216 – Weathering

Weathering vs Erosion

Key Terms

- Weathering:

Weathering is the process where rock is dissolved, worn away or broken down into smaller and smaller pieces.

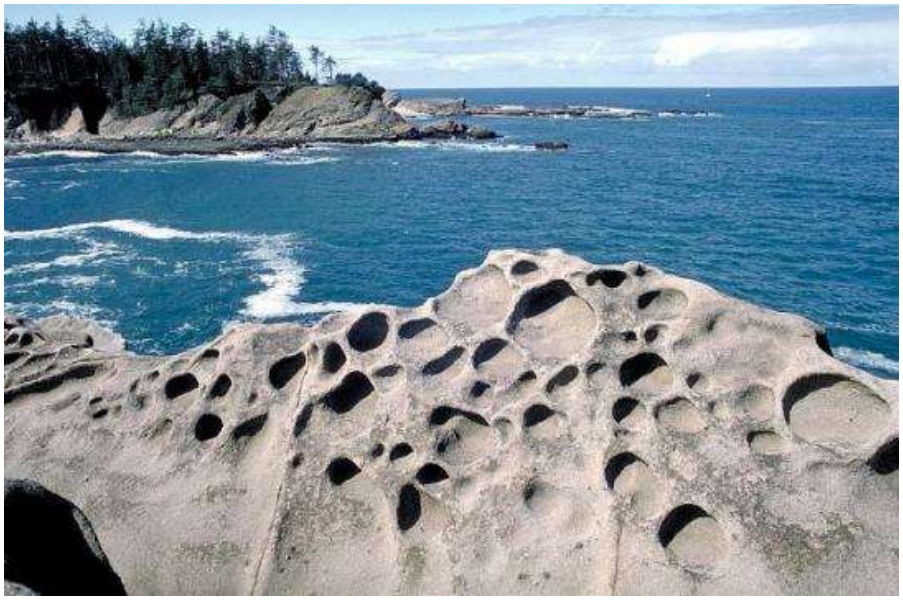
- Erosion:

Erosion happens when rocks and sediments are picked up and moved to another place by ice, water, wind or gravity

Weathering versus Erosion

Weathering:

<u>Breaks</u> down rocks & soil…



https://www.americangeosciences.org/education/k5geosource/content/rocks/what-is-weathering

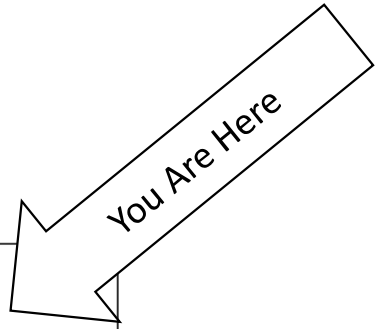
Erosion:

<u>Takes</u> weathered material away…

https://en.wikipedia.org/wiki/Soil_erosion

216 Weathering

Chemical



WEATHERING

Weathering Definition:

Chemical Weathering	Mechanical/Physical Weathering	Biological Weathering
The breaking down of rocks by:	The breaking down of rocks by:	The breaking down of rocks by:

Agents of Chemical Weathering	
Agent	Definition and Example
1.	A. Dissolution: B. Hydrolysis:
2.	Oxidation:
3	Carbonation:

Agents of Mechanical Weathering	
Agent	Definition and Example
1.	
2.	
3.	
4	

Agents of Biological Weathering	
Agent	Definition and Example
1.	
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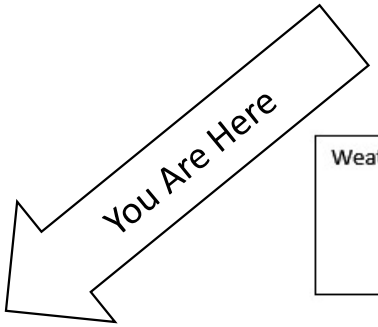
Key Terms

- Weathering:

Weathering is the process where rock is dissolved, worn away or broken down into smaller and smaller pieces.

Weathering Breaks!



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Key Terms

- Weathering:
  - Chemical Weathering:

Chemical Weathering is the breaking down of rocks by chemical reactions.

- Erosion:
  - Landslides:
  - Runoff:
  - Infiltration:
- Deposition:

Agents of Chemical Weathering

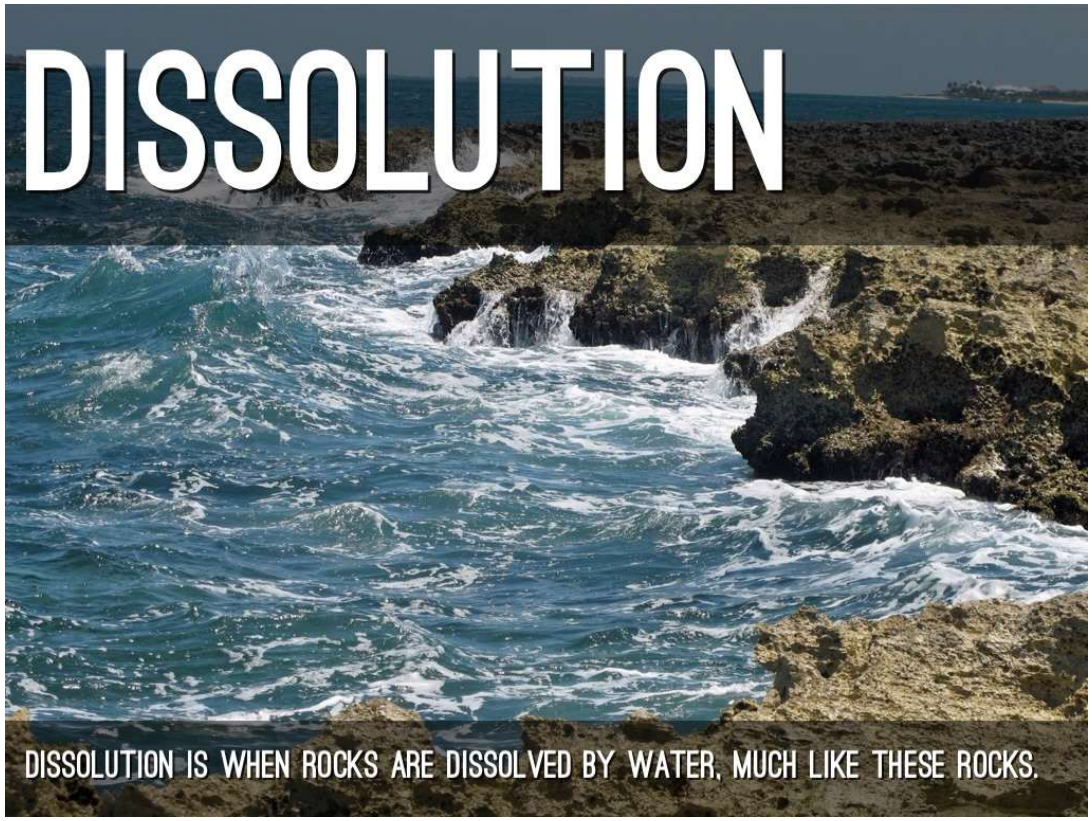
1. **Water** – can cause rock to be broken down and dissolve (dissolution) or chemically change (hydrolysis)

2. **Air** – oxygen combines with iron causing rust (oxidation)

3. **Weak Acids** – acid precipitation and acids in ground water (carbonation)

Chemical Weathering - Water

- Water weathers rock by dissolving it.



Salt?
It's a rock!?

Salt
Water?

Chemical Weathering - Water

Dissolving (dissolution)

Water will dissolve minerals from a rock body leaving cavities in the rock.

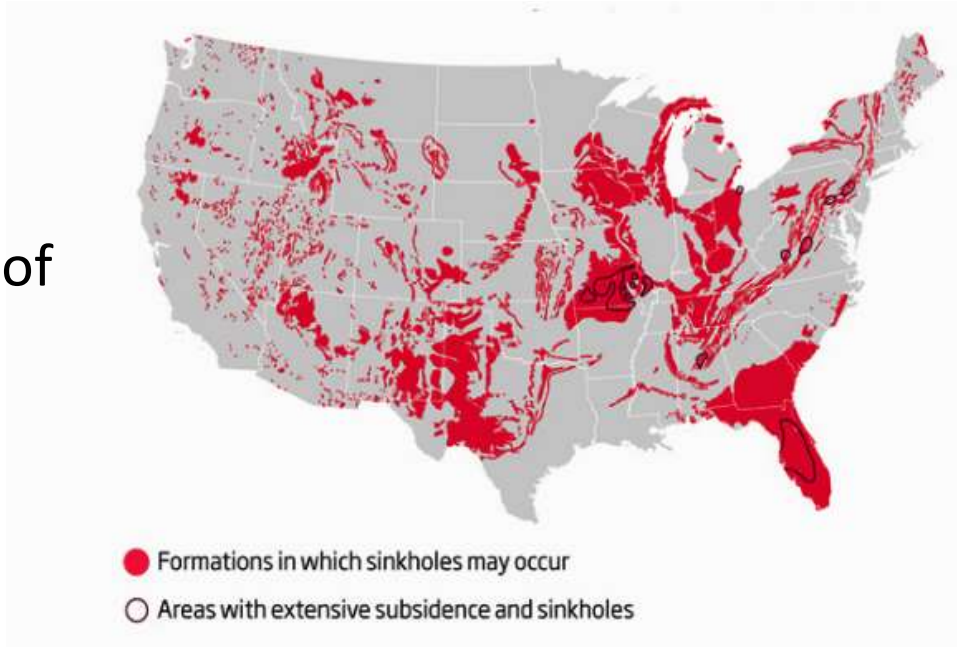
Often contains acid from dissolved carbon dioxide.

These cavities may generate sinkholes or cave features such as stalactites and stalagmites.

Limestone cave feature - the result of dissolution

Chemical Weathering – Sink Holes

- Acidic ground water eats away at the limestone bedrock through the process of carbonation.
- click here to watch news clip on man-eating sinkhole

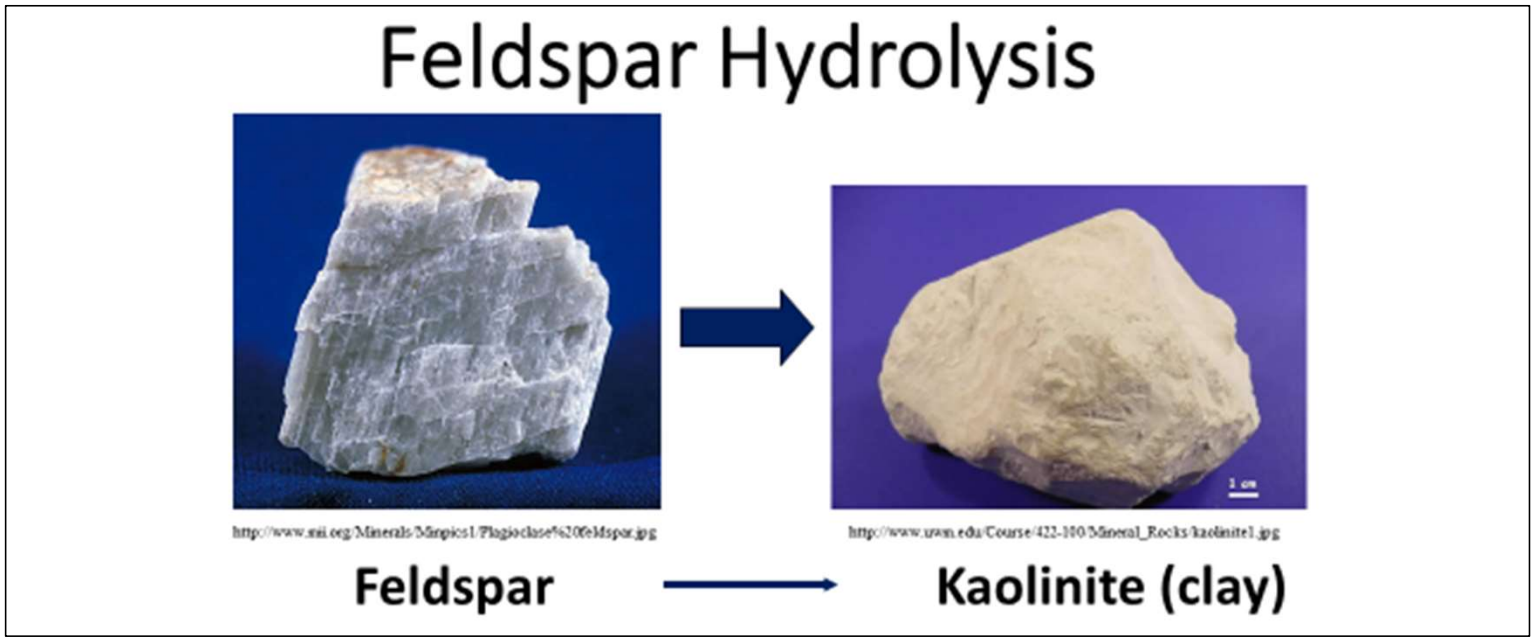


https://www.youtube.com/watch?v=was4L42vlyc

Chemical Weathering - Water

Hydrolysis

Minerals may chemically combine with water to form new minerals. The new minerals are generally not as hard.



Chemical Weathering - Oxygen

Oxidation

Minerals may combine with oxygen to form new minerals that are not as hard (less dense).

For example, the iron-containing the mineral pyrite forms a rusty-colored mineral called limonite.

Oxygen

Water + Oxygen +Iron = RUST

When water and oxygen mix with Iron it creates rust. This is called oxidation.

Chemical Weathering – Weak Acid (Carbon Dioxide)

Carbonation

Carbon dioxide dissolves in rain water and produces Carbonic acid

Carbonic acid easily weathers marble and Limestone.

Factors in Chemical Weathering

1. **Climate** – wet and warm maximizes chemical reactions
2. **Plants and animals** – living organisms secrete substances that react with rock
3. **Time** – longer contact means greater change
4. **Mineral composition** – some minerals are more susceptible to change than others

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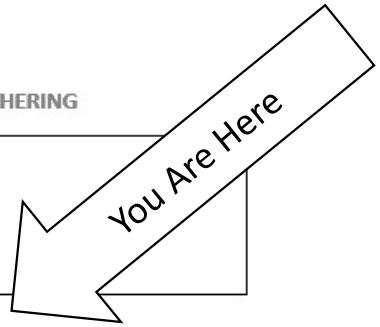
Mechanical

WEATHERING

Weathering Definition:



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Key Terms

- Weathering:
  - Chemical Weathering:
  - Mechanical Weathering:

Mechanical Weathering is the breaking down of rocks by physical processes.

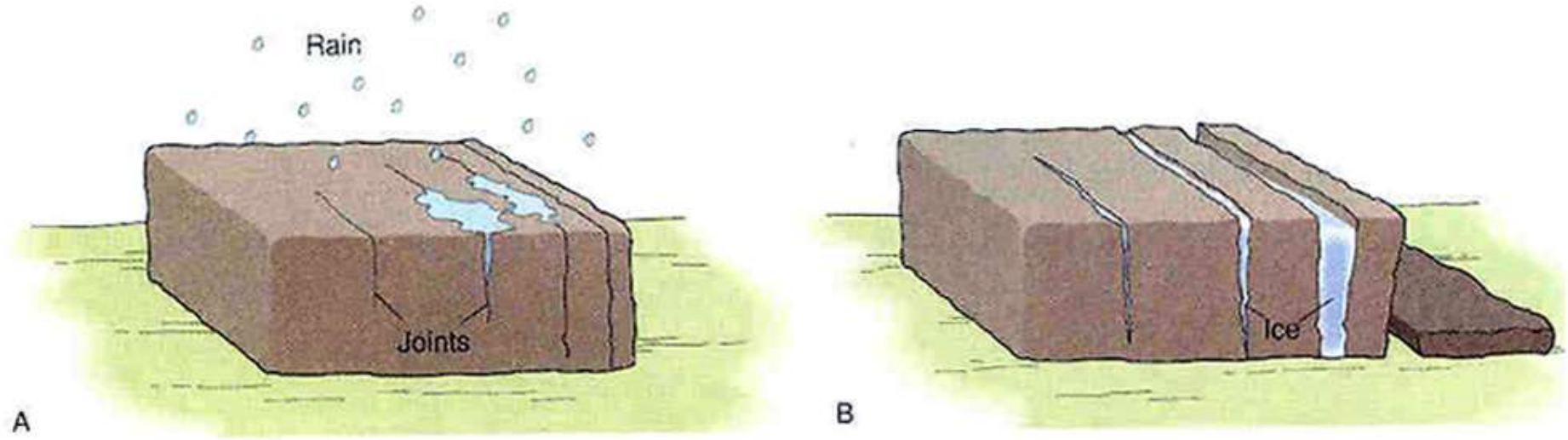
Agents of Mechanical Weathering

These are actions or things that break down Earth materials:

1. frost wedging
2. thermal expansion and contraction
3. mechanical exfoliation
4. abrasion by wind, water or gravity

Mechanical Weathering

- **Frost Wedging** – <u>cracking of rock mass by the expansion of water as it freezes in crevices and cracks</u>



Frost Wedging

http://www.uwsp.edu/geo/faculty/ozsvath/images/frost%20wedging.jpg

Frost Wedging

Mechanical Weathering – Thermal Expansion

http://content.answers.com/main/content/wp/en-commons/thumb/d/dc/250px-Weathering_freeze_thaw_action_iceland.jpg

- **Thermal expansion and contraction –**

  repeated heating and cooling of materials cause rigid substances to crack and separate

Processes and Agents of Mechanical Weathering

- **Exfoliation** – As underlying rock layers are exposed, there is less pressure on them and they expand. This causes the rigid layers to crack and sections to slide off (similar to peeling of outer skin layers after a sunburn). The expanding layers often form a dome.

Processes and Agents of Mechanical Weathering

- **Abrasion** – Abrasion occurs when rocks and sediments rub against each other and become scored (scratched lines), smooth, polished or rounded.

Factors in Mechanical Weathering

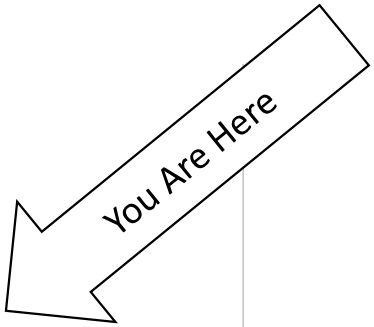
1. **Climate** – The more severe the weather changes in a region, the more mechanical weathering you will have
2. **Plants and animals** – living organisms are more vibrant in some climates than others and therefore more likely to weather rocks
3. **Time** – longer contact means greater change
4. **Mineral composition** – some minerals are more susceptible to change than others

216 Weathering

Biological

WEATHERING

Weathering Definition:



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Key Terms

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  - Chemical Weathering:
  - Mechanical Weathering:
  - Biological Weathering:

Biological Weathering is the breaking down of rocks by plants and animals.

Processes and Agents of Biological Weathering

Plant Growth –

1. Plants send out roots
2. Roots find their way into cracks in the rocks
3. As the roots increase in size, they force the rock sections apart

Plant Wedging

Processes and Agents of Biological Weathering

Protection –

1. Many animals bore into rocks for protection
2. They scrape away the grains, or
3. Secrete acid to dissolve the rock

Piddock Clam holes

Processes and Agents of Biological Weathering

<u>Feeding</u> –

Tiny bacteria, algae and lichens produce chemicals that help break down the rock on which they live, so they can get the nutrients they need.

I'm "Lichen" these rocks!

Factors in Biological Weathering

1. **Climate** – The more severe the weather in a region, the less biological weathering you will have, however the opposite is also true. Living organisms are more vibrant in some climates than others and therefore more likely to weather rocks
2. **Time** – longer contact means greater change
3. **Mineral composition** – some minerals are more susceptible to change than others

Other Bio

- https://www.geolsoc.org.uk/ks3/gsl/education/resources/rockcycle/page3568.html