

## Wave Action and Coastal Erosion

### Geography 12

**Wave Action:** coastline is impacted by different types of waves that are responsible for building and destroying the coast.

#### 1) constructive or spilling waves

- waves that hit gentle sloping beaches
- begin their breaking motion far from the shore
- they \_\_\_\_\_ the beach

#### 2) destructive or plunging waves

- waves that strike steep sloping beaches
- breaking motion begins close to shore
- sand is \_\_\_\_\_ back into the ocean

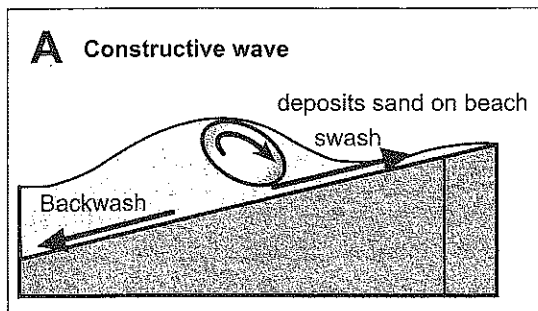
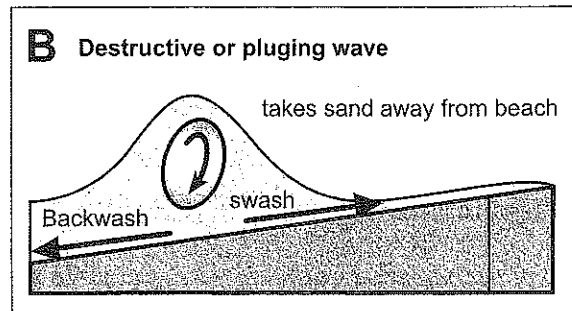


Figure 14.3 Constructive or spilling wave

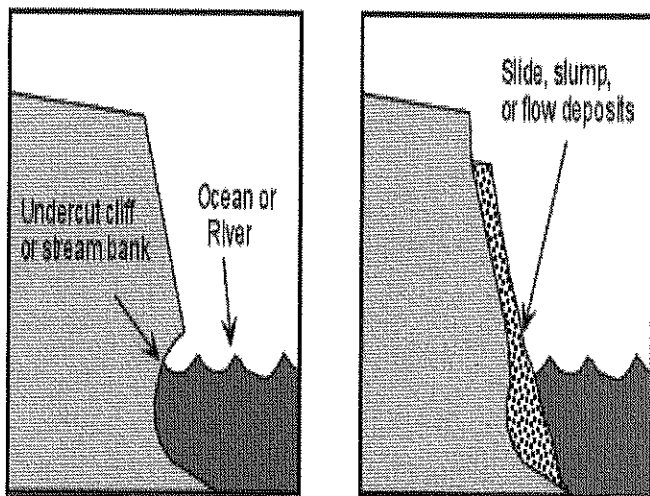


Destructive or plunging wave

### Types of Coastal Erosion

1. **Corrosion:** material absorbed by the salt content in water
2. **Abrasion:** sediment (sand) carried in water can wear down rock surfaces.
3. **Attrition:** rock particles striking each other and fracture.
4. **Hydraulic Action:** wind generated waves strike shoreline going into cracks of rock and widening gaps.

## Example: Hydraulic Action and Undercutting



### Undercutting:

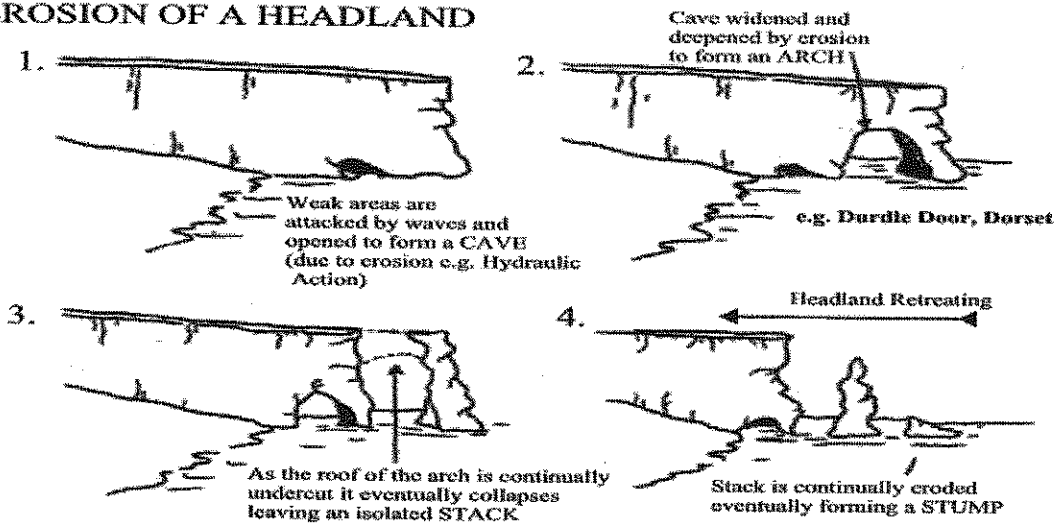
Erosional action occurs at the base of the cliff. As rock is cracked and worn down a process called **undercutting** takes place.

Wave is driven into the cliff → force of water widens gaps in rock → rock breaks away.

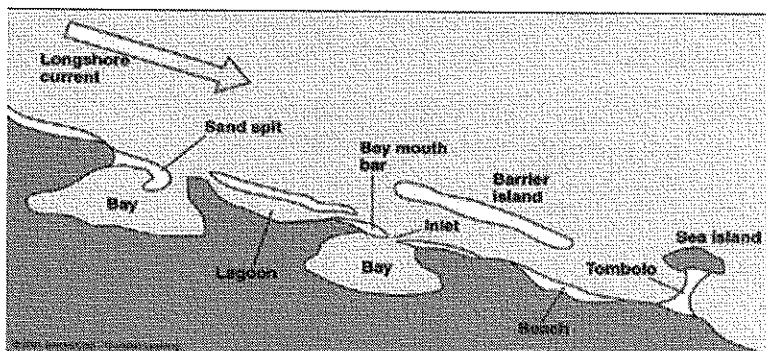
Can create **steep cliffs** and **cliff retreat** as cliffs collapse because it can no longer support the weight.

## Cliff Retreat and Erosional Features

### EROSION OF A HEADLAND



**Depositional Features:** created when sand, silt, and clay is carried by ocean currents.



# Erosional and Depositional Features of Coastal Regions

## Unit 5: Gradational Processes

### Geography 12

Name:  
Period:

#### Features formed as cliffs retreat

Cliff erosion begins with the formation of caves in the weakest rock surfaces along the cliff. As hydraulic action enlarges the caves, support for the overlying rocks is lost and the cliff collapses into the sea. As this process continues, the cliff retreat leads to the formation of a second feature, the bay. Bays continue to increase in size as soft shoreline areas erode away. If there are sections of hard rock which resist erosion, then headlands will begin to take shape. It is on these slowly eroding headlands that lighthouses are commonly constructed but even the headlands will eventually wear away and the lighthouses must be moved farther inland. At this stage of cliff retreat, large bays and prominent headlands are evident. Eventually, waves begin to attack the headland from both sides. Again, the first erosional feature to form will be a cave. The caves get larger and deeper and they may join together with a cave from the other side of the headland to create a tunnel. As waves continue their relentless attack on the headland, the tunnels increase in size, eventually forming an arch. As the arches grow, cracks begin to appear in the upper sections of the arch and collapse is imminent. When the top of the arch finally collapses, only the sides remain standing. These large, isolated rock pillars are called stacks. Over time, even the stacks will wear away and the final feature of cliff retreat will have formed. Called a wave-cut platform, these flat, rocky remains of the original headlands are evidence that the cycle of headland erosion has been completed. Often visible only in low tide, the wave-cut platform is an accumulation of sand and rocks, many of them polished smooth by abrasive action. Bays, inlets, headlands, arches, and stacks are common coastline features and nowhere in the West are they more spectacular than along the Oregon coast.

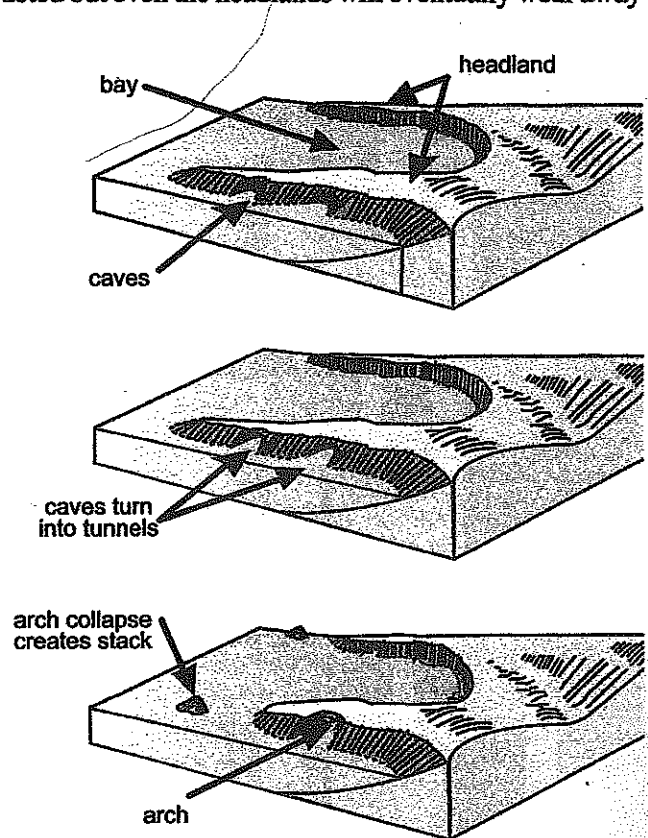
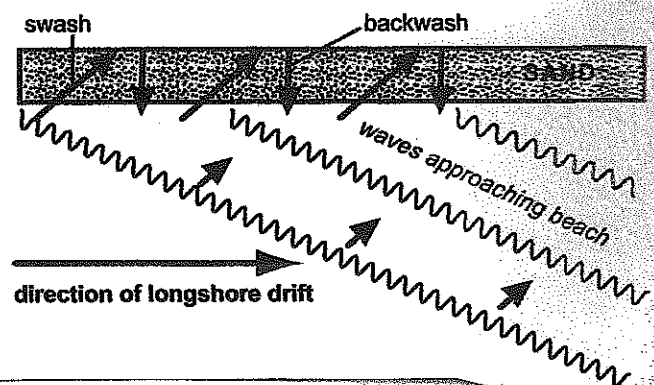


Figure 14.7 Shoreline erosional features

#### Swash, backwash, longshore drift

Much sand and silt is carried by a rolling wave and is driven up the beach by the power of the wave. This is referred to as swash. The water returning back into the ocean is called backwash. Waves normally approach shorelines on an angle, therefore, the sand driven up the beach by the swash is transported along the beach horizontally as seen in the diagram. The zigzag movement of sand along the beach in this way is referred to as longshore drift.



### Shoreline depositional features

Sand, silt, and clay from eroded cliffs is slowly carried along by longshore drift and ocean currents and may form a depositional feature called a spit. A spit is a long ridge of sand as shown in the diagram. In areas where abundant cliff erosion is occurring, spit formation can be several meters a year and sometimes may threaten the entrance to harbours so that the channel must be dredge regularly to keep it clear of sand. At times a sand spit will grow long enough that it joins an island to the mainland. Such a ridge of sand joining an island to the mainland is called a tombolo.

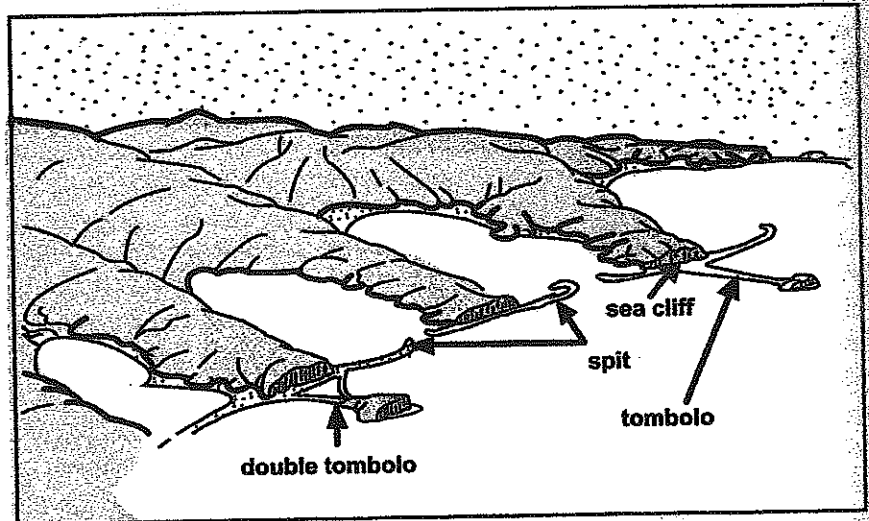
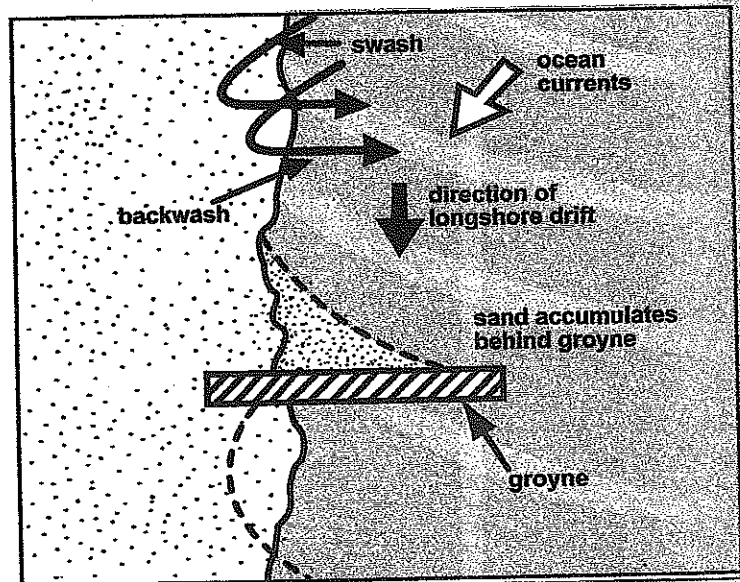


Figure 14.9 Shoreline depositional features

On some beaches it is desirable to keep as much sand on the beach as possible, so walls are constructed into the water to block longshore drift. These walls, called **groynes**, are usually made of timbers and do an impressive job in keeping sand on the beach. At Waikiki Beach in Hawaii, groynes were constructed decades ago but today most of them are no longer visible as they have been buried by sand.

### Submerged shorelines

- **Estuaries** are bodies of water near the ocean that rise and fall with the tides. They contain a mix of fresh and salt water. Estuaries are especially common in drowned river valleys after land has subsided or sea level has risen.
- **Rias** are long, flooded river valleys that have been created by land subsiding or sea levels rising.
- **Fjords** (also spelled 'fjords') are deep glacial troughs created when a glacier eroded a river valley to the ocean. Fjords are U-shaped and in many cases, extremely deep. But at the mouth of the glaciated inlet, where the terminal moraine is located, fjords are relatively shallow.



Explain the following seashore terms: swash, backwash, longshore drift, and tombolo. Draw a diagram of a shoreline to demonstrate each of the terms. Use arrows to show the direction of sand or water movement.

- swash Seawater carried onto the beach by a force of wave
- backwash water returning back into the ocean after being carried to the beach
- longshore drift concrete depositional features - munt of sand along a
- tombolo spit that joins an island to the beach as a result of SSB

