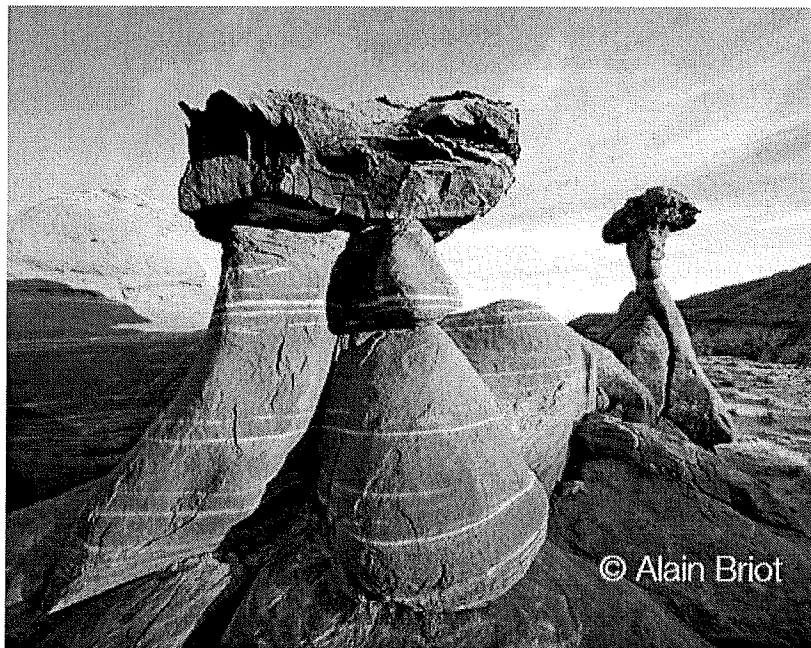


Name: _____



Earth Science 11

Weathering and Erosion



Hoodoos

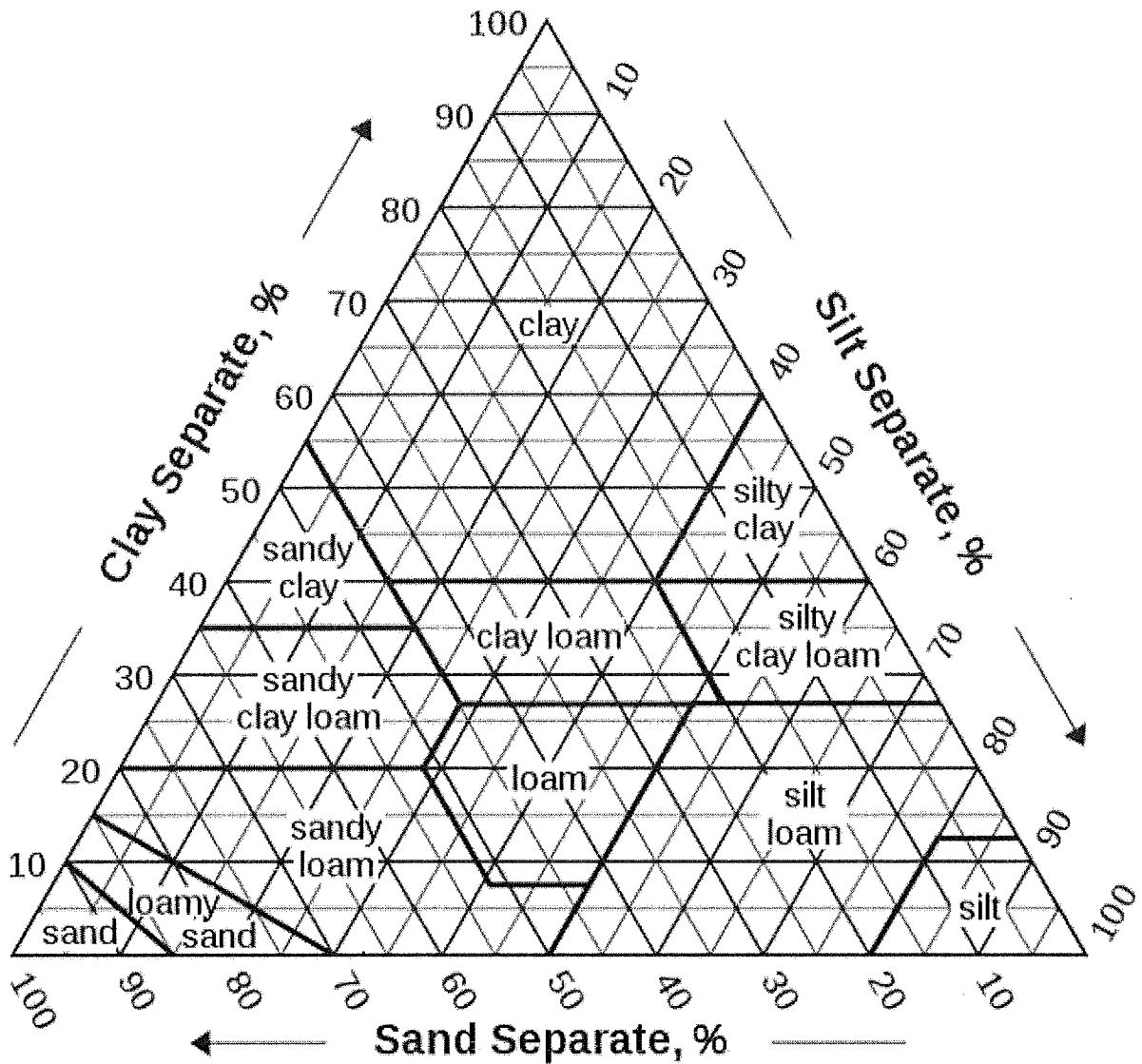
Name _____ Date _____

9-8 Changing Earth Word Search

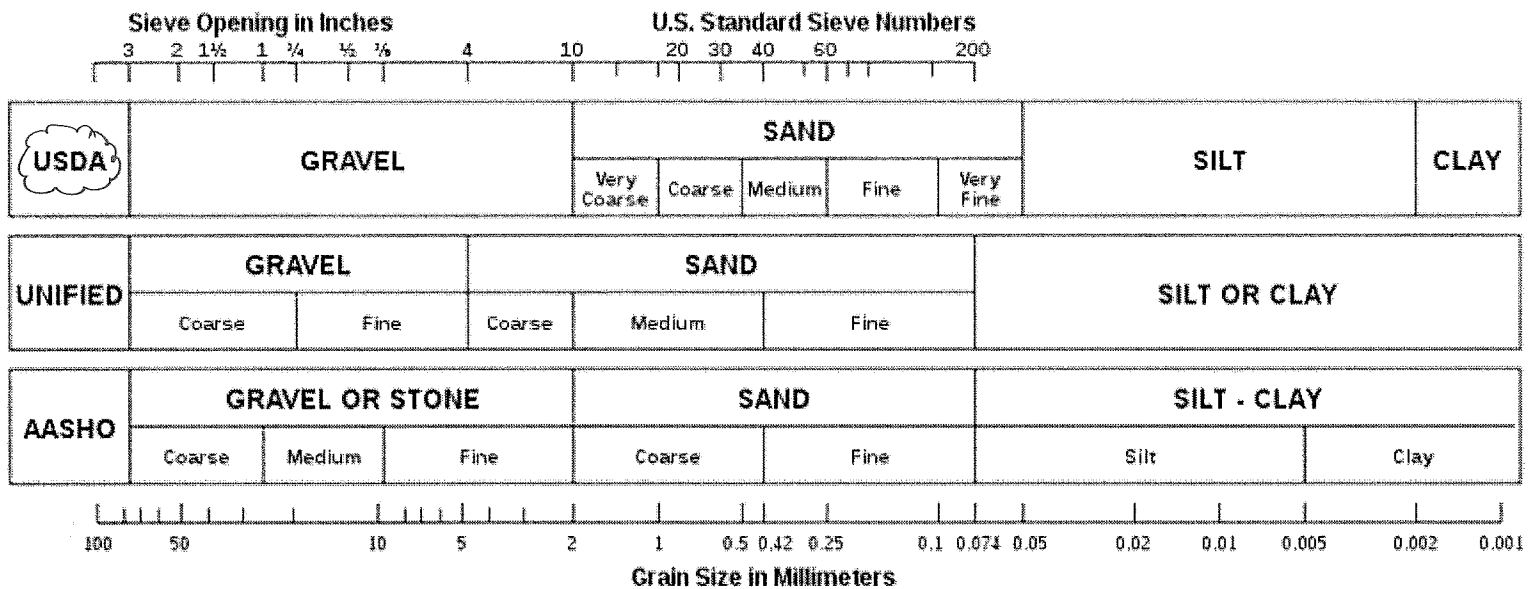
The nineteen terms listed below relate to forces or events that shape the Earth's surface. Seventeen of the terms may be, for the most part, attributed to nature, or humans may have a small part in making them happen. Two of the terms, without a doubt, are man-made. Use blue to *circle* the terms that occur naturally (ten of them), use green to circle the terms that are partially created by humans (seven of them), and use red to circle the terms that are totally caused by humans (two of them). Terms may be found forward, backward, vertically, horizontally, and diagonally.

g	d	c	y	e	h	f	e	d	i	l	s	d	n	a	l
i	l	d	r	i	g	b	m	r	o	t	s	z	o	e	a
a	c	a	m	h	n	e	r	o	s	i	o	n	c	a	p
b	w	i	c	d	i	s	c	u	b	m	m	j	o	g	n
f	b	e	a	i	l	r	n	o	w	s	e	k	n	e	a
g	t	k	v	y	e	a	r	a	i	i	t	a	s	f	h
a	l	a	n	d	m	r	v	h	k	n	t	q	t	i	s
s	b	u	r	i	s	e	p	u	j	a	u	m	r	o	t
x	f	q	e	w	s	o	x	r	c	c	b	e	u	q	r
t	f	h	l	a	r	k	i	r	e	l	p	a	c	e	e
l	a	t	e	t	a	v	e	i	w	o	d	o	t	m	a
k	c	r	s	e	e	e	r	c	p	v	j	f	i	k	m
w	e	a	i	r	k	o	d	a	n	r	o	t	o	e	v
j	i	e	a	f	o	j	e	n	a	c	g	d	n	f	n
d	k	g	l	a	c	i	s	e	h	o	n	i	u	t	a
m	a	v	a	l	a	n	c	h	e	i	t	l	s	i	e
c	i	r	r	l	b	i	u	a	w	p	d	u	o	l	c

avalanche
construction
creek
diastrophism
earthquake
erosion
glacier
hurricane
landslide
river
storm
stream
tornado
tsunami
volcanism
war
waterfall
waves
wind



COMPARISON OF PARTICLE SIZE SCALES



Classifying Soil

Using the Soil Texture Triangle provided, classify your soil sample based on the USDA scale classification system (the first one).

Based on the USDA scale, my soil sample is classified as:

Soil Composition:

Please list the four basic components of soil and their percentages

Component of Soil	Percentage of Component
1.	
2.	
3.	
4.	

What are the 5 soil types ?

- 1.
- 2.
- 3.
- 4.
- 5.

Name: _____ Date: _____ Period: _____

Edible Soil Lab

Follow the directions step by step and make sure to answer the questions as you go. USE YOUR NOTES!

Step 1: Horizon R (Bedrock) – Oreo cookie in the bottom of the cup.

Why do you think we are using an Oreo to represent horizon R?

Bedrock is solid rock. Parent material is formed from the bedrock after a long weathering process. There are two basic ways that weathering can happen.

What are the two main types of weathering?

_____ and _____.

Physical weathering is

Chemical weathering is

Step 2: Horizon C – Crumbled cookies as the next layer.

How do the crumbled Oreos represent horizon C?

This is the C horizon in a soil profile. It is called the parent material because it is the weathered rock and partly weathered soil from which the soil layers above are formed.

What influences does the parent material have on the other horizons?

Step 3: Horizon B – Vanilla pudding as the next layer.

Horizon B is also known as _____.

Why is it lighter in color than the A Horizon?

Step 4: Horizon A – Chocolate pudding as the next layer. Add a gummy worm to the pudding.

Horizon A is also known as _____.

This is the top layer of soil. Nutrients, bacteria, fungi, and small animals are abundant. Plants thrive in it because of the nutrients in it.

Step 5: Litter – Sprinkles on the top.

The sprinkles represent the organic matter. This layer is usually less than an inch thick. Litter decomposes into nutrients that enrich the soil. In areas where the temperature is lower, the composition of organic matter is slower.

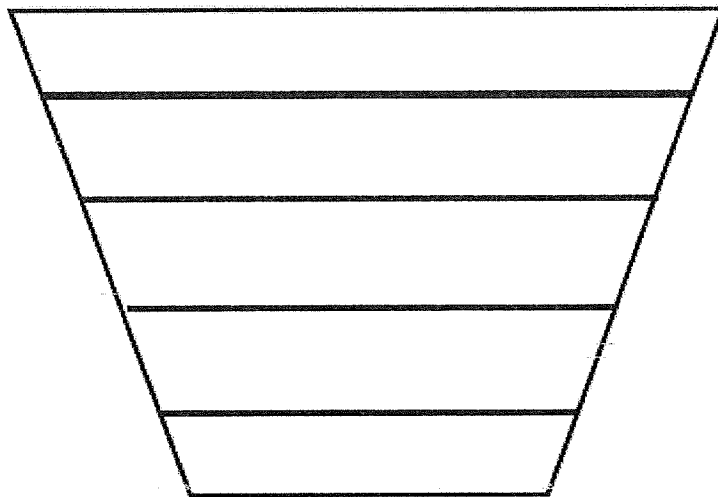
The decomposed litter will become _____.

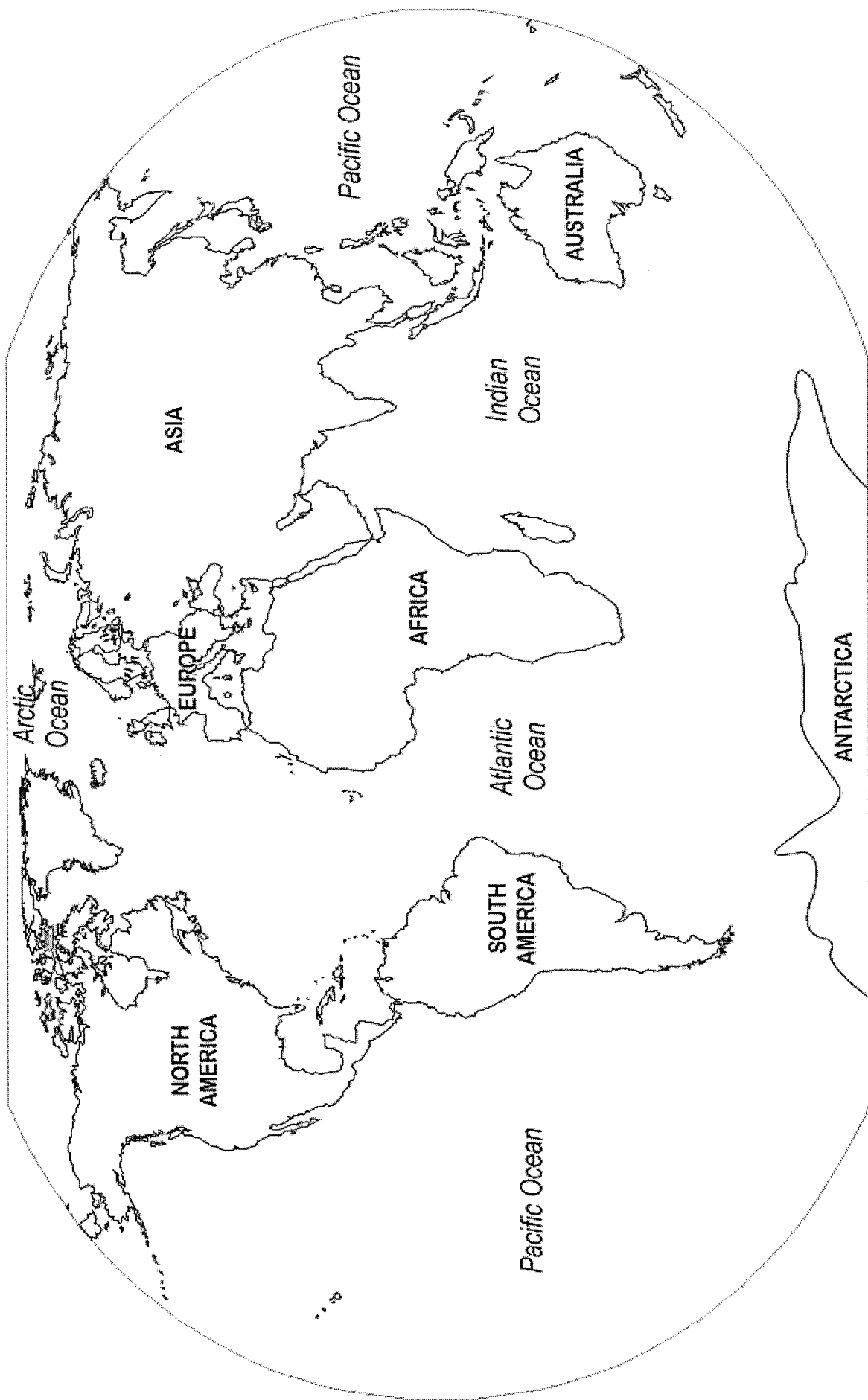
Analysis:

In the cup below draw what you see in your cup. Label both the actual soil layer or part and the edible representation of the part.

Soil layer

Edible representation





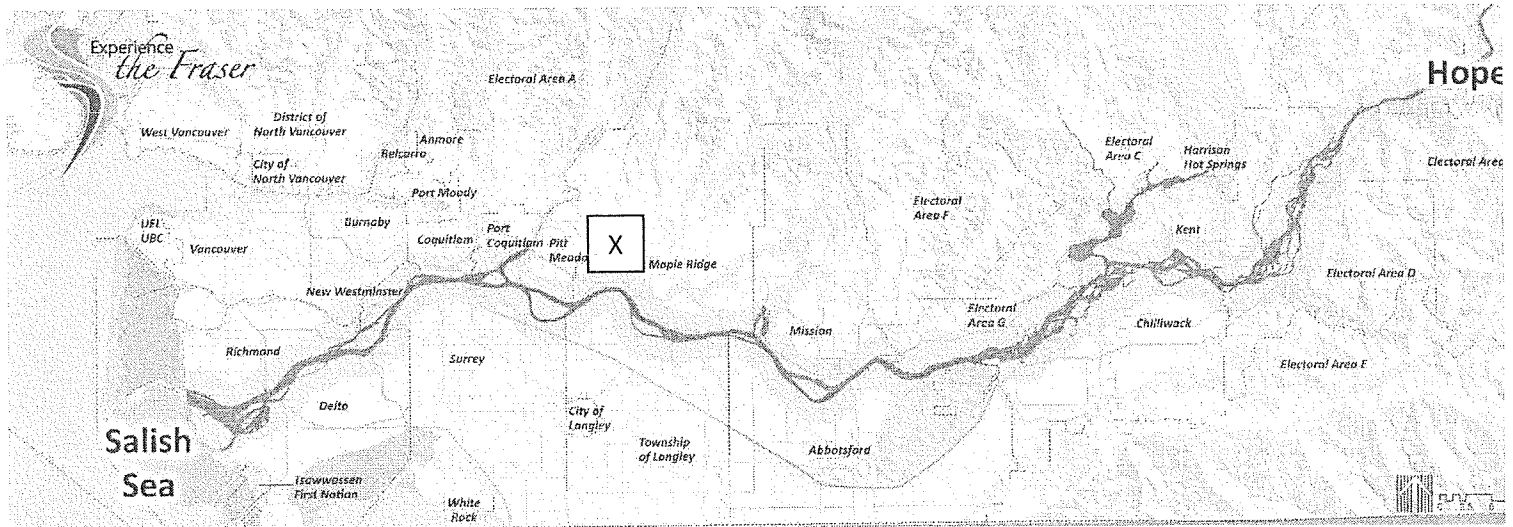
Focus on the Fraser

1. Fraser River Watershed (Drainage Basin):



- Define watershed/drainage basin.
- Look at the map above and list the main rivers in the Fraser River watershed (from near Jasper to Vancouver).
- Explain why the Fraser only flows west and not east as well. (Use the words "continental divide" in your answer.)
- What shape of valley would the Fraser River be carving as it passes through the mountains? Describe/illustrate the process to form this type of valley.
- How do you think a waterfall could form? What is a plunge pool?

2. Lower Fraser Valley:



- Notice how the Fraser River curves as it passes through the lower mainland. Explain/draw how this happens. Use the words "meander" and "flood plain" in your description.
- Draw the cross-section of the Fraser River that would be located directly south of the "X" on the map above. Label the N and S sides of your cross-section.
- Draw the cross-section of the Fraser River in the lower mainland where it is flowing straight.
- What are Richmond and Delta built on? How do features like this form?

3. Define the following:

a. stream capacity –

b. stream discharge –

c. gradient –

d. stream speed (Where would it move fastest if everything else were the same?) –

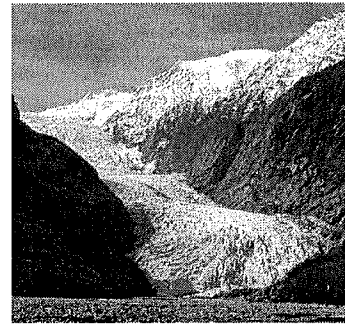
e. stream load –

4. How does a river erode rocks? What characteristics of the rocks would be important to consider? Also, use the terms about streams from #3 in your answer for #4.

Glacier Terms

1. Glaciers – rivers of ice

a. How do glaciers form?



b. _____ - lowest level that permanent snow reaches in the summer.

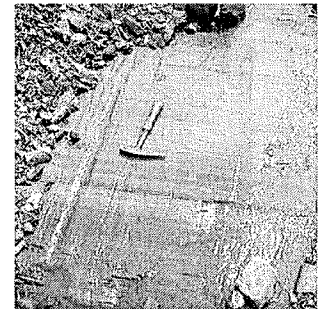
c. How do glaciers erode the bed rock?

2. Glacier Types

a. _____ - Wedge-shaped stream of ice found in mountains.

b. _____ - Moves outward from center as gravity squishes. Covers large areas. Also called Ice Sheet.

c. _____ - Small (tributary) glacial valley cut off by larger glacier. (Often have waterfalls when glacier melts.)



3. Erosional Features

a. _____ - Long parallel scratches left by coarse sand, pebbles, sharp boulders that are imbedded in the ice and dragged over other rocks (bedrock).

b. _____ - Semicircular basin formed at the head of a glacial valley.

c. _____ - Knife edge ridge between 2 cirques on a peak or between 2 U-shaped valleys.

d. _____ - formed by 3 or more glaciers sliding down from the peak of a mountain.



4. Depositional Features

a. _____ - all deposits of glacial origin are called this

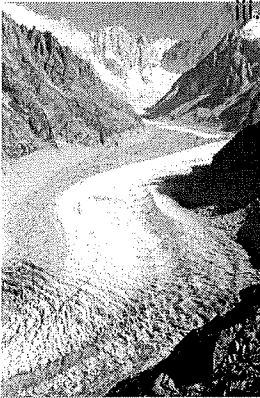
b. _____ - large buildups of rock pieces carried in the bottom of the glacier – deposits under the glacier

c. _____ - deposits made by streams of glacial meltwater

d. _____ - long lines of rock. There are various types:

i. _____ - As a glacial moves down a valley, rocks from the valley walls fall onto the glacier. When the glacier melts, the rocks are deposited (dumped) along the sides of the valley.

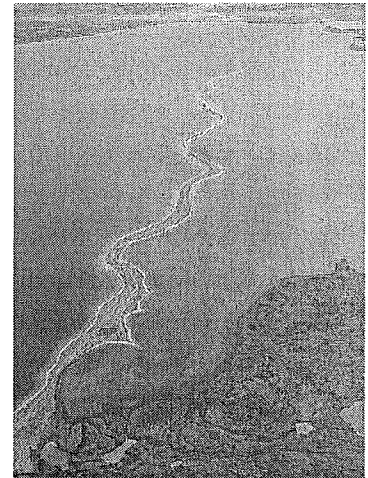
- ii. _____ - If two glaciers from separate valleys join into one valley, the two central lateral moraines join to become one. When the glacier melts, the rocks are deposited in the middle of the valley.



_____ - Formed at the end of a glacier. There are two types:

1. _____ - as a glacier moves it bulldozes material in front of it, making a line of rock at the toe.
2. _____ - As a glacier retreats (melts faster than it moves forward) it temporarily stops (melts at the same rate as it is moving forward) and all the rocks in the ice that is melting at the toe are deposited at that one spot.

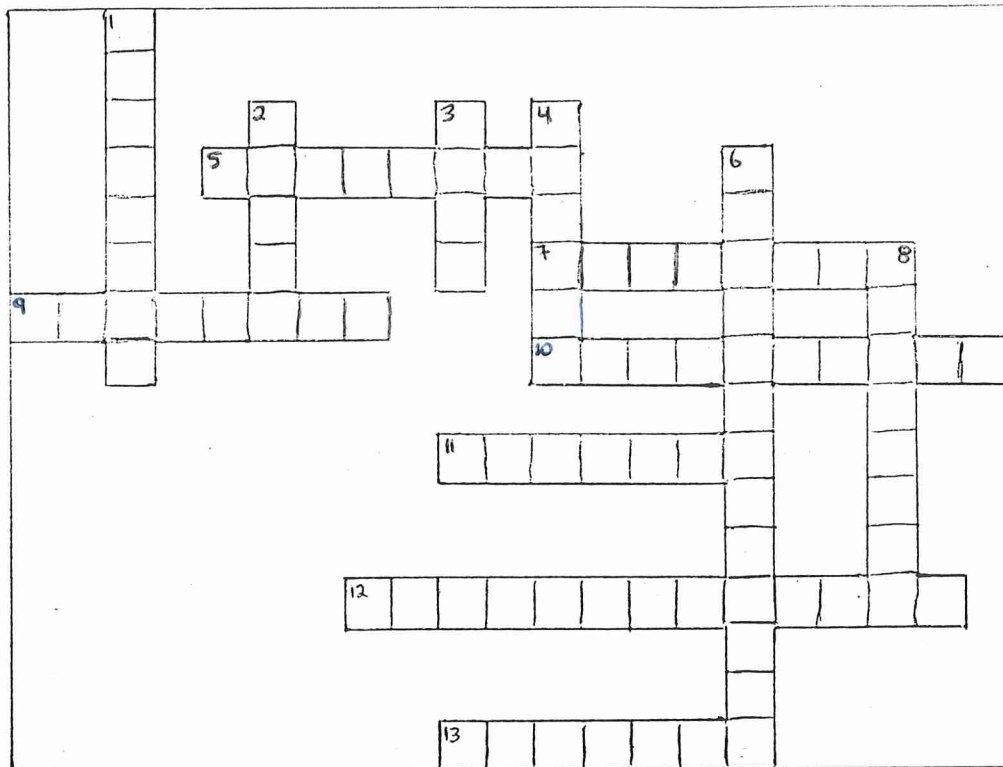
- e. _____ - Large boulders that have been transported to an area by a glacier but don't belong there.
- f. _____ - glacial meltwater forms streams, from end of glacier – alluvial fans (deltas out of water) formed, overlap and form plains.
- g. _____ - Meandering stream tunnels in/under glacier become partly filled with rocks. When glacier melts material is deposited in stratified s-shaped curves. These streams erode up since ice is softer than rocks below!
- h. _____ - Cone-shaped hill formed when streams on top of glacier deposit rocks in lakes on top of glacier. When glacier melts, rocks deposited in stratified cone.
- i. _____ - When streams empty into still water (lakes/oceans), alluvial fan in water.
5. Other Features
- a. _____ - Long, smooth, canoe-shaped hills made of till formed when advancing glacier runs over earlier deposited moraine.
- b. _____ - Circular hollows on terminal moraines and out washed plains- large lump of ice left imbedded in out washed material then ice melts, leaving a hole.



6. Glacial Lakes

- a. _____ - Formed when water fills the cirque basin left by alpine glaciers, also called tarns. Ex. Lake Louise
- b. _____ - Formed when water fills kettles
- c. _____ - River valley (used to be glacial valley) blocked by moraines EX. Moraine dammed lake on \$20 bill.





ACROSS

- 5 Long, smooth canoe-shaped hills made of till
- 7 Large glacial boulders that have been transported into an area
- 9 Moving mass of ice far larger than a valley glacier
- 10 long parallel scratches caused by coarse sand, pebbles, and sharp boulders *which are imbedded in glaciers*
- 11 A kind of drift including deposits made by streams of glacial meltwater *(found beyond the end of a glacier)*
- 12 A long, slow-moving, wedge-shaped stream of ice *in the mountains*
- 13 Circular hollows found on terminal moraines and outwash plains *formed by chunks of ice left as glacier retreated*

DOWN

- 1 Accumulations of glacial till *(there are several types)*
- 2 The divide formed when two cirques are formed next to each other on a peak *(or two glaciers travel parallel to each other)*
- 3 Large buildup of rock pieces carried in the bottom of a glacier
- 4 Long winding ridges formed when glaciers melt *("S-shaped curves")*
- 6 Broad flat areas formed when overlapping meltwater deposits flour, sand, and gravel *(similar to 11 across)*
- 8 The lowest level that permanent snow reaches in summer

Wind and Waves Activity

1. What can cause ocean waves? List anything you can think of:

2. What experience have you had with wind? Worst/best? Or what have you heard of?

3. Creating wind

- Make a gentle breeze in the palm of your hand.
- Now make a hurricane in your palm.
- Use a straw to make gentle, medium, and strong winds.
- How is it different when using just your mouth, compared to the straw, if blowing with the same strength?

- What kind of energy does wind have?

4. Wind on the water

- Create wind on the water by blowing through the straw (keep straw above the water).
- What happens when wind hits the water?
- Experiment with different strengths of wind.
- Change the angle (vertically) of the straw.
- Change the distance from the water. Summarize what you see:
- What happens when you blow for longer or shorter?

5. Discuss with your partner/group what you think affects the wave size. Record below:

Energy is transferred from moving _____ to the _____. This kinetic energy moves at the speed of the _____; the water moves at a much _____ speed.

6. Dip the flat side of the wavemaker into the water and create waves of consistent height and frequency. After you get going, what do you notice about:

- Wave energy?
- Height of the wave?
- Time between waves?
- Any other patterns you notice?

7. Impact of waves on a shoreline:

- Place an assortment of large and small rocks into one end of the bin.
- Create waves using your wavemaker.
- What happens? Do any of the rocks move? Which ones?
- Does size or frequency of waves make a difference? If so, describe.
- How might waves affect a rocky shore differently than a sandy one?

8. Summarize what you know about how waves can be created, what affects their size, and which waves will cause the most damage to shorelines.

5 Minute Science: Wind and Waves (5 min)

Wind

Dunes:

- formed by wind erosion
- Wind (usually) only picks up _____ grains or smaller
- Sand dunes have a _____ side and a _____ side



- The _____ side is the direction the wind is coming from. Draw an arrow on the diagram above
- Wind erodes the shallow side and _____ on the steep side causing dune _____

Sand blasting:

- Wind picks up _____ and blows it against things causing destruction

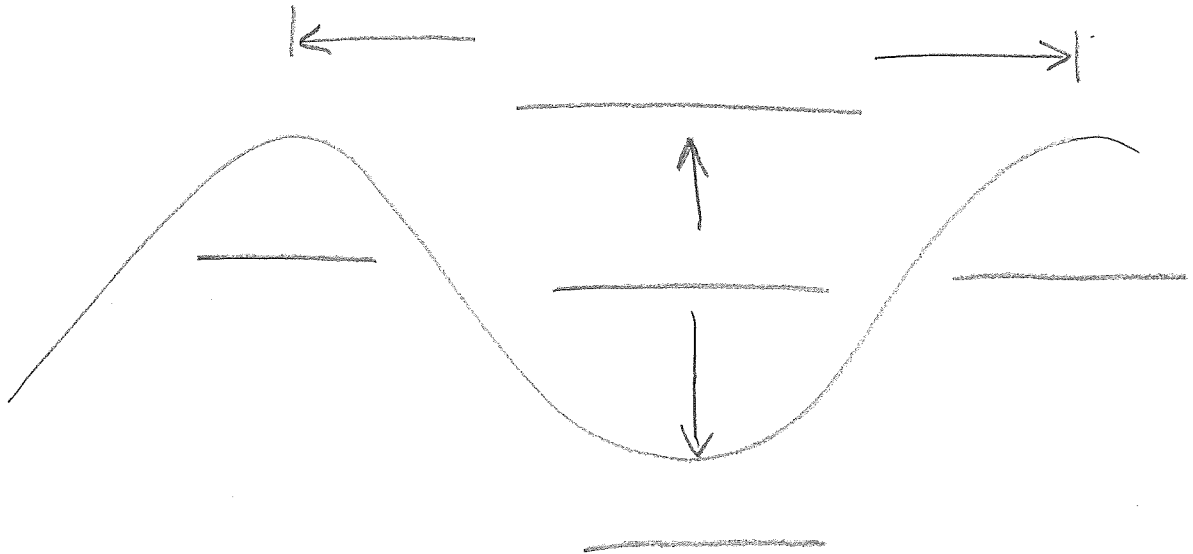
Waves

Beach erosion:

- Waves always come in at a slight _____
- As the wave goes out you feel the sand get _____ from underneath your feet
- Sand being carried down the beach is called _____ drift
- To prevent erosion of beaches we build _____
- When waves lose energy they _____ what they are carrying (like streams!)
- Any sediments being carried will undergo _____ causing round and _____ sediments.

Ocean Waves and Erosion (7.5 min)

- The stronger the waves, the _____ erosion that happens
- Hard rocks erode more slowly than _____ rocks => _____ erosion
- Normal ocean waves result from frictional drag of _____ on the surface of water



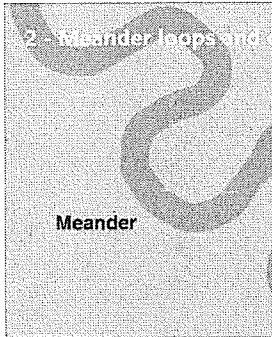
- Distance over which wind has blown = _____; long fetch = _____ waves
 - Storms create _____ waves = _____ erosion
 - Swell waves have _____ wavelengths compared to locally produced waves
 - Cliff _____ is from hydraulic action and abrasion
 - When rocks rub against each other and break, this is called: _____
 - Notch: waves undercut cliff until it _____
 - Why is it important to know about cliff retreat? _____
-
- Wave cut/_____ platform – found at the bases of _____
 - At the _____ of the platform there is an escarpment
 - Rocks being eroded between high and _____ water mark
 - Differential erosion results in formation of: _____, sea caves, _____ and stacks
 - Softer rock erodes _____ leaving harder rock as the feature
 - Honeycomb weathering – caused by _____ crystals getting into cracks of rocks. Dries from sun, crystals heat and _____, wedging apart the confining rock.

Weathering and Erosion Scavenger Hunt

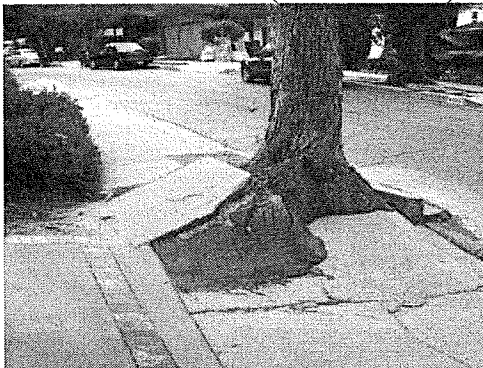
Take pictures of at least 10 of the items, create a pdf of these pictures, LABLED and email it to me...

Along the Way...

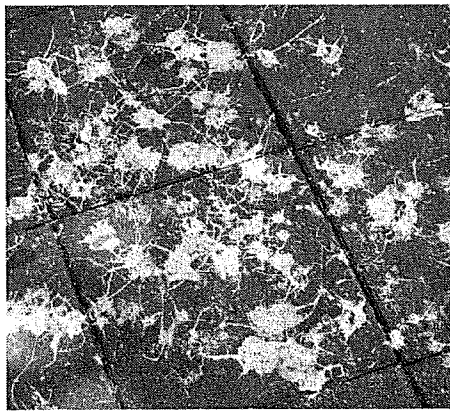
☐ 1. Meander



☐ 2. Plant Roots (mechanical)



☐ 3. Acids of decay (chemical)



☐ 4. Oxidation

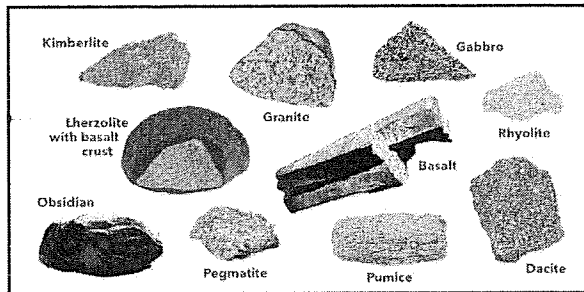


☐ 5. Ice Wedging / Frost Action

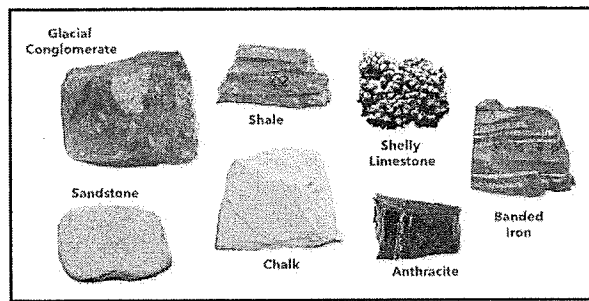


At the Site...

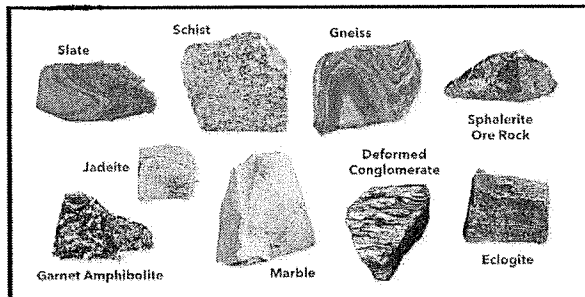
☐ 1. An Igneous Rock



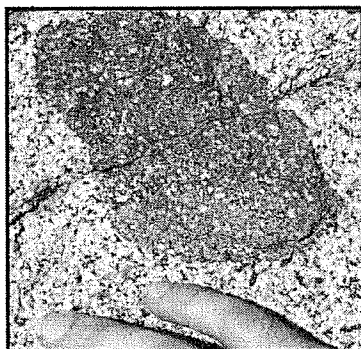
☐ 2. A Sedimentary Rock



☐ 3. A Metamorphic Rock



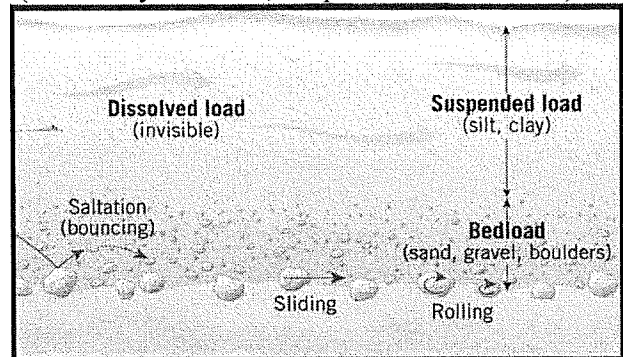
☐ 4. A Xenolith Rock



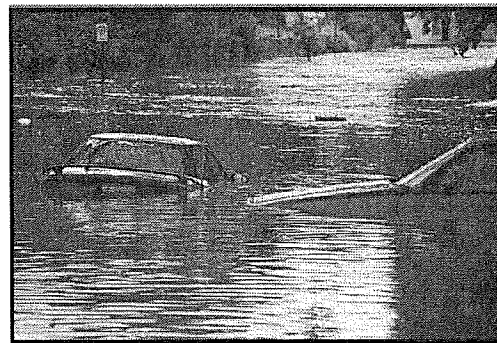
☐ 5. Rip Rap



☐ 6. Stream Load (carried by solution, suspension or bedload)



☐ 7. Flooding



Human and Climate Effects on W&E

What human activities could accelerate/decelerate weathering and erosion? Explain. Solutions?

How can current climate change accelerate/decelerate weathering and erosion? Explain.