin, S. C., and Sandford, T. C., 1990, Stability of natural slopes in the Presumpscot Formation: Maine Geol. Survey, Open-File Rept. 90-24, 75 p.

Kelley, J. T., and Dickson, S. M., 2000, Low-cost bluff-stability mapping in coastal Maine: Providing geological hazard information without alarming the public: Environmental Geosciences, v. 7, no. 1, p. 46-56.

Kelley, J. T., Dickson, S. M., Belknap, D., 1996, Maine's history of sea-level changes:
http://www.maine.gov/doc/nrimc/pubedinf/factsht/marine/sealevel.htm

Kelley, J. T., Kelley, A. R., and Pilkey, O. H., 1989, Living with the coast of Maine: Duke University Press, 174 p.

National Research Council, 2004, Partnerships for Relaxing Landslide Risk, National Academies Press, www.nap.edu, Washington, D.C., 131 p.

Novak, I. D., 1987, Inventory and bibliography of Maine landslides: Maine Geological Survey, Open-File Report 87-3, 27 p., map (1:500,000).

Novak, I. D., 1990, Air photo reconnaissance of slope failures in the Presumpscot Formation, Cumberland County, Maine: Maine Geological Survey, Open-File Report 90-22, 4 p., map (1:50,000).

U.S. Geological Survey, Geologic hazards: Landslides:
http://landslides.usgs.gov/index.html

Limitations of the Data - This map provides only general information on the overall stability of bluffs. It should not be the sole basis upon which specific land-use decisions are made. Some map information 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. Historical and potential landslide areas are partially based on air photos taken in the last four decades. Since the air photos were taken, land changes may have altered the map classification. Because of the map scale, shoreline characteristics are generalized into segments at least 150 feet long. It is important to realize that the classification only shows the average condition inferred for each section of the shoreline. For an evaluation of specific shoreline erosion risks or landslide potential certified geologists or geotechnical engineers should conduct site-specific studies.

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Methods of Mapping Landslide Hazards

Landslide Site - Includes the following: (1) Locations based on historical records and eyewitness accounts. In general, these earth movements have occurred in the last three centuries. (2) Locations based on interptetation of aerial photography. The age of these features is usually unknown. Some may have formed in the last few years, others in the last century, and some possibly sometime in the last few thousand years.

Landslide Risk Area - Includes the following: (1) Observations from land corroborated with geomorphology observed on air photos, sediment types shown on surficial geologic maps, and both elevation above sea level and steepness of bluff slopes shown on topographic maps. Bluff sediments are usually muddy and twenty feet or more in thickness. The slope on the bluff face appears steep and similar to areas where there have been landslides in the past. (2) Observations from a small boat. Primarily steeply-sloping sediment bluffs that were visually estimated to be twenty feet or more in elevation. Other instability characteristics included unvegetated slopes on the bluff face; leaning, fallen, or crooked tree trunks; and visible slump deposits at the base of the bluff near the high-tide line. The site may be adjacent to previous landslides. In this second category, aerial photographs were not used nor were the surficial geologic materials investigated.

Potential Landslide Area - This determination was based on the presence of a bluff as indicated on MGS Coastal Bluff Maps, the proximity of a twenty-foot topographic contour to the shoreline (similar to areas adjacent to previous landslides) and geomorphology visible in air photos. These bluff areas have not had field investigations to fully evaluate landslide risk.

Low Coastal Bluff - This determination was based on the presence of a bluff as indicated on MGS Coastal Bluff Maps and the proximity of a twenty-foot topographic contour to the shoreline. By comparison with bluffs adjacent to previous landslides, these areas are less steep than those that have shown a tendency to fail due to weakness in the earth landward of the top of the bluff.

Non-Bluff Shoreline - This shoreline type was determined by visual observation from a small boat and corresponds to the no-bluff unit on MGS Coastal Bluff Maps. These shorelines can be composed of bedrock, salt marshes, beaches and dunes, or low-lying sediments without the presence of a bluff more than three feet high and 150 feet long. Within this category there may be short shoreline segments that contain bluffs. These small coastal bluffs are not illustrated on this map.

Unmapped Shoreline - In some locations, access to a shoreline was limited so some areas remain unmapped. These sites generally are in the inland reaches of estuaries or beyond the scope of the field effort in this region.