

Soil Science Ice Ages Unit Notes

Name: _____

(DO NOT LOSE)

AREA OF FOCUS: WEATHERING

Review!

- Erosion: Process where fragments of soil and rock are broken off from the ground surface and carried away.
- Deposition: Process by which fragments of rock are deposited in a new location

Weathering

- The breaking of rock into smaller pieces.
- Either mechanical or chemical

Mechanical Weathering: Physically breaking rocks into smaller pieces without chemicals.

Mechanical Weathering

- Heat
 - Water
 - Ice
 - Pressure
- } **Gravity**

- Ice/Frost Wedging: Water enters cracks in the rocks, freezes, expands and breaks rocks.

Water

- It causes rocks to hit each other and become smaller and smoother.

Mechanical Weathering Continued...

Sheeting / Exfoliation – layers fall off like an onion.

Thermal Expansion: repeated heating and cooling of rocks will induce stress and breakage.

Root Wedging: Plant roots enter crack, grow and expand the crack.

Animal Activity: Animals mechanically wear away the rock.

Human Activity – Humans mechanically break up rock. Can occur at a rate faster than occurs in nature.

Wind weathering: Particles of sand, pebbles, and dust are carried by wind and cause abrasion and slowly break down rock.

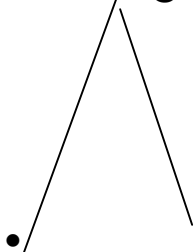
Chemical Weathering: Chemical processes dissolve and decay earth materials.

- Chemical weathering rate depends on
- Temperature
- Amount of surface area
- Availability of water or natural acid

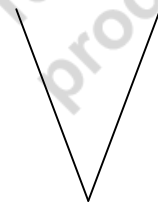
Examples of Chemical Weathering

- Carbonation: Water and CO_2 create carbonic acid which wears down rock.
- Hydrolysis: Chemical reaction between the minerals in the rock and hydrogen in rain water (H_2O) wear down rock.
- Oxidation: The process by which oxygen combines with water and minerals in the rock to weaken it.
- SOLUTION: Process by which minerals in the rocks dissolve directly in water.

Stalagmite



Stalactite



HYDRATION: Process where minerals in the rock absorb water and expand, creating stress.

- Other sources of chemical weathering
 - Sulfuric Acids from volcanic activity.
 - Organic acids in soil and from lichens.
 - Salts (Chemical)
 - Human air pollution

Mass movement: The down slope movement of earthen materials from **gravity**.

Landslide: A slide of a large mass of dirt and rock down a mountain or cliff.

Soil Creep: The slow, steady downhill movement of soil and loose rock.

Freezing soil expands, melting contracts it. Gravity pulls it down slope. (Soil Creep)

Slump: A landslides in which the moving material moves in a block, more or less.

Synergism of mechanical and chemical weathering.

Mechanical weathering increases surface area, which speeds chemical reaction rates.

Chemical weathering weakens rocks which facilitates entry of water and further mechanical weathering.

Biological processes accelerate both types of weathering.

Surface area affects rate of weathering. As pieces get smaller, they have more surface area and thus weather faster.

Angle of Repose -The maximum angle of a stable slope determined by friction, cohesion and the shapes of the particles.

NEW AREA OF FOCUS: SOIL

Soil is

- A mixture of weathered rock and decaying organic material.
- Plants, animals, fungus, bacteria...

Dirt is...

- Mainly mineral based
- Pebbles and finely ground rock

Color

If soil is black

- Lots of organic matter (carbon).
- May be poorly drained.
- Usually fertile.

If soil is brown

- Lots of sand and clay
- Well drained
- Good soil

Very light browns, whites, orange, red, yellow.

- Many compounds present, Iron, Manganese, Sulfur.
- High in salt.
- Not as healthy.

-Particle Size in soils (large to small)



Boulder – Largest (Greater than 25 cm)

Cobble (6-25 cm)

Gravel (2cm-7.5cm)
 Coarse Sand (2mm)
 Sand (2mm - .125mm)
 Fine Sand
 Very Fine Sand
 Silt
 Clay (less than .002mm)
 Dust – (Into the micrometers)

Soil Permeability: The rate at which water and air move through the soil.

Soil Porosity: The spaces that allow air and water to move through the soil.

Soil Horizon – Layers of different types of soil.

O Horizon (Organic Matter) Leaves

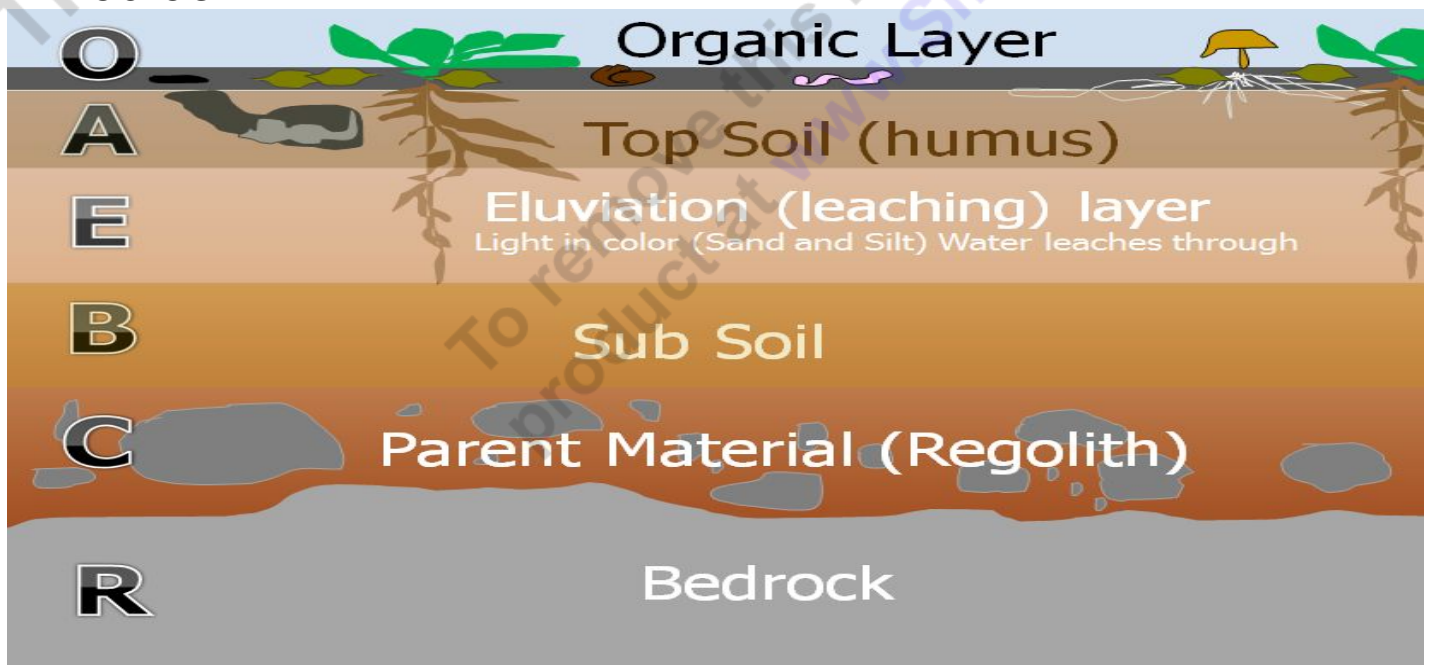
A – Topsoil – High in organic matter (humus)

E – Eluviation (leaching) layer –Light in color (Sand and Silt) water leaches through .

B - Subsoil

C – Parent Material (Regolith)

D- Bedrock



NEW AREA OF FOCUS: SOIL CONSERVATION

Erosion - Process of wearing or grinding something down.

Deposition: The natural process of laying down a deposit of something. (Sediment)

Soil degradation is a real and serious problem.

- Soil takes hundreds of years to form.
- It takes very little time to destroy it.

Two key factors to conserve soil

- Reduce erosion
- Restore fertility (nutrients)
 - Nitrogen, Phosphorus, Potassium

Soil Conservation Measures

- Conservation Plowing: Disturbing the ground and plant cover as little as possible.
 - Use of a seed injector.
- Terracing: Creating steps against water erosion.
- Contour plowing: A practice of slowing water run-off by planting across a hills contours.
- Cover Crop: A plant that grows first and protects the cash crop.
- Strip Cropping: Alternate the type of plant on each row to control water and nutrient uptake.
- Alley Cropping: Plant trees in between ground crops
 - Provides shade, wind break, and prevents water loss.
- Crop Rotation: Planting different crops each year.
 - Changes nutrient uptake (increased soil fertility over a long period)

□ Gully Reclamation: Dam gullies to trap silt
Plant ground vegetation to stabilize slopes.

□ Plant Wind Breakers: Trees at edge of field to break the wind.

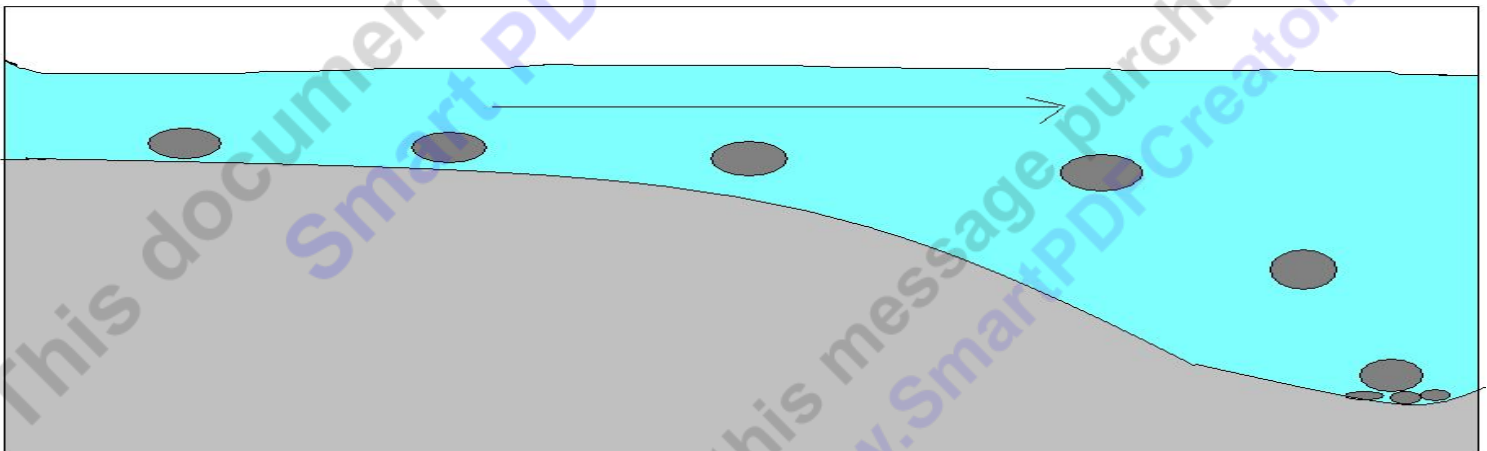
Increasing Fertility: Adding animal manure to plants for nutrients.

Green Manure: Add plants to plants

Fertilizer: A chemical or natural substance added to soil or land to increase its fertility.

AREA OF FOCUS – Ice Ages, Paleoecology, Glaciers, Glacial Landforms

Erratic Boulders entry question



Glacier- A moving mass of snow and ice that moves downhill

Glaciers form when more snow and ice accumulate than melt. It takes many years and the snowfall compacts into ice.

- Two types of glaciers
 - -Continental Glaciers: A Giant ice sheet that spreads out from a center of accumulation.
 - -Alpine Glaciers: A glacier that starts in a mountain and moves into a valley.

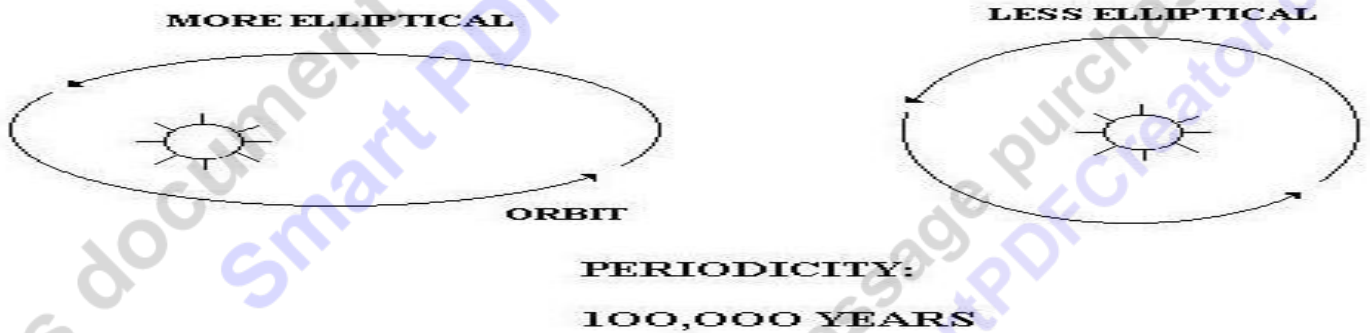
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Iceberg – A giant piece of freshwater ice that broke off of a glacier or ice shelf.

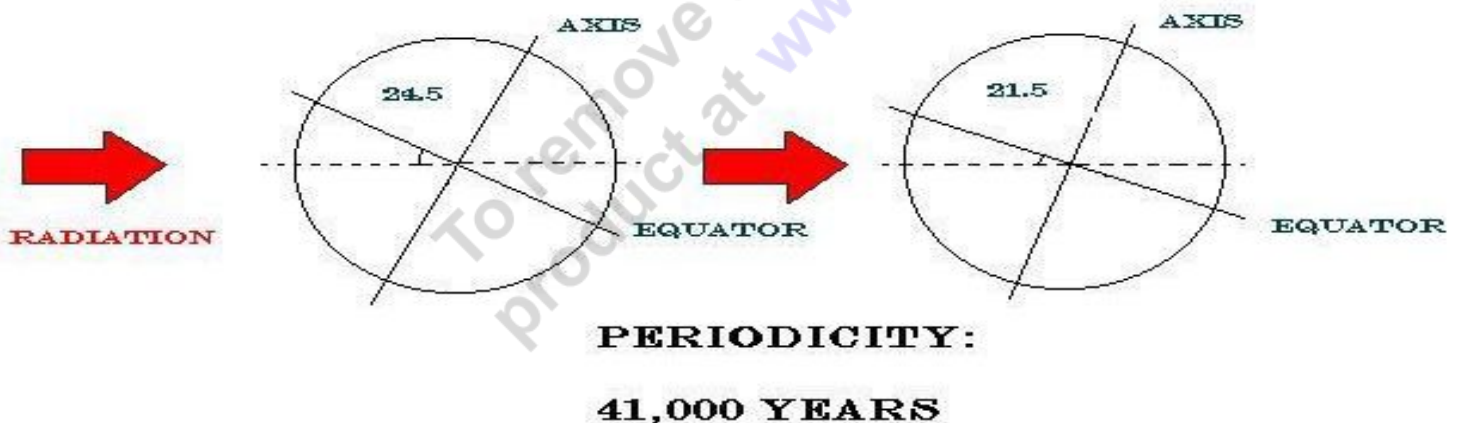
Ice Age: A cold period marked by episodes of extensive glaciation alternating with episodes of relative warmth.

- Milankovitch Cycles
 - Eccentricity (100,000 year cycle)
 - Axial Tilt (41,000 year cycle)
 - Precession (26,000 year cycle)

ECCENTRICITY



AXIAL TILT



- Maunder Minimum: A period roughly spanning 1645 to 1715 when sunspots became exceedingly rare, as noted by solar observers of the time.
 - Fewer sun spots = less solar radiation.
 - This led to a cooler period on Earth / Little Ice Age. (Theory)
- Glacial erratic: A piece of rock carried by glacial ice some distance from the rock outcrop from which it came.

Talus – Piles of weathered glacial rock.

Cairn: Manmade pile of stones, usually conical, and often marks the path of an alpine trail.

Glacial Landforms

Glacial Striations: Multiple, straight parallel lines which represent the movement of the sediment loaded base of a glacier.

U-Shaped Valley: Glaciers carve valleys into a U shape.

Fjord: U-Shaped valley near the sea

Kettle Lake : A depression filled with water left by a glacier.

Tarn: A glacial lake produced by scouring. These are often found in cirques.

Horn - A sharp peak on a mountain cut by glaciers.

Cirque - a steep-sided carve into a mountain by a glacier.

Aret'e- A knife edge caused by glaciers and erosion.

Esker- A narrow, steep-sided ridge of sediment, the remains of sediment piling up in a winding river under the glacier.

Moraine- Material transported by a glacier and then deposited. Many types of Moraines.

Drumlins: Formed glacial till (sediment). They are elongated features that can reach a kilometer or more in length.

Outwash - Material deposited by the debris-laden glacial valley.

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