Print

Woods Hole Sea Grant: Cape Cod Landforms and Coastal Processes Poster

Publication Announcement

The Cape Cod Landforms and Coastal Processes Poster is a 22" x 28" full-color, illustrated portrayal describing the geologic evolution of Cape Cod, its landform types, and present-day physical coastal processes. The beneficial functions of coastal landforms and the effects of certain human activities, such as revetment, groin, and jetty construction, on these processes are described in words and colorful illustrations.

The original base map for the poster is based on an actual satellite image of Cape Cod drawn by Dana Gaines, an artist living on Martha's Vineyard. The colorful base map illustration depicts ground elevations or relief and bathymetric contours by gradations of shades of green and blue: the darkest shades indicate the highest topographic elevations and deepest bathymetric areas. Numerous kettle ponds and spring sapping valleys are shown throughout Cape Cod. All the thumbnail illustrations on the poster were drawn by Dana Gaines based on actual ground and aerial photographs taken by Jim O'Connell of Cape Cod Cooperative Extension and the Woods Hole Oceanographic Institution (WHOI) Sea Grant Program.

The poster was published by Barnstable County's Cape Cod Cooperative Extension and the WHOI Sea Grant Program. Jim O'Connell was project manager, researched and provided text, and provided the satellite image and ground and aerial photographs for illustrations. Dana Gaines drew all illustrations. Jim Canavan, WHOI Graphics Department, provided design and production. Patriot Press, Hyannis, MA, produced copies.

To purchase copies of the poster contact Woods Hole Sea Grant at (508) 289-2665 or seagrant@whoi.edu or Barbara Conway, Cape Cod Cooperative Extension, at (508) 375-6697 or bconway@umext.umass.edu. Cost: $5 single copy ($7.50 mailed); 10 or more copies, $3.00 per copy plus shipping.

Geologic Terms

Geologic terms used on the poster are defined and sources of information for the poster are provided below.

Definitions used for terms below are from:
— Canadian Soil Information System (CanSIS)
— U.S. Army Corps of Engineers, Shore Protection Manual, 1984
— Massachusetts Wetlands Protection Regulations (310 CMR 10.00 et. seq.)
— Oldale, R.N., 2001 (see references below)

Barrier beach: a narrow, low-lying strip of land generally consisting of coastal beaches and dunes extending roughly parallel to the trend of the coast. It is separated from the mainland by a narrow body of fresh, brackish, or saline water or a marsh system. A barrier beach may be joined to the mainland at one or both ends.

Coastal beach: unconsolidated sediment subject to wave, tidal and coastal storm action which forms the gently sloping shore of a body of salt water and includes tidal flats. Coastal beaches extend from the mean low water line landward to the dune line, coastal bankline, or the seaward edge of existing man-made structures, when these structures replace one of the above listed lines, whichever is closer to the ocean.

Coastal bank: the seaward side or face of an elevated landform, other than a coastal dune, which lies at the landward edge of a coastal beach, land subject to tidal action or other wetland.

Coastal dune: any hill, mound or ridge of sediment landward of a coastal beach deposited by wind action or overwash. Coastal dune also means sediment deposited by artificial means and serving the purpose of storm damage prevention or flood control.

Drift: general term for all glacial deposits including those laid down directly by ice and those transported by meltwater.

End moraines: a ridge formed at the front of a glacier and underlain by drift.

Glaciofluvial deposits: material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and may occur in the form of outwash plains, deltas, kames, eskers, and kame terraces.

Groin: a shore protection structure built (usually perpendicular to the shoreline) to trap littoral drift or retard erosion of the shore. Its primary purpose is to build a beach on its updrift side.

Ice-contact drift: drift deposited over and against glacial ice.

Jetty: on open seacoasts, a structure extending into a body of water, which is designed to prevent shoaling of a channel by littoral materials and to direct and confine the stream or tidal flow. Jetties are built at the mouths of rivers or tidal inlets to help deepen and stabilize a channel.

Kame: a knoll or hill underlain by stratified glacial drift that was deposited in a hole in the ice. Larger kames may have a flat, stream-graded surface.

Kame and Kettle Terrain: a region of hummocky topography made up of kame and kettles, underlain by collapsed stratified drift.

Kettle hole: a topographic depression marking the site of a formerly buried ice block that is usually surrounded by glacial stream deposits.

Moraine: a ridge formed of drift deposited along the front or at the sides of a glacial lobe.

Longshore current: a shore-parallel current that results from the oblique approach of waves to the shore.

Longshore sediment transport or littoral drift: the movement of material along the shore, generally sand, pebble, and cobble, propelled by longshore currents.

Nodal zone: an area in which the predominant direction of the longshore transport changes.

Outwash: sedimentary deposit, mostly sand and gravel, deposited beyond a glacial ice front by meltwater streams.

Outwash delta: formed by deposition of successive layers of sediments deposited as outwash into glacial lakes.

Outwash plain: broad, gently sloping, alluvial surface underlain by outwash sand and gravel that was deposited by meltwater streams.

Relative sea level rise: the combination of worldwide (eustatic) sea level rise and glacioisostatic adjustment of a landmass. On average, in quantitative terms over the past sixty years Massachusetts has been sinking at a rate of 1.9mm per year (0.0062 ft/year) while the ocean has been rising at 1mm per year (0.003 ft/yr), resulting in an approximate rate of relative sea level rise in Massachusetts of one vertical foot every 100 years.

Revetment: a facing of stone, concrete, etc., built to protect a scarp, embankment, or shore structure against erosion by wave action or currents.

Spring sapping valley: most likely formed by a process called spring sapping which occurs when water issuing from a spring carries away loose sand and gravel and causes the spring to migrate headward carving a long, straight valley. On Cape Cod the valleys were most likely formed by a high water table caused by high glacial lake levels causing springs to form on the outwash plains. They are dry except where their lower reaches have been drowned by the rise in sea level.

Till: unsorted and mostly unstratified drift laid down directly by a glacier.

Tombolo: a bar or spit that connects or ties an island to the mainland or to another island.

Sources of Information

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