3. Depositional Coasts

Longshore Drift

The transport of sediment (e.g., sand) parallel to the shoreline, mainly in the surf and swash zone.

Longshore drift is the main way sediments move along coasts.

Large-Scale Features of Depositional Coasts
How a spit forms

A single section of coast with river input, longshore drift, and eventual output down a submarine canyon. Sediment inputs and sediment outputs are balanced.

Cape Cod, Martha’s Vineyard, & Nantucket (Mass.)

Glacial moraine sediments, reworked by ocean waves

Coastal Region

Coastal Cells

See Fig. 11.15, p. 256
Beaches

- Sediments are composed of locally available materials.
- The sizes of particles vary widely between beaches.
- Particle size largely determines the slope of the beach.
- The larger the particles, the steeper the slope of the beach.

<table>
<thead>
<tr>
<th>Wentworth particle name</th>
<th>Maximum size (mm)</th>
<th>Average beach slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cobble</td>
<td>64</td>
<td>24°</td>
</tr>
<tr>
<td>Pebble</td>
<td>4</td>
<td>17°</td>
</tr>
<tr>
<td>Granule</td>
<td>2</td>
<td>11°</td>
</tr>
<tr>
<td>Very coarse sand</td>
<td>1</td>
<td>9°</td>
</tr>
<tr>
<td>Coarse sand</td>
<td>0.5</td>
<td>7°</td>
</tr>
<tr>
<td>Medium sand</td>
<td>0.25</td>
<td>5°</td>
</tr>
<tr>
<td>Fine sand</td>
<td>0.125</td>
<td>3°</td>
</tr>
<tr>
<td>Very fine sand</td>
<td>0.063</td>
<td>1°</td>
</tr>
</tbody>
</table>

Lower part of beach exposed at low tide

Boomer Beach, La Jolla, California

Tidal fluctuations alternately expose and submerge tidal flats which almost surround Mont-Saint-Michel, France

See Fig. 11.13, p. 254
winter storage

See Fig. 11.13, p. 254

Fig. 11.14, p. 255

Groins

Fig. 11.30, p. 266

Breakwater

Fig. 11.31, p. 267

(a) Summertime beach (fair weather)

(b) Wintertime beach (storm)

Groins built at right angles to the shore at Cape May, New Jersey, to slow the migration of sand. The groins intercept the flow of longshore currents, so sand is trapped on their upcurrent sides. This extra sand is released to the south, and south of the groins, on the downcurrent side, sand is eroded.

Sandbar

winter storage

Sand

Rock

Long, low waves

Sand

Rock

Short, high waves

Sand

Rock

Fig. 11.31. Deposition and longshore transport can occur in the absence of beach or rip currents. Deposition in the beach is influenced by wave height. Deposition occurs during low tide. Deposition occurs in the absence of beach or rip currents. Deposition occurs at the beach and in the absence of rip currents.
Barrier Islands

- Ocean beach
- Dune
- Barrier flat
- High salt marsh
- Low salt marsh
- Lagoon
- Rising sea level pushes barrier island landward

Historical Changes in Barrier Islands in the Cape Cod Region: 1830-1987

Martha’s Vineyard, MA (UL)
Cape Hatteras, NC (UR)
Tom’s River, NJ (LR)
Deltas

- Rivers deposit sediment at coast
- If more fluvial (river) influence than ocean waves influence ⇒ Bird’s foot delta
- If more ocean waves influence than river influence ⇒ Arcuate delta

Nile River Delta
(“delta” = Δ)

Mississippi River Delta
(bird’s foot type)

http://rst.gsfc.nasa.gov/Sect17/Sect17_4.html, Fig. 11.22a, p. 260
4. Biological Coasts & Estuaries

- Formed / dominated by biological activity
  - Coral reefs:
    - Fringing reefs cling to the margin of land
    - Barrier reefs are separated from land by a lagoon
    - Atolls are ring-shaped islands of coral reef enclosing lagoons
  - Mangrove-dominated coasts

Ganges River Delta (world’s largest)

Yukon (L) and Lena (R) Deltas (Alaska and Siberia)

http://rst.gsfc.nasa.gov/Sect17/Sect17_4.html
See Fig. 11-22b, p. 260

http://rst.gsfc.nasa.gov/Sect17/Sect17_4.html
**Coral Reefs**

Charles Darwin was the first to propose that the three types of reefs (fringing, barrier, and atoll) reflected a single process. The first type of reef to form around a new island is a **fringing reef**. As an island gradually sinks, a fringing reef grows upward to become a **barrier reef**. As the island sinks below sea level, only a ring of coral -- an **atoll** -- is left at the surface.

**Estuaries**

- A body of water, partially surrounded by land, in which fresh river water mixes with salty ocean water
- Very rich biological habitats
- Highly vulnerable to pollution & urban development

4 types based on **structure**:
- Drowned river mouths
- Fjords (= drowned glacial valleys)
- Bar-built (a barrier island separates a lagoon from the open ocean)
- Tectonic (faults have dropped crustal block)
5 types based on pattern of mixing between fresh and salt water:

- Salt wedge
- Well mixed
- Partially mixed
- Fjord
- Reverse

*e.g., Puget Sound*

**Estuaries**

**The Fertile Fjord**

http://www.wsg.washington.edu/pubs/fjord/fjord.html

**U.S. Coastal Erosion & Deposition**

5. Characteristics of U.S. Coasts
Atlantic Coast of U.S.
- Mainly submergent
- Barrier islands
- Glaciers shaped some shorelines
- Eroding coasts
- Subsidence in most areas

Gulf Coast of U.S.
- Mainly submergent
- Barrier islands
- Mississippi delta
- High rates of erosion
- Tectonic subsidence

Pacific Coast of U.S.
- Mainly emergent
- Less erosion (but…)
- Mainly rocky shoreline
- Dams on rivers ⇒ beach starvation
- Tectonically active

“5-Minute Write”
1. Summarize the main points of today’s lecture.
2. List 3 to 5 questions you have, based on today’s lecture.
3. What did you find most interesting about today’s lecture?
4. How was the lecture relevant to you?