

# Weathering, Erosion, and Deposition



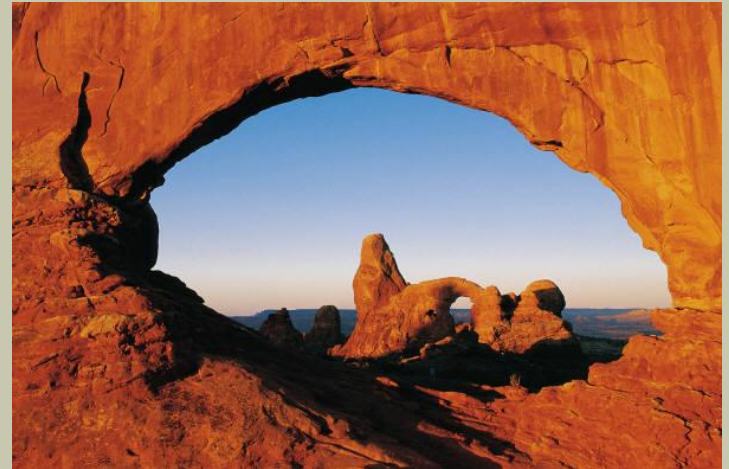
**EQ: HOW IS THE EARTH AFFECTED BY  
CONSTRUCTIVE AND DESTRUCTIVE FORCES?**



# Weathering



**EQ: HOW IS THE EARTH AFFECTED BY  
CONSTRUCTIVE AND DESTRUCTIVE FORCES?**



# What is weathering?



- *Weathering* is the breakdown, either physical or chemical, of rocks on the earth's surface.
- There are many types of weathering: wind, water, plants, ice, etc.
- When these elements come in contact with rocks, they will wear away small pieces.
- Often, weathering occurs slowly—like with wind.
- Other times weathering occurs quickly—like with a rock slide.

# Three Types of Weathering



## Physical Weathering

- The breakdown of materials by physical means
- Examples: water, temperature, wind

## Chemical Weathering

- The breakdown of materials by chemical means
- Examples: acid rain, oxygen

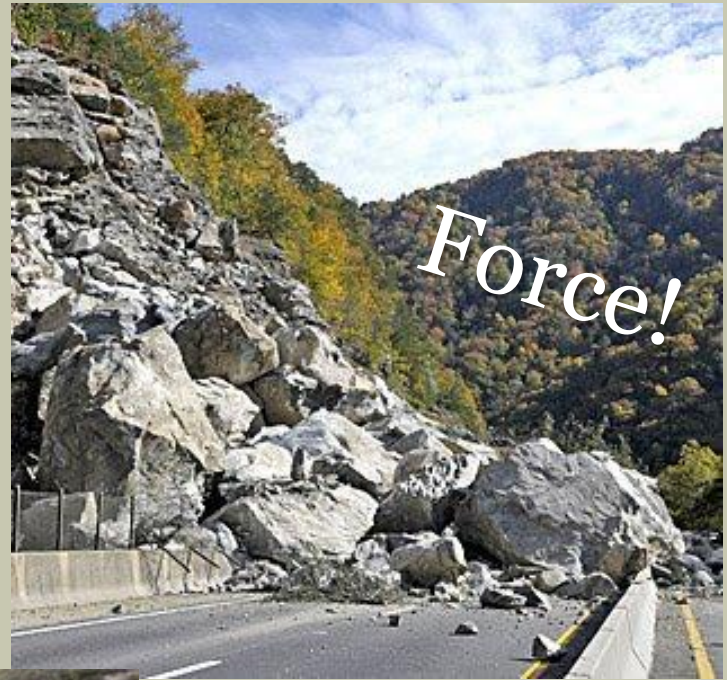
## Biological Weathering

- The breakdown of materials by living organisms
- Examples: animals, plants

# Physical Weathering



Wind!

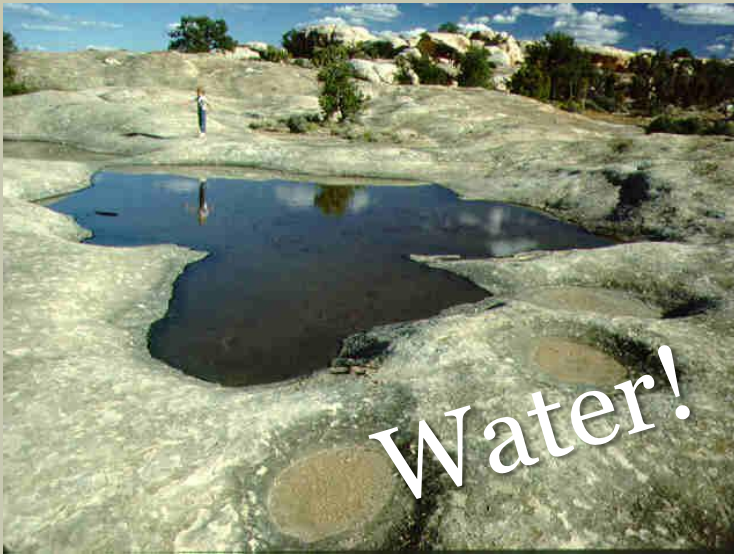


Force!



Temperature!

# Chemical Weathering



Water!



Dissolution!



Oxygen!

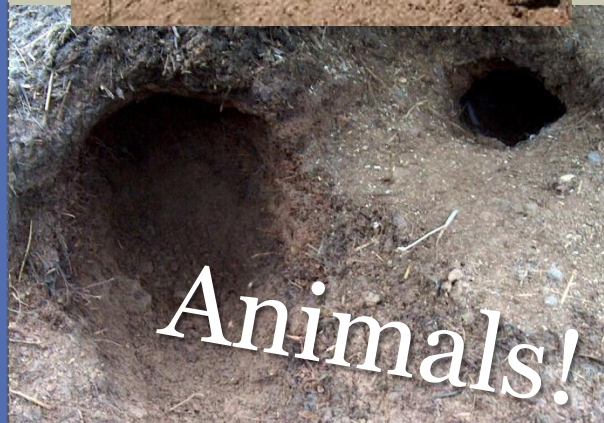
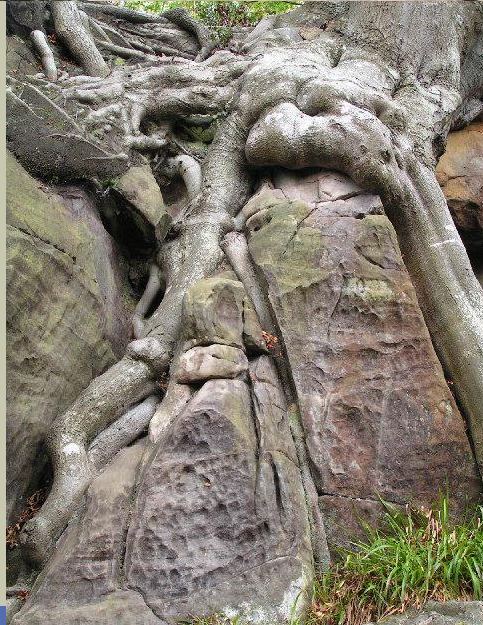


Acid rain!

# Biological Weathering



Plants!



Animals!



People!



# Human Activity



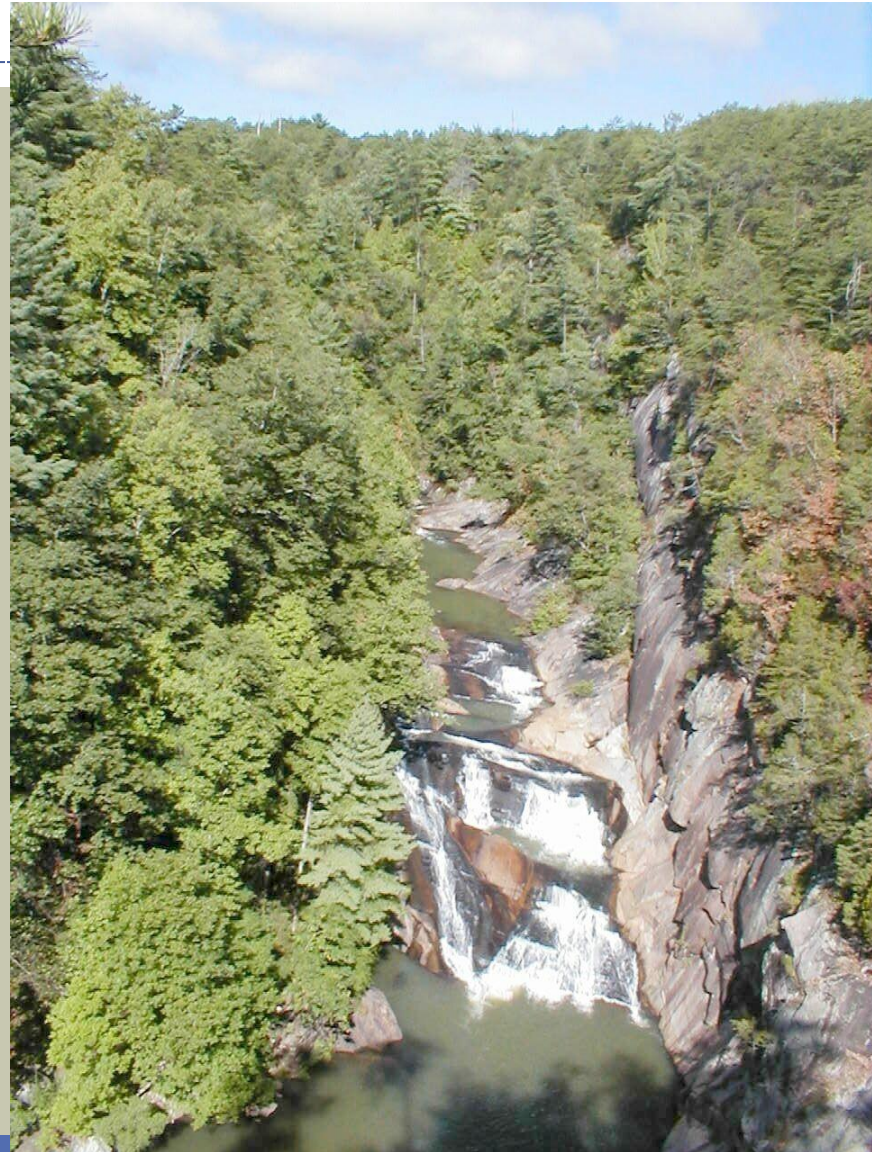
- Mankind plays a large role in affecting constructive and destructive processes.
- Sometimes, we help to stop destructive and constructive forces, and sometimes we accidentally speed them up.
- One example of how mankind helped stop weathering in Georgia is a place known as Tallulah Gorge.





# Tallulah Gorge

- One example of how mankind has affected the earth's surface in Georgia is Tallulah Gorge.
- Tallulah Gorge is a 1,000-foot deep gorge (rocky canyon) that was carved out of mountain granite by mighty rapids in the Northeast Georgian Mountains.
- <http://www.gpb.org/georgiatraveler/111-tallulah>



# Human Intervention



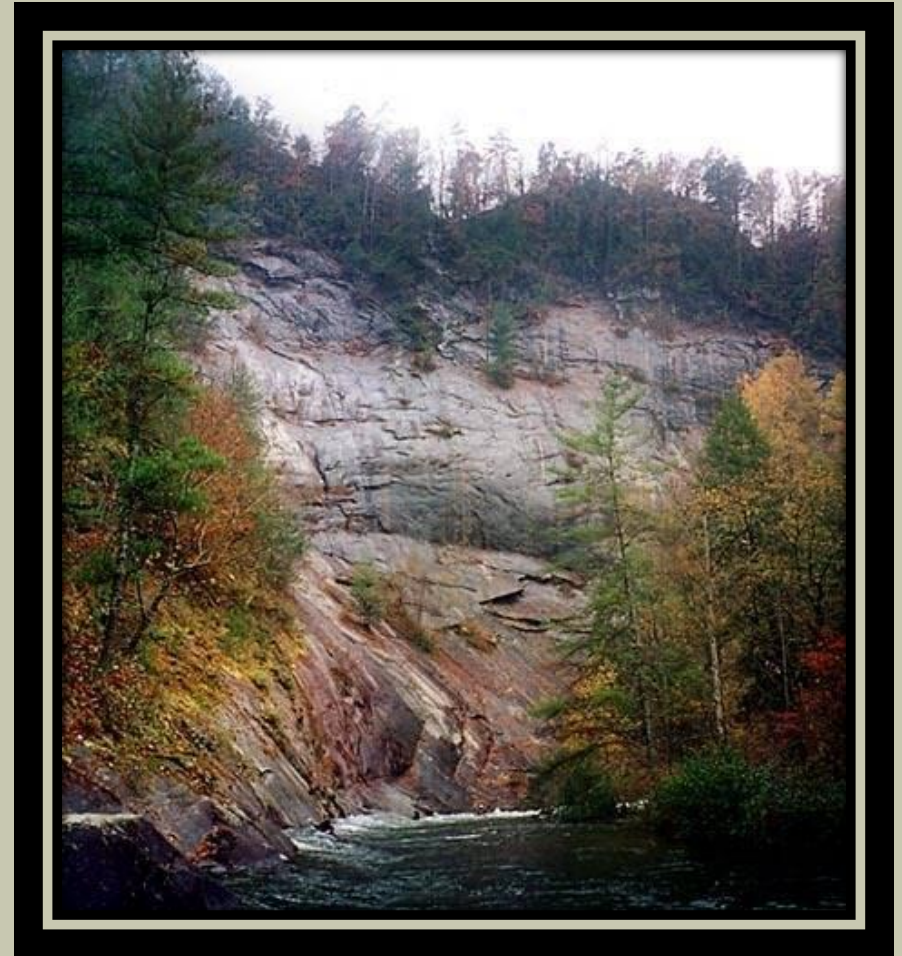
- The Tallulah River once had four major waterfalls cascading down through the mountains—L'Eau d'Or, forty-six-foot-tall ; Tempesta, eighty-one feet; Hurricane, ninety-six feet; Oceana, forty-two-feet.
- The reason the Tallulah gorge was so amazing, was that it cut through solid rock creating massive natural cliffs and observation points that allowed observation of these magnificent waterfalls.
- In 1913, Georgia Power decided to use the great power of the Tallulah River to generate electricity for much of Northern Georgia (Atlanta included).
- Once they built the dam, the water no longer raged down the gorge as it once did.
- The dam is 116 feet tall and 400 feet long.
- Now, the raging river rapids and mighty waterfalls only rage on select weekends during the year.



# Tallulah Gorge



- Now that the dam is stopping the rapid flow of water, the raging rapids are not constantly cutting into the rock of the mountain and breaking it away as it once did.
- Hence, we have altered the natural weathering of the Tallulah Gorge...



Weathering... Constructive or Destructive?



**DESTRUCTIVE!**



# Erosion



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# Erosion



- *Erosion* is the movement of soil by water or wind.
- After weathering turns rocks into smaller pieces or soil, then often erosion takes place and moves the smaller pieces away.
- Rivers and streams are constantly getting deeper into the crust of the earth. They will continue to slowly move more and more soil and sand downstream.
- Wind also blows soil and sand around on the earth.
- Water and wind can work slowly each and every day or quickly in a sudden storm.
- The geologists of Stone Mountain believe it formed from both volcanic activity under the ground, and then from weathering and erosion of the surrounding soil above ground.



## Formation of Stone Mountain



The energy and force from the Earth's interior slowly put the pre-continent of Africa and North America on a collision course.



As they continued to come together, ocean islands smashed into the North American continent.



The continents converged and eventually collided about 300 million years ago. The steady force of the two colliding masses buckled and fractured the Earth, creating the Appalachian Mountain chain to the west.



After a few million years of cooling, Stone Mountain solidified eight to ten miles below the Earth's surface.



Stone Mountain granite is more resistant to erosion than the surrounding countryside. For 285 million years, the eight to ten miles of land above the mountain wore away, leaving Stone Mountain standing almost 800 feet high.



What could have caused the erosion of Stone Mountain, if it wasn't millions of years?



# Human Activity

- Mankind plays a large role in affecting constructive and destructive processes.
- Sometimes, we help to stop destructive and constructive forces, and sometimes we accidentally speed them up.
- One example of how we accidentally sped up a destructive force is a place in Georgia known as Providence Canyon.
- <http://link.brightcove.com/services/player/bcpid9113583001?bctid=1504464249>



# Providence Canyon



- Providence Canyon was originally farmland.
- Farmers in the early 1800s cleared the forest to farm the land.
- The original forest blocked erosion. However, once the trees and plants were gone, rainwater washed the soil away.
- By 1850, ditches three to five feet formed in the land.
- Once these deep ditches formed, this only sped up the rate of erosion, and now we have the beautiful canyons that show today.
- Even though Providence Canyon is really not supposed to exist, it is one of mankind's most beautiful accidents.

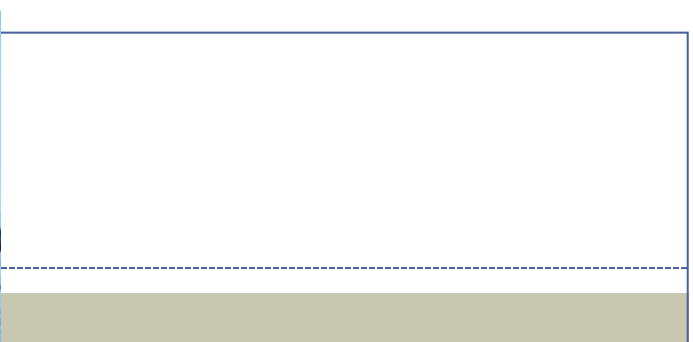


# Erosion



- Now, even though Providence Canyon is a marvelous sight, soil erosion that occurs on earth is considered bad by most people.
- The reason for this is because soil is necessary to grow crops and sustain buildings and structures.
- If the soil around your house's foundation erodes away, what would eventually happen to your house?
- This is why houses have gutters. Gutters move water from the roof down a pipe where it can be drained out at a place that will not wash away.





- This house is on a hill, and rainwater is eroding away the soil around its foundation.

# Ways to SLOW DOWN Erosion...



- Plant plants!—Plant roots help to hold soil in place to keep it from washing away.



- Build a Retaining Wall—Retaining walls keep the soil behind it in place.



# Ways to SLOW DOWN Erosion...



- Use Mulch—Mulch protects the soil from wind and water.



- Channel the water—Building a channel makes the water flow somewhere else that might not erode as quickly.





Erosion... Constructive or Destructive?



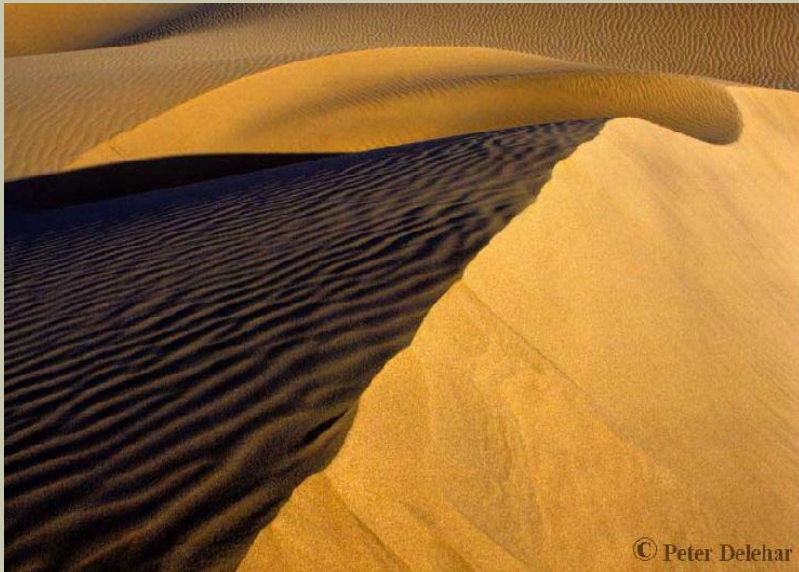
**DESTRUCTIVE!**



# Deposition



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# Deposition



- After soil has eroded, deposition can then occur.
- *Deposition* is deposits of material which is added to a landform.
- After the soil or sand has been moved away by erosion, the water or wind will then “deposit” the material somewhere else.

# Examples of Deposition:



Sand dunes-Wind

Deltas-Water



© Peter Delehar



# Georgia's Barrier Islands

- In Georgia, there are places that constantly endure change on the earth's surface. They are Georgia's very own Barrier Islands.
- <http://www.gpb.org/secretseashore>



# What are Barrier Islands?



- Georgia's Barrier Islands are constantly changing islands along Georgia's coastline that protect it.
- They form a barrier between the raging ocean and inland.
- This means they are the first line of defense when an ocean storm comes ashore.
- They especially run along the eastern coast of North America.
- Because barrier islands are exposed to so much natural erosion and deposition, they are constantly changing shape, moving, and shifting.



# Nature's Effects on Barrier Islands



Barrier islands are constantly changing. They are influenced by the following conditions:

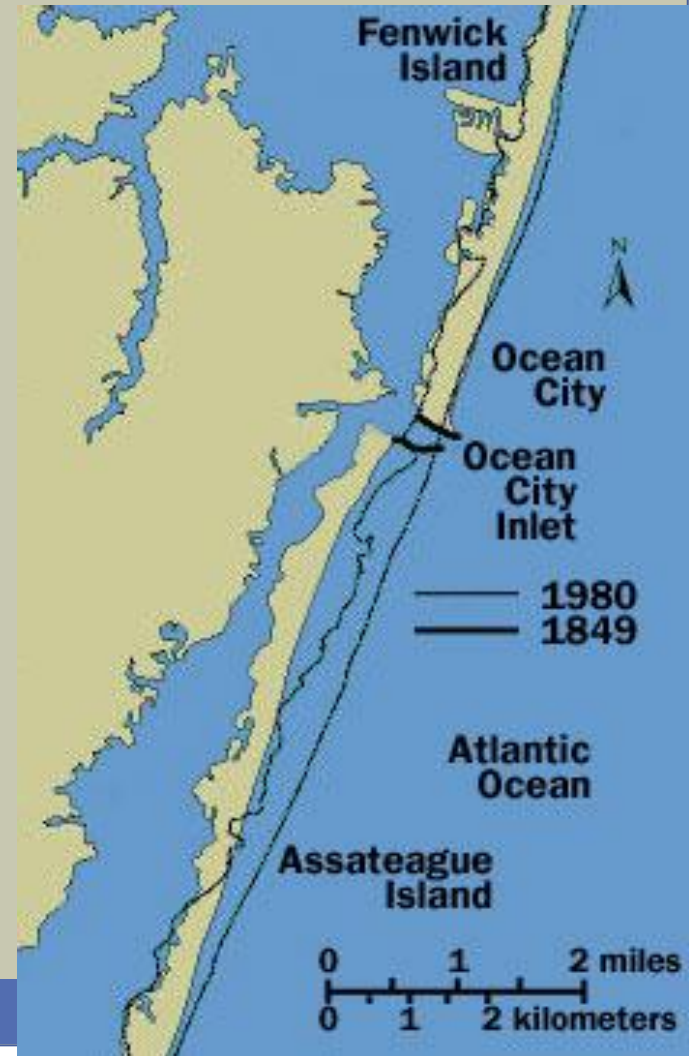
- **Waves** - Waves continually deposit and remove sediments from the ocean side of the island.
- **Currents** - Longshore currents that are caused by waves hitting the island at an angle can move the sand from one end of the island to another. For example, the offshore currents along the east coast of the United States tend to remove sand from the northern ends of barrier islands and deposit it at the southern ends.
- **Tides** - The tides move sediments into the salt marshes and eventually fill them in. Thus, the sound sides of barrier islands tend to build up as the ocean sides erode.
- **Winds** - Winds blow sediments from the beaches to help form dunes and into the marshes, which contributes to their build-up.
- **Sea level changes** - Rising sea levels tend to push barrier islands toward the mainland.
- **Storms** - Hurricanes and other storms have the most dramatic effects on barrier islands by creating overwash areas and eroding beaches as well as other portions of barrier islands.

\*Source: <http://science.howstuffworks.com/environmental/conservation/issues/barrier-island3.htm>

# Ways Human Efforts have Changed Barrier Islands



- Sometimes we try to stop the erosion of barrier islands, and in doing so we have completely changed the natural shifting of the islands.
- For example, this island to the left was once where the outline was. It moved inland after humans put up rock walls on the ocean city inlet.
- By stopping the erosion here, the island began shifting back.
- The same thing that happened in Maryland could happen to Georgia's Barrier Islands, if we are not careful.





# Beach Nourishment



- One way people try to stop barrier island erosion is to try man-made deposition. They deposit more sand where the sand is washing away.
- This is known as beach nourishment or beach reclamation. However, it is only a temporary fix and is very expensive (costing millions of dollars).
- Below is a beach in Florida that underwent beach nourishment, but within a year, all that sand (and all that money spent) washed away.



# Tybee Island



- The offshore currents that happen on the United States' east coast usually hit the islands at an angle.
- This means they often erode away sand from the northern end of the islands, and then deposit the sand on the southern ends of the islands.
- Tybee Island is the northern-most island of Georgia's Barrier Islands.
- It is often the only island that requires beach nourishment.
  - Why do you think that would be?



# ANSWER:

Its sand is being deposited on the islands to its south!



Deposition... Constructive or Destructive?



**CONSTRUCTIVE!**



# Human Intervention and Recent Technology



- Scientists have learned how constructive and destructive processes occur, and they are still constantly working to find out ways to predict or control them.
  - Seismographs help scientists study earthquakes and volcanic activity.
  - Erosion control by:
    - ✦ Planting plants
    - ✦ Building retaining walls
    - ✦ Water channeling/storm drains/gutters
    - ✦ Building dams
    - ✦ Beach nourishment