

Topic 10: Deposition

Topic 10 Section 1

Overview: the process by which sediments are released, settled from, or dropped from an erosional system is called *deposition*. Deposition includes precipitation of minerals from solution forming chemical minerals (salt or gypsum, e.g.) Deposition is part of a series of processes that starts with weathering and erosion. Deposits are placed in locations where they may form beds (or layers) of sedimentary rock. Most final deposition occurs in large bodies of water like lakes and oceans because running water is the most important natural erosional system. Before reaching a final depositional region, many deposits are temporarily located in different environments by other means such as wind or glaciers

Factors causing deposition

Velocity of an erosional system and rate of deposition

Deposition occurs when the velocity of an erosional system (wind, glacier, running water) decreases or stops

The rate of deposition varies based on:

- the velocity of the erosional system
- the characteristics of the sediments

The faster the velocity of an erosional system, the larger the particles the system can carry (See NYS ESRT page 6) Relationship of Transported Particle Size to Water Velocity

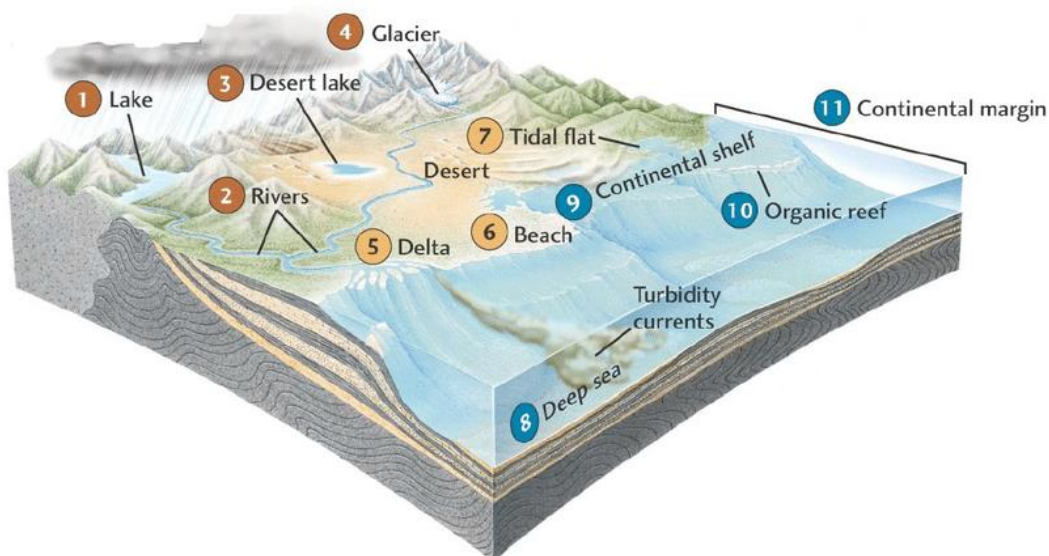
Similar relationships occur for other erosional systems

Characteristics of sediments and rate of deposition

- size – other factors being equal, larger sediments settle first
- shape – rounder sediments settle first, flatter sediments settle last
- density – denser particles settle faster
- saturation – increases in the concentration of a dissolved material, changes in temperature, and evaporation may result in a saturated condition which then results in precipitation

Sediments formed by precipitation tend to be pure and composed of only one mineral

Types of Erosional Systems



Topic 10: Deposition

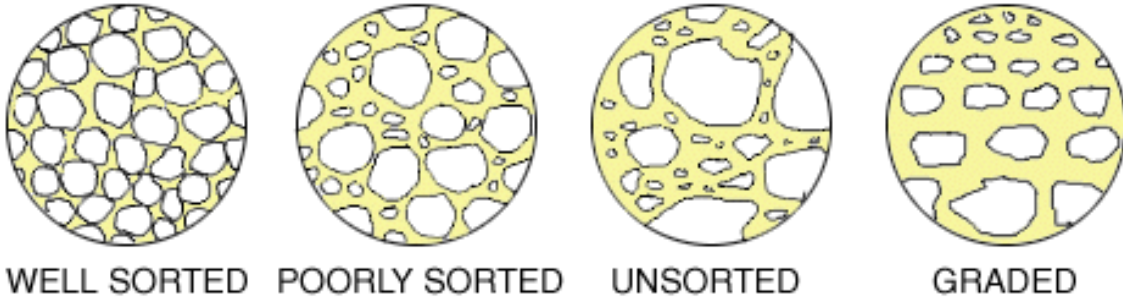
Topic 10 Section 2

Sorting of sediments and deposition

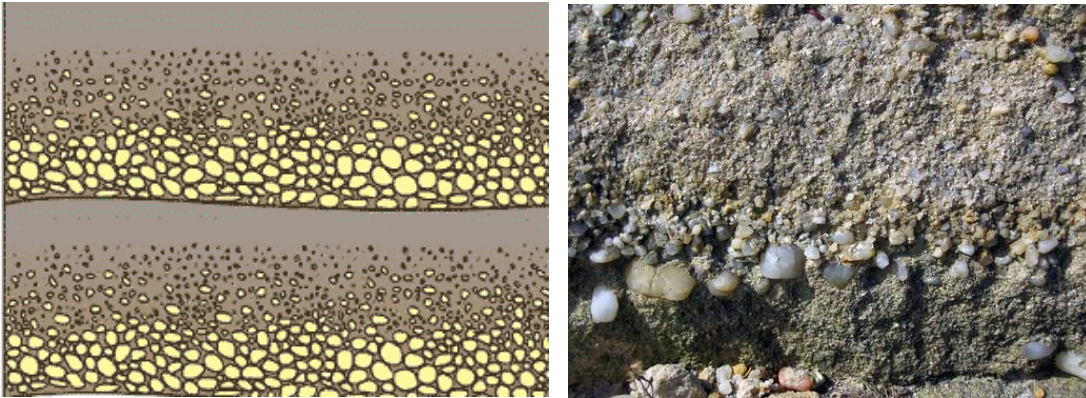
Sorted sediments – a deposit or layer that has particles with similar size, density, or shape

The greater the similarity of the particles, the more sorted the particles are

Unsorted sediments – a deposit or layer that has particles with mixed sizes, density, or shapes



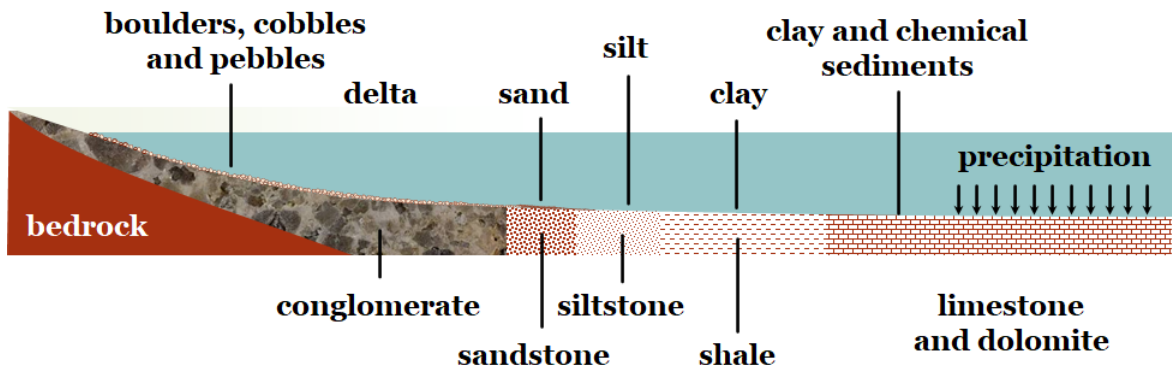
If a mixed sediment settles rapidly in water, the largest particles will settle faster and the smallest particles will settle slowest resulting in a graded bed or layer



Graded beds occur when density currents come to a sudden stop, most often:

- on large lake bottoms
- in oceans off the coasts of continents

If the velocity of an erosional system decreases gradually, the result is horizontal sorting



Horizontal sorting:

- usually occurs at the mouth of a river forming a delta
- is the major reason most deposits are sorted

Topic 10: Deposition

Unsorted deposits are usually the result of glaciers or mass movement (direct gravity)
Glaciers are solid erosional systems and therefore carry sediments of all sizes, shapes, and densities that are deposited at the same time when the glacier melts
Mass movement results in a pile of unsorted sediments at the base of a cliff



Unsorted glacial till: note partial rounding



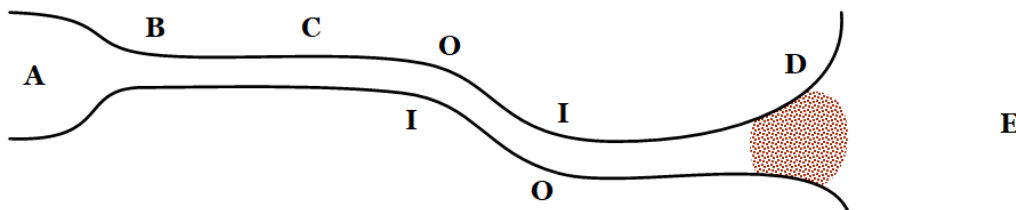
Mass movement: note angularity

Model of an erosional-depositional system

side view



top view



At point A, the PE is at a maximum

Moving from B to E, PE decreases

KE is at a maximum at point C

B to C, the stream is too fast for meanders to form

C to D, the stream is slow enough for meanders to form

The current is faster on the outside of meanders (erosion occurs at points O)

The current is slower on the inside of meanders (deposition occurs at points I)

There must be an erosional-depositional interface between I and O

There are also erosional-depositional interfaces at points where the slope changes, C

Dynamic equilibrium of an erosional system

Since all sediments picked up by a stream must eventually be deposited, the system is in a state of dynamic equilibrium

Topic 10: Deposition

Topic 10 Section 3

Characteristic features of the chief depositional agents

Deposition by streams occurs:

- at the inside of meanders
- a small mound at the bank of the stream during flooding forming a levee
- all across the flood plain during flooding
- as the stream enters a lake or the ocean forming a delta

The high velocity of a stream at flooding may cut a straight course through meanders

The cut off part of the meander forms an oxbow lake

Deposition by glaciers:

- at the end of a glacier, where melting and forward movement balance, sediments are dropped in unsorted sheets called a *moraine*
 - thin moraines deposited from the bottom of a glacier are called a *ground moraine*
 - if the terminus of a glacier is stable for a long time, it builds a large pile of sediments called a *terminal moraine* – parts of central Long Island, NY formed by a terminal moraine at the end of the last ice age
 - moraines that build up along the side of a glacier will form a streamlined oval shape called a *drumlin* – drumlins indicate the direction a glacier traveled
- glaciers sometimes leave blocks of ice buried in moraines
 - once the ice melts, a circular depression called a *kettle* or *kettle hole* is formed
 - a kettle that intersects the water table will form a *kettle lake*
- running water from melting glaciers may produce horizontal sorting
 - one such feature is called an *outwash plain* – parts of southern Long Island, NY were formed by an outwash plain when the last ice age ended

Deposition on coastlines by water waves and currents:

Wind generated waves in oceans and large lakes slow down as they drag the bottom near the shore and form a strip of sand at the shoreline called a *beach*

- beaches commonly form on the side of a projection facing a longshore current
 - the side facing away from the longshore current is eroded
- storms may produce powerful waves that pull the beach sand away from the shoreline and form a bar that may eventually form a *barrier island*
 - the side facing away from the longshore current is eroded



Find the sea cliff formed by erosion, the beach, and the barrier island in the picture

Topic 10: Deposition

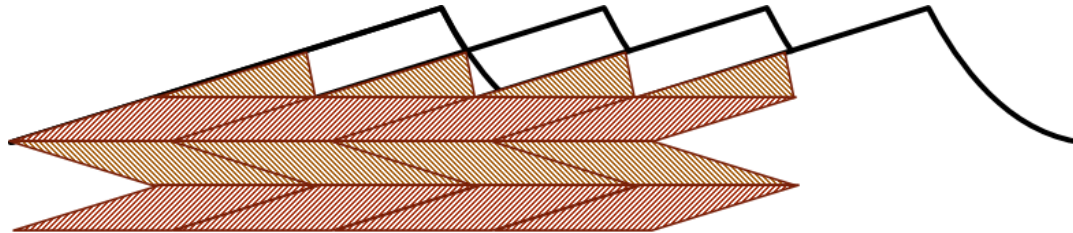
Deposition by wind:

The low density of wind can typically carry only sediments the size of sand or smaller

- sediments smaller than sand are called dust
 - dust and volcanic ash are deposited over large regions
- sand is usually deposited in mounds called *dunes*
 - dunes form a gentle slope on the windward side and steeper slope on the leeward side
 - dunes form a gentle slope on the windward side and steeper slope on the leeward side



- sand within the dunes is usually rounded and frosted due to collisions
- ripples in the sand create a bias that leave evidence of shifts in wind direction



Deposition by mass movement:

Mass movement drops sediments that stop moving once they hit the ground

- the sediments are usually unsorted and unlayered
 - the sediments usually have sharp edges, especially if they are the result of frost action
 - the most recognizable feature of mass movement is that the sediments are usually found at the base of cliffs or hills