

Cape Cod

1961 National Seashore

I Introduction

A. Human history

1. over 9,000 years of occupation
2. 1600s - Wampanoag Indians
3. 1620 - first landfall for Pilgrims and site of creation of Mayflower Compact
4. European settlement - whaling and fishing industry, and shell fishing
5. lighthouses, lifesaving, and Coast Guard stations reflect heritage
6. technological advances
 - a. first transatlantic cable laid between Cape Cod and France in 1866
 - b. 1903 - Marconi - first transatlantic wireless messages between President Theodore Roosevelt and King Edward VII

II. Pre-glacial geology

- #### A. Coastal plain resembling east coast around NJ, Delaware, Maryland, and VA

III. Glacial Geologic history - largest glacial peninsula in the world

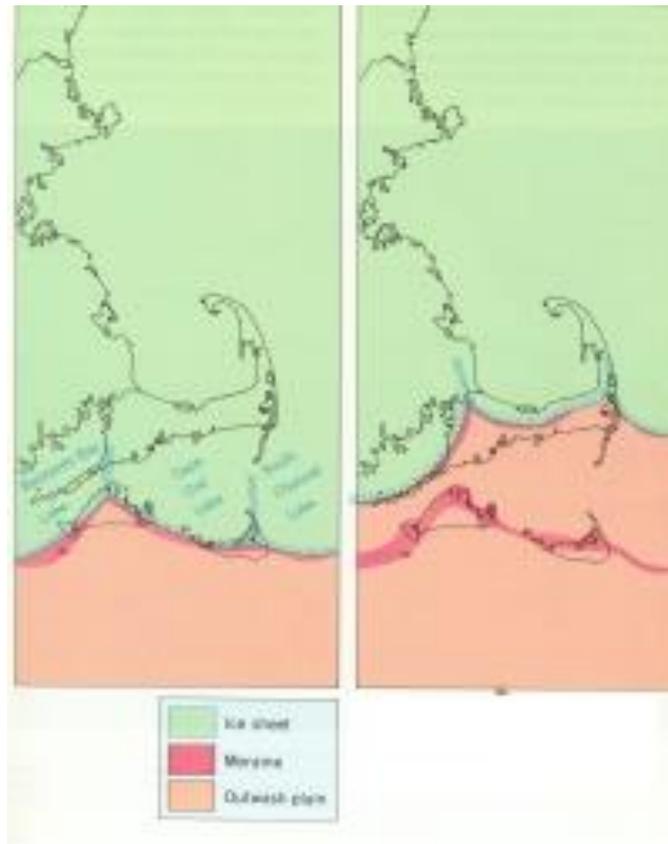
A. Last 25, 000 years

1. Advance and retreat of last continental ice sheet – lobes from Labrador
2. rise in sea level that followed the retreat of the ice sheet

B. 23,000 years ago - maximum advance – Nantucket and Martha’s Vineyard



2. ice sheet characterized by lobes that occupied basins in bedrock surface



- a. responsible for location and overall shape of Cape Cod and islands
 - 1.) western side of Cape Cod was formed by the Buzzards Bay lobe
 - 2.) middle part by the Cape Cod Bay lobe
 - 3.) lower or outer Cape by the South Channel lobe

B. Rapid retreat

- 1. by 18,000 years ago, retreated from Cape Cod and into Gulf of Maine
- 2. by 15,000 years ago, retreated from Gulf of Maine & S New England.

IV. Post-Glacial Geology

- A. World-wide sea level drop during glaciation and for some time after the retreat of the ice away from Cape Cod

- 1. ~ 400 feet below its present level



b. Glacial Deposits

1. >200' to >600" thick
2. drift – fine to coarse rock debris unstratified and unsorted = glacial till
 - 1.) deposited directly by ice
 - 2.) mixture of all sizes of rock - clay-sized particles to boulders
- b. stratified drift
 - 1.) deposited by water - separates and stratifies different sizes of fragments in meltwater streams and lakes

a. Glacial Features

1. moraines - ridges of drift

a. formed when ice front remains in same place because advance of glacier is balanced by melting along ice front

1.) when debris falls free of ice, it accumulates along ice front

a.) Buzzards Bay and Sandwich moraines formed when ice front overrode sediments and thrust sheets of drift upward and forward to form a large ridge beyond ice front

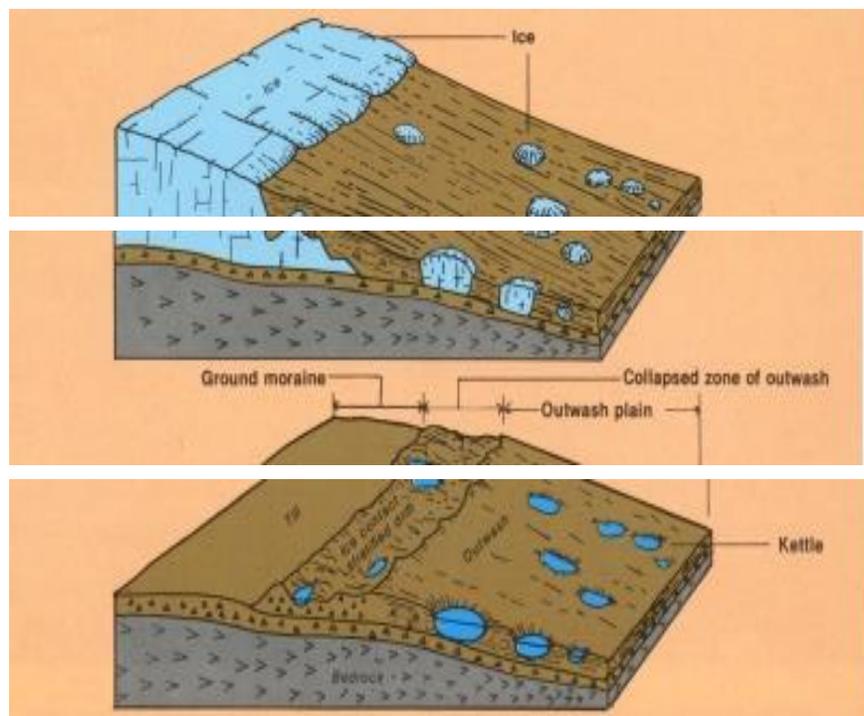
2. outwash plains - sand and gravel deposited by meltwater streams

a. forms broad flat depositional surface sloping gently away from ice front

1.) form irregular and unorganized terrane of kames and kettles

b.) kame - hill composed of deposits, originally filled hole in ice; ice melted, deposits collapsed to form a hill

c.) kettle is opposite; outwash deposited around and over ice block, ice block melted away, outwash collapsed to form hole.



3. glacial erratics

a. boulders scattered about the glacial surface

b. too large to have been carried by running water and thus must have been deposited directly by the ice

4. baymouth bars
 - a. low ridges composed of beach sand
 - b. waves erode sections along shore - form cliffs; eroded sand & gravel carried along shore and deposited across reentrents in the shoreline
 5. outwash channels- melting during warming causes floods which scour out channels
 - b. Post-Glacial Sea Level
 1. sea level rose as continental ice sheets melted and water
 - a. at first ~50'/1,000 years
 - b. as glacial ice volumes became reduced, rise in gradually slowed.
 - c. Cape Cod
 - 1.) between 6,000 years ago and 2,000 years ago – 11'/ 1,000 years
 - 2.) from 2,000 years ago, the rate of sea-level rise was about three feet per 1,000 years
 - 3.) ~ 6,000 years ago, the rising sea reached the cape and wave erosion of the glacial deposits began
 - a.) headlands composed of glacial drift began to erode as waves attacked the fragile land to form marine scarps or sea cliffs
- B. Present-day processes
1. Waves shaped broad, sweeping curves of today~ 3'/yr to west
 2. Tides
 - a. formation of mudflats and salt marshes
 - 1.) mudflats
 - a.) thin layers of mud brought in by tides
 - 2.) Salt marshes
 - a.) plants growing in mud flats trap clay
 - b.) surface builds up to level of high water
 - c.) tidal stream carries in flood waters and returns ebb waters