A BEACH IS A BEACH...

Or Is It?

Pt. Reyes, California

Hawaii

Eastern Maine

Western Florida

What is a beach?

A beach is a strip of shoreline washed by waves and tides.

Crane Key, Florida Bay

St. Croix, US Virgin Islands

Eastern Maine

Are all beaches alike?

Some beaches are sandy, some are swampy and some are rocky. Some are very narrow and others are very wide. Whatever their composition, waves and tides are constantly moving the particles around so beaches are constantly changing.

Where does the sand and rock on beaches come from?

Sand can come from:

- **Weathering and wave erosion of rocks along the shoreline**
- **Sediment carried from inland by rivers and streams**
- **Eroding reefs in tropical and subtropical locations**
- **Glaciers from the Pleistocene age**

Sources of Beach Sand

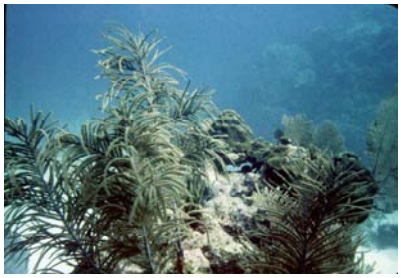
Weathering and wave erosion of rocks along the shoreline

Mt. Desert Island, Maine

Sediment carried from inland by rivers and streams

Little Sur River, California

Eroding reefs in tropical and subtropical locations



John Pennecamp National Park, Florida Keys

Glaciers from the Pleistocene age

Lake McDonald Beach, Glacier National Park

Is all beach sand the same?

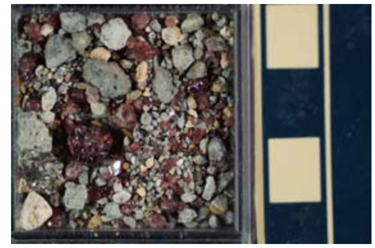
•Most beach sand is composed of quartz with other minerals and rock fragments mixed in.

•When the sediment comes from erosion of cliffs and nearby mountains the sand particles are large and the texture of the beach is coarse.

•When most of the sediment is transported by rivers from further inland, the sand texture is finer.

•Some beaches, like the black sand beaches in Hawaii, are made up entirely of rock fragments.

•Some beaches, like many of those in Florida, are made up of shell fragments and the remains of creatures that live in the coastal waters.



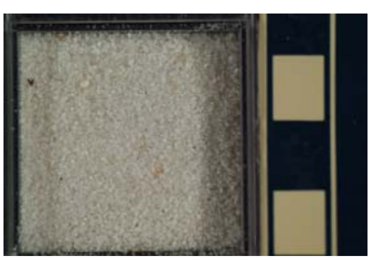






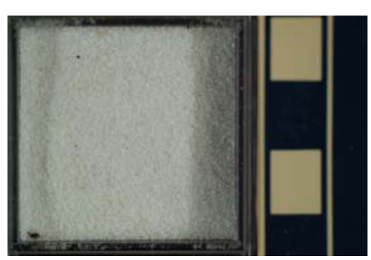













Take a look at some beach sands from around the world.

First look at some sand samples with your naked eye.

How are they alike and how are they different? Think about:

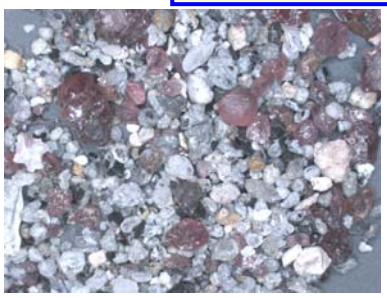
- **Color of sand**
- **Size of grains (fine, medium or coarse)**
- **Are all of the grains alike or are there many different colors, shapes and sizes?**

Now look at the sands again with a magnifying lens or microscope

Is your conclusion the same? Consider:

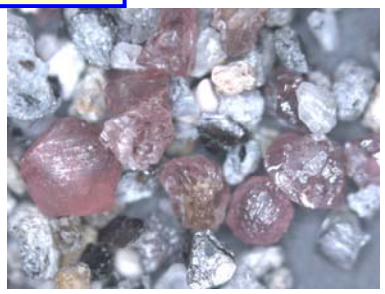
- **Shape of grains (rounded edges, sharp edges, crystalline)**
- **Color of grains**
- **Size(s) of grains**

This sand is from a river outlet near Carboneras, Spain.
The red grains are garnets.



5.8 X

10 X



20 X

This sand is from a beach on the southern tip of Hawaii.
The green grains are olivine.

5.8 X

10 X

20 X

This sand is from a beach in Belize.
The sand is made up of shells.

5.8 X

10 X

20 X

How do scientists use this type of information?

- To find out where the sand came from
- To learn how the beach formed
- To predict whether the beach is disappearing or getting bigger
- To decide how far away from shore to build houses
- To decide how to repair or renourish a beach that has eroded away

Papakolea Beach, HI
Green Sand Beach

River outlet near
Carboneras, Spain

Field work in the tropics
Sand is made up of shells
And other fragments

Why would a geologist want to know about the type of sand on a beach?

Planning successful beach replenishment projects

March 1984

1985
beach replenishment
project
$1.7million

April 1986

Carolina Beach, NC is the most extensively replenished beach on the East Coast of the US.

erosion

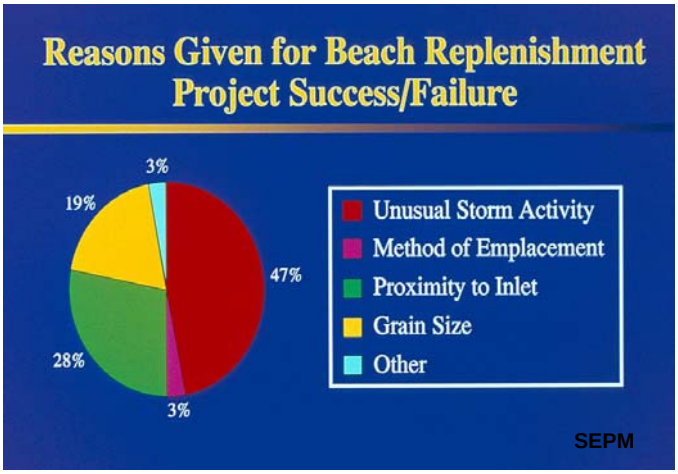
October 1987 - no trace of the extensive beach replenishment project of 1985

1988
beach replenishment
project
$1.8million

April 1988 - the results of another replenishment project

Replenishment History of Carolina Beach, NC (since 1965)

Year	Type	Volume (cy)	Length (mi)	Cost
1965	Flood Control	3,597,362	1.9	$925,506
1967a	Emergency	441,000	0.8	$206,398
1967b	Navigation	115,000		
1968	Navigation	97,000		$291,159
1970		346,000	0.8	
1971	Flood Control & Emergency	760,000	2.2	$517,897
1981	Emergency	406,000		$679,985
1982	Flood Control	3,662,181	2.7	$8,800,000
1985	Flood Control	764,162		$1,652,004
1988	Erosion Control, Hurricane & Wave Protection	951,000	1.0	$1,798,079
1991	Hurricane, Wave & Shore Protection	862,000	2.7	$3,251,000



In the early 1970's, Miami Beach, FL had lost most of its beach due to poor placement of seawalls.

The largest and most successful beach replenishment project is here at Miami Beach, FL. This sixty million dollar 1981 project is still largely in place.

Ocean City, NJ is the site of a failed beach replenishment project. The multimillion dollar replenishment was gone in two months.

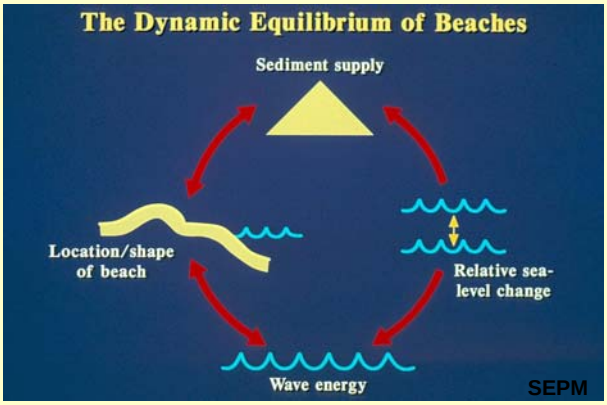
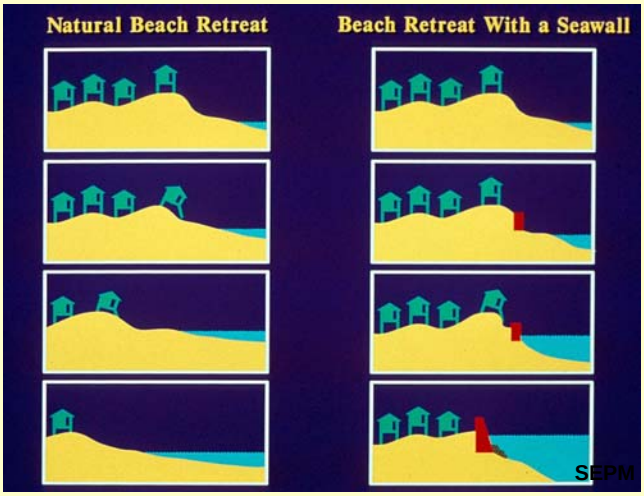


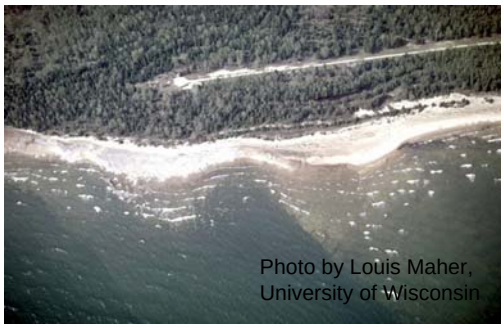
Illustration of the dynamic equilibrium Of beaches and how the four factors That control equilibrium are connected.



These illustrations contrast natural beach retreat with the eradication of the beach by using a seawall. With natural retreat the Buildings are lost and with a seawall the wall must be continually built higher and stronger.

Deciding how to handle disappearing beaches is sometimes difficult.

Michigan Beaches



North Shore of Lake Michigan

Lake Huron Beach in Michigan

Shoreline erosion along Lake Michigan

Shoreline erosion showing a house in shambles

Two months after this seawall was constructed, this is all that is left of Rosabelle Beach in Ottawa County, Michigan

Here on the shore of Lake Michigan a succession of failed and ineffective seawalls have replaced any trace of a beach