

Earth Science

Chapter 18 - EROSION BY WIND AND WAVES

Section 3 - Coastal Erosion and Deposition

STANDARDS:

SES3. Students will explore the actions of water, wind, ice, and gravity that create landforms and systems of landforms (landscapes).

d. Relate the past and present actions of ice, wind, and water to landform distribution and landscape evolution.

Objectives

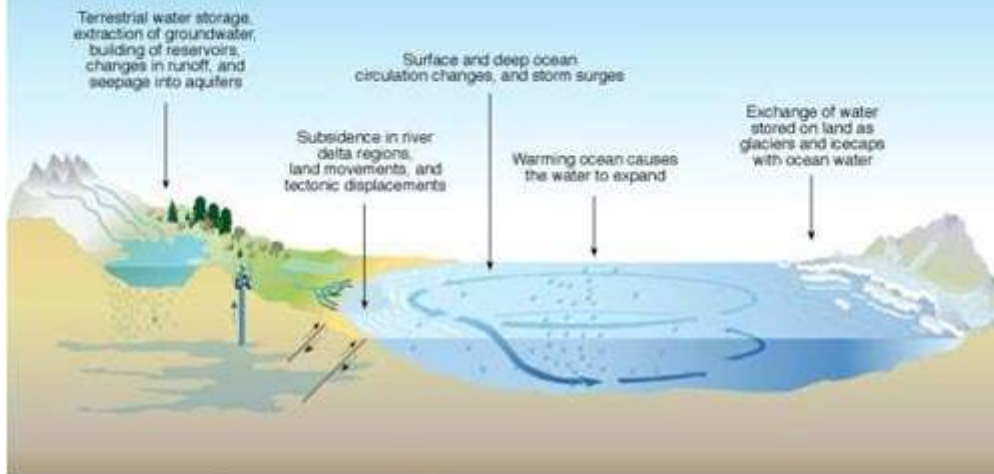
- **Explain how changes in sea level affect coastlines.**
- **Describe the features of a barrier island.**
- **Analyze the effect of human activity on coastal land.**

Absolute Sea-Level Changes

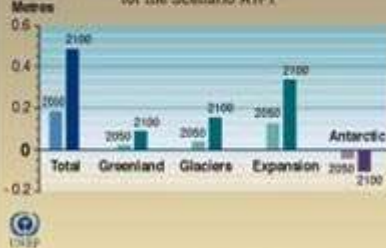
- **A change in the amount of ocean water causes sea level to rise or fall, so coastlines are covered or exposed.**
- **Since the last glacial period, the ice sheets have been melting and sea level has been rising at a rate of about 1 mm per year.**
- **If the polar icecaps were to melt completely, the ocean would rise about 60 m and submerge low-lying coastal regions, including many large cities, such as New York, Los Angeles, Miami, and Houston.**



What Causes the Sea Level to Change?

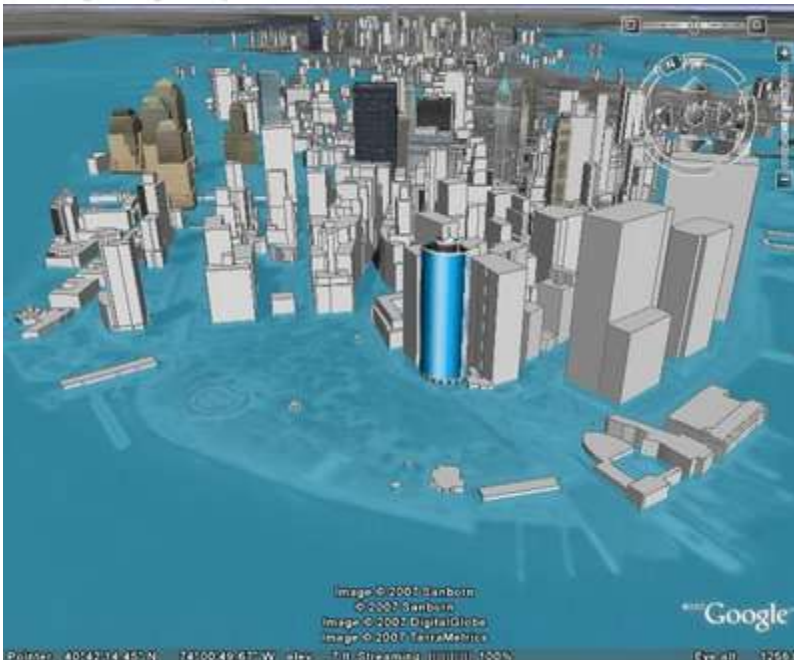


Components of Mean Sea Level Rise for the Scenario A1F1



The A1 scenario family describes a future of rapid economic growth, a global population that peaks in the middle of the 21st century and then declines, and the rapid introduction of new and more efficient technologies. The major underlying themes are convergence among regions, capacity-building, and increased cultural and social interaction, with a substantial reduction in regional differences in per capita incomes. The A1 scenario family develops into three groups with alternative directions of technological change according to their energy systems: fossil intensive (A1FI), non-fossil energy sources (A1T), or a balance of both (A1B).

Source: David Griggs, in Climate Change 2001, Synthesis report, Contribution of working groups I, II and III to the Third Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, 2001.



Sea level rises are the probably most immediate and worrisome factor in the ongoing environmental refugee crisis. Rising global temperatures are melting the polar ice caps which are releasing massive amounts of water in to the oceans and seas, approximately 100 billion tons of ice melt annually in Greenland alone. And as the oceans warms not only does more ice melt but also the water expands raising sea levels still further.

So why is this a problem? Approximately 100 million people live in areas below sea level that means any storm surges or sea level rises have the potential to displace these people from their coastal residences. UN Under-Secretary General Anwarul Karim Chowdhury has said that the most at risk countries from sea level rises are Bangladesh, Cambodia, Kiribati, the Maldives, Comoros, Samoa, the Solomon Islands, Tuvalu and Vanuatu. Already two islands belonging to Kiribati have been totally submerged.



Louisiana

Relative Sea-Level Changes

- **Absolute sea-level changes when the amount of water in the ocean changes.**
- **Relative sea-level changes when the land or features near the coast changes.**

- These changes can be caused by large-scale geologic processes or by localized coastal changes.

Submergent Coastlines

estuary - an area where fresh water from rivers mixes with salt water from the ocean; the part of a river where the tides meet the river current



- When sea level rises or when land sinks, a ***submergent coastline*** forms.
- When U-shaped glacial valleys become flooded with ocean water as sea level rises, spectacular narrow, deep bays that have steep walls, called ***fiords***, form.



Sea kayaking Expedition FULL
Northern Patagonia Fiords, Chile



North Fiord, Lake Te Anau, Fiordland
National Park, New Zealand

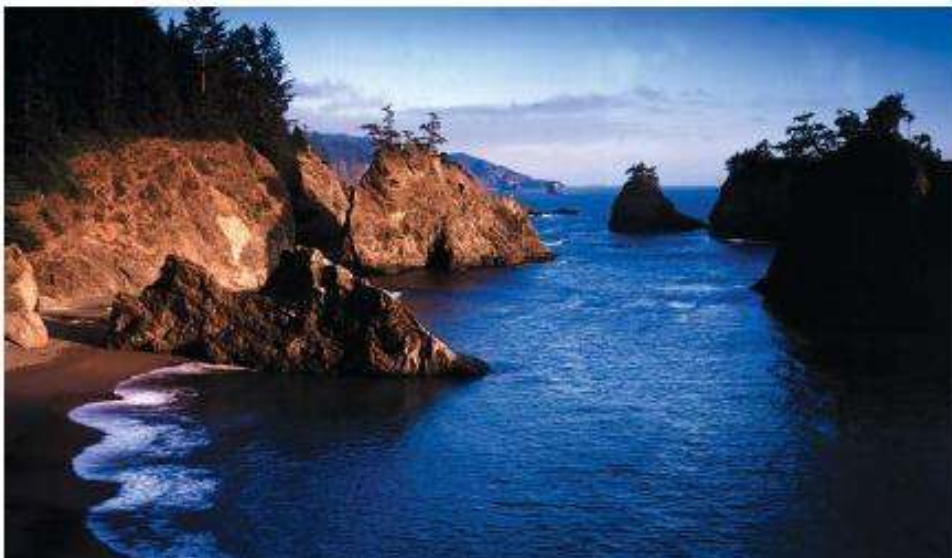
• **Emergent Coastlines**

- When the land rises or when sea level falls, an ***emergent coastline*** forms.
- If an emergent coastline has a steep slope and is exposed rapidly, the coastline will erode to form sea cliffs, narrow inlets, and bays.

- **The gentle slope forms a smooth coastal plain that has few bays or headlands and that has many long, wide beaches.**



The California coast is known as an emergent coast, an area that was formerly under water and has gradually risen above sea level either through geologic uplift of the land or a drop in sea level. PHOTOGRAPH REPRODUCED BY PERMISSION OF THE CORBIS CORPORATION



The coast of the Pacific Ocean in Boardman State Park, Oregon, an example of an emergent coast. (*Reproduced by permission of Photo Researchers, Inc.*)

Barrier Islands

barrier island - a long ridge of sand or narrow island that lies parallel to the shore
lagoon a small body of water separated from the sea by a low, narrow strip of land

- As sea level rises over a flat coastal plain, the shoreline moves inland and isolates dunes from the old shoreline to form barrier islands.
- Barrier islands also form when sand spits are separated from the land by storms or when waves pile up ridges of sand that were scraped from the shallow, offshore sea bottom.
- Large waves from storms, especially waves from hurricanes, may severely erode barrier islands.



Georgia has five Barrier Islands and each one has a different flavor. Cumberland Island
Cumberland Island can be found seven miles northeast of St. Mary's. It is considered to be the East Coast's most natural and unspoiled island. Much of the island is managed by the National Park Service because in 1972 it was declared a National Seashore. On Cumberland Island you won't find the usual amenities such as golf courses, tennis courts or swimming pools. It is the ideal place if you are looking for walks along beaches that are undeveloped, fishing, exploring and swimming in the pristine Atlantic Ocean.



Cumberland Island



Jekyll Island

Situated just nine miles south of Brunswick, Jekyll Island has the distinction of once being the playground in the winter months for the rich and famous such as the Morgans, Pulitzers and Rockefellers. It is the smallest of Georgia's islands.

It is no longer an exclusive closed society that it once was in its glorious past so anyone that is looking for white sand beaches that stretch for miles can feel free to make it their holiday destination.

There is a championship golf course as well as tennis complexes and many families come here because of the various outdoor recreational opportunities.



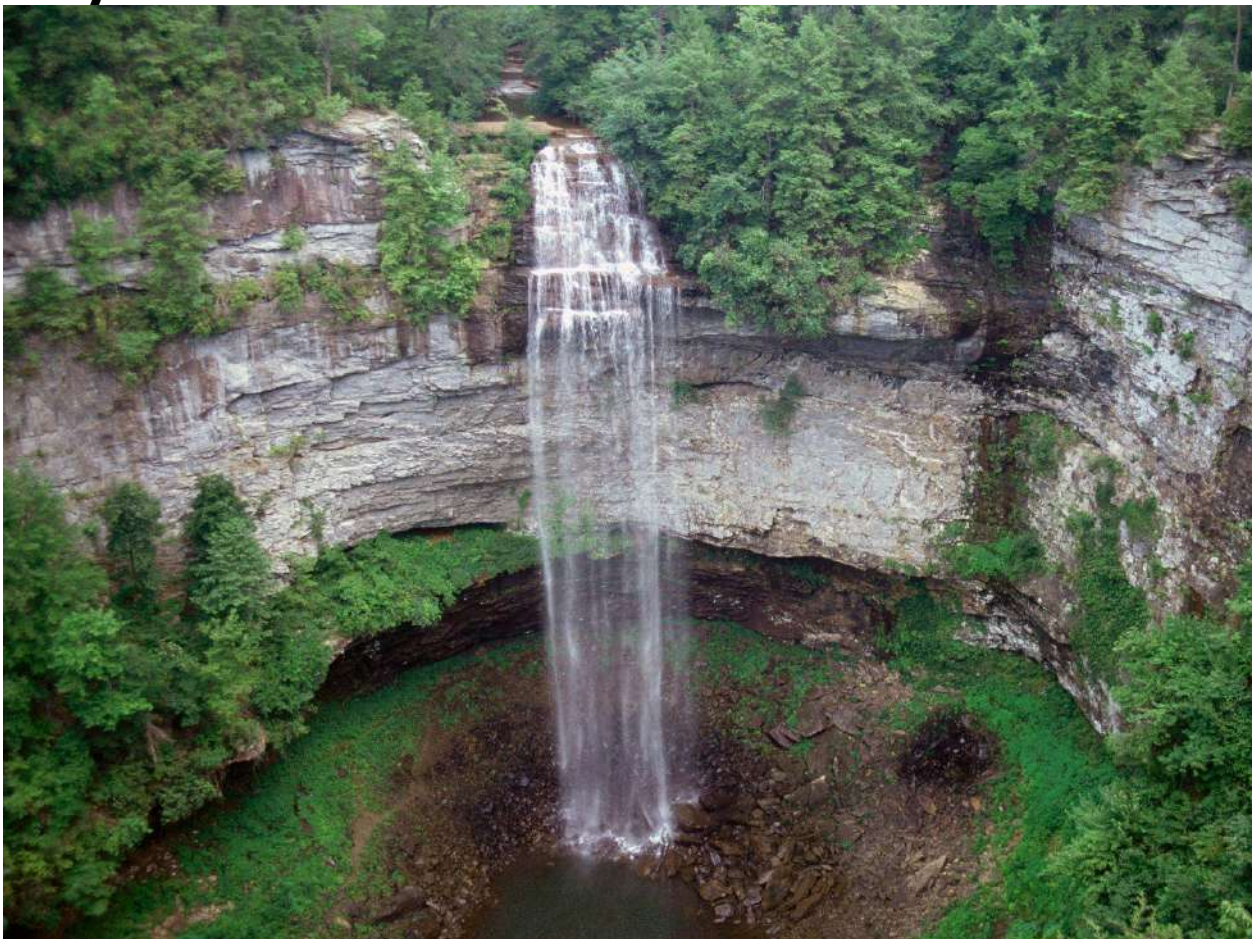
Jekyll Island



Jekyll Island



Jekyll Island



Sapelo Island - One of Georgia's Barrier Islands



Sea Island

The Cloister Hotel has laid claim to Sea Island since 1928. You will find some of the most **spectacular mansions and villas** on the island.

The rich folk often own second homes which are designed in the style of Spanish-Mediterranean. If you can afford to rent a cottage, there are a few that are available, but Sea Island is not really suitable for the Average Joe.



St. Simons Island

Not only is it the Golden Isles largest island, it also boasts the most popular beaches. Biking through ancient oaks you can take in the magnificent scenery as you traverse the island.

There are ***golf courses*** for those fans of the sport as well as a variety of tennis courts. Many consider it to be a haven for vacationing families.



Little St. Simons Island

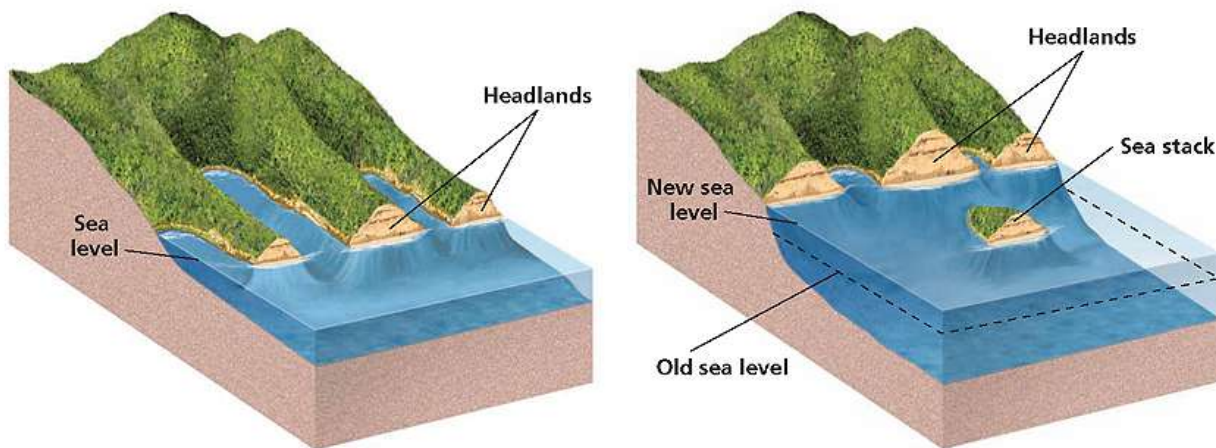
The only way to reach this island it is by a twenty minute ride by boat from St. Simons Island.

Commercial development has not yet touched the wild beauty of the island.

It is just about three miles wide and six miles long and it is an island that is privately owned where the current proprietors have been welcoming guests since 1978.

There are only accommodations for twenty four so if you want to vacation on this pristine island you should make your reservations well in advance.

The image below shows the features of a submergent coastline.



READING CHECK:

How do barrier islands form?

As sea levels rise over a flat coastal plain, the shoreline moves inland and isolates dunes from the old shoreline. These dunes become barrier islands.

Preserving the Coastline

- **Pollution is a serious threat to coastal resources.**
- **Garbage, pollution from industry, and sewage from towns on the coast can pollute the coastline.**
- **This pollution can damage habitats and kill marine birds and other animals.**
- **To preserve the coastal zone, private owners and government agencies often work together to set guidelines for coastal protection.**



