



EROSION... HARMFUL OR HELPFUL?

OBJECTIVES:

- Distinguish between naturally caused and human influenced erosion
- Explain erosion rates
- Explain off shore sand transport and barrier beach formation
- Describe advantages to keeping natural systems intact

GRADE/SKILL LEVEL:

Adaptable to grade 5 and beyond.

MATERIALS:

- Fact sheets on erosion
- Video, [Sands of Time](#)
- Clear plastic bottles, water and sand
- Guide's Guide to Cape Cod National Seashore, erosion sections

BACKGROUND:

Erosion is a natural phenomenon on Cape Cod. In fact, much of what we enjoy about Cape Cod today is the by-product of natural erosion. Wide sandy beaches are nourished by sand taken from the glacial scarp cliff faces. All of the Province Lands, as well as Nauset Spit, North Beach, Monomoy Island, and Sandy Neck were created by the long shore transportation and redeposition of sand. If erosion of the outer beach cliffs could somehow be halted, these formations would also disappear.

Human features, however, suffer significantly from erosion. Highland and Nauset Lights were in danger of falling over the cliff and had to be moved. The Old Harbor Life Saving Station also had to be moved from Chatham to its present location in Provincetown in order to save it. The 300-car parking lot at Coast Guard Beach in Eastham was demolished by the Great Storm of 1978. Private homes in Chatham have fallen into the ocean as a result of shoreline retreat.

Community planning at federal, state and local levels has shifted to encouraging building structures and facilities well away from the shoreline and planning for their eventual demise and replacement on a cyclic basis. Natural systems have been encouraged to flourish, since scientific studies have found that they are more effective at minimizing erosion rates than land-altering approaches (such as sea walls, jetties, rocks, etc.). Beach grass planting in the Province Lands' dunes is a related natural restoration activity.

ACTIVITIES:

Pre-visit:

- Read fact sheets on erosion on Cape Cod
- Watch the video, *Sands of Time*
- Discuss why people think erosion is bad. Ask if erosion is bad to natural things? Is erosion bad to the Grand Canyon? Is erosion bad to endangered animals if they have no place else to live? (Careful!)
- Piping plovers and some other rare species actually benefit from beach overwashes!).

On Site:

- Measure (in paces) the distance from the shore to a structure, such as the Coast Guard NEED building. Calculate the lifespan of the structure at an erosion rate of three feet per year.
- Look at the old photographs of Coast Guard Beach. Notice that the barrier beach and dunes have been able to move backward and reform naturally.
- Discuss how storms cause waves to approach Cape Cod in “half circle” configurations. Show how the sand in the water along the shore is transported either north or south as a result, forming spits and barrier beaches.
- When traveling in the Province Lands, look for the absence of large rocks, or other solid ground formations. Discuss how this area was made from sand brought from other portions of the Cape through wave and wind action, and therefore looks very different.
- Look for the outer sand bars on the horizon. Discuss how rough winter waves carry sand off the shore, then drop the sand when they get to calmer (deeper) areas — hence forming sandbars. Discuss how gentler summer waves bump into these sand bars and in turn bring in (and leave off) more sand than they take away.
- Use a clear plastic container to demonstrate on and off shore sand movement. Fill it with sand and water. Shake it up and the sand will float. Stop shaking and the sand will settle.
- Discuss how dunes are formed by wind action and beach grass. Place a handful of sand on a flat piece of cardboard. Blow on the sand, and see it move and eventually spill off the opposite side. Glue finely shredded paper or steel wool onto the cardboard. Repeat the exercise.

Post Visit:

- Write essays about the good and bad effects of erosion.
- Collect and share newspaper and magazine articles on erosion issues around the United States.



EROSION ... HELPFUL OR HURTFUL?

Student Information Sheet

Erosion is a very natural process on Cape Cod. In fact, much of what we enjoy about the Cape is a result of erosion. The wide sandy beaches we walk on are made of sand that falls down from the glacial cliffs behind the beach. Waves, currents and wind then move much of this sand to other parts of Cape Cod. All of the Province Lands area, as well as Nauset Spit and much of Great Island, were created by the movement and relocation of sand. If erosion of the outer beach cliffs were somehow stopped, these formations would eventually disappear.

Human features such as buildings and parking lots, however, often suffer severely from coastal erosion. The Highland Lighthouse was in danger of falling over the cliff as a result of "shoreline retreat" and had to be moved in 1997. Twenty years earlier, in 1977, the Old Harbor Life Saving Station had to be moved from North Beach in Chatham to its present location in Provincetown in order to save it. And in 1978, a 300-car parking lot located at Coast Guard Beach in Eastham was completely demolished by the Great Storm of 1978. More recently, several private homes in Chatham have fallen into the ocean as a result of coastal erosion.

We have now learned that it is better to build further away from the shoreline, and to plan for regular replacement of buildings and features that need to be located close to the water's edge.

We have also learned that natural "systems" are often better at slowing and controlling erosion on a large scale than human created "solutions" such as building sea walls or jetties. Scientists have found that the natural movement and placement of sand (both up and down the coast, as well as on and off the shoreline), slows the erosion effect of waves. You can test this on your own. Time yourself running on a sandy beach for a specific distance. Then time yourself running the same distance in a parking lot. The sand on the beach will slow you down considerably. Likewise, the soft sandy beach slows down the power of storm waves much better than solid concrete barriers can.

Beach grass planting in the Province Land dunes is another way in which natural restoration activities can help correct unnatural erosion rates. Beach grass traps the sand blown by the wind, and is actually responsible for forming all of the dunes you see on Outer Cape Cod. When people or animals trample beach grass and kill it, the dunes can begin to fall apart. Before the Pilgrims arrived on Cape Cod, the beach grass in the Province Lands did such a good job of holding the dunes together that a complete forest existed there. Sometimes you can still see the remains of old trees poking through the sand.

While there may be little or no erosion in some years, scientists have calculated the average natural erosion rate on the Outer Cape at approximately three feet a year. This process is due primarily to sea level rise. Thus, the Cape is gradually getting narrower. While its natural lifespan is still several thousand more years, human activities that increase erosion can upset the natural "give and take." That is why it is important for people to learn not to take short cuts through the dunes or over cliffs to get to beaches. Likewise, while beach grass can withstand the most powerful storms, it can die if stepped on more than twice by people.

Erosion is a natural process that has shaped much of Cape Cod as we see it today. Thus on Cape Cod, it is important that this process be kept natural and not be upset by human interference whenever possible. Without natural erosion, the Cape would not have such beautiful wide sandy beaches. Some of this sand released by erosion also nourishes the long thin barrier beaches that protect portions of the Cape's shoreline, and the marshes and bays behind them. Nauset Marsh and Pleasant Bay are two examples of natural features that benefit from healthy barrier beaches. Thus there are many reasons why it is important to allow natural erosion and sand renourishment processes to continue.

The National Park Service has tried to do its part to help in several ways. For example, at Cape Cod National Seashore when the parking lot at Coast Guard Beach in Eastham was demolished by the big winter storm of 1978, a new replacement parking lot was built about a half mile inland. Today summer visitors ride a shuttle bus from this inland parking lot to Coast Guard Beach. Many people think the beach here is now more beautiful than ever -- especially because there are no more cars or a parking lot to interfere with the spectacular natural scenery at this spectacular oceanside location. Is erosion good or bad? Perhaps it is best to answer by saying that erosion is neither good nor bad, but part of a natural process. Planning ahead, and accepting nature's balance of "give and take" are also part of the correct answer.

Chatham fishermen have gained a new inlet into the open ocean, submerged bars created from the constantly shifting sands make their trips more treacherous. Likewise, shellfishing has been affected in some locations, due to the disturbance of shellfish beds in the once-quiet waters of Pleasant Bay.

However, while some suffer, others gain. The new island has offered scientists a chance to study native animals and plants in a secluded setting and has given birds a quieter area in which to nest. Further, while the increased water turbulence is presently disturbing some shellfish beds in the bay, the cleansing process inherent with the break will eventually benefit the greater shellfish population.

EROSION STUDY SHEET

- 1 Erosion on Cape Cod results in _____ feet of shoreline disappearing every year.

- 2 Sand taken from the cliffs is often deposited into _____

- 3 Buildings and parking lots should be placed _____ from the shoreline whenever possible.

- 4 Sand bars and beaches help to naturally slow down _____

- 5 _____ can be planted in the sand to help preserve the dunes.

- 6 As the sea level continues to gradually rise, natural erosion will _____, but the Cape should still be around for several thousand years.

- 7 The shuttle bus at Coast Guard Beach in Eastham _____