Do Now (2 minutes)

4/11

K What I know about Erosion	W What I want to find out about Erosion
1. 2. 3.	1. 2. 3.

Think about the Stream Table

Do Now (2 minutes)

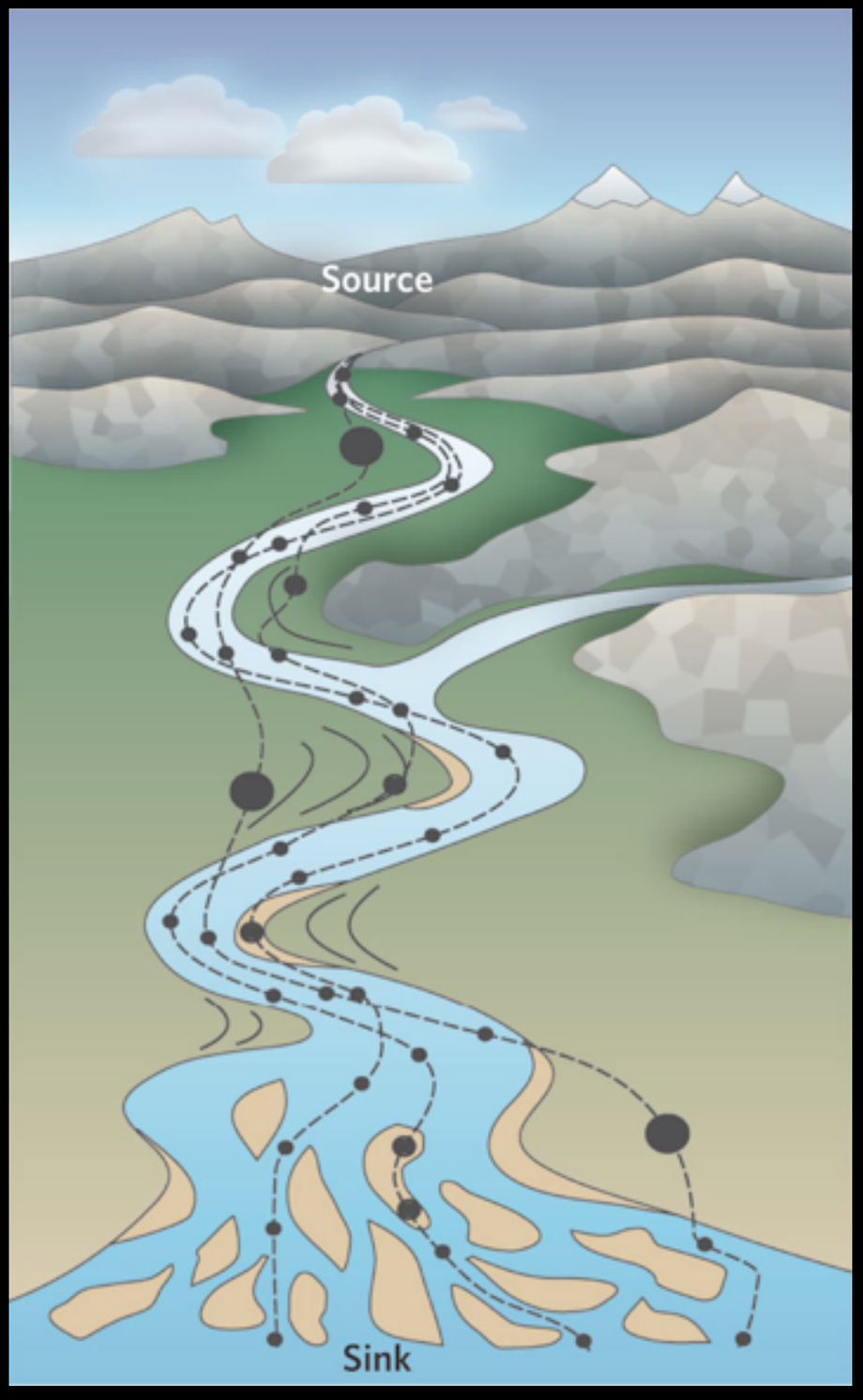
4/15

Answer in your Guided

K What I know about Rivers	W What I want to find out about Rivers
1. 2. 3.	1. 2. 3.

Think about the Stream Table

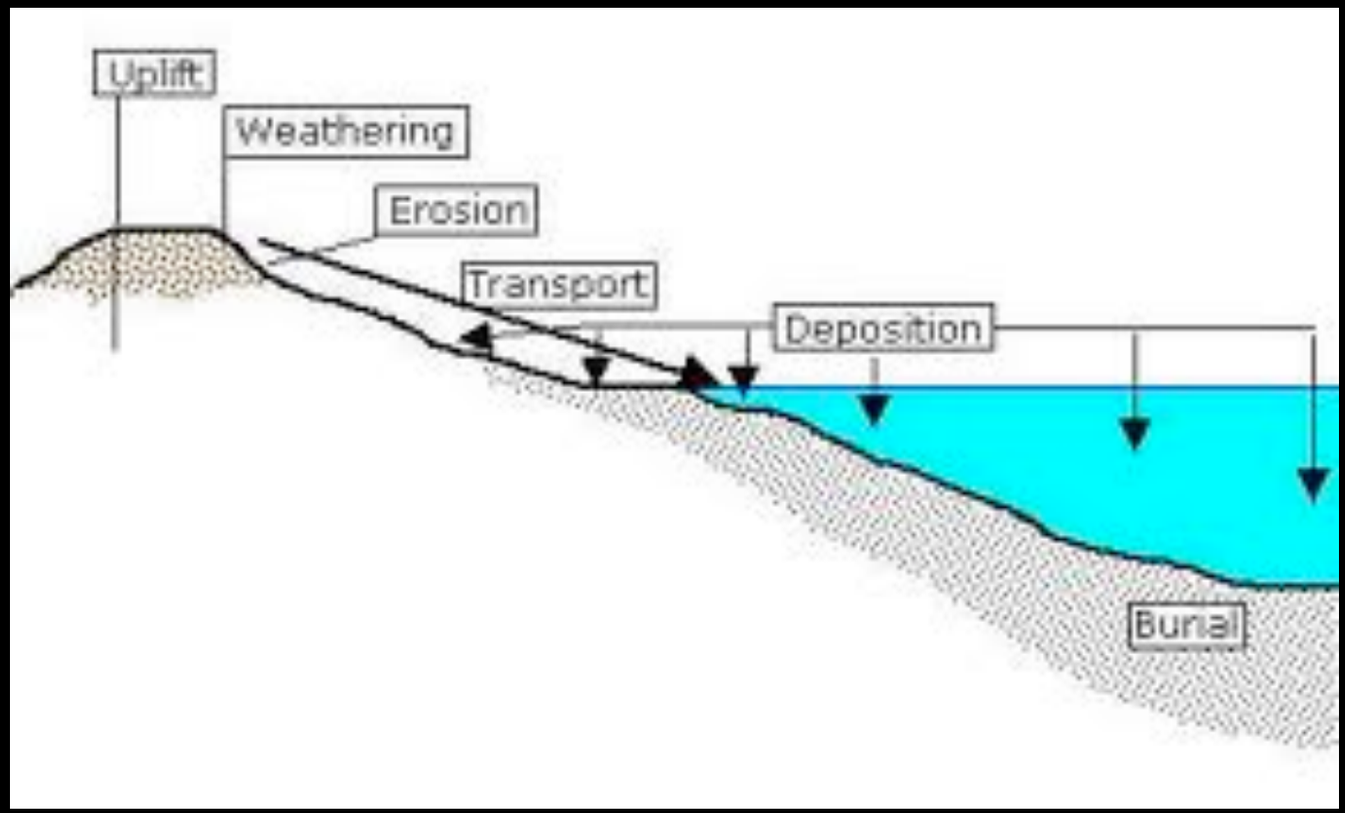
Surface Processes



Weathering, Erosion, Deposition
What are the processes that shape our Earth?

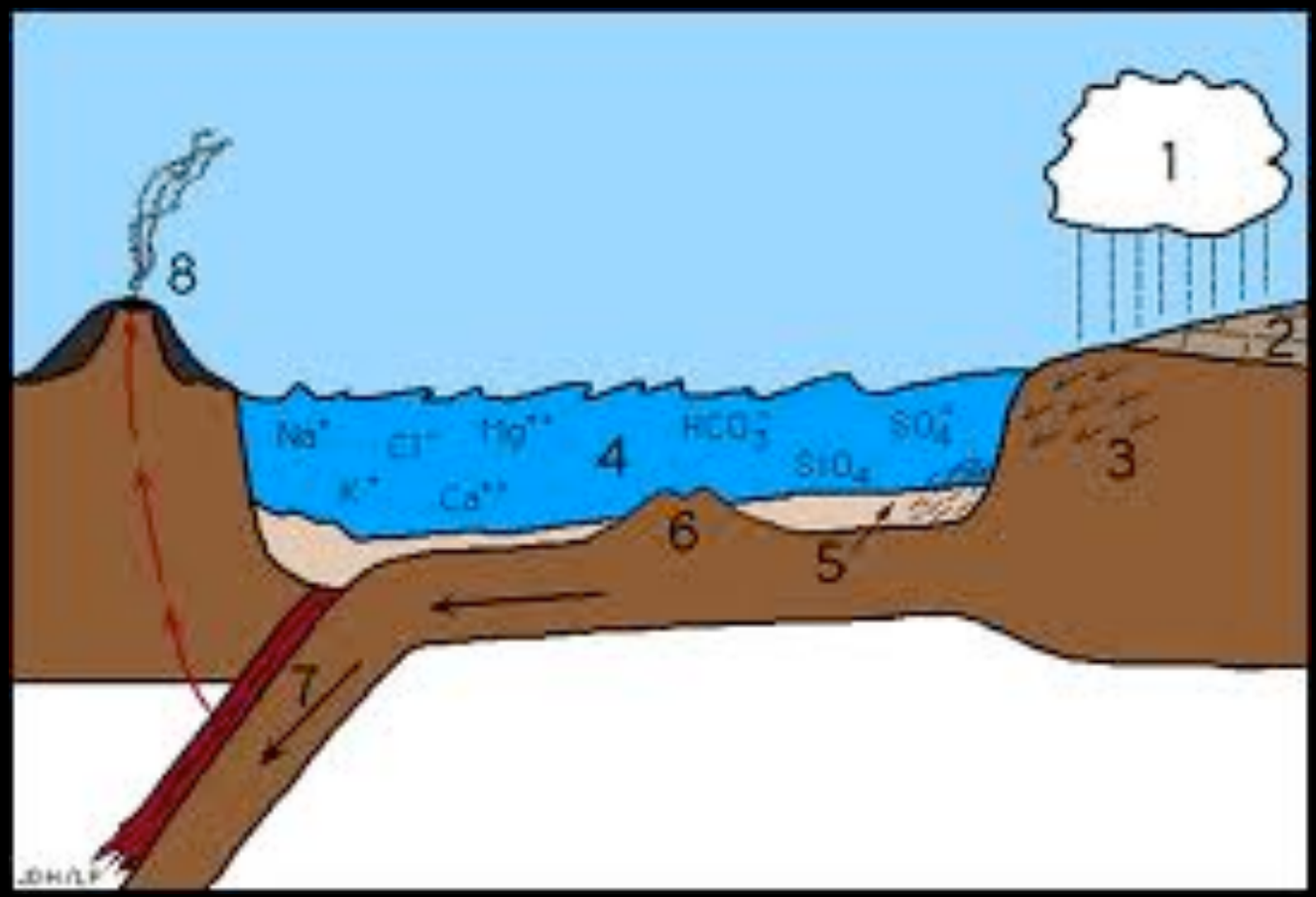
Weather, Erosion & Deposition

Weather, Erosion & Deposition



Stream Table

Weather, Erosion & Deposition



<u>Weathering</u> - The breakdown of rock at or near the Earth's surface

<u>Sediments</u> - Smaller pieces of rock that have undergone weathering

Weather, Erosion & Deposition

Weathering occurs when rocks are exposed to:

Air

Water

Actions of Living Things

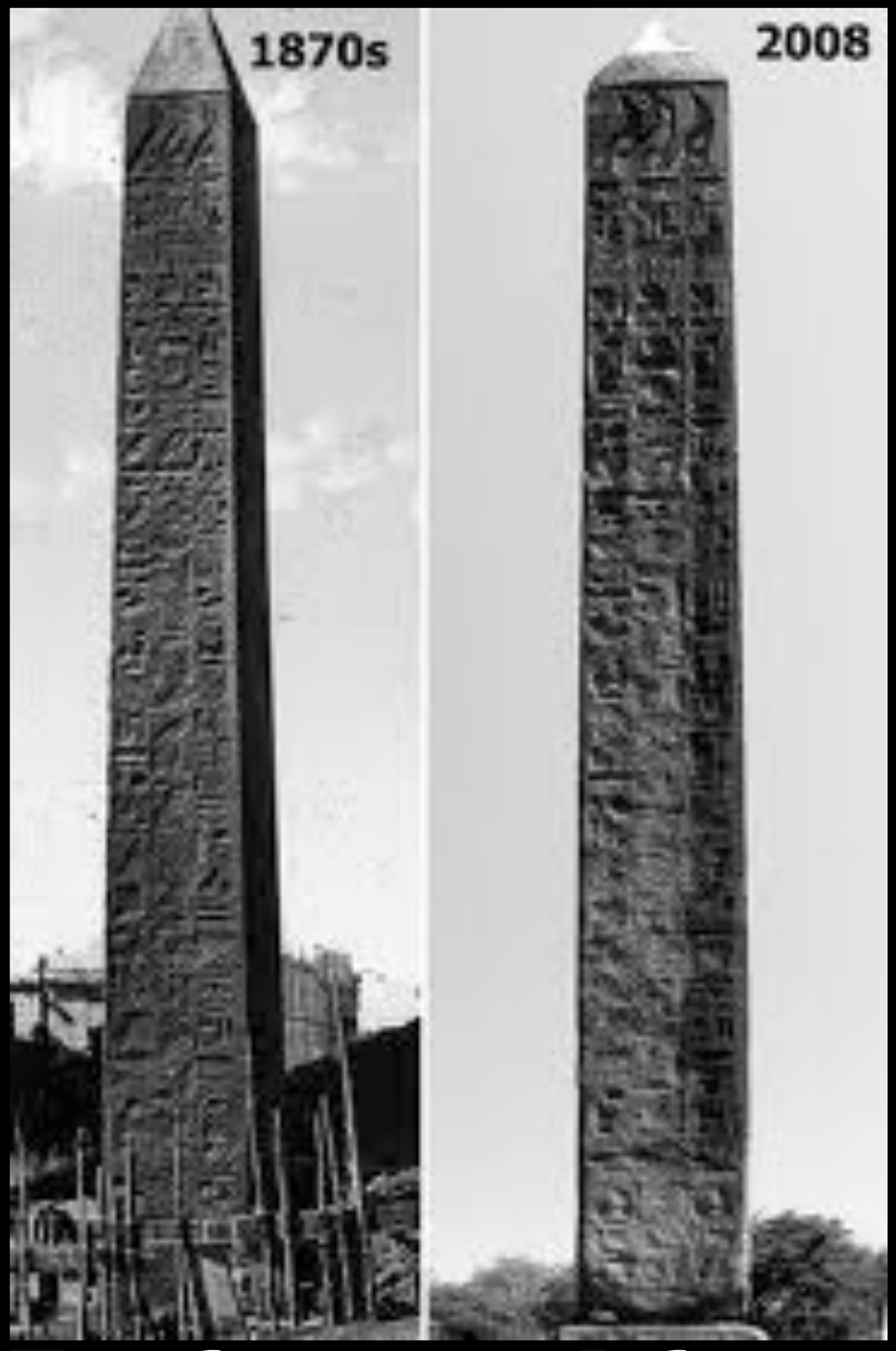
Weather, Erosion & Deposition

<u>Chemical Weathering</u> -

The breakdown of rock through a change in mineral or chemical composition

The rate of chemical weathering increases in **warm**, **moist climates (mT)**

Weather, Erosion & Deposition



Before After

Before After

Weather, Erosion & Deposition

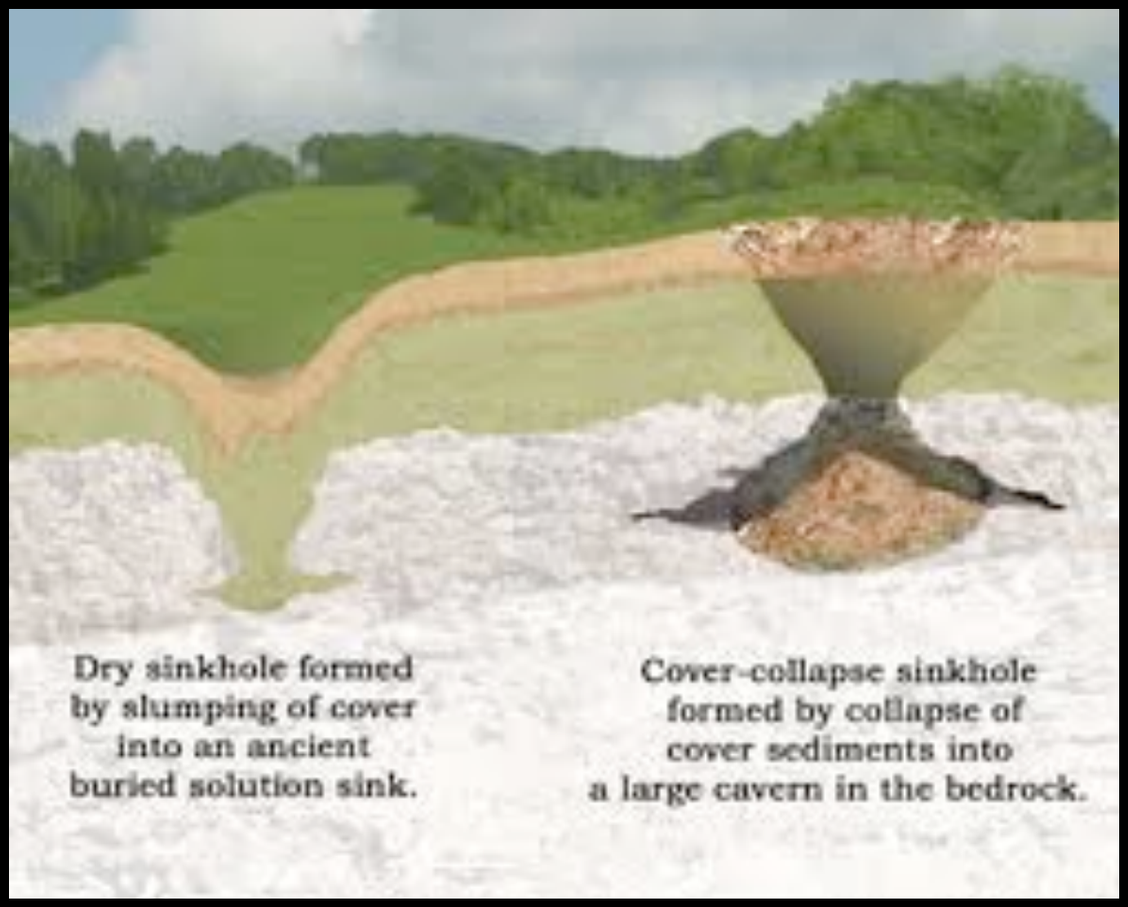
Oxidation -
when iron combines with oxygen to make rust

Weather, Erosion & Deposition

Effects of Water on Rock:

- Sometimes called the "universal solvent," because given enough time, water can dissolve nearly anything.
- Water can combine with CO_2 to form carbonic acid
- Carbonic acid can dissolve most rock, especially limestone - contain mineral calcite

Weather, Erosion & Deposition



Sinkhole

Weather, Erosion & Deposition

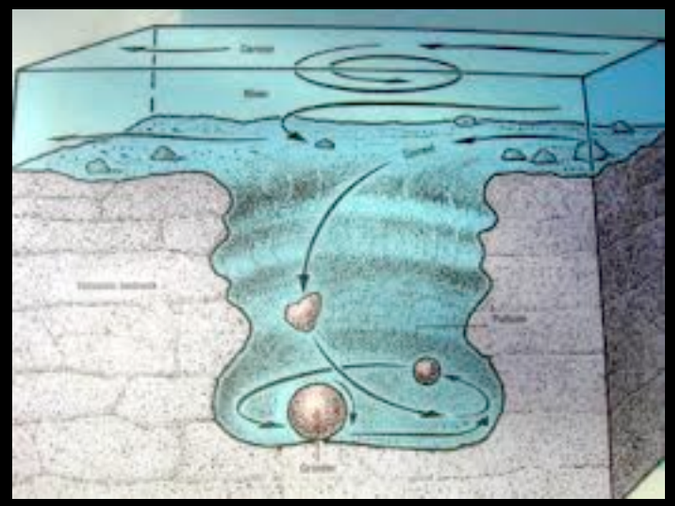
Physical Weathering -

The breakdown of rock into smaller pieces without chemical change

Weather, Erosion & Deposition

Abrasion -

Occurs when rock particles grind against rock

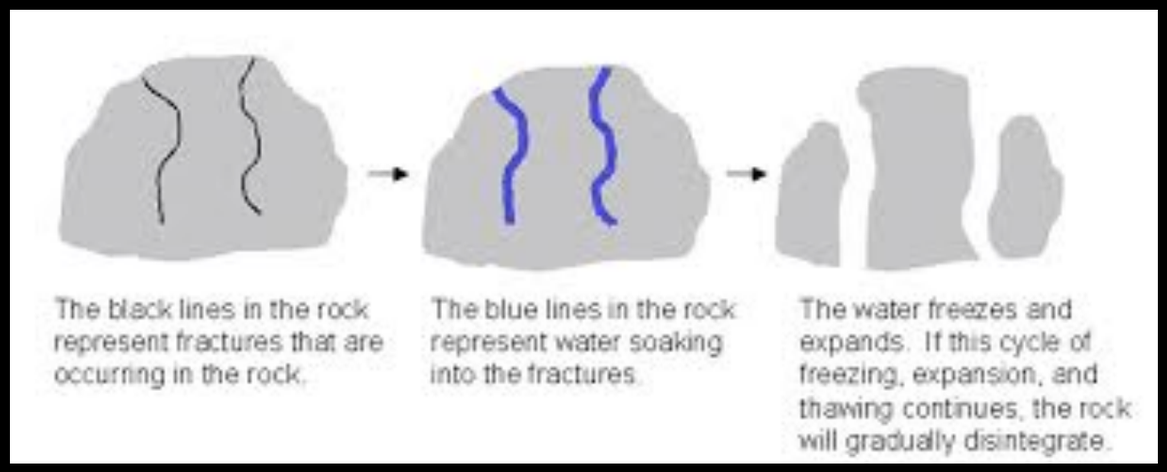


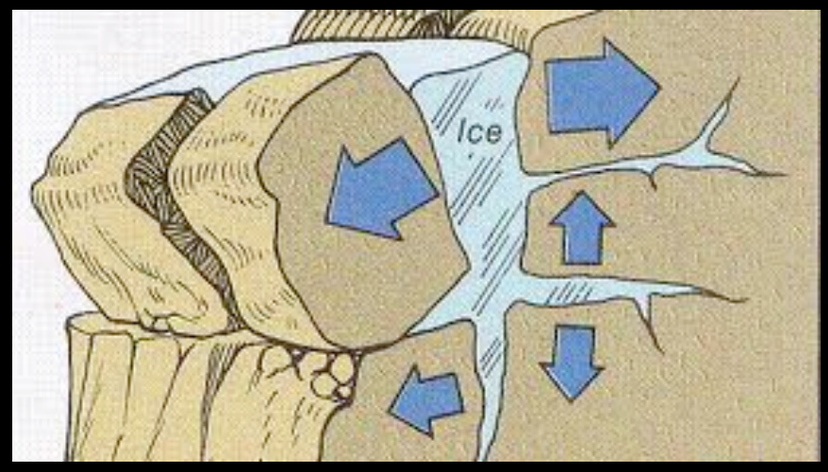
- **Characteristics** - round shaped rocks
- Occurs as sediments are moved by ice, running water, gravity, or air.

Weather, Erosion & Deposition

Frost Action -

Weathering process caused by cycles of freezing and thawing of water in rock openings





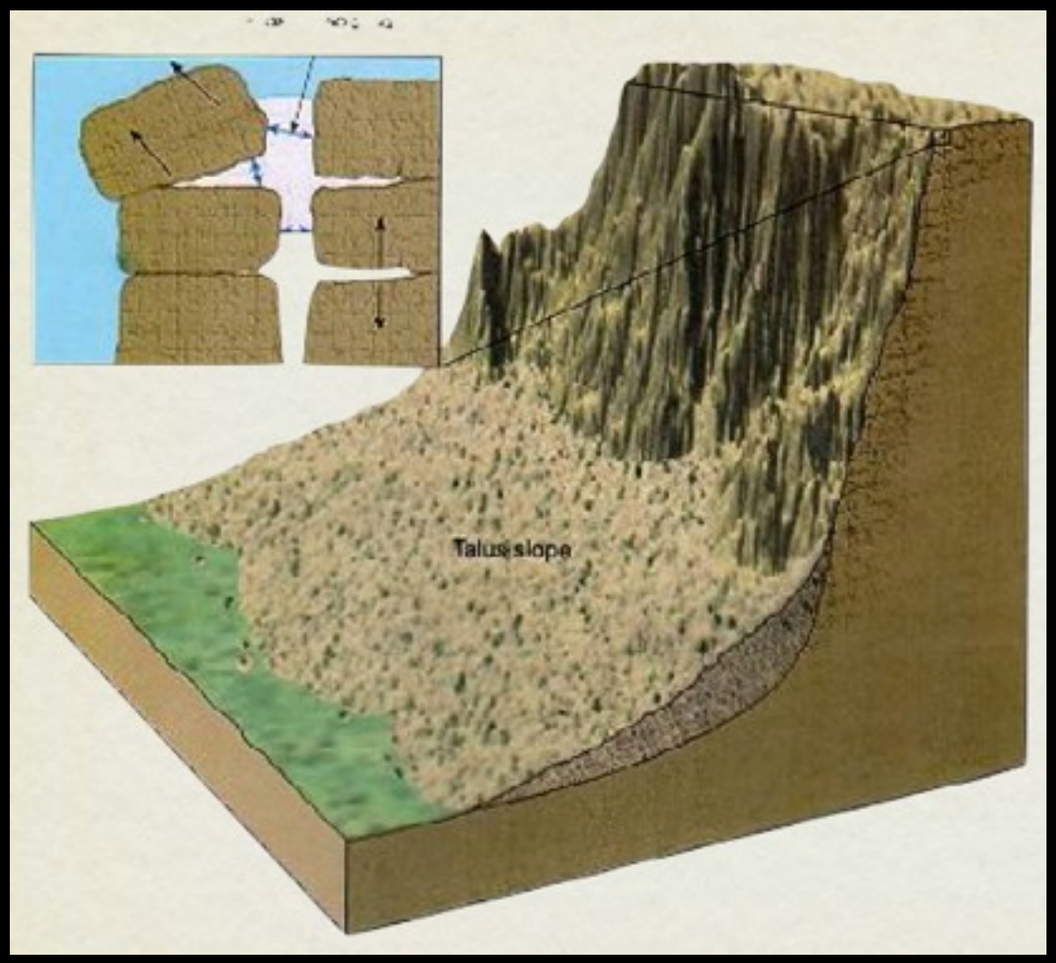
Water infiltrates cracks in the rock and when it freezes, it expands & causes the rock to split.

Infiltration -

The process which water penetrates into soil

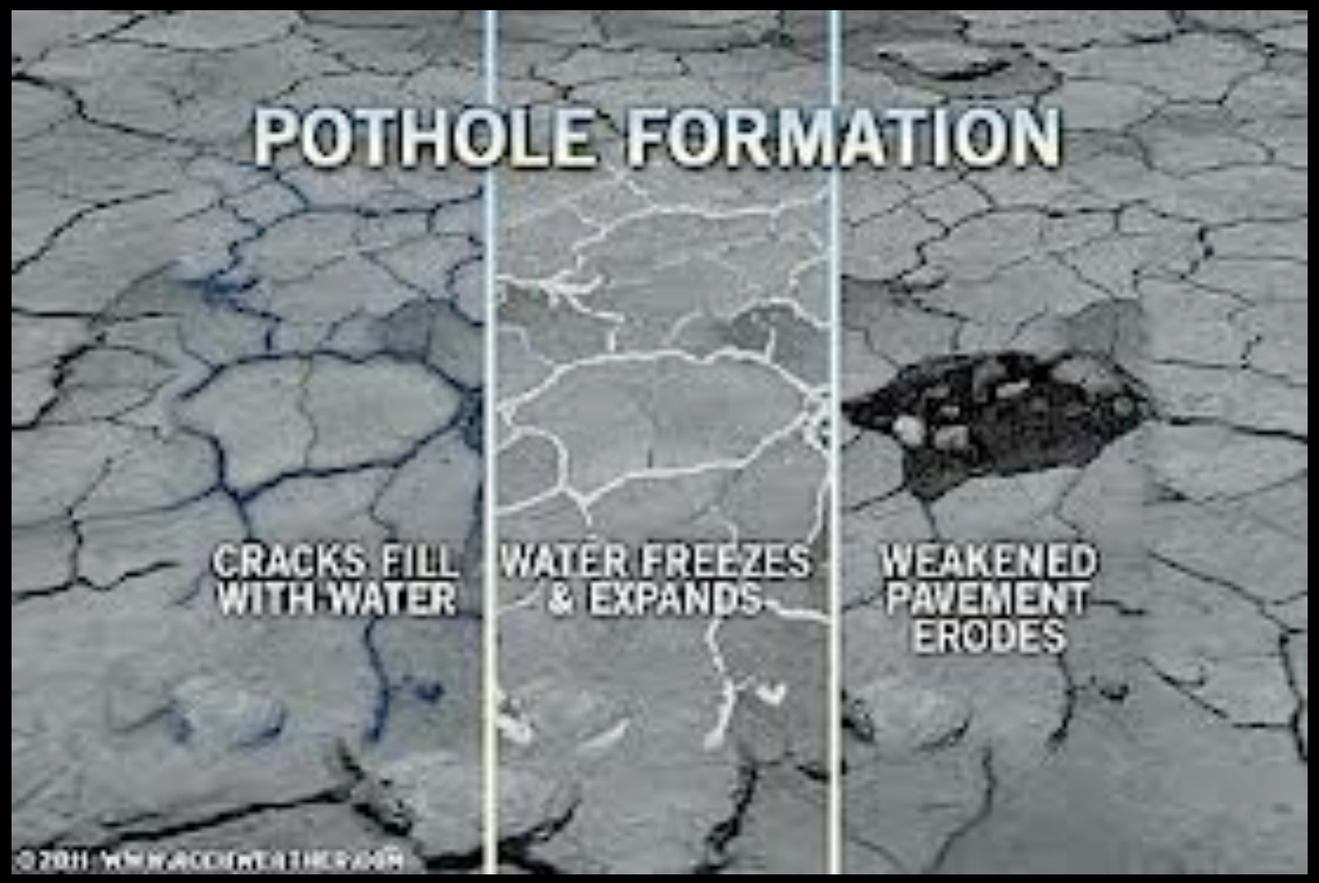
Weather, Erosion & Deposition

Frost Action



Potholes

Weather, Erosion & Deposition



Weather, Erosion & Deposition

Plant Root Growth -

As plants grow, they can also spread cracks apart even farther

Weather, Erosion & Deposition

Abrupt Temperature Changes -

As temperature increases, rocks can expand and fracture

Exfoliation

Weather, Erosion & Deposition

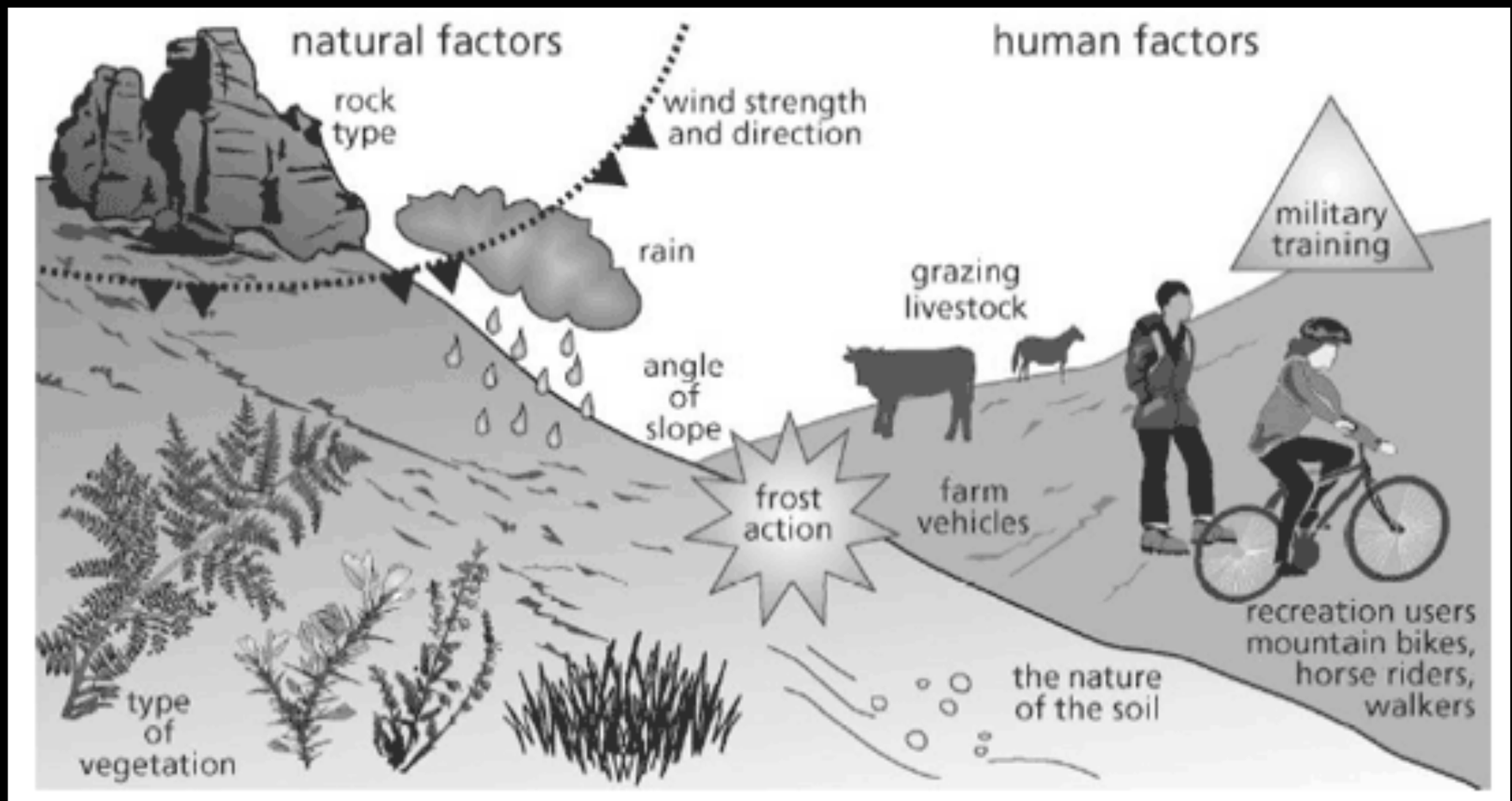
After rocks are broken up from weathering, they need to be moved

Erosion- process where particles are transported as sediment

Over time, erosion helps shape and lower all surface features

Weather, Erosion & Deposition

<u>Agents of Erosion</u>- Forces that are set in motion by gravity that causes sediments to move



Weather, Erosion & Deposition

Examples of Agents of Erosion-

Streams or Rivers
Waves
Glaciers
Wind
Mass Movement

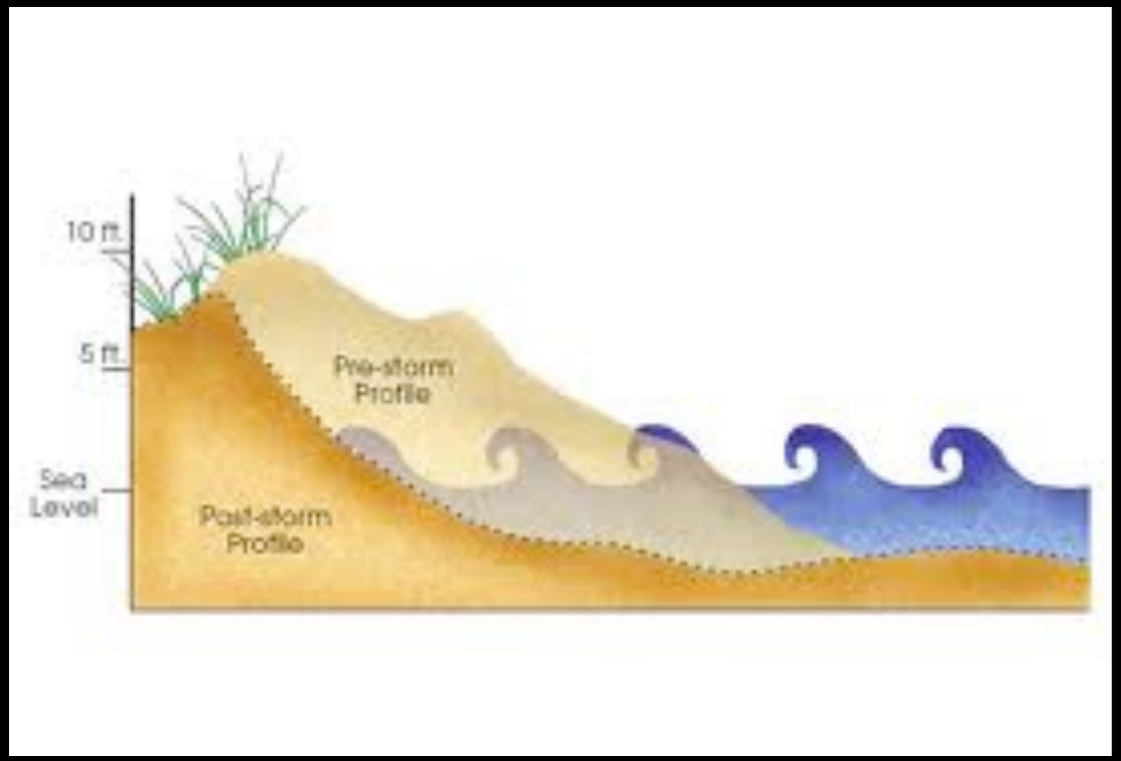
Weather, Erosion & Deposition

Examples of Agents of Erosion-

Streams

Weather, Erosion & Deposition

Examples of Agents of Erosion-



Waves

Weather, Erosion & Deposition

Examples of Agents of Erosion-

Glaciers

Weather, Erosion & Deposition

Examples of Agents of Erosion-

Wind

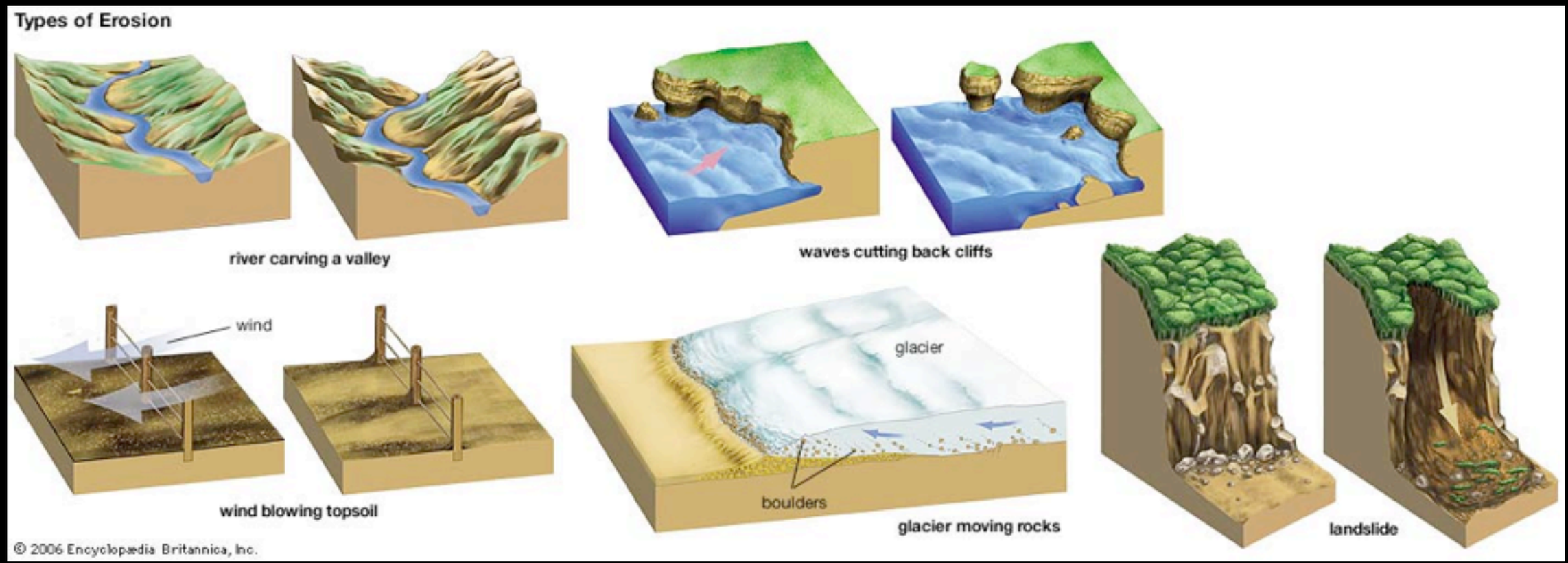
Weather, Erosion & Deposition

Examples of Agents of Erosion-

Mass Movement

Weather, Erosion & Deposition

Gravity - Direct Role



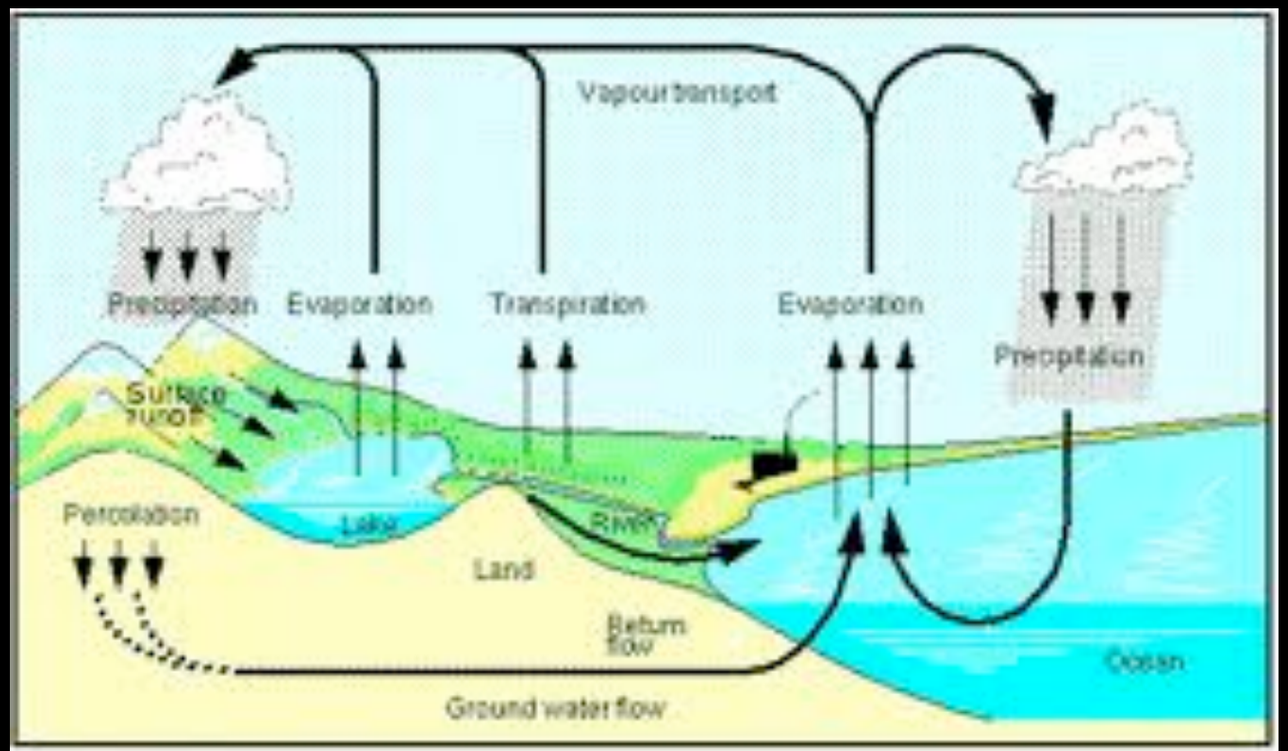
Force behind most agents of erosion
Causes rivers to flow, Ice to move, Rocks to slide

Weather, Erosion & Deposition

The Sun - Indirect Role

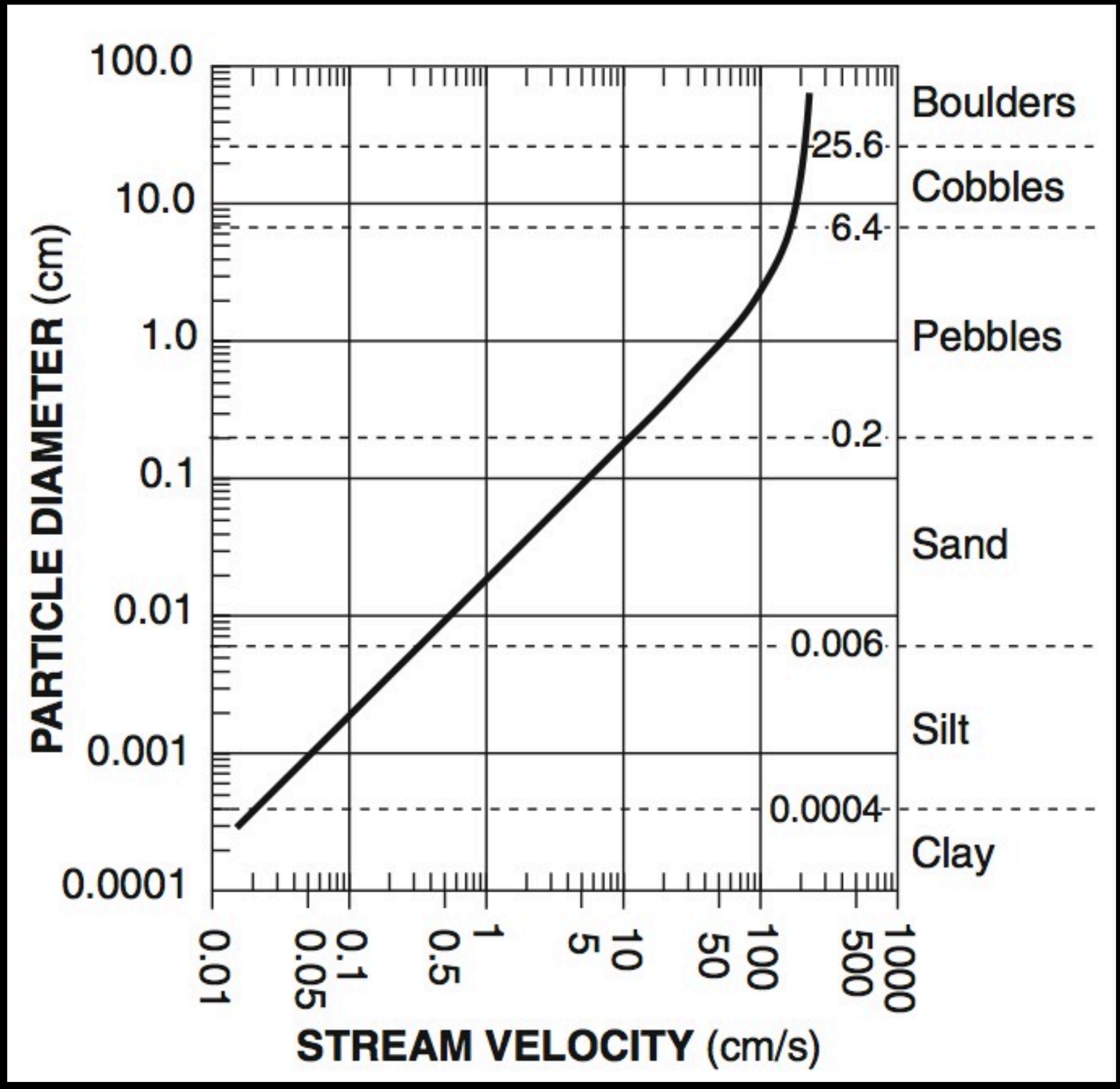
Drives the water cycle which produced rain and ice

Fuels winds and drives ocean currents



Courtesy Erich Roeckner, Max Planck Institute for Meteorology

Weather, Erosion & Deposition



Weather, Erosion & Deposition

Deposition - the process by which sediments are released from an erosional system

Sediments are deposited in locations where they form layers of Sedimentary Rock

Weather, Erosion & Deposition

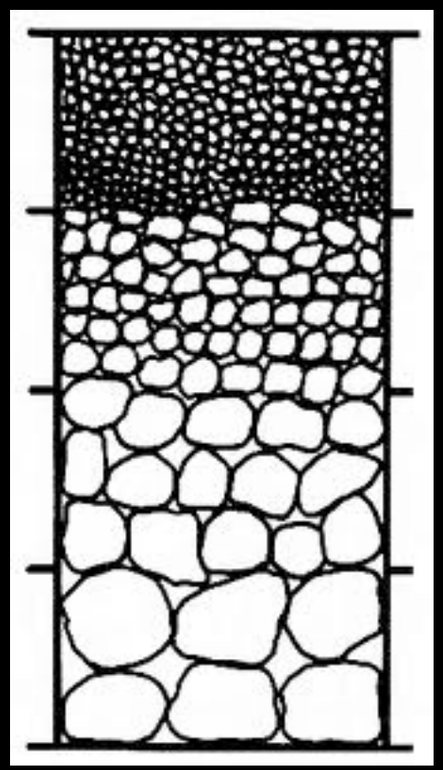
The sediments determine how fast they are deposited:

- **Size** - larger sediments will settle faster
- **Shape** - rounder sediments settle faster and flatter sediments will take longer
- **Density** - More dense sediment will settle faster

Weather, Erosion & Deposition

Sorted Sediment - Layers of sediment that are similar in size, shape or density

Example - Deposition from a stream

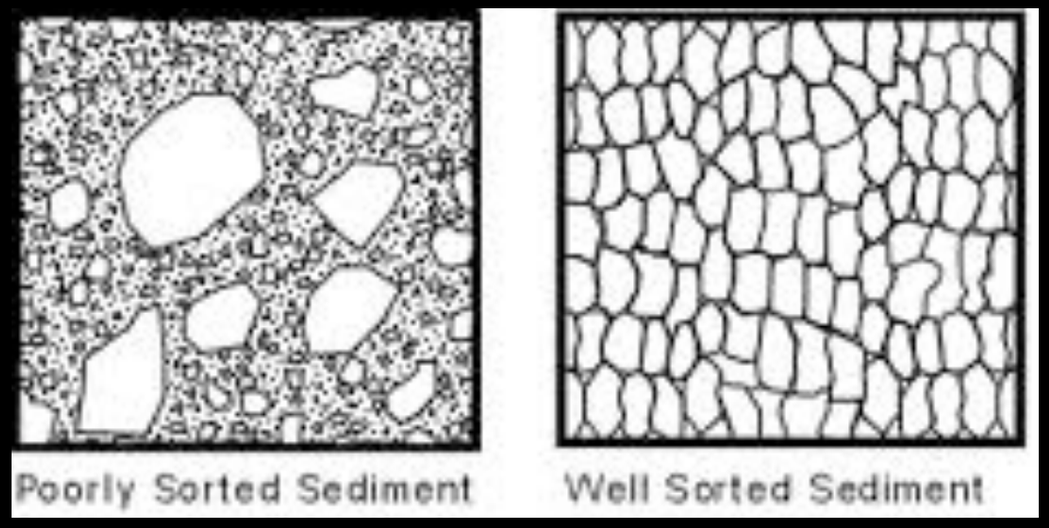


Vertical Sorting

Weather, Erosion & Deposition

Unsorted Sediment - Layers of sediment that are mixed in size, shape or density

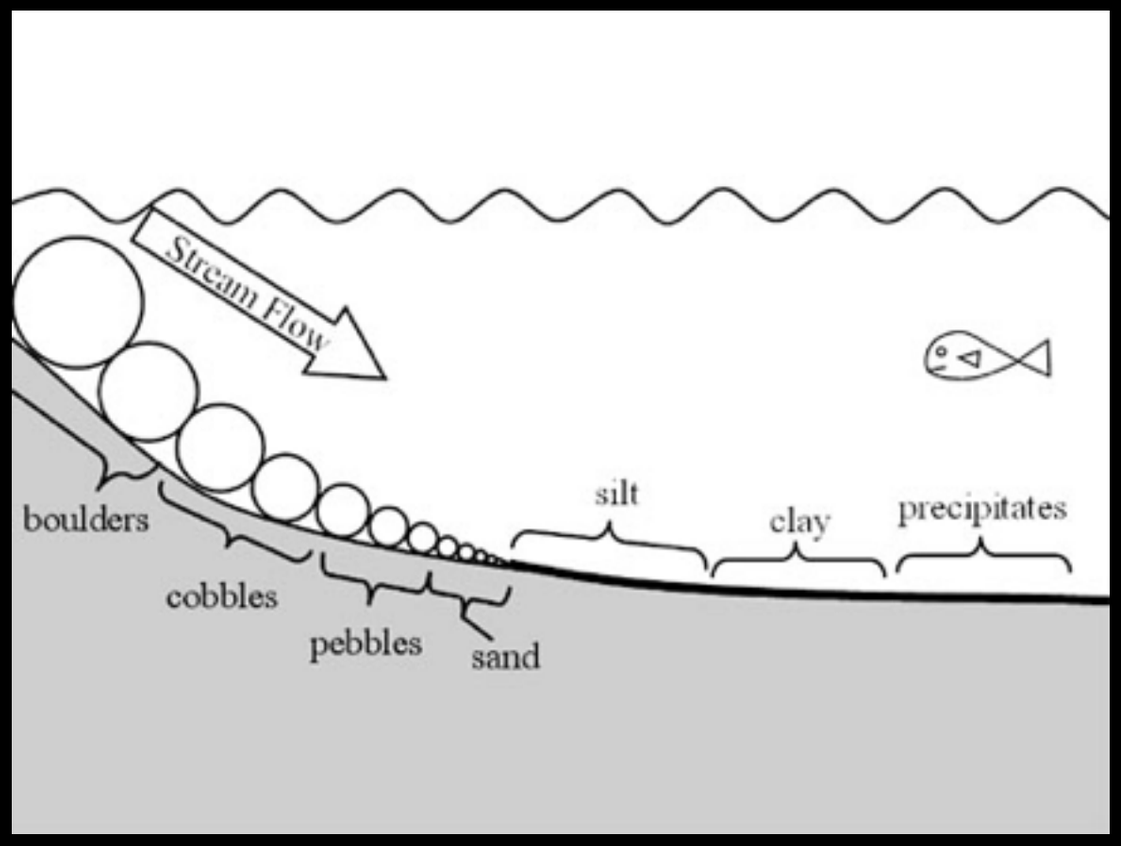
Example - Deposition from a glacier



Weather, Erosion & Deposition

Horizontal Sorting -

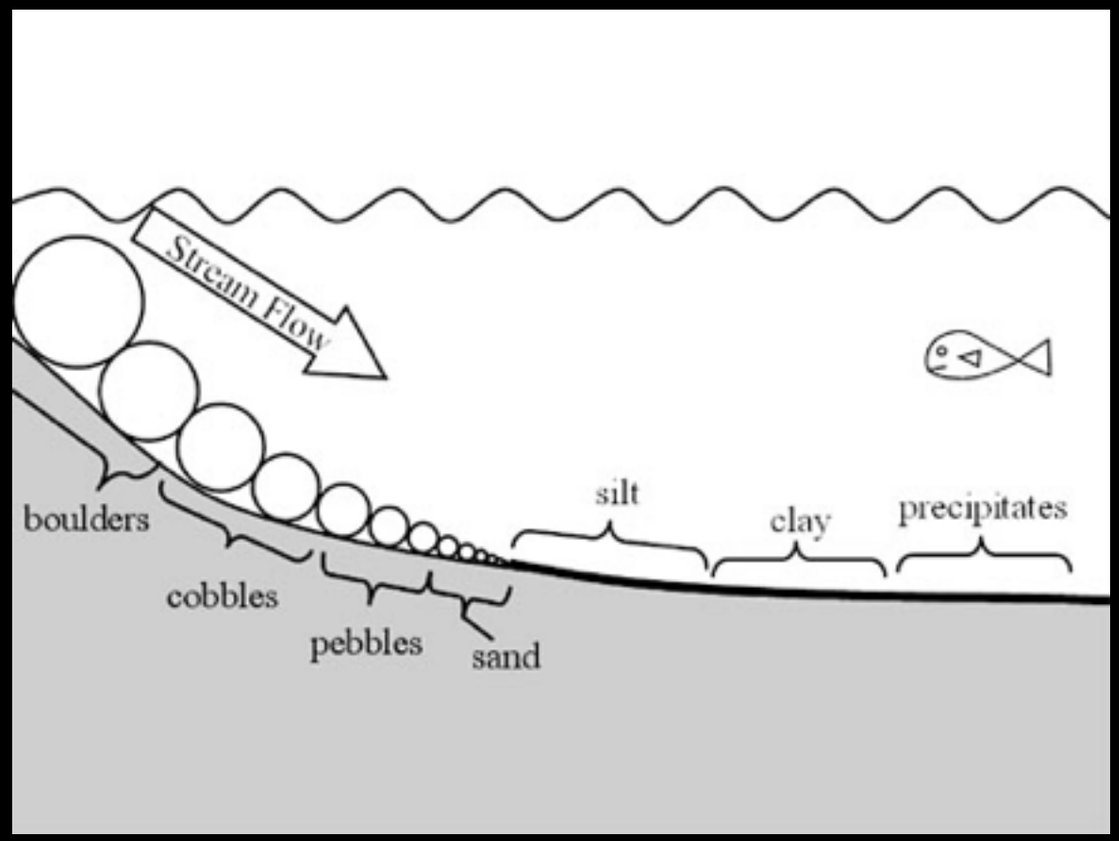
When the velocity of wind or water erosional system gradually decreases, the larger, more dense particles settle first



Weather, Erosion & Deposition

Horizontal Sorting -

Size, roundness and density gradually decrease as water velocity decreases when you move farther out



Weather, Erosion & Deposition

Vertical Sorting -

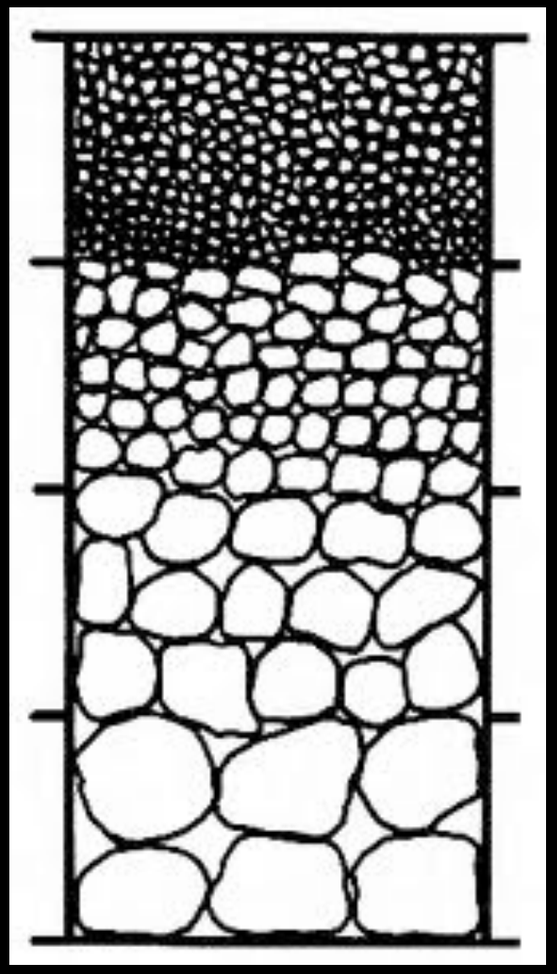
Larger or more dense sediments settle to the bottom first, followed by decreasing size and density

Example:

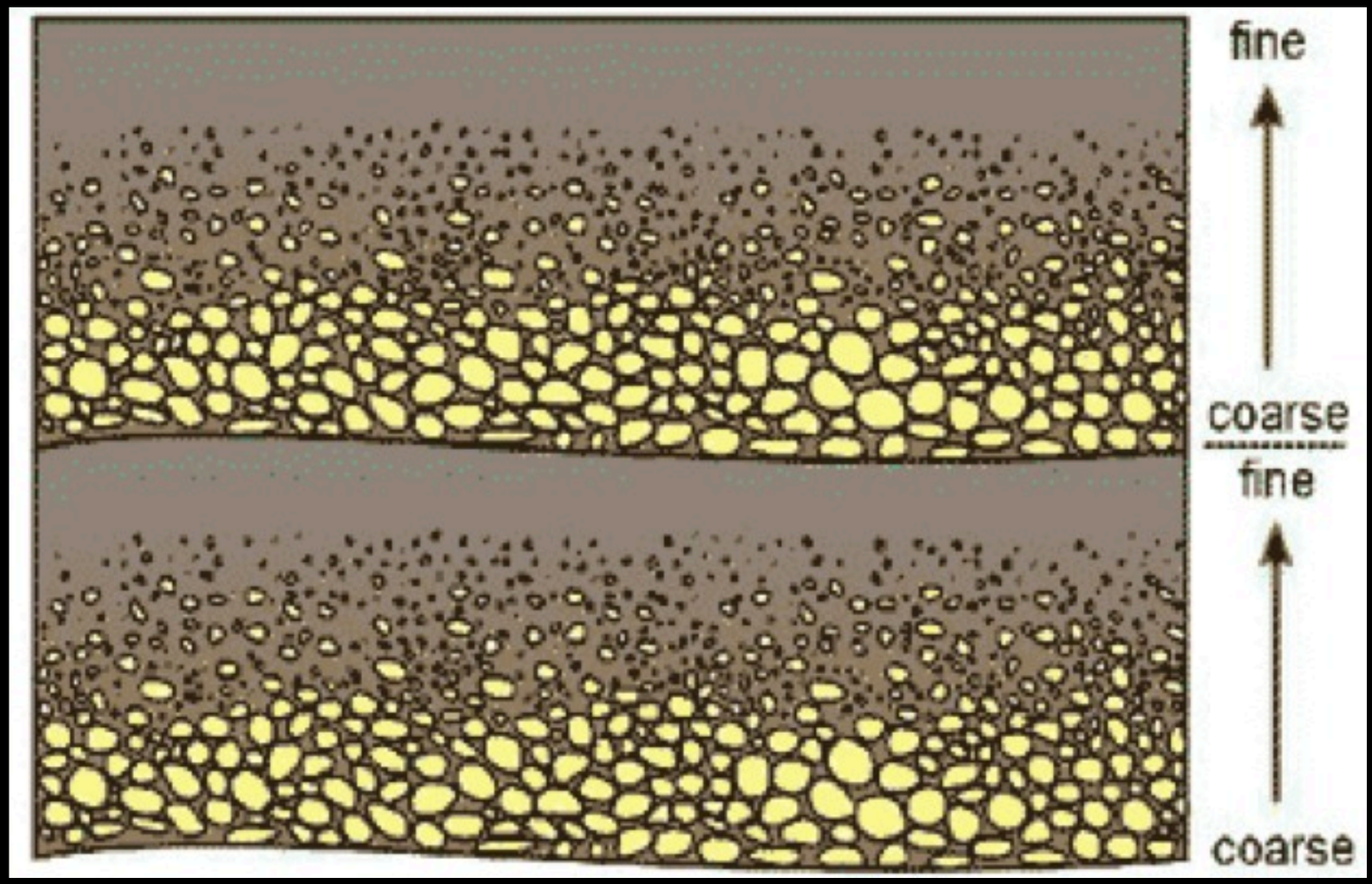
as a stream slows down throughout the year it can no longer transport larger material and begins to deposit the sediments according to size order

Weather, Erosion & Deposition

Vertical Sorting -



Weather, Erosion & Deposition

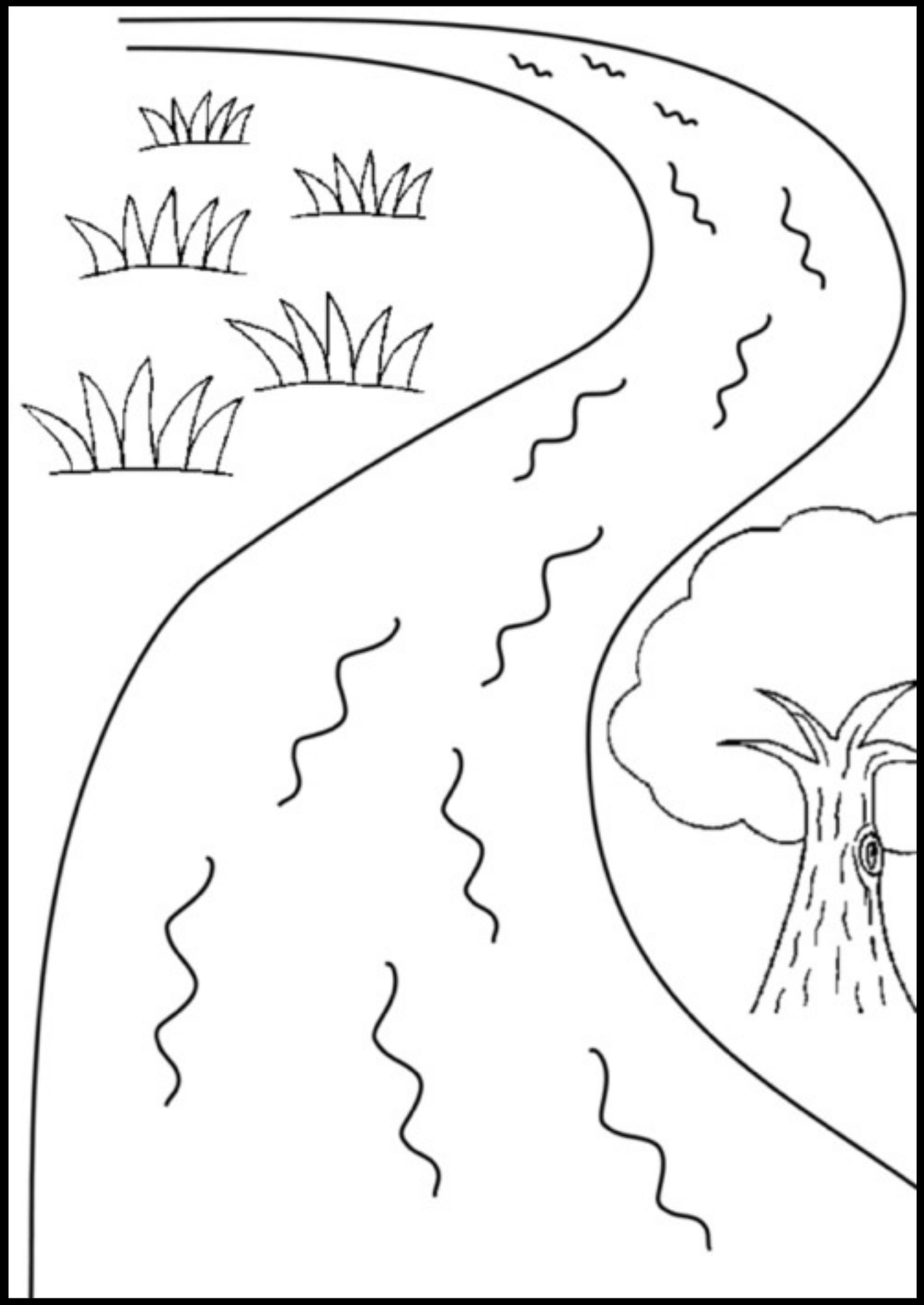


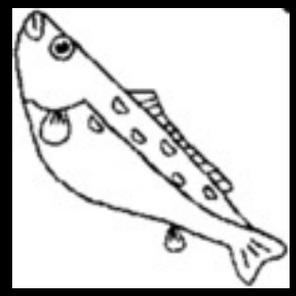
Vertical Sorting

Vertical Sorting

Weather, Erosion & Deposition

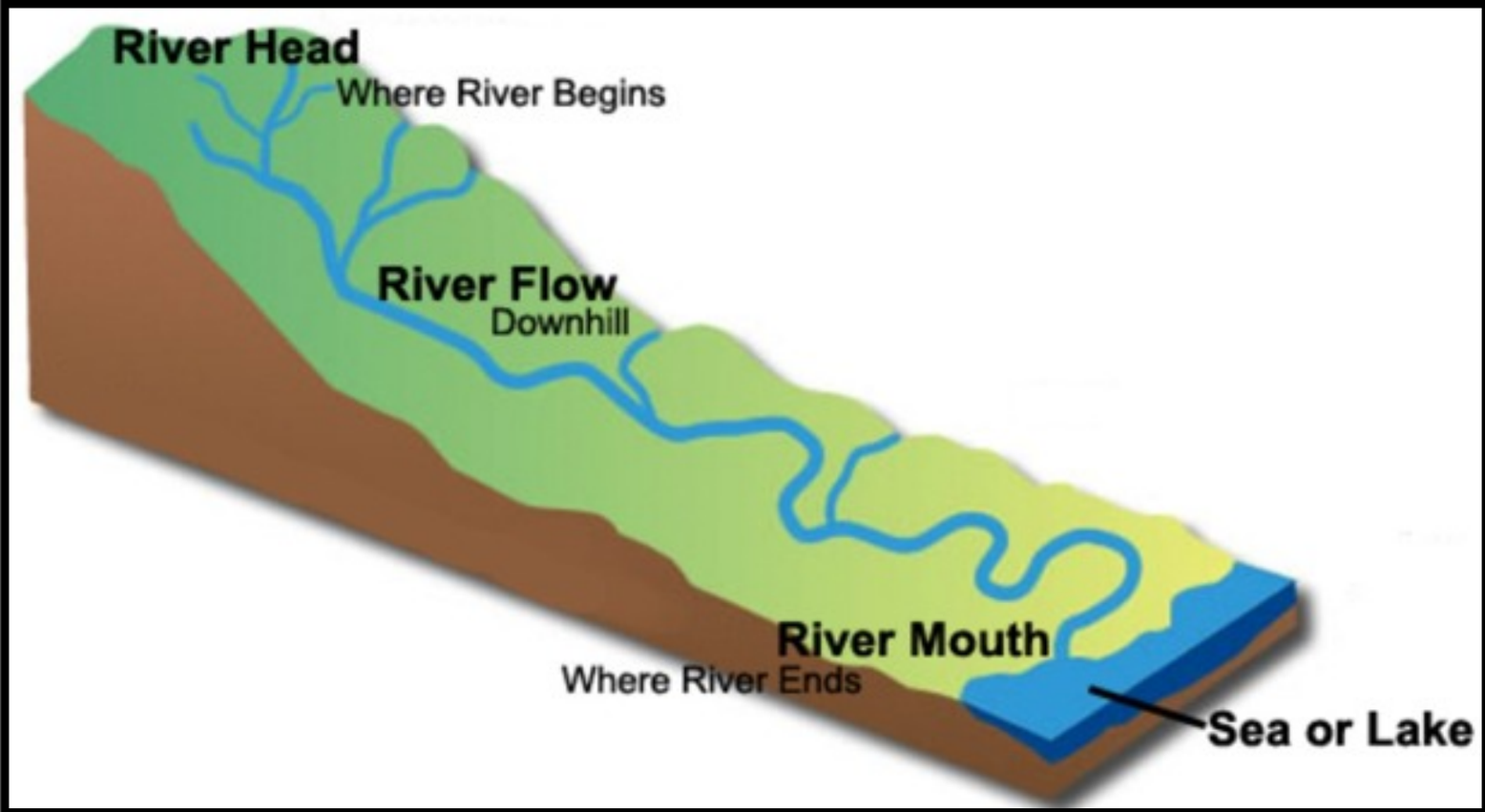
Deposition





Lab - River Features

4/17



Objective - To identify features along a river.

Due at the end of

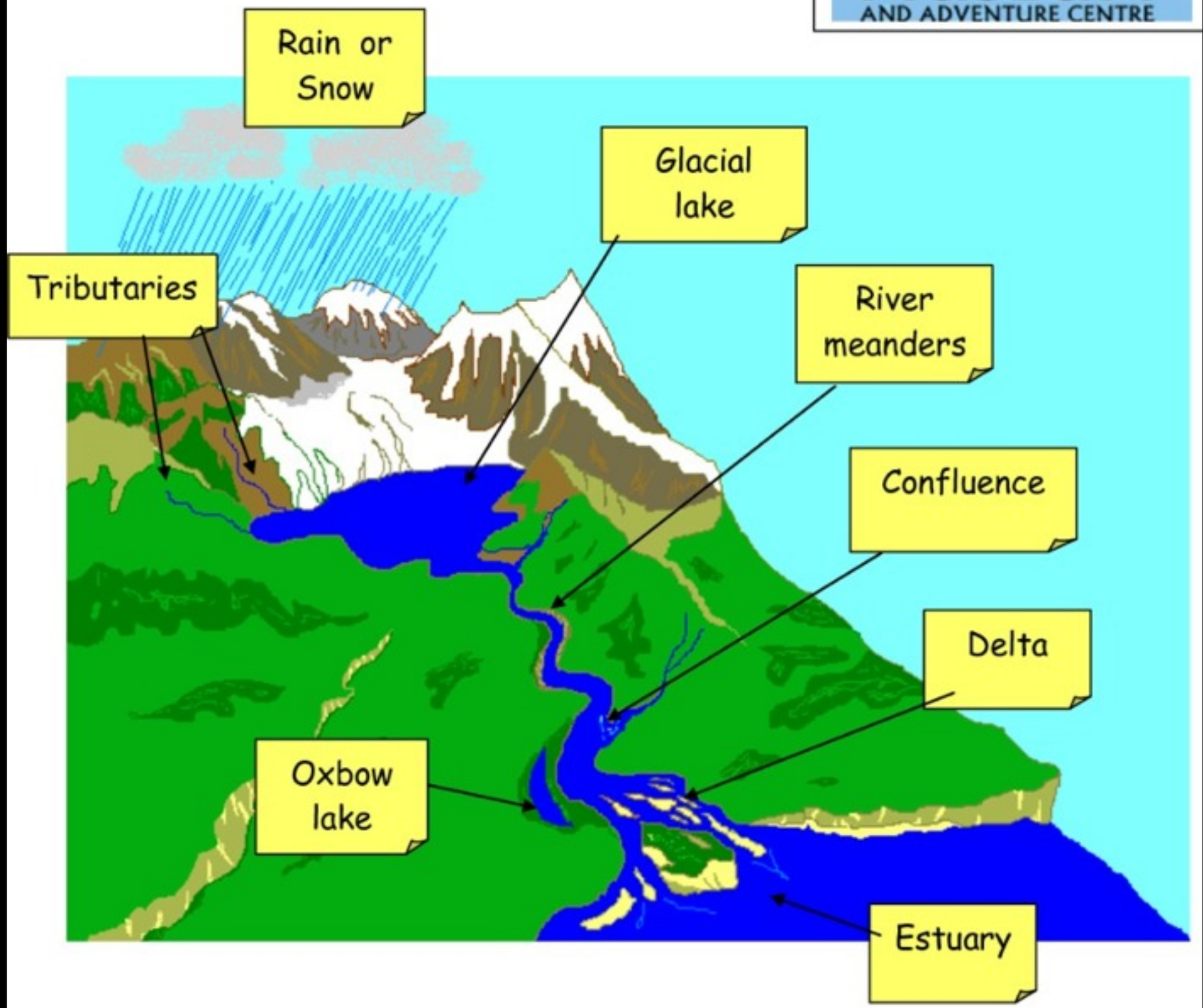
Announcements -

Quiz Friday - Surface Processes - Weathering, erosion &

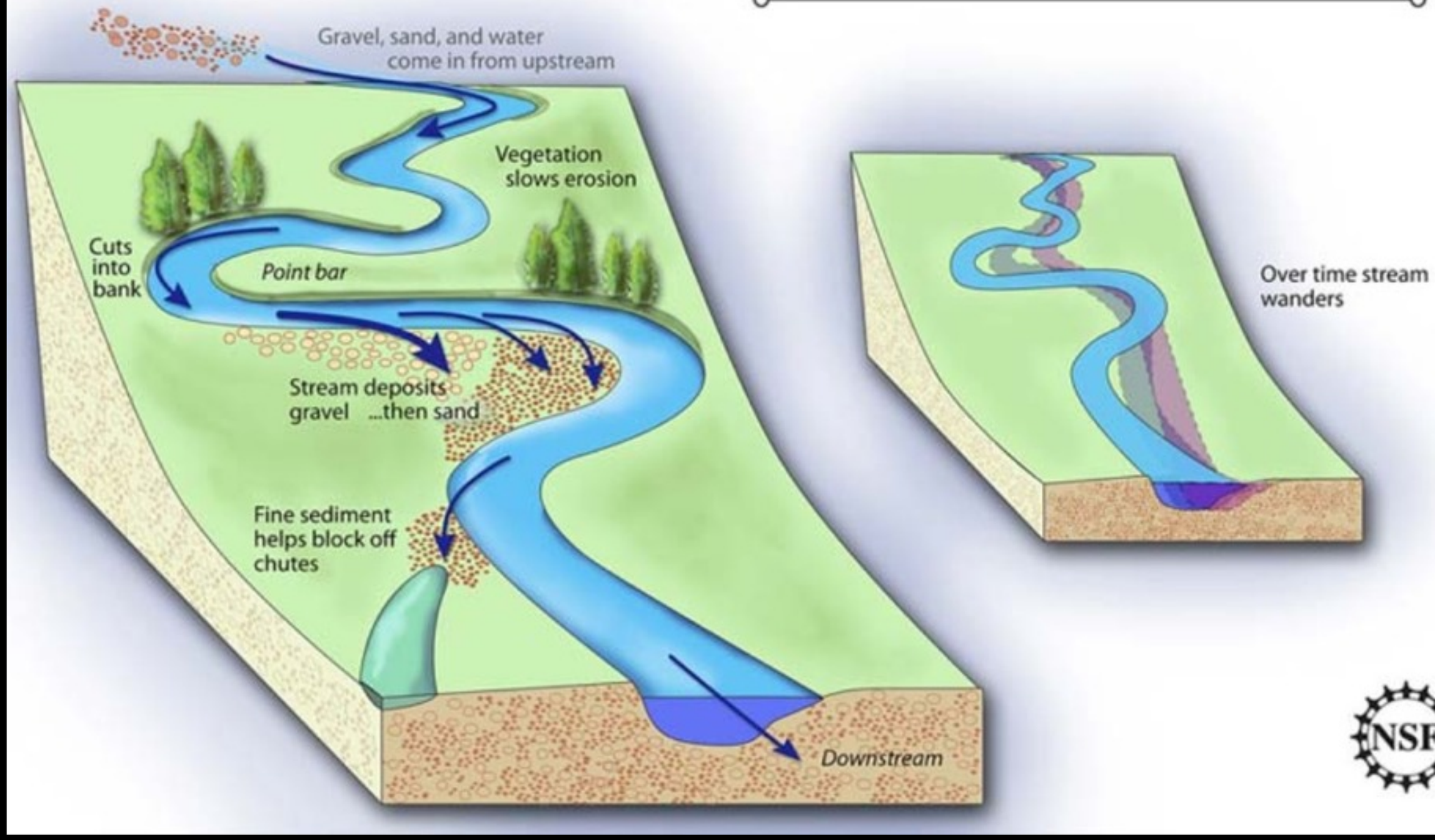
NO CELL PHONES - 1 point penalty every

The Parts of a River

THE Waterways MUSEUM AND ADVENTURE CENTRE

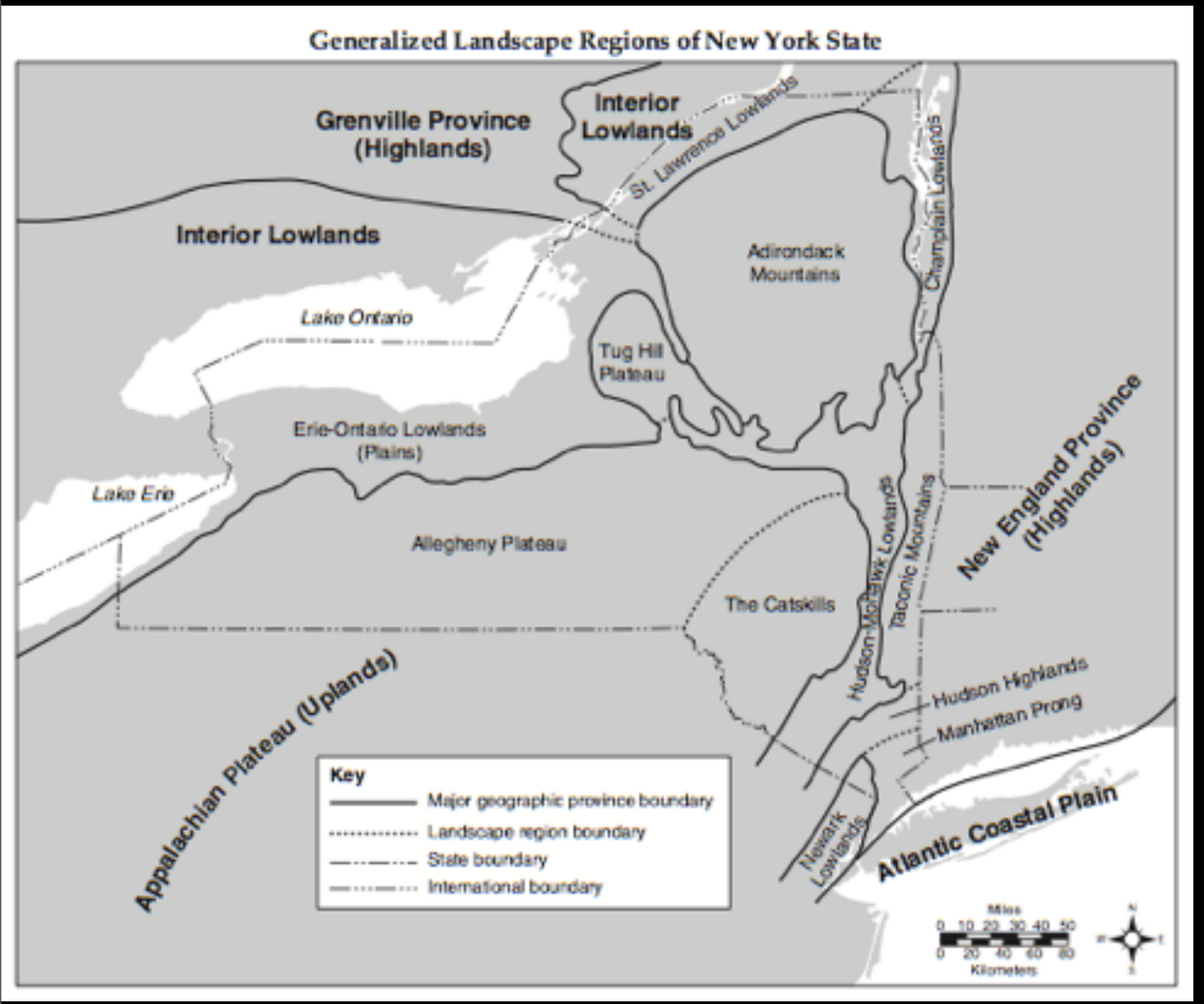


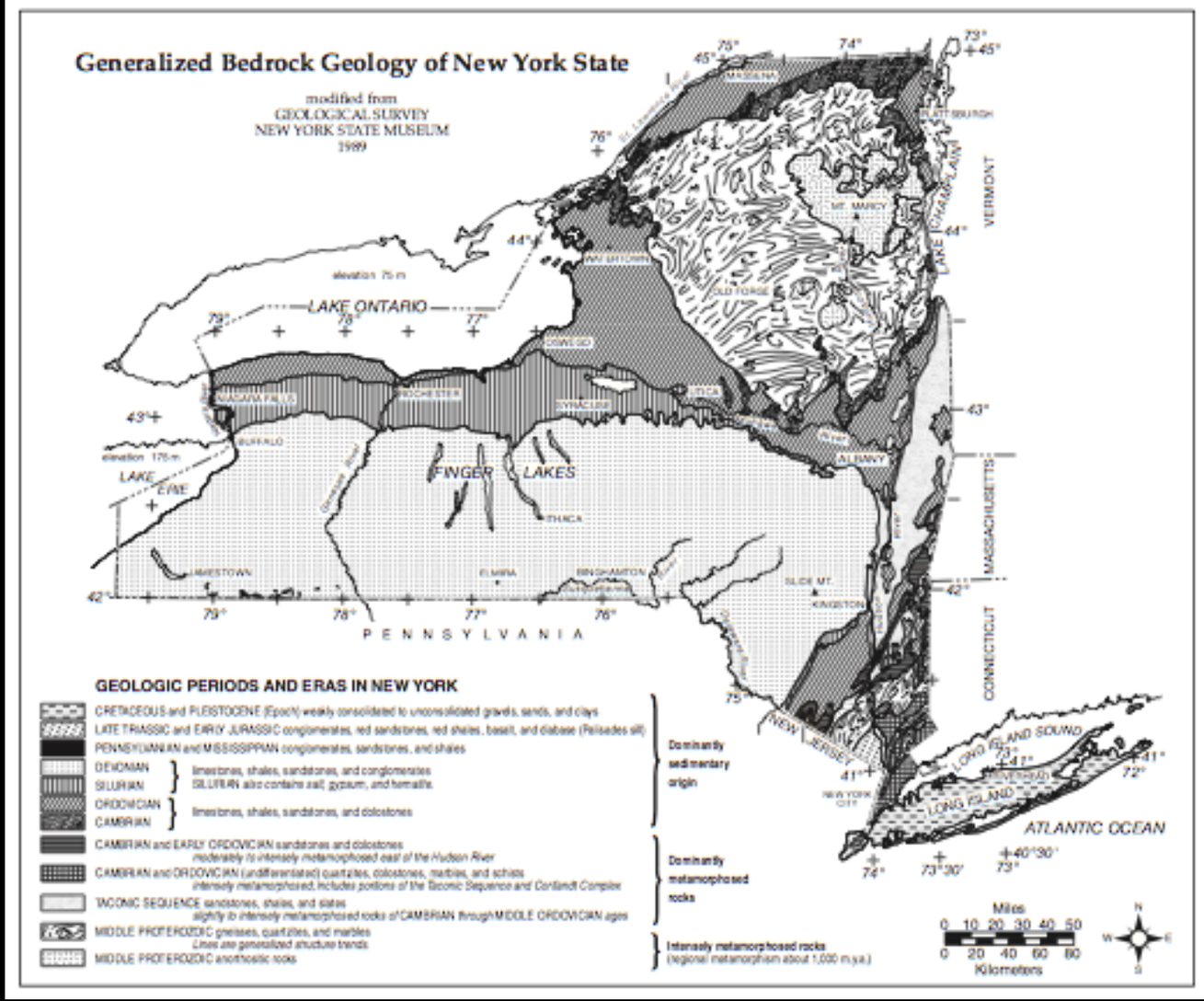
INGREDIENTS FOR A MEANDERING RIVER



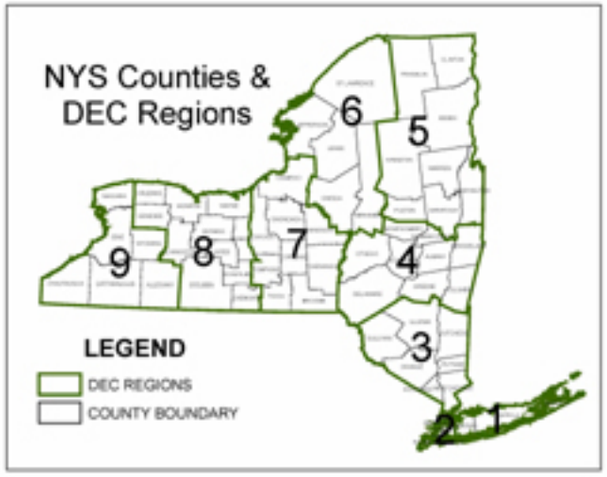
NSF

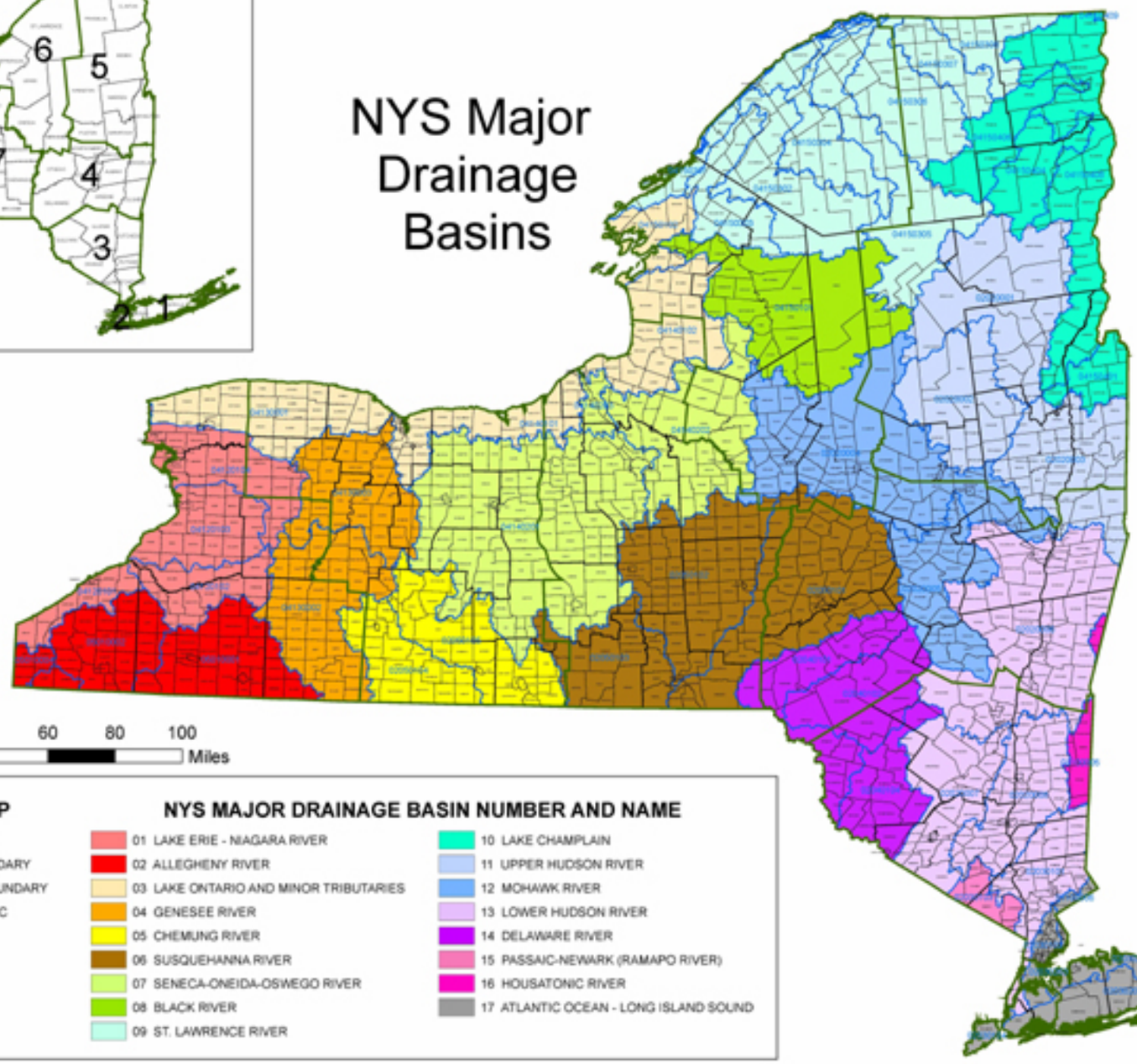
ESRT Pages 2 & 3





NYS Major Drainage Basins





0 10 20 40 60 80 100 Miles

BASE MAP

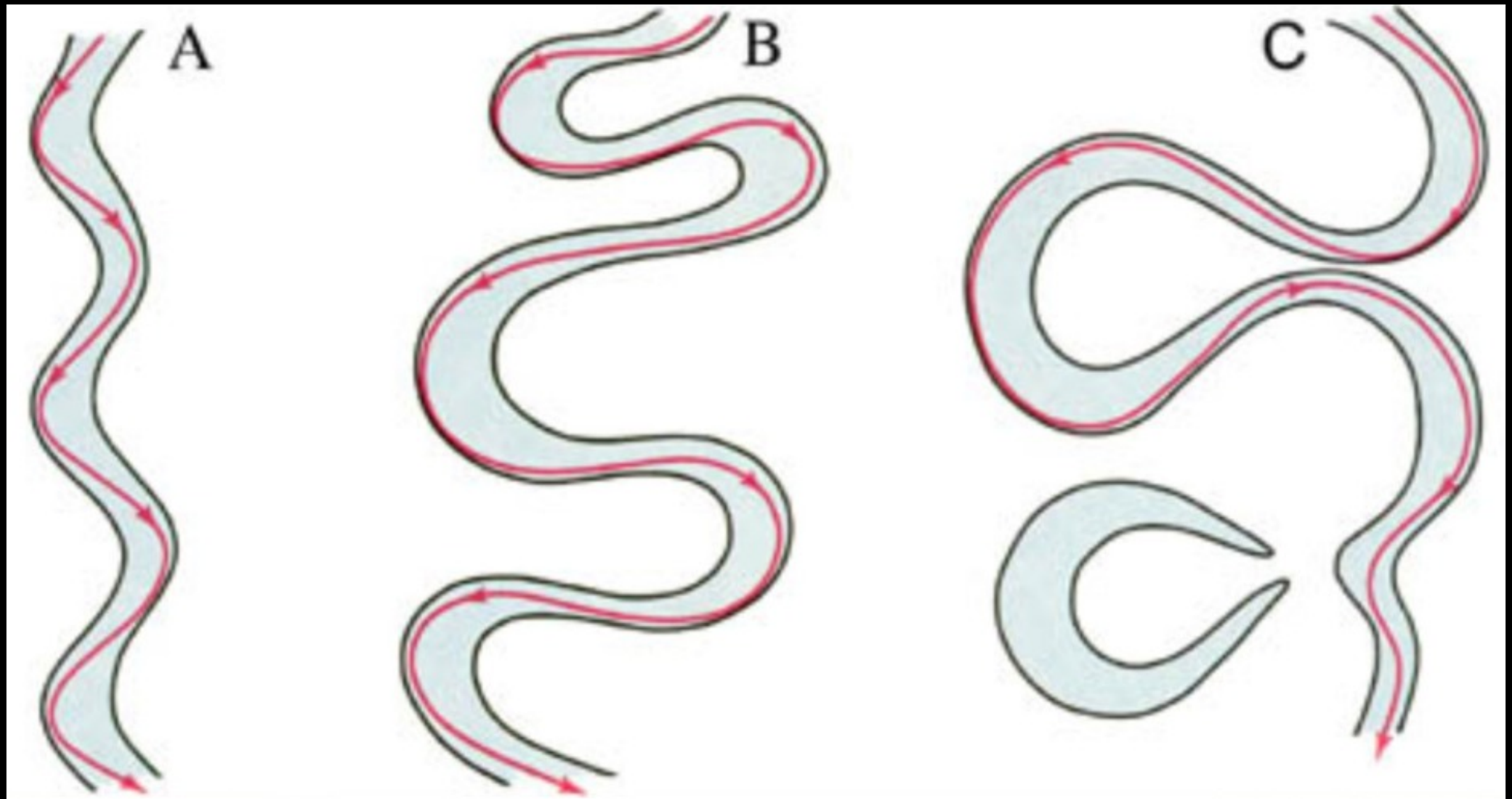
- DEC REGIONS
- COUNTY BOUNDARY
- TOWN/CITY BOUNDARY
- NYS 8 DIGIT HUC

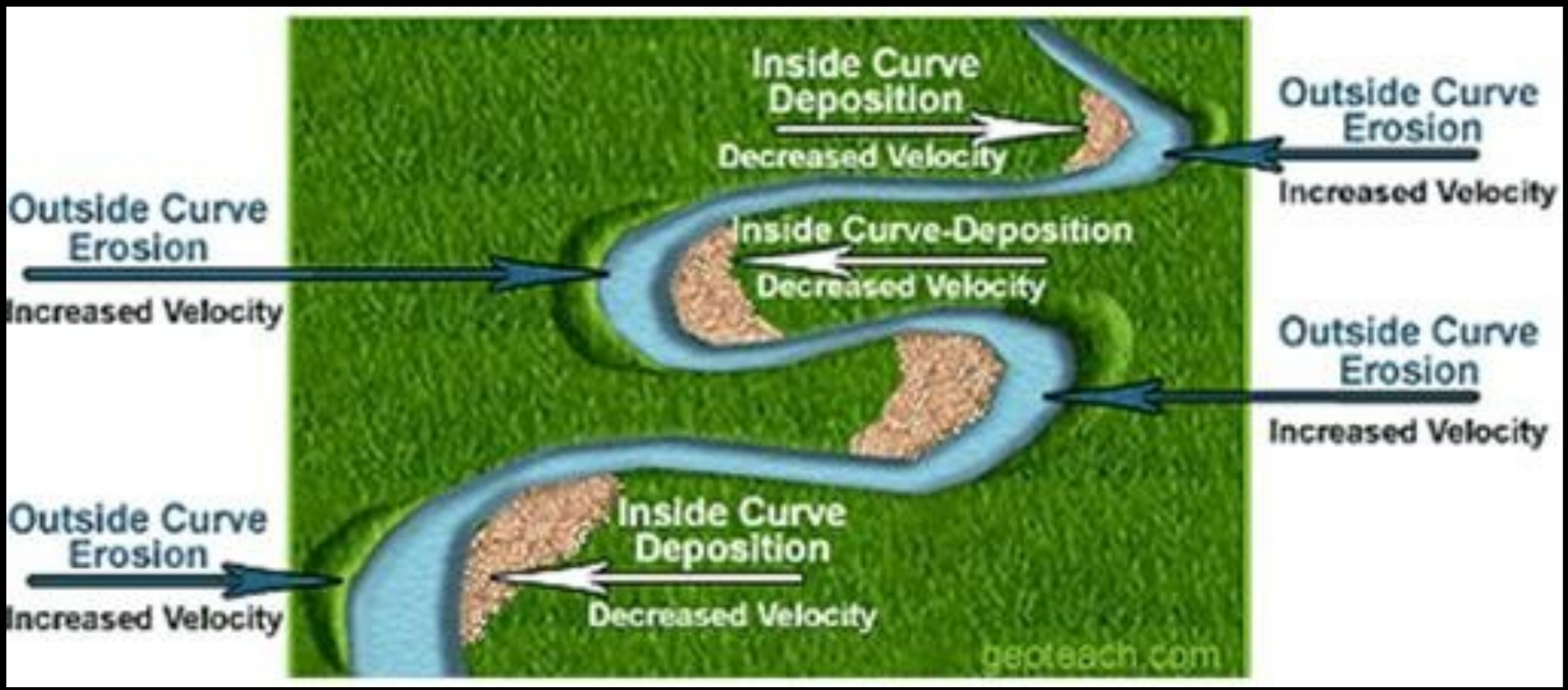
NYS MAJOR DRAINAGE BASIN NUMBER AND NAME

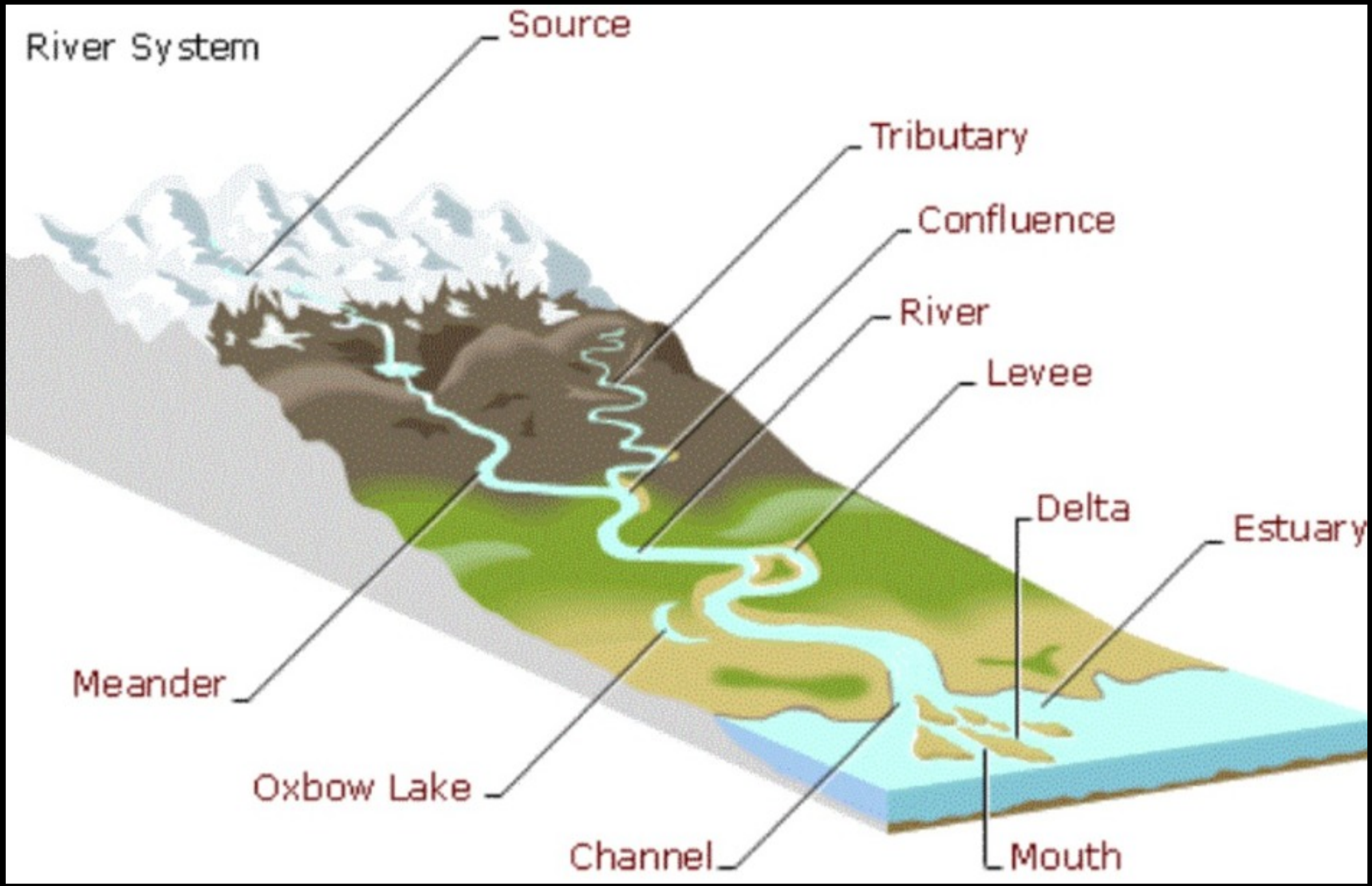
- 01 LAKE ERIE - NIAGARA RIVER
- 02 ALLEGHENY RIVER
- 03 LAKE ONTARIO AND MINOR TRIBUTARIES
- 04 GENESEE RIVER
- 05 CHEMUNG RIVER
- 06 SUSQUEHANNA RIVER
- 07 SENECA-ONEIDA-OSWEGO RIVER
- 08 BLACK RIVER
- 09 ST. LAWRENCE RIVER
- 10 LAKE CHAMPLAIN
- 11 UPPER HUDSON RIVER
- 12 MOHAWK RIVER
- 13 LOWER HUDSON RIVER
- 14 DELAWARE RIVER
- 15 PASSAIC-NEWARK (RAMAPO RIVER)
- 16 HOUSATONIC RIVER
- 17 ATLANTIC OCEAN - LONG ISLAND SOUND

HUC 8	HYDROLOGIC UNIT NAME
04120101	Chautauqua-Conneaut
04120102	Cattaraugus
04120103	Buffalo-Eighteenmile
04120104	Niagara
05010001	Upper Allegheny
05010002	Conewango
05010004	French
04130001	Oak Orchard-Twelvemile
04140101	Irondequoit-Ninemile
04140102	Salmon-Sandy
04150102	Chaumont-Perch
04130002	Upper Genesee
04130003	Lower Genesee
02050104	Tioga
02050105	Chemung
02050101	Upper Susquehanna
02050102	Chenango
02050103	Owego-Wappasening
04140201	Seneca
04140202	Oneida
04140203	Oswego
04150101	Black
04150301	Upper St. Lawrence
04150302	Oswegatchie
04150303	Indian
04150304	Grass
04150305	Raquette
04150306	St. Regis
04150307	Salmon
04150308	Chateaugay-English
04150401	Mettawee River
04150404	Ausable River
04150406	Saranac River
04150408	Lake Champlain
04150409	Richelieu River
02020001	Upper Hudson
02020002	Sacandaga
02020003	Hudson-Hoosic
02020004	Mohawk
02020005	Schoharie
02020006	Middle Hudson
02020007	Rondout
02020008	Hudson-Wappinger
02030101	Lower Hudson
02040101	Upper Delaware
02040102	East Branch Delaware
02040104	Middle Delaware-Mongaup-Brodhead
02030103	Hackensack-Passaic
01100005	Housatonic
01100006	Saugatuck
02030102	Bronx
02030104	Sandy Hook-Staten Island
02030201	Northern Long Island
02030202	Southern Long Island
02030203	Long Island Sound

October 2012


A
B
C


Inside Curve
Deposition
Decreased Velocity
Outside Curve
Erosion
Increased Velocity
Outside Curve
Erosion
Increased Velocity
Inside Curve-Deposition
Decreased Velocity
Outside Curve
Erosion
Increased Velocity
Outside Curve
Erosion
Increased Velocity
Inside Curve
Deposition
Decreased Velocity
geoteach.com


River System
Source
Tributary
Confluence
River
Levee
Delta
Estuary
Meander
Oxbow Lake
Channel
Mouth

RUNNING WATER

Running Water

How does running water help shape our Earth?

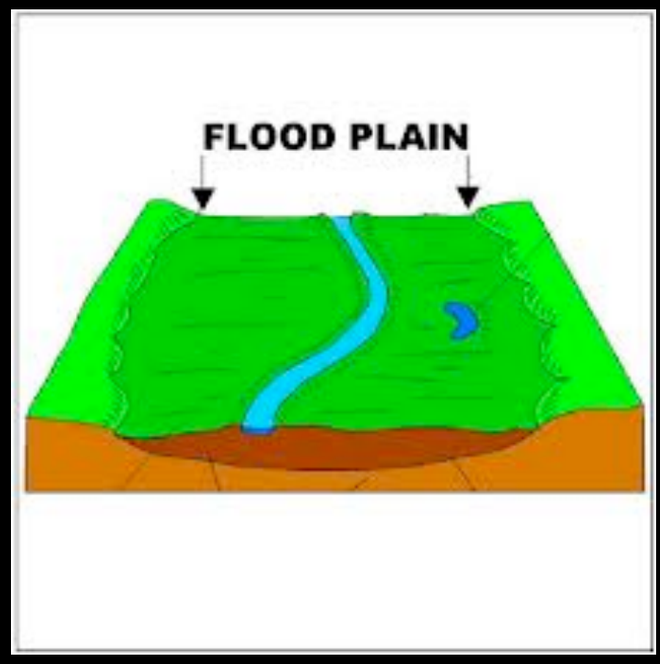
RUNNING WATER

- Running water is the most common agent of erosion
- **Stream** - running water that is confined to a channel (creeks & brook)
- **Tributary** - smaller streams that flow into a larger one

RUNNING WATER

Flood Plain - Nearly level plain that borders the river

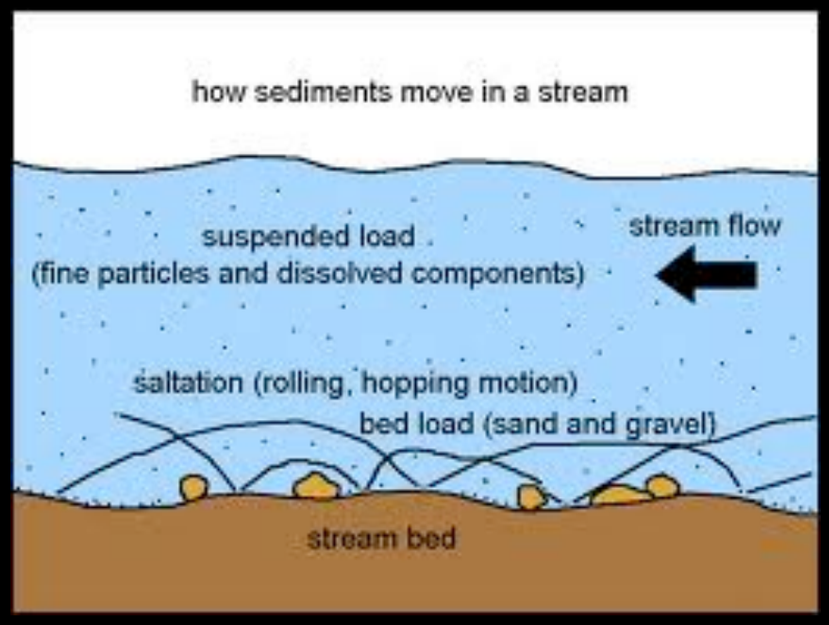
Levee - Mound of sediment that parallels the course of the river that prevents flooding



RUNNING WATER

Streams carry sediment in various ways:

- Dissolved minerals in solution
- Solid particles are suspended in water
- Larger particles are usually carried by rolling, bouncing, or sliding along the stream bottom



RUNNING WATER

Stream Velocity - the speed of the stream

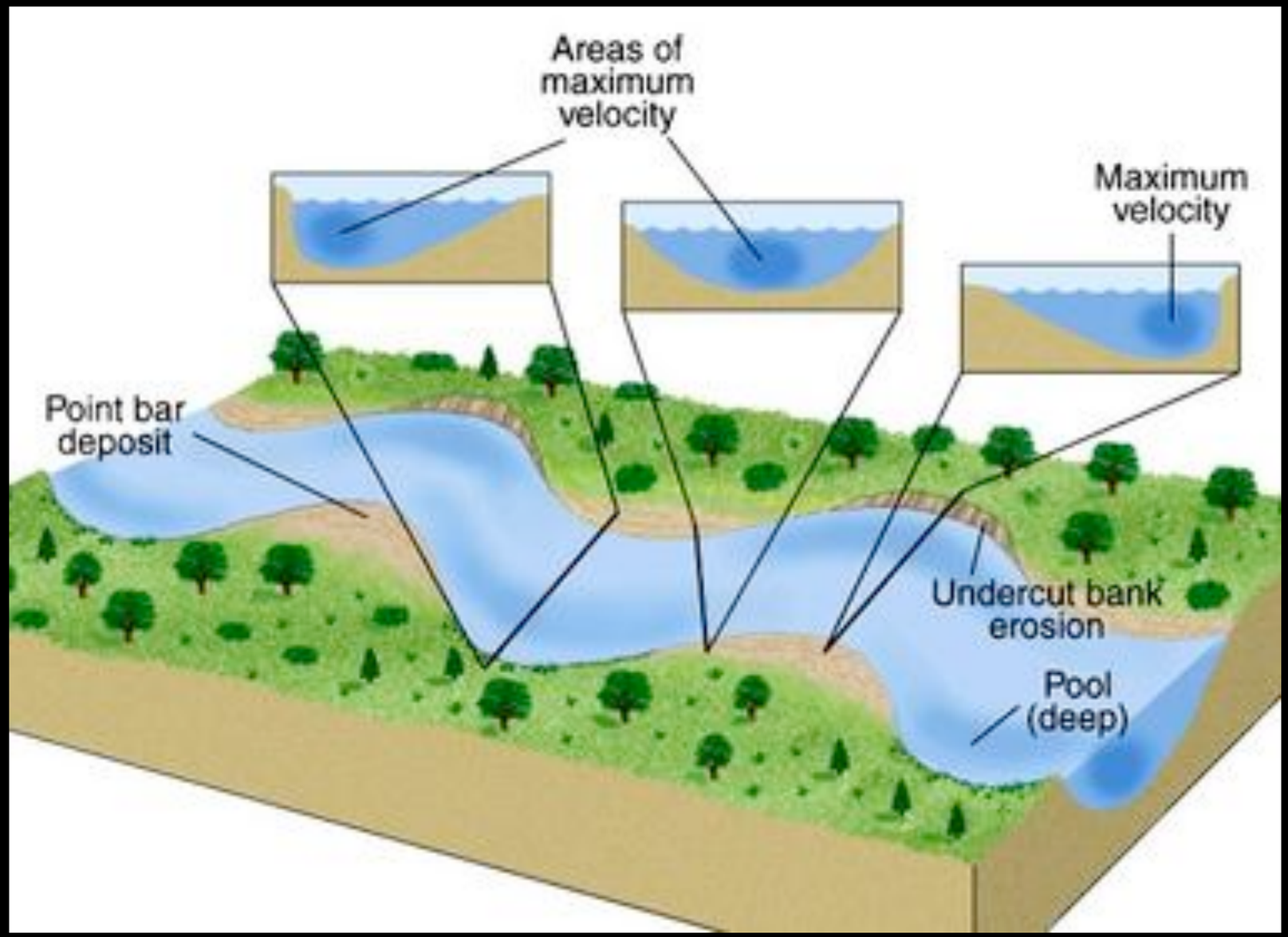
- **Gradient** - slope of the stream
- **Discharge** - amount of water that flows past a given point at a given time
- **Channel Shape** - shape of the bed where the running water is confined

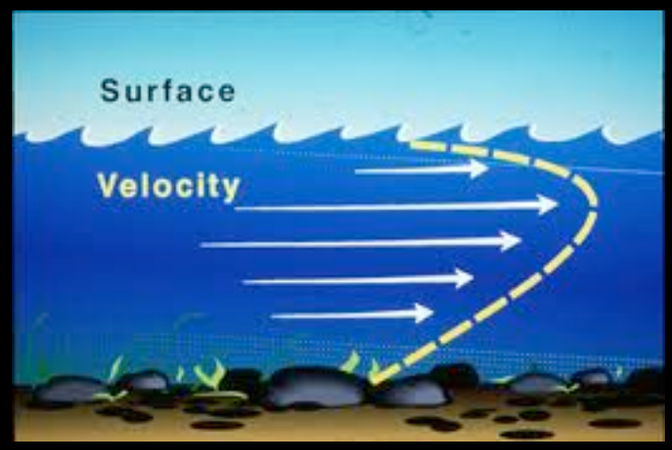
RUNNING WATER

Variations in Stream Velocity:

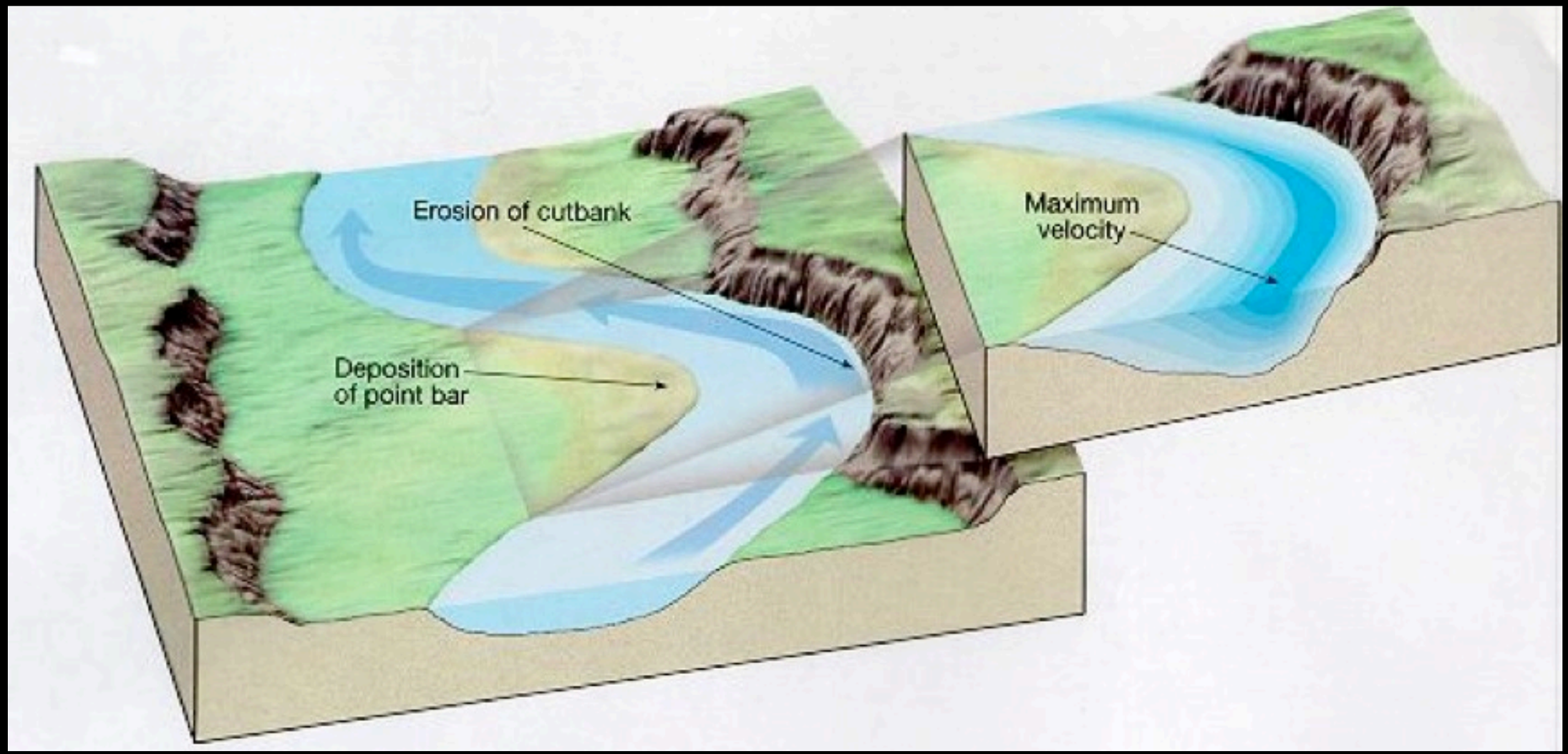
- When a stream channel is straight the greatest velocity is in the middle
- When a stream channel curves the greatest velocity is on the outside of the curve

RUNNING WATER



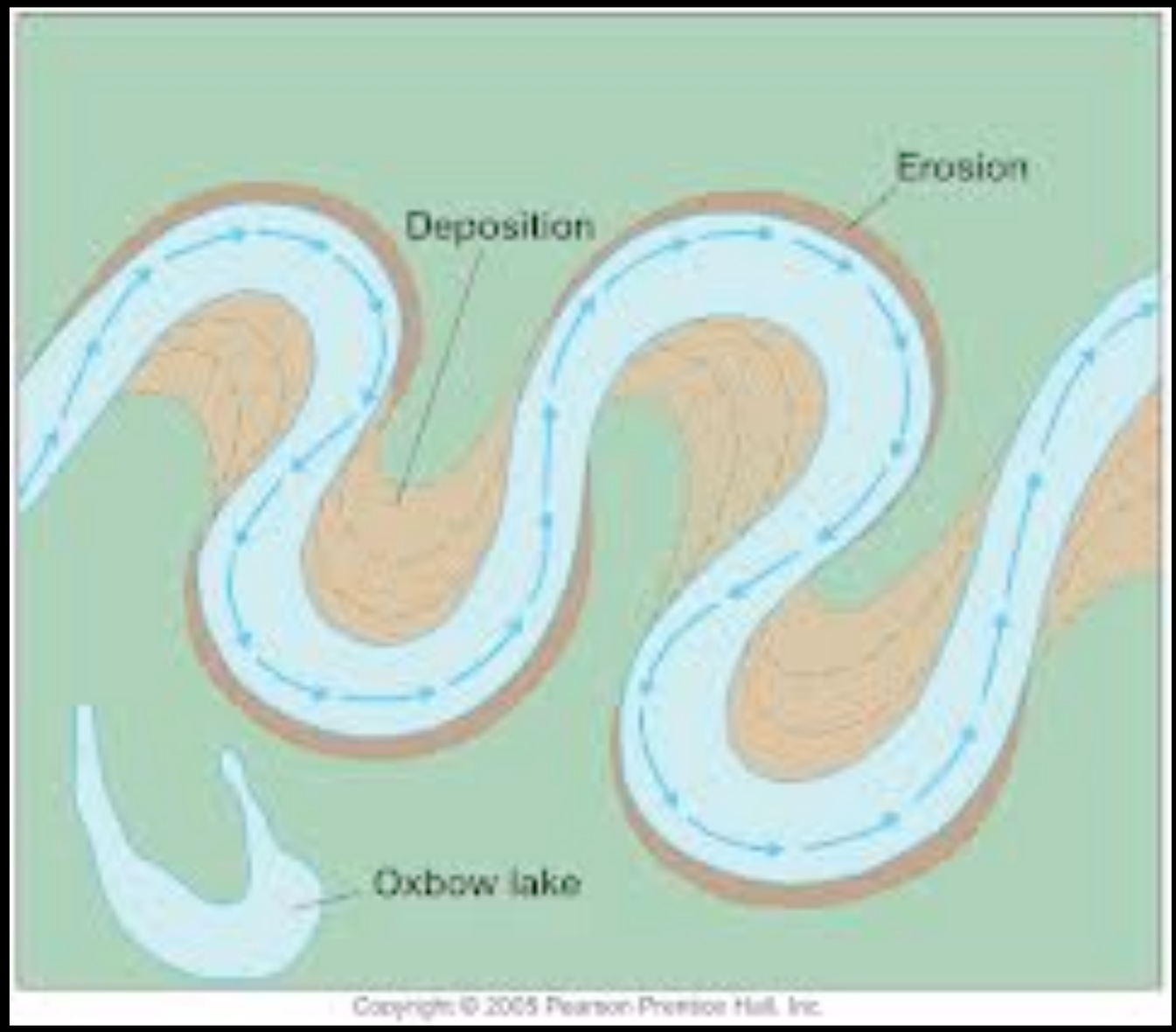


RUNNING WATER



RUNNING WATER

Variations in Stream Velocity:



RUNNING WATER

RUNNING WATER

Stream Characteristics:

<u>V-Shaped Valley</u> - downcutting of a stream

<u>Meanders</u> - as a stream gets older, it begins to shift its course in a series of bends.

RUNNING WATER

V-Shaped Valley

Meanders

Do Now (2 minutes)

4/18

Answer in your Guided Notes

K What I know about Glaciers	W What I want to find out about Glaciers
1. 2. 3.	1. 2. 3.

GLACIERS

GLACIERS

How do glaciers help shape our Earth?

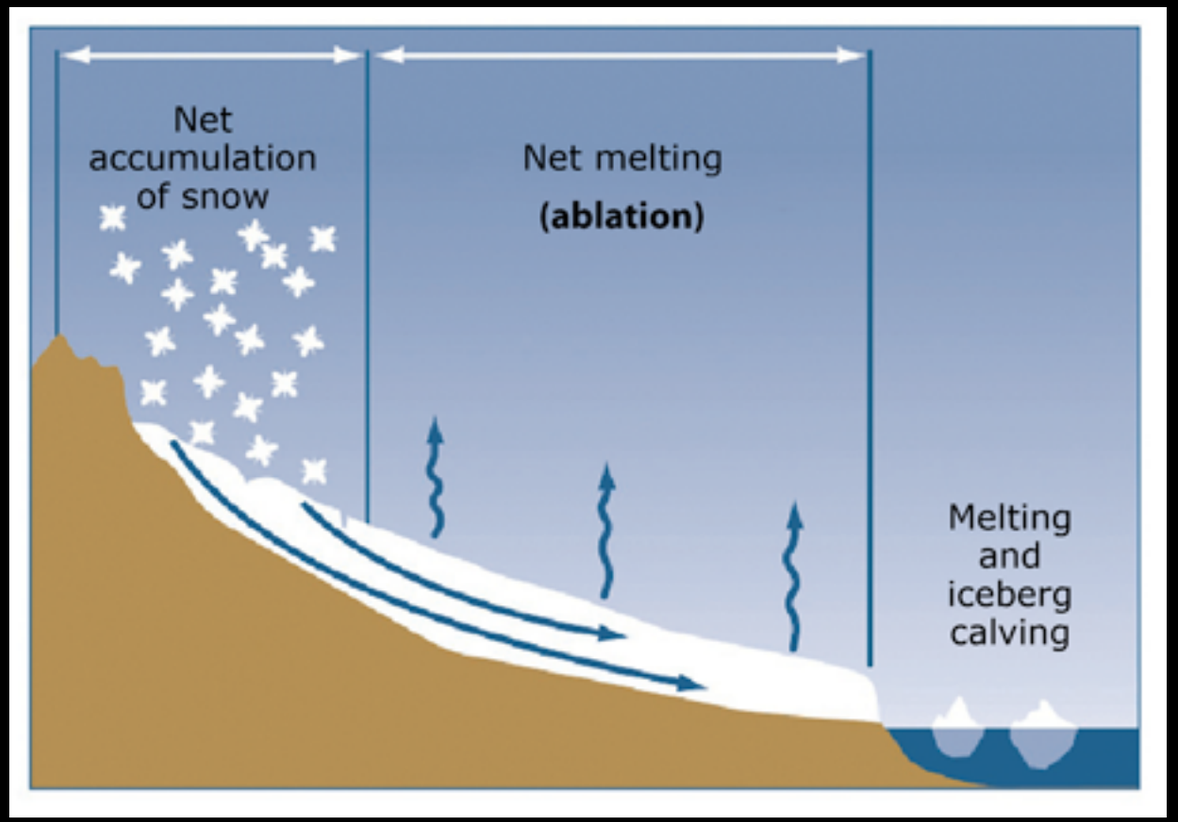
GLACIERS

GLACIERS

Glacier -

Naturally formed mass of ice and snow that moves downhill under the force of gravity

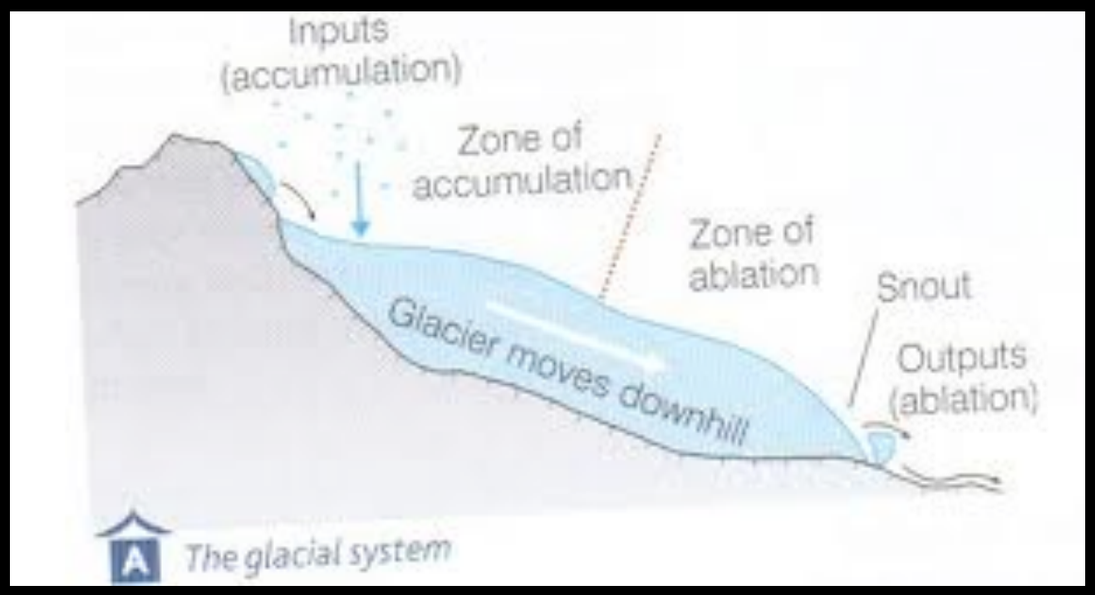
GLACIERS



Glacier Movement -

- As snow and ice **accumulate** the glacier moves **forward** under its own mass and the pull of gravity
- Sometimes called a "**river of ice**" glaciers act like fluids and flow in a **plastic like** motion

GLACIERS


Inputs
(accumulation)
Zone of
accumulation
Zone of
ablation
Snout
Outputs
(ablation)
Glacier moves downhill
A
The glacial system

Types of Glaciers

<u>Continental Glaciers -</u>

Huge sheets of ice that cover entire land masses

Greenland

Antarctica

<u>Valley Glaciers -</u>

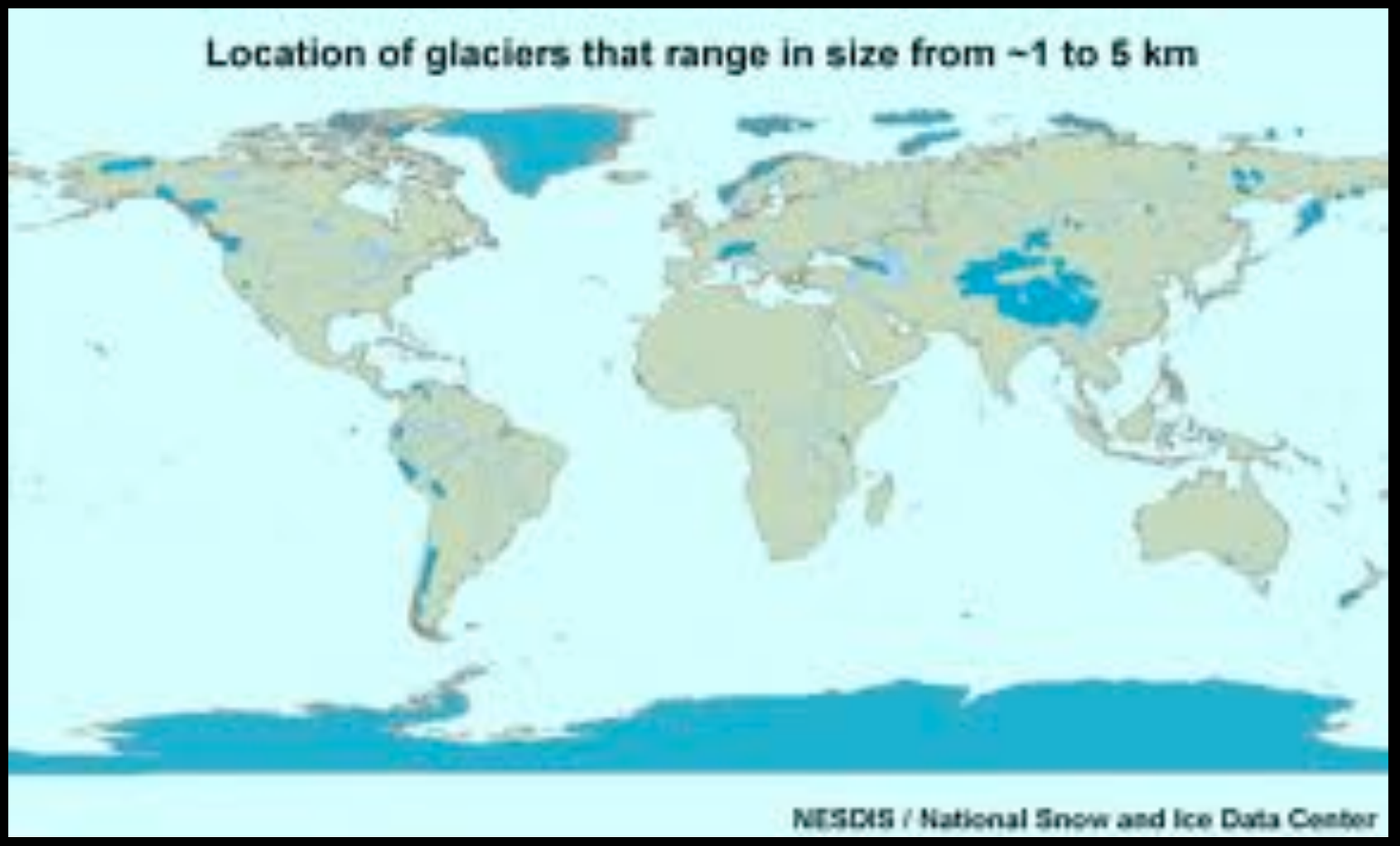
Glaciers that form in high elevations in mountain valleys

Types of Glaciers

Continental Glaciers

Valley Glaciers

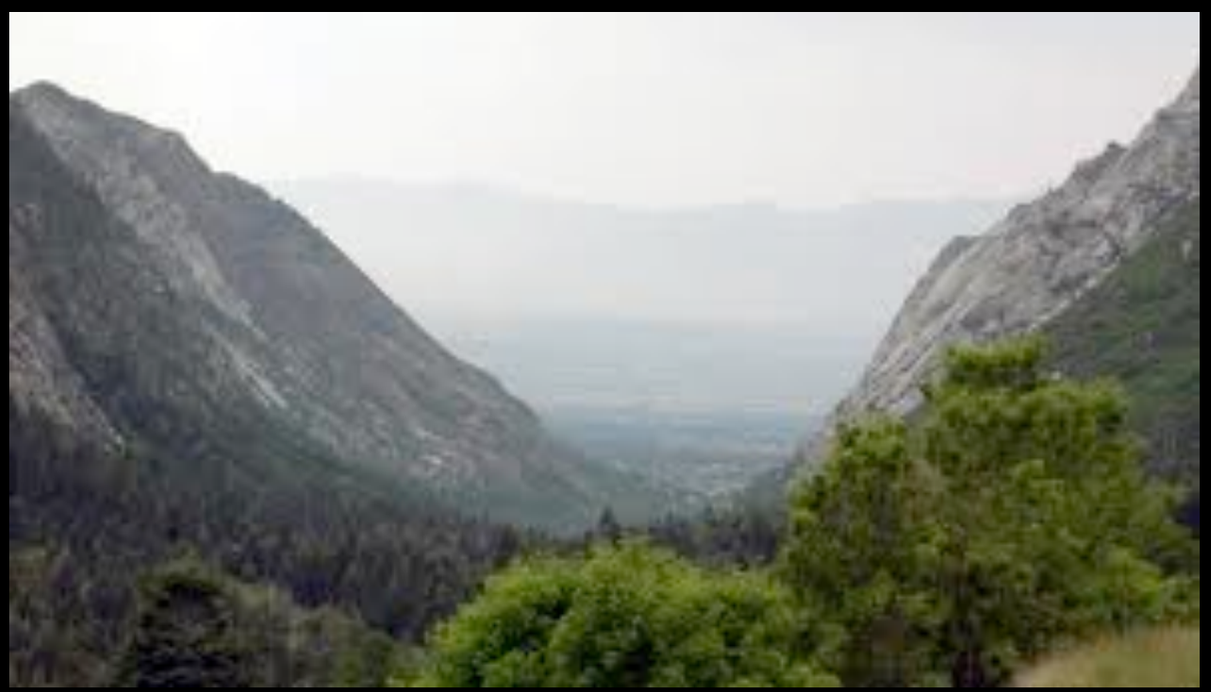
Types of Glaciers



Glacial Features:

U-Shaped Valleys

Shape of the valley walls from glacial erosion



Glacial Features:

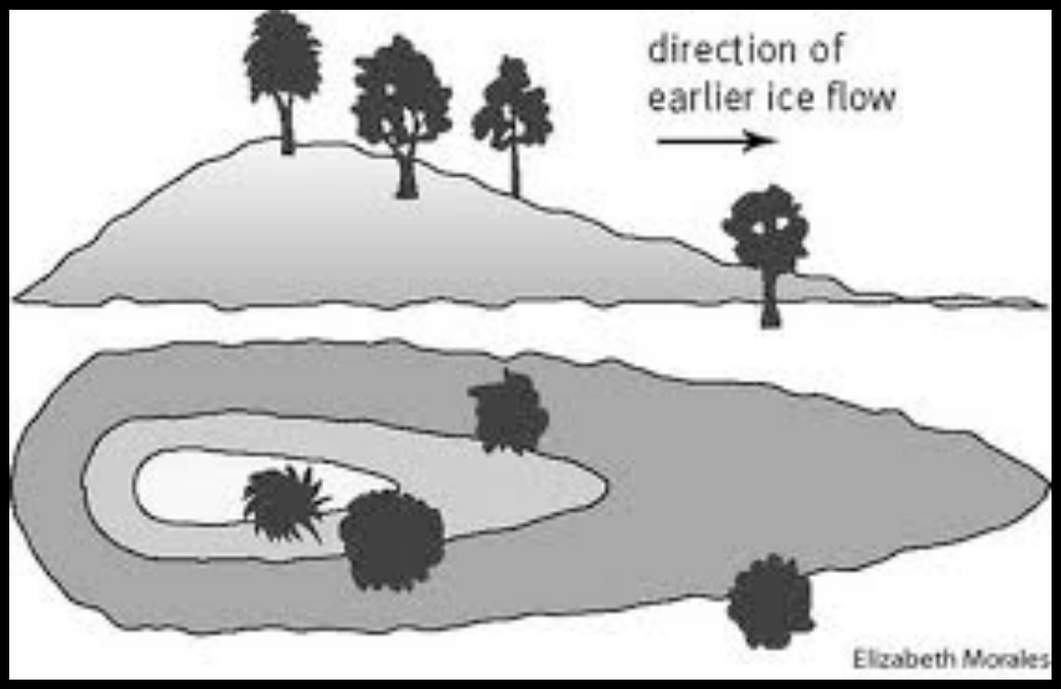
Erractics

Large deposited fragments that can be transported hundreds of miles inside or on top of the glacier

Glacial Features:

Drumlins

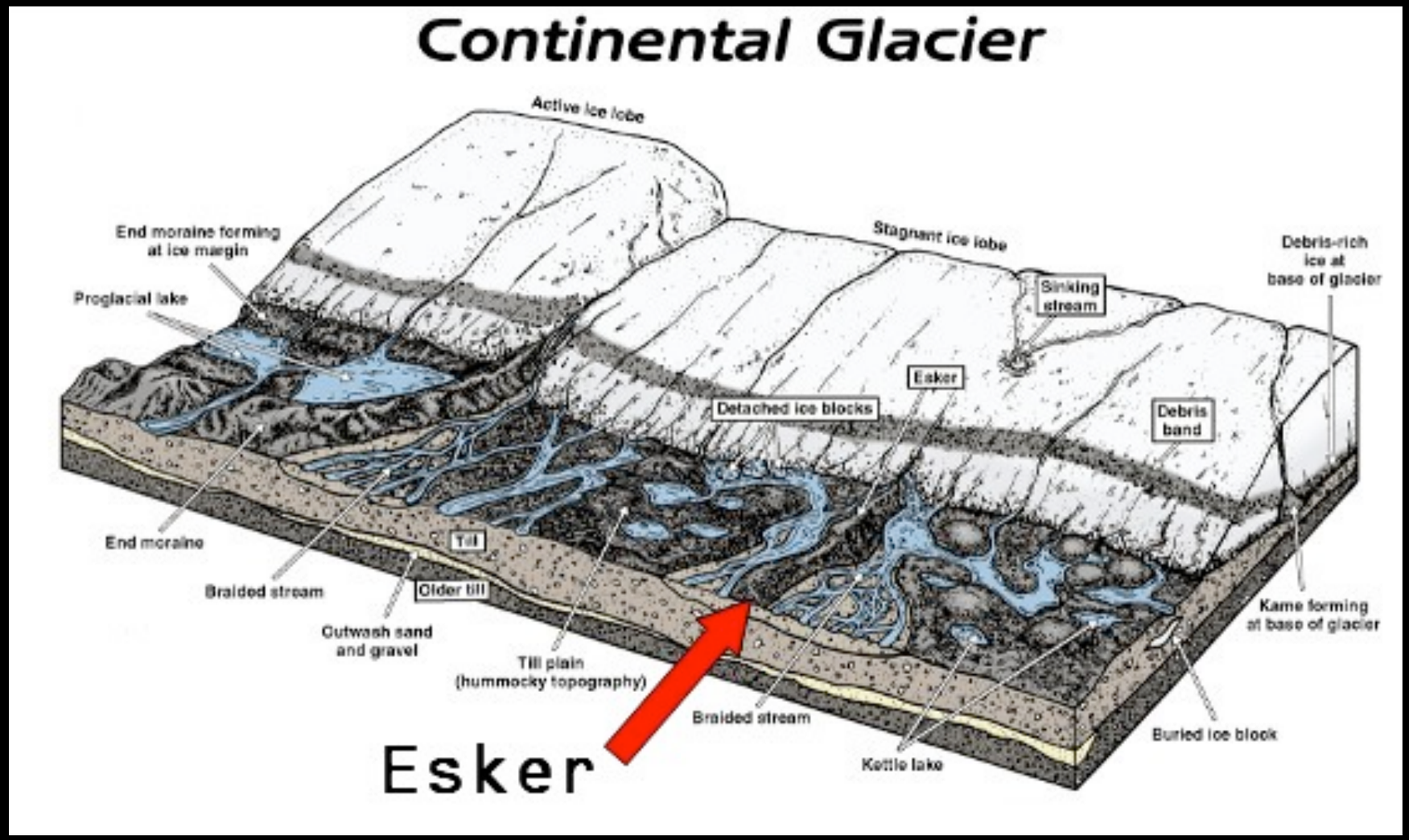
streamlined oval shaped mounds of unsorted sediment



Glacial Features:

Eskers

A long winding ridge of sands and gravels



Glacial Features:

Terminal Moraines

a mound of till deposited along the leading edge of a glacier

Glacial Features:

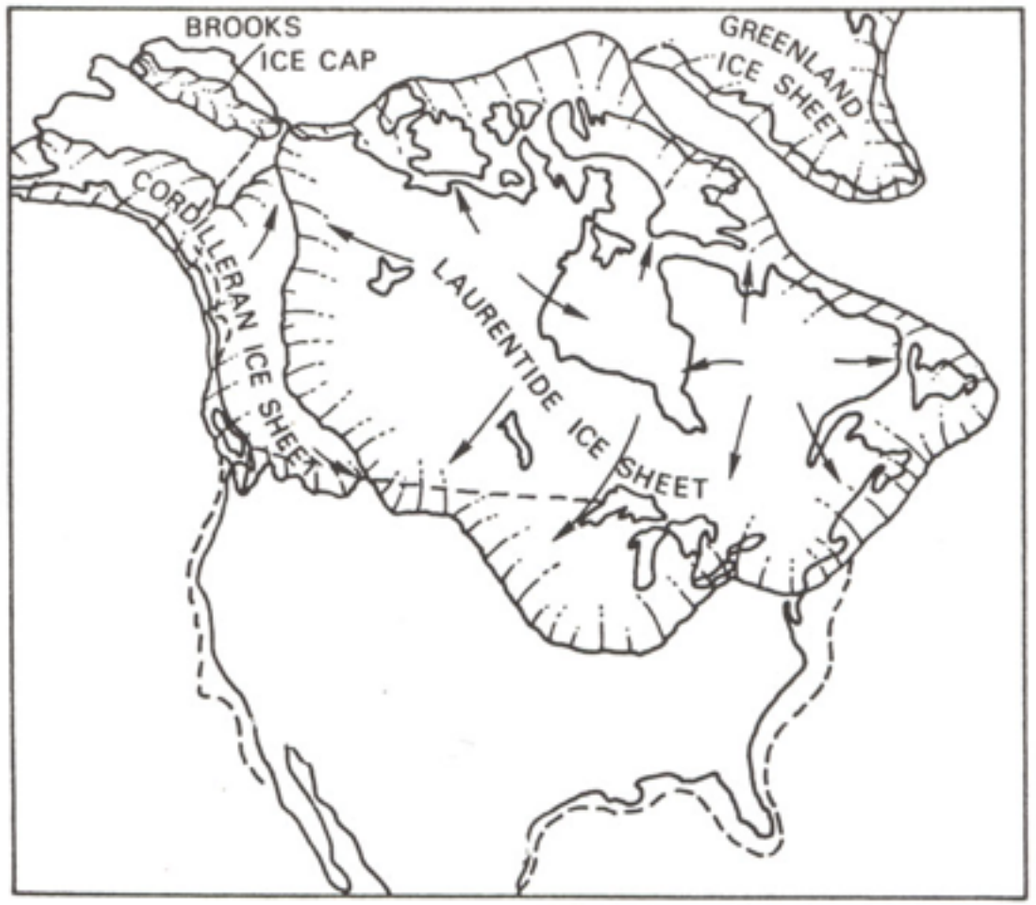
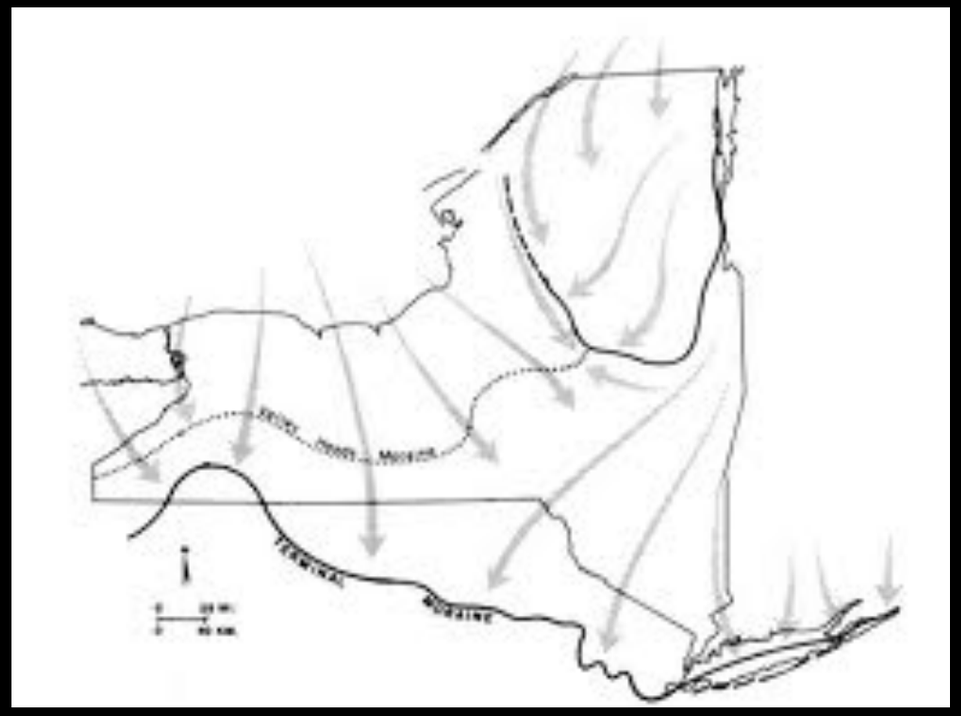


Figure 46 - Approximate maximum extent of major ice sheets in North America during the Great Ice Age. Ice caps and glaciers in the mountains of the Western United States are not shown. Dashed line is approximate coastline during full-glacial development (From Matsch, 1976).

Terminal Moraines

Glacial Features:



Glacial Features:

Glacial Grooves

long parallel scratches formed by sediment embedded in a glacier that has passed over the surface

The grooves indicate the direction the glacier has traveled

Glacial Features:

Kettle Lake

depression left in the ground that is filled with glacial melt water

Glacial Features:

Outwash Plain:

broad glacial feature of smaller sediment carried from the melting water of a retreating glacier

Lab: Glaciers April 19

Objective:

To gain an understanding of glaciers, glacial movement and their **depositional** features.

Midterm Tuesday -

Regents style, will cover everything that we have learned!

Lyrid Meteor Shower (this weekend)

Best time to watch the shower will start as soon as the sky is dark in your Northern Hemisphere location on the 21st through the morning of the 22nd and again on the evening of the 22nd through the morning of the 23rd.

The meteors will generally be all over the sky but mostly concentrated and moving outward from the radiant.

MASS MOVEMENTS, WIND & WAVES

MASS MOVEMENT, WIND & WAVES

How does mass movement, wind and waves help shape our Earth?

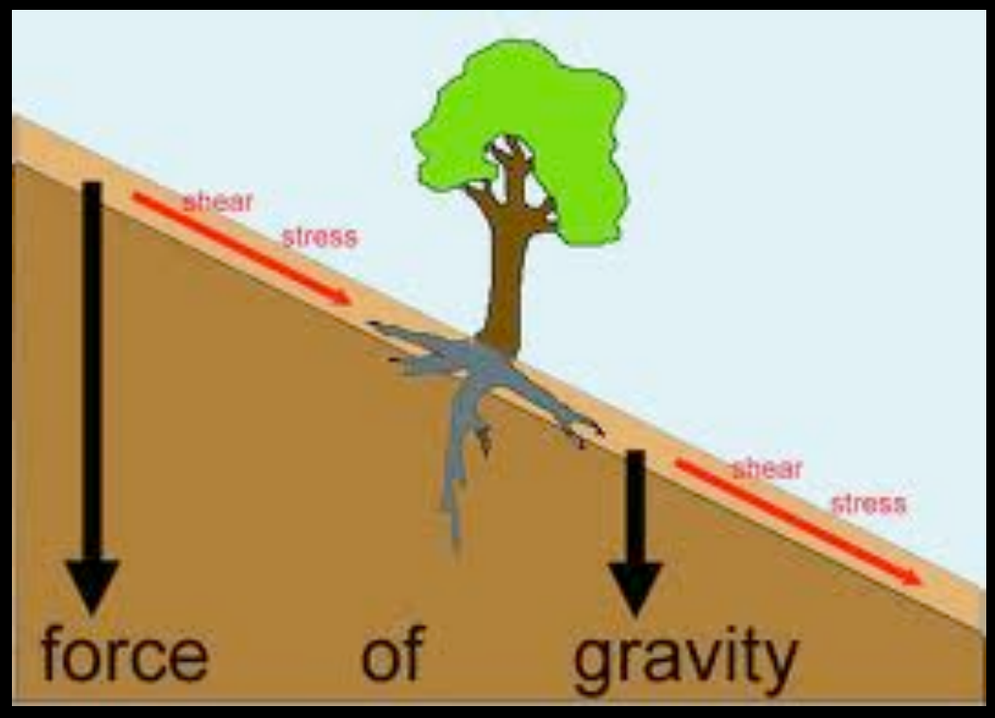
MASS MOVEMENTS, WIND & WAVES

MASS MOVEMENT, WIND & WAVES

MASS MOVEMENTS, WIND & WAVES

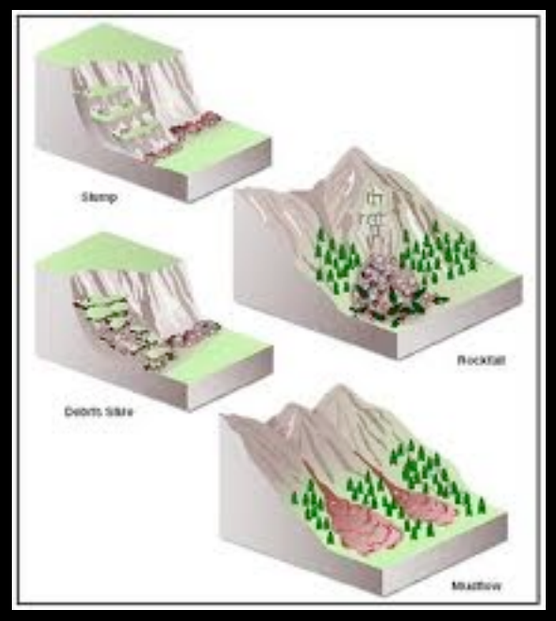
Mass Movement -

the pulling of rock and sediment downhill by the force of gravity



Examples:

Avalanches
Landslides
Mudslides



Characteristics:

unsorted Sediment

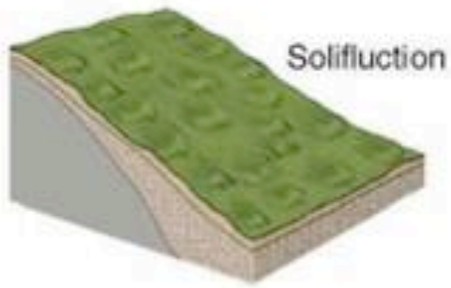
Drier — Water content — Wetter

Slower — Rate of mass movement — Faster

Mass Movement Classes

Soil creep

Figure 10-19



Solifluction

Translational slide

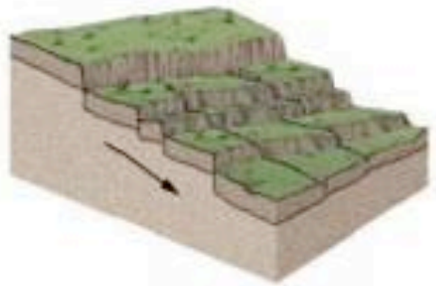
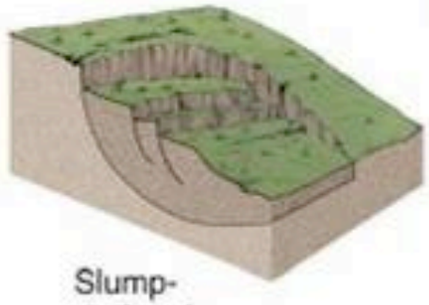
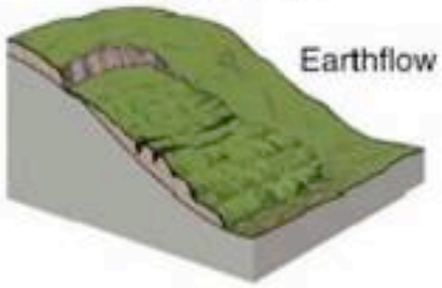


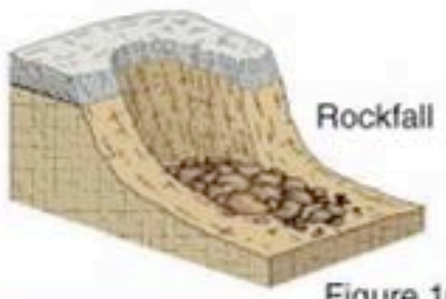
Figure 10-18



Slump-rotational slide

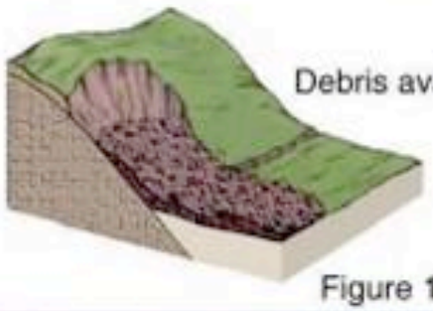


Earthflow



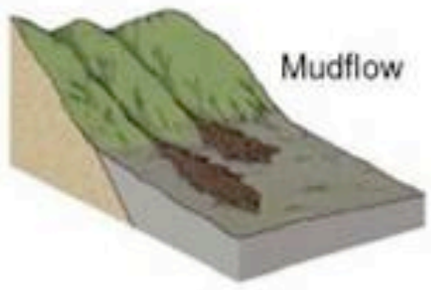
Rockfall

Figure 10.7



Debris avalanche

Figure 10.17



Mudflow

Drier — Wetter

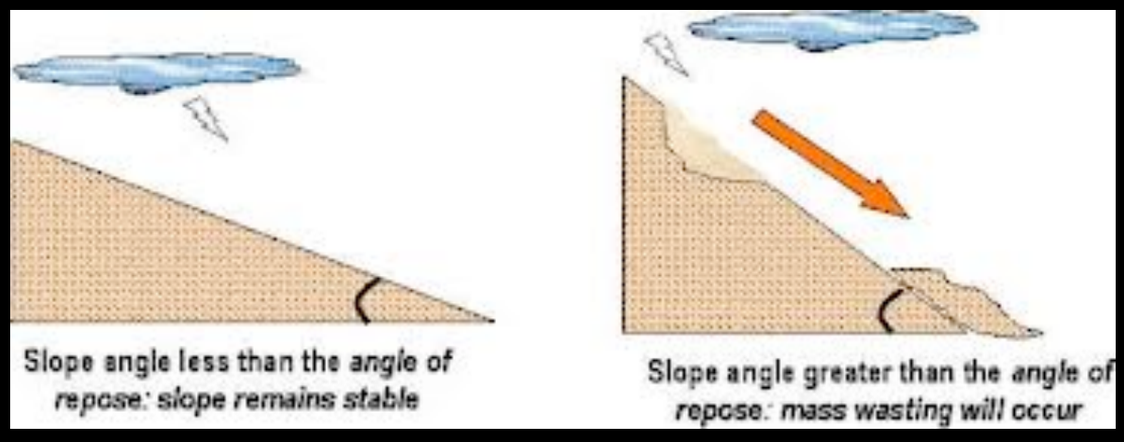
Faster

Mass movement involves two forces:

Gravity - the force of attraction where objects fall towards the center of the Earth

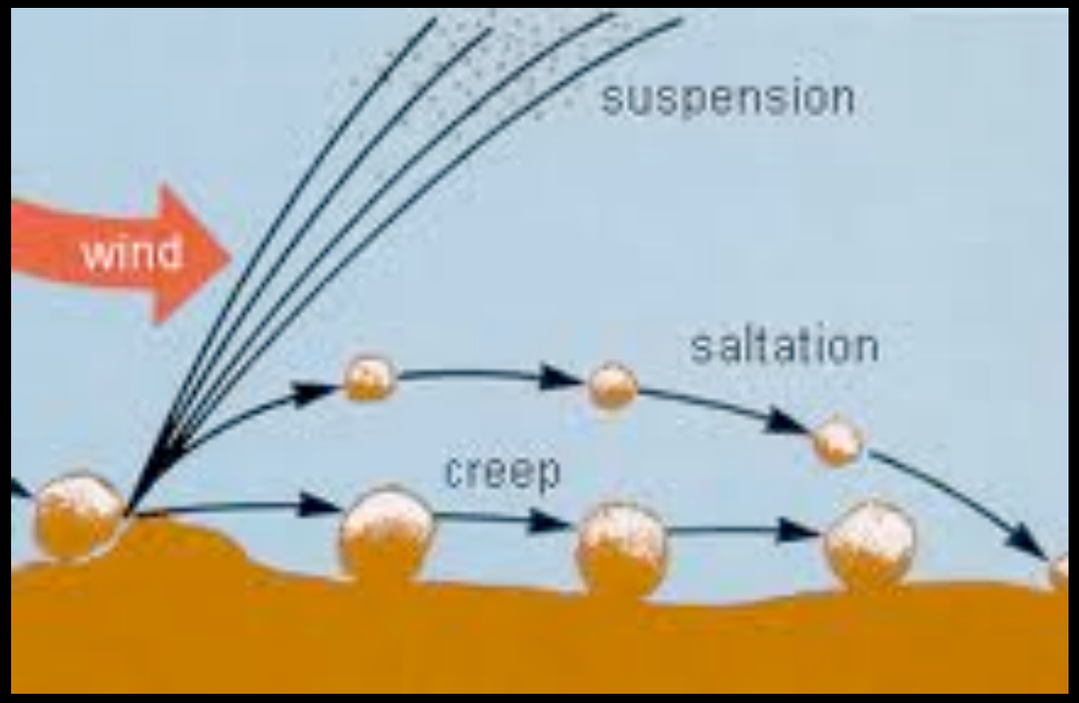
Friction - the rubbing of one object against another

- When rain weakens the force of friction gravity then pulls rock and sediment down a slope



MASS MOVEMENTS, WIND & WAVES

MASS MOVEMENTS, WIND & WAVES



<u>Wind</u> - air that is moving horizontally

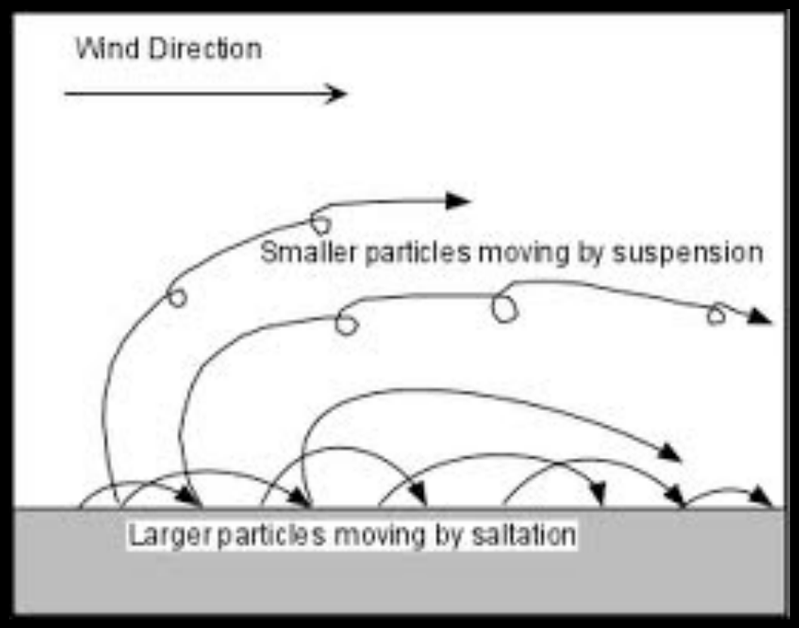
- Wind picks up loose sediments such as sand and silts and carries them to a new location

MASS MOVEMENTS, WIND & WAVES

MASS MOVEMENTS, WIND & WAVES

Deflation - wind readily blows away loose sediment lowering the land surface until there is no more loose sediment to erode

MASS MOVEMENTS, WIND & WAVES



<u>Abrasion</u> -
wind picks up and blows smaller sediment against another surface wearing it down

MASS MOVEMENTS, WIND & WAVES

<u>Sand Dune</u> -
depositional feature when sand is deposited in layers or mounds

- Windward Side: gentle slope
- Leeward Side: steep slope

MASS MOVEMENTS, WIND & WAVES

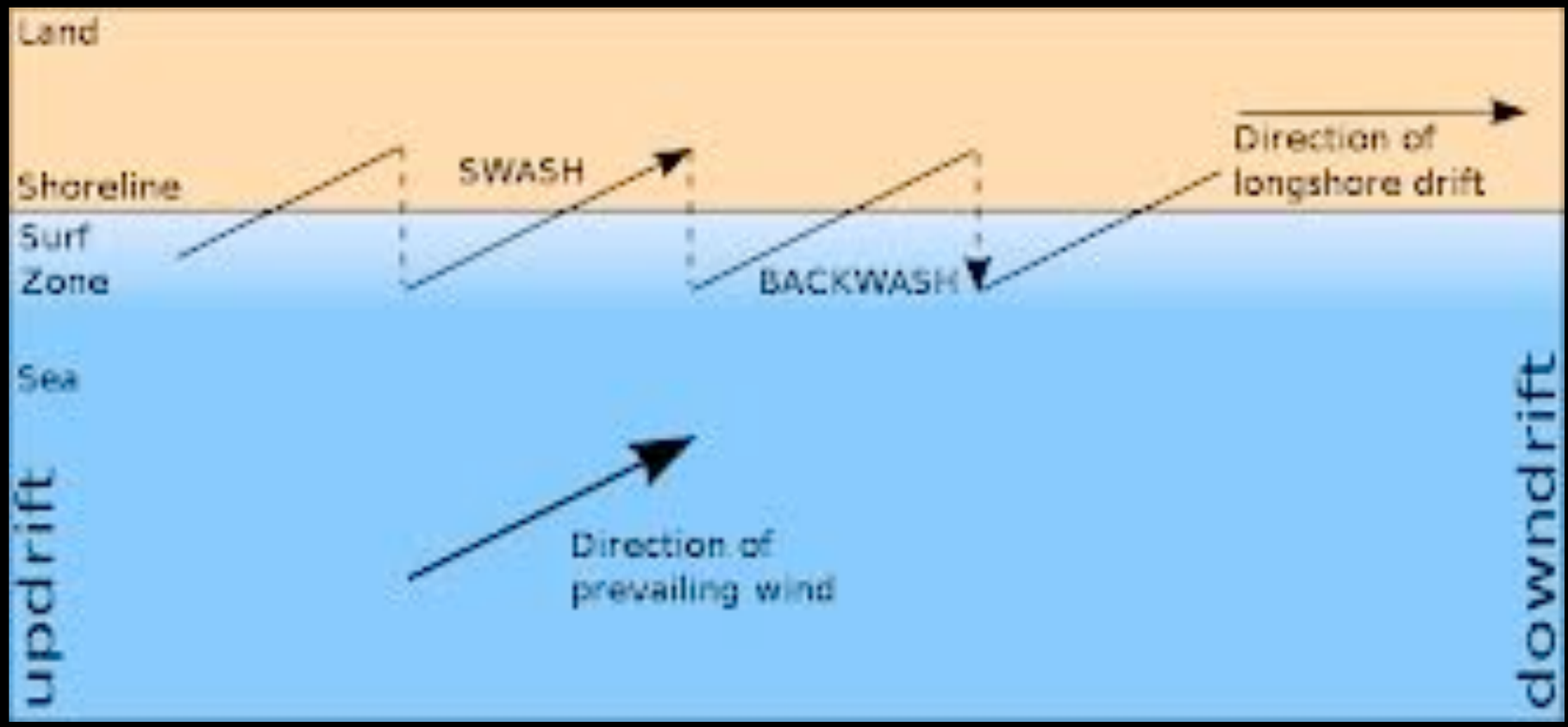
Waves -

the up and down motion of water in the ocean or lake; usually caused by wind

- As **wind** pushes a wave towards the shore, it drags along the bottom of the ocean floor
- The dragging slows the bottom of the wave, but the top continues at the same speed
- Eventually the wave becomes unstable and "**breaks**"

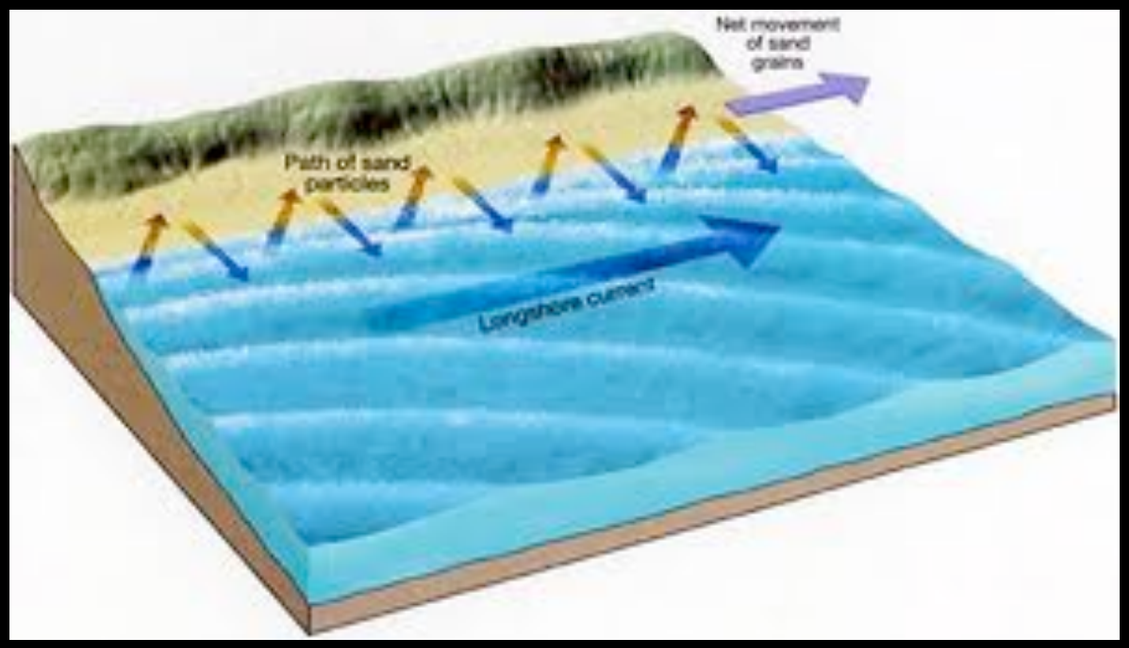
MASS MOVEMENTS, WIND & WAVES

MASS MOVEMENTS, WIND & WAVES



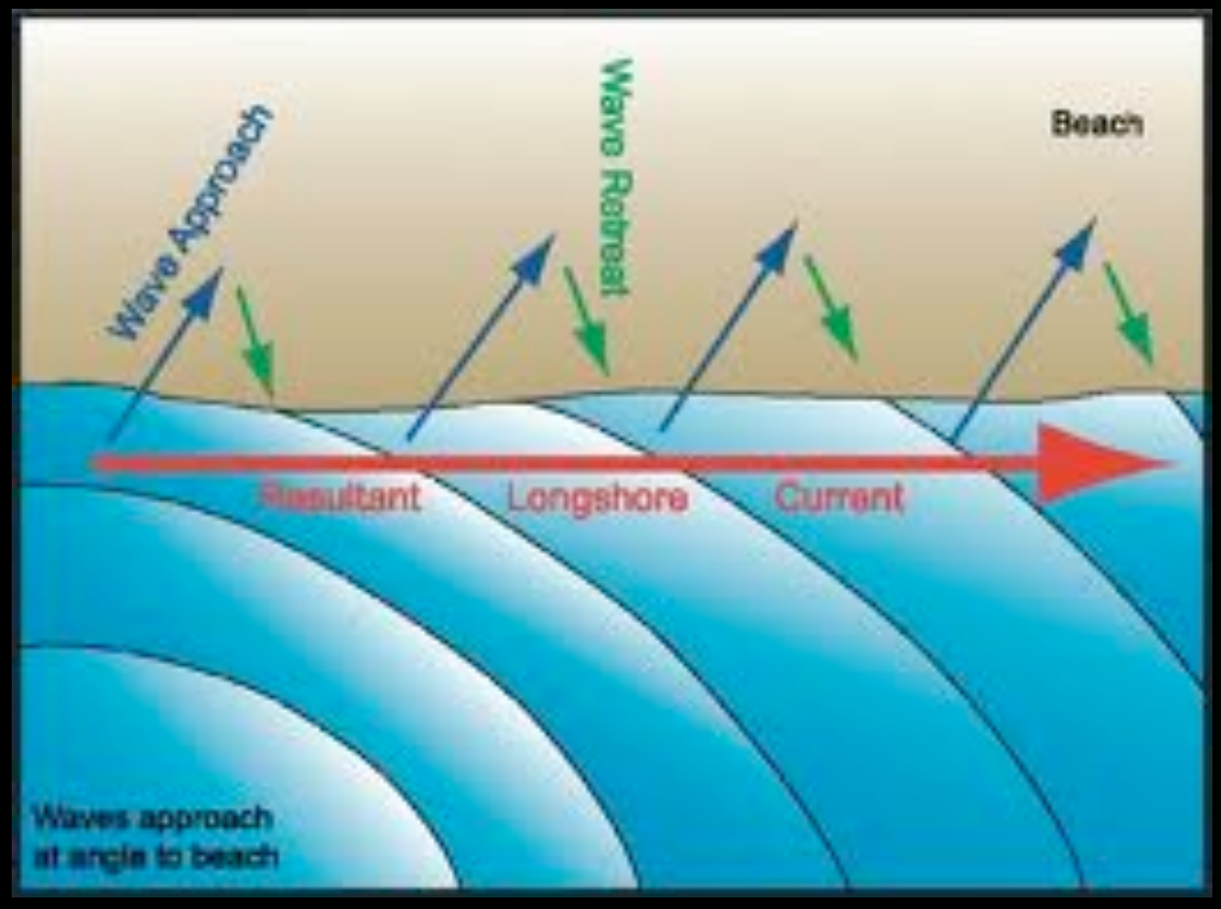
Waves approach the shore at an angle, but retreat parallel to the shore, creating a zigzag pattern

MASS MOVEMENTS, WIND & WAVES



The zigzag pattern carries sand parallel to the shore

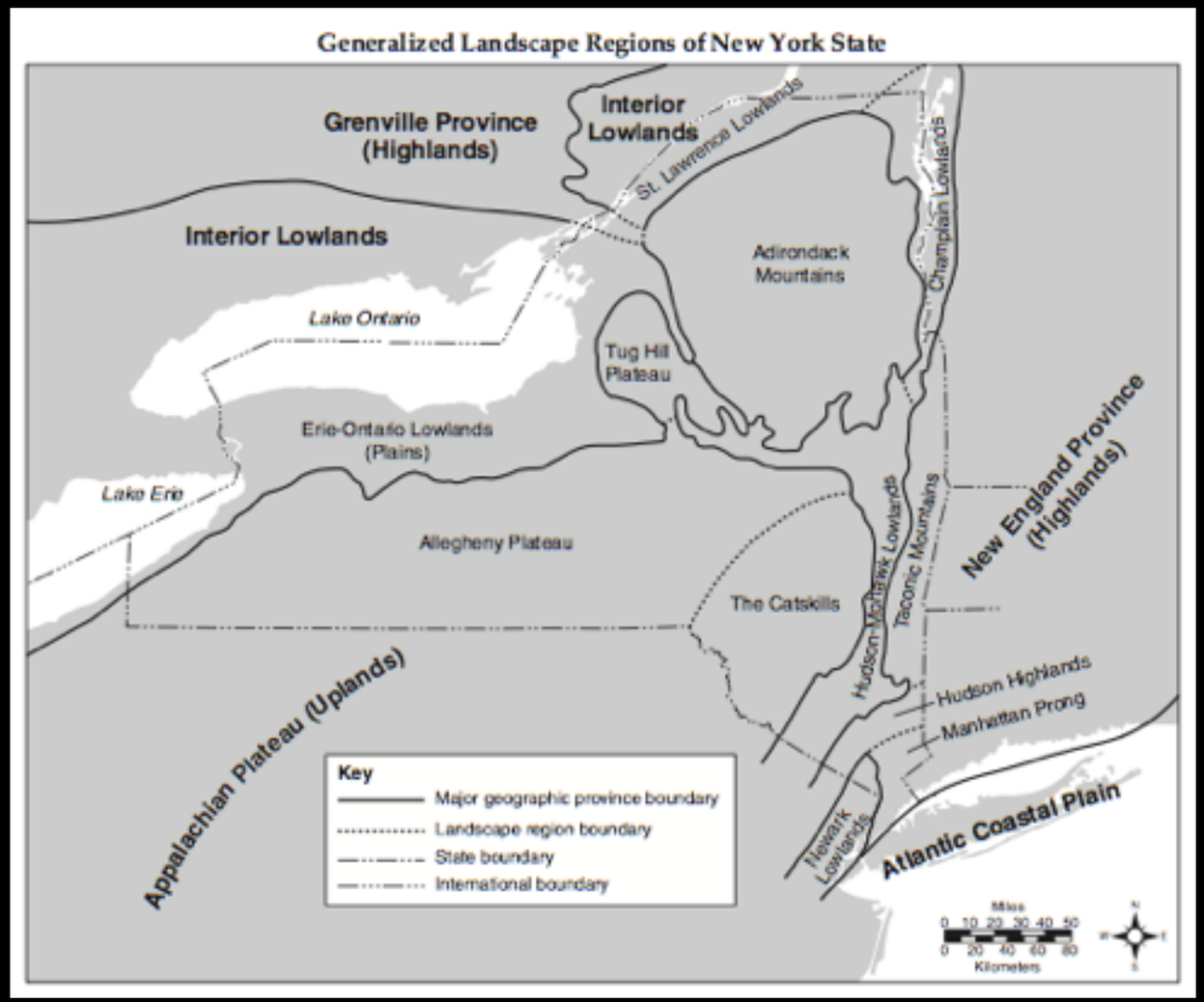
MASS MOVEMENTS, WIND & WAVES



Long Shore Current -

ocean current that flows parallel and close to the shore

NYS LANDSCAPES

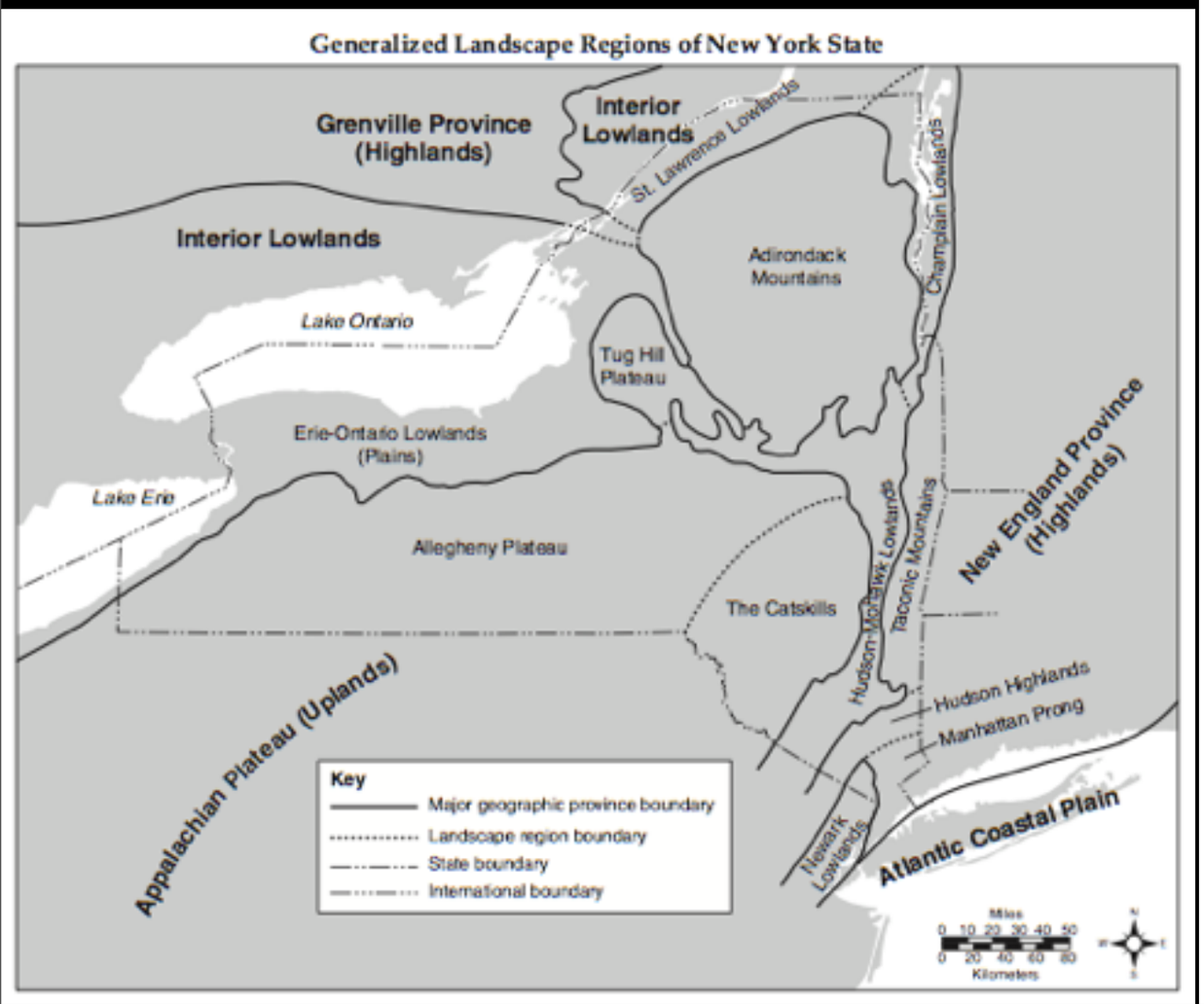


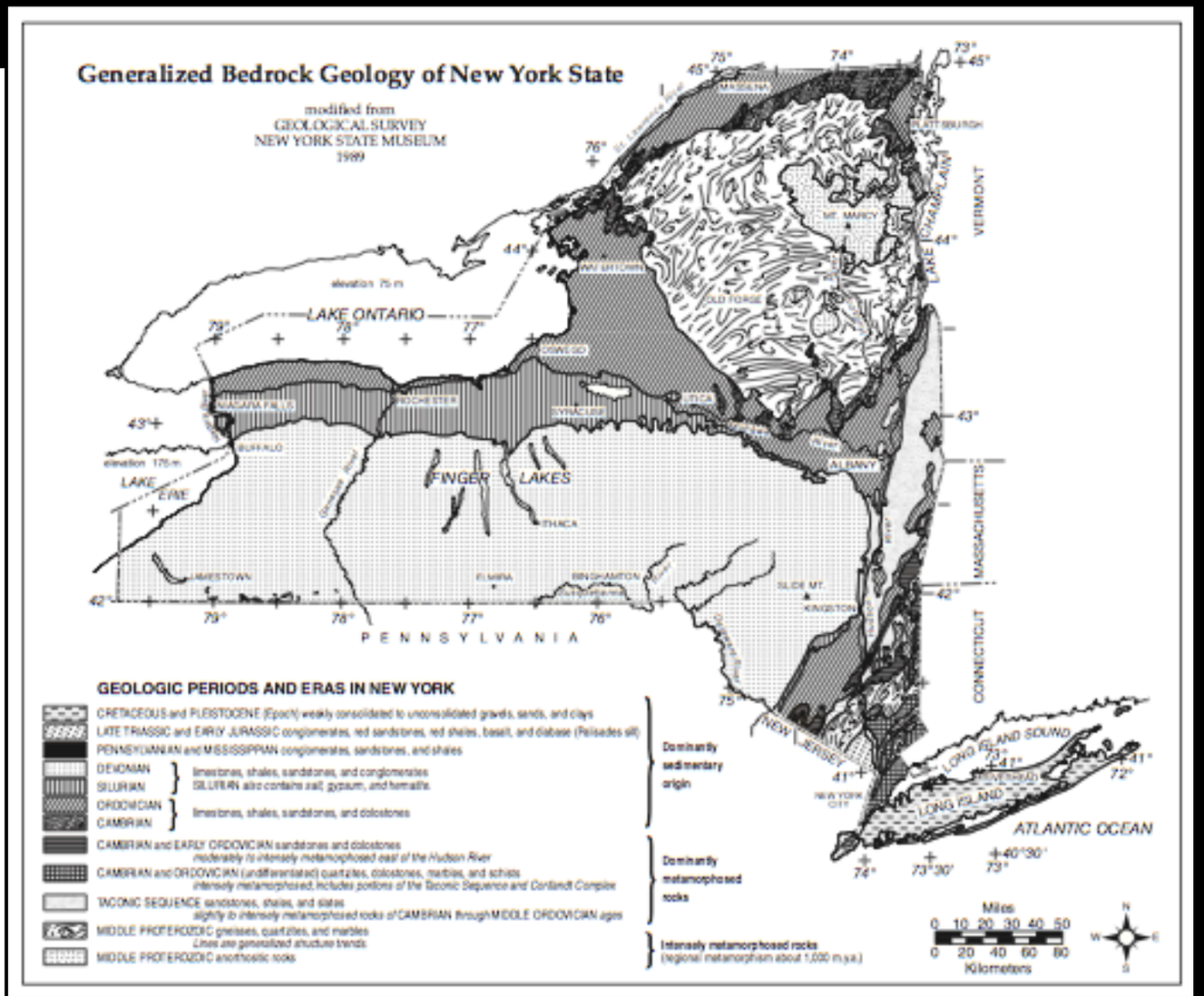
What are the different Landscapes of New York State?

New York State *contains many different landscape regions*
characterized by <u>elevation</u> and <u>rock types:</u>

- High Elevations: mountains and highlands
- Medium Elevations: plateaus
- Low Elevations: plains and lowlands

ESRT Pages 2 & 3



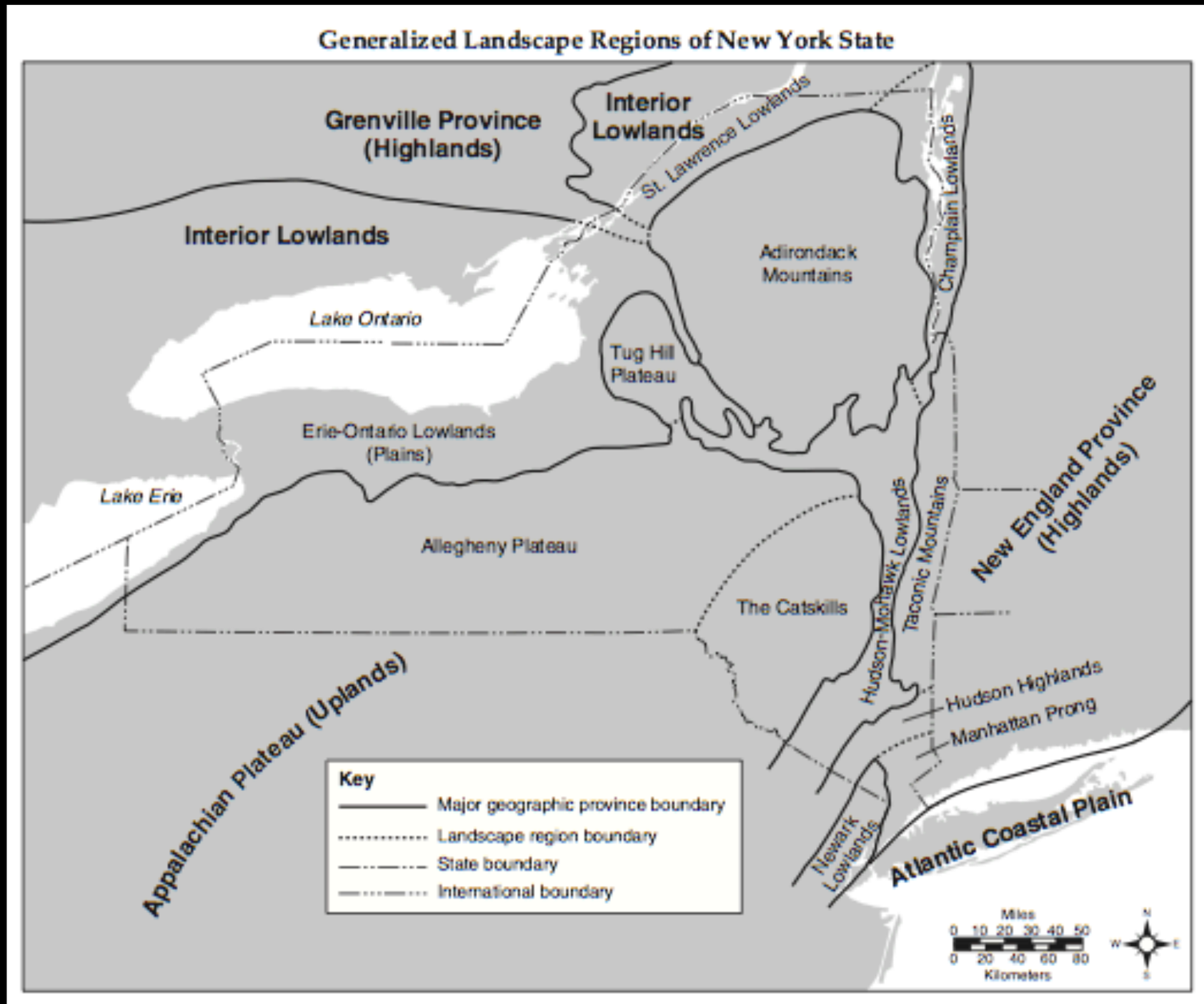


Classwork - Answer pages 12 & 13

Atlantic Coastal Plain

- landscape region formed during the *Cretaceous and Pleistocene*

- Composition: sedimentary rock
- Elevation: low



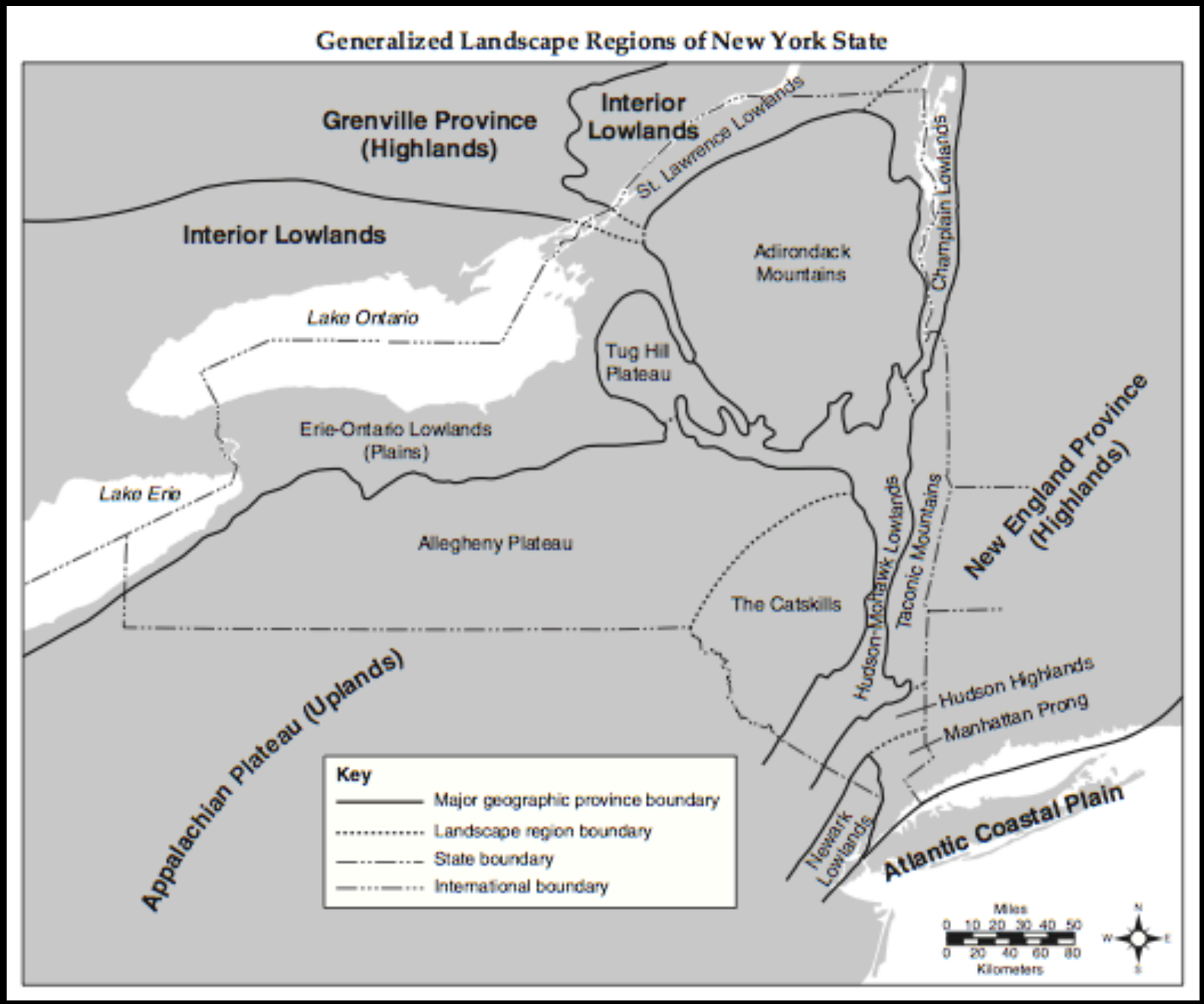
Atlantic Coastal Plain

Atlantic Coastal Plain

Manhattan Prong

- landscape region formed during the *Cambrian and Ordovician*

- Composition: metamorphic rock
- Elevation: low

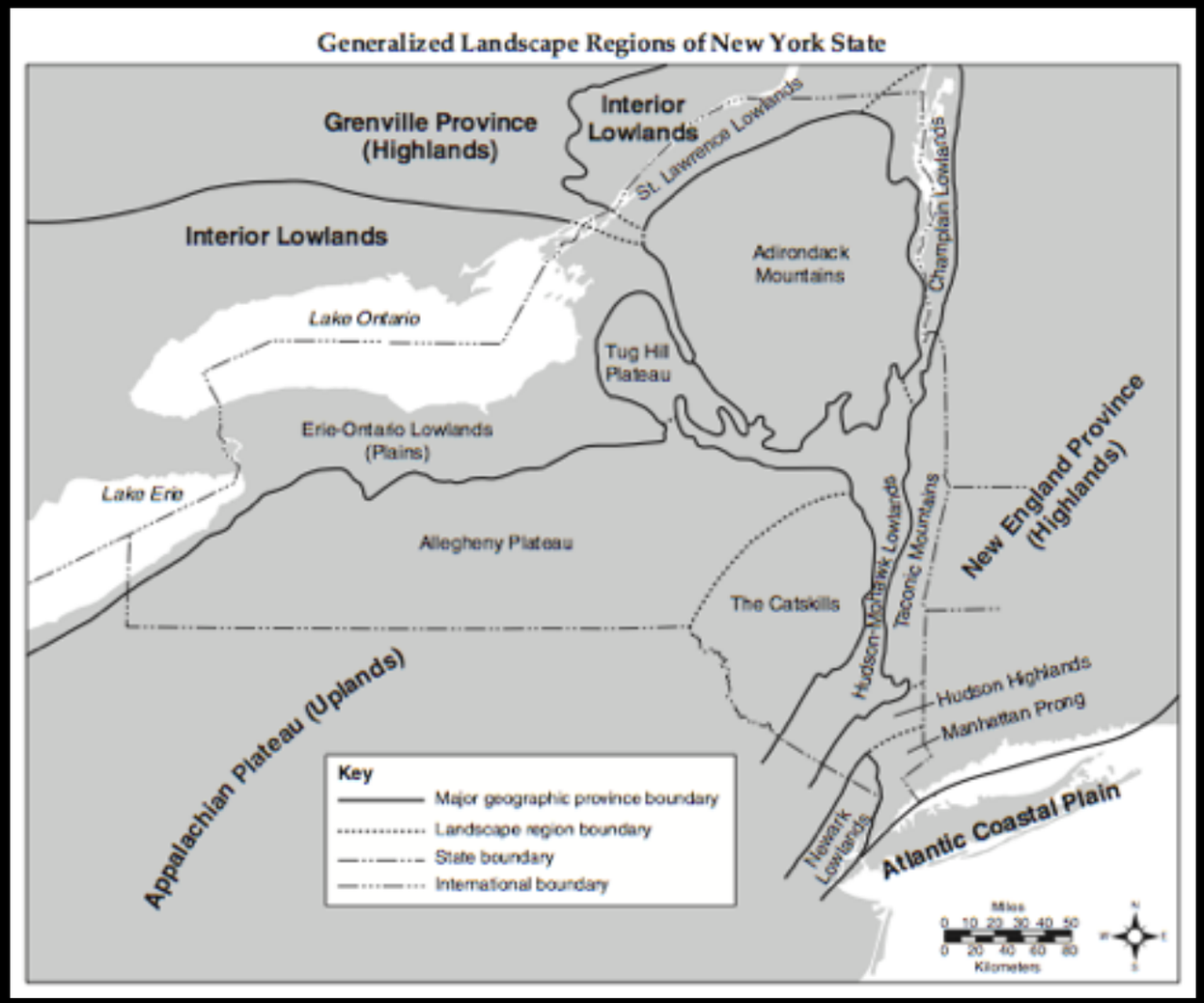


Manhattan Prong

Manhattan Prong

<u>Hudson Highlands / Taconic Mountains</u> - landscape region formed during the middle of the *Proterozoic*

- Composition: metamorphic rock
- Elevation: high



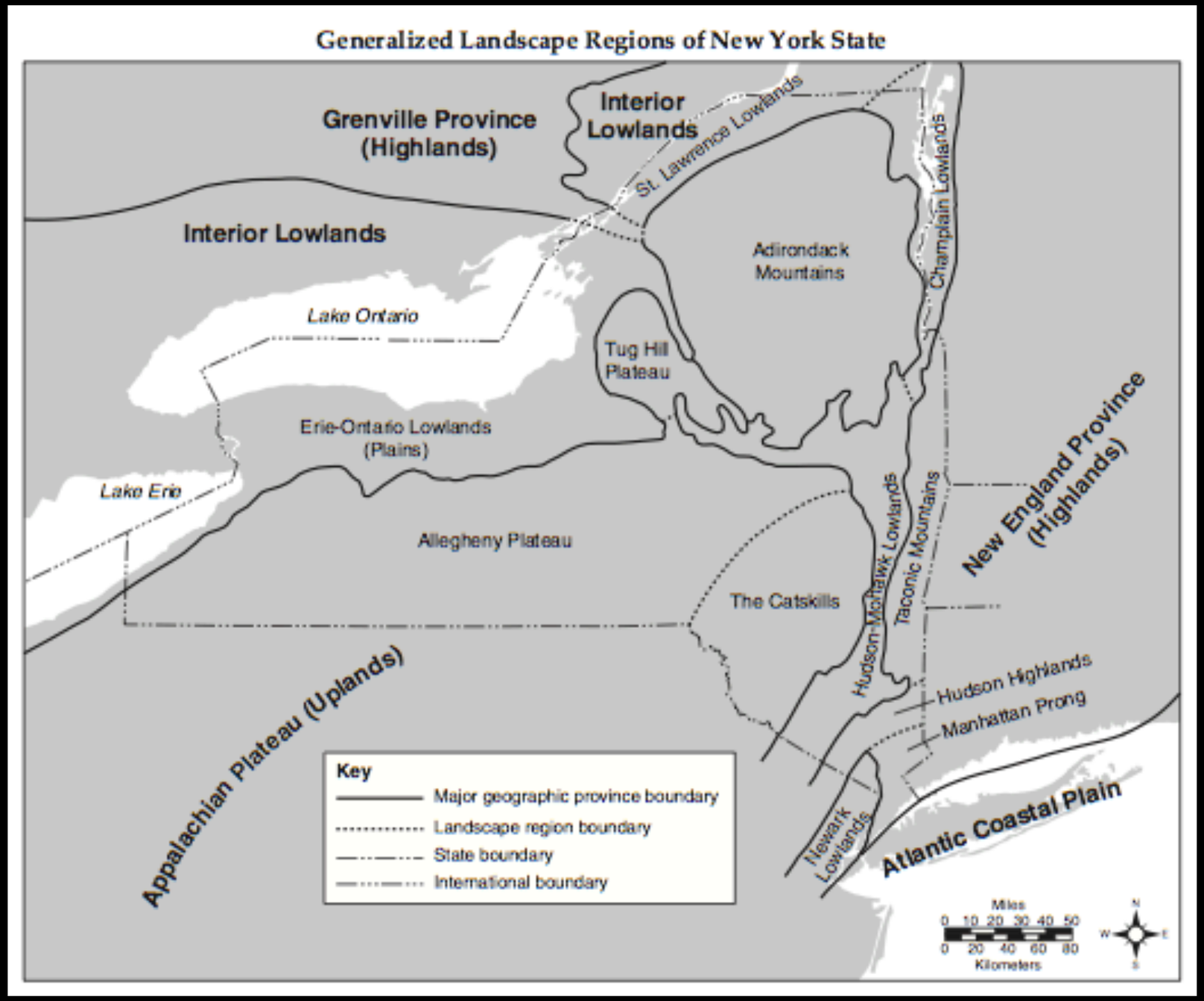
Topographic Maps
Hudson Highlands / Taconic Mountains

Topographic Maps
Hudson Highlands / Taconic Mountains

Hudson / Mohawk Lowlands

- landscape region formed during the *Ordovician*

- Composition: sedimentary rock
- Elevation: low



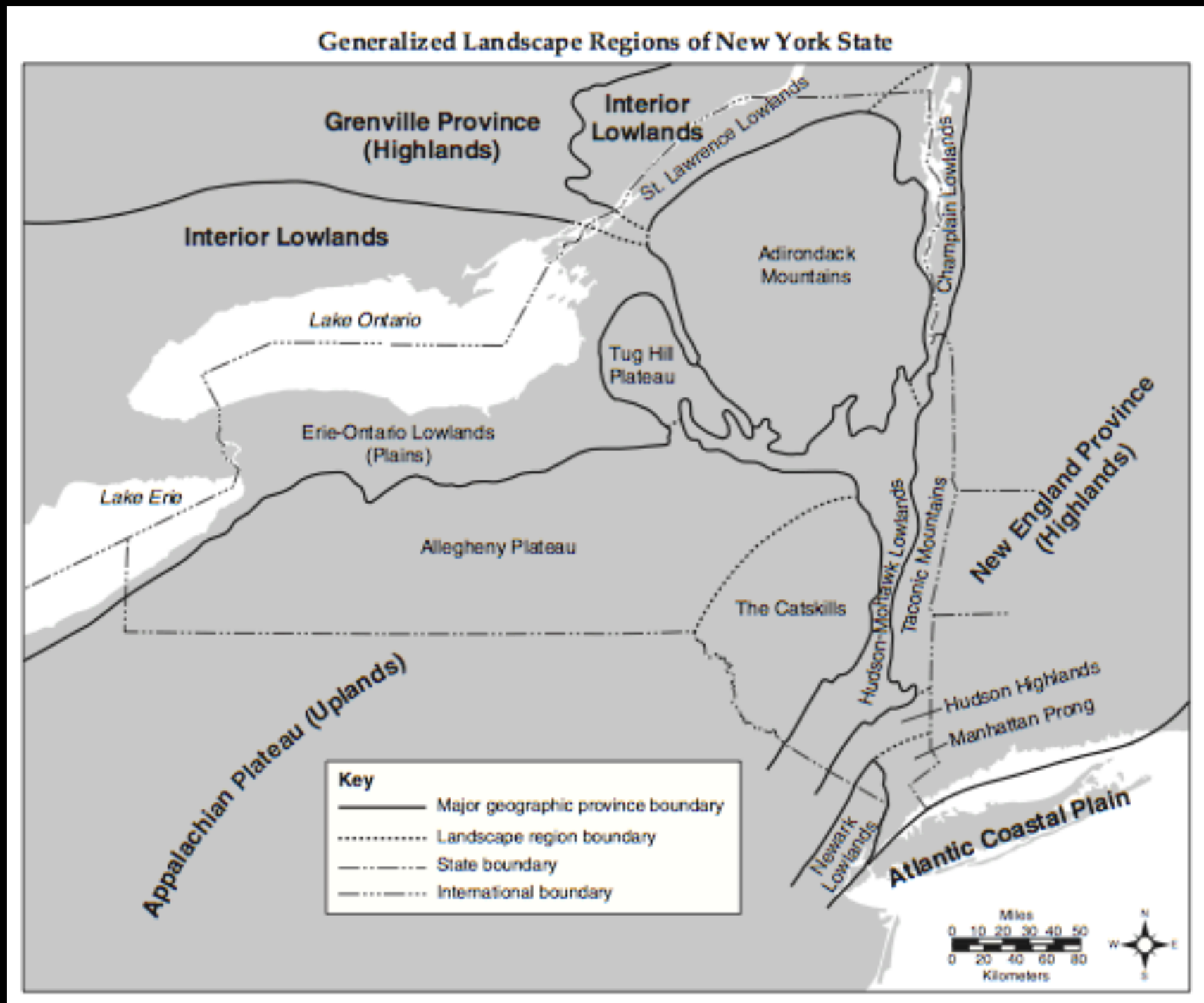
Hudson / Mohawk Lowlands -

Hudson / Mohawk Lowlands -

<u>Adirondack Mountains -</u>

landscape region formed during the middle of the *Proterozoic*

- Composition: metamorphic rock
- Elevation: high



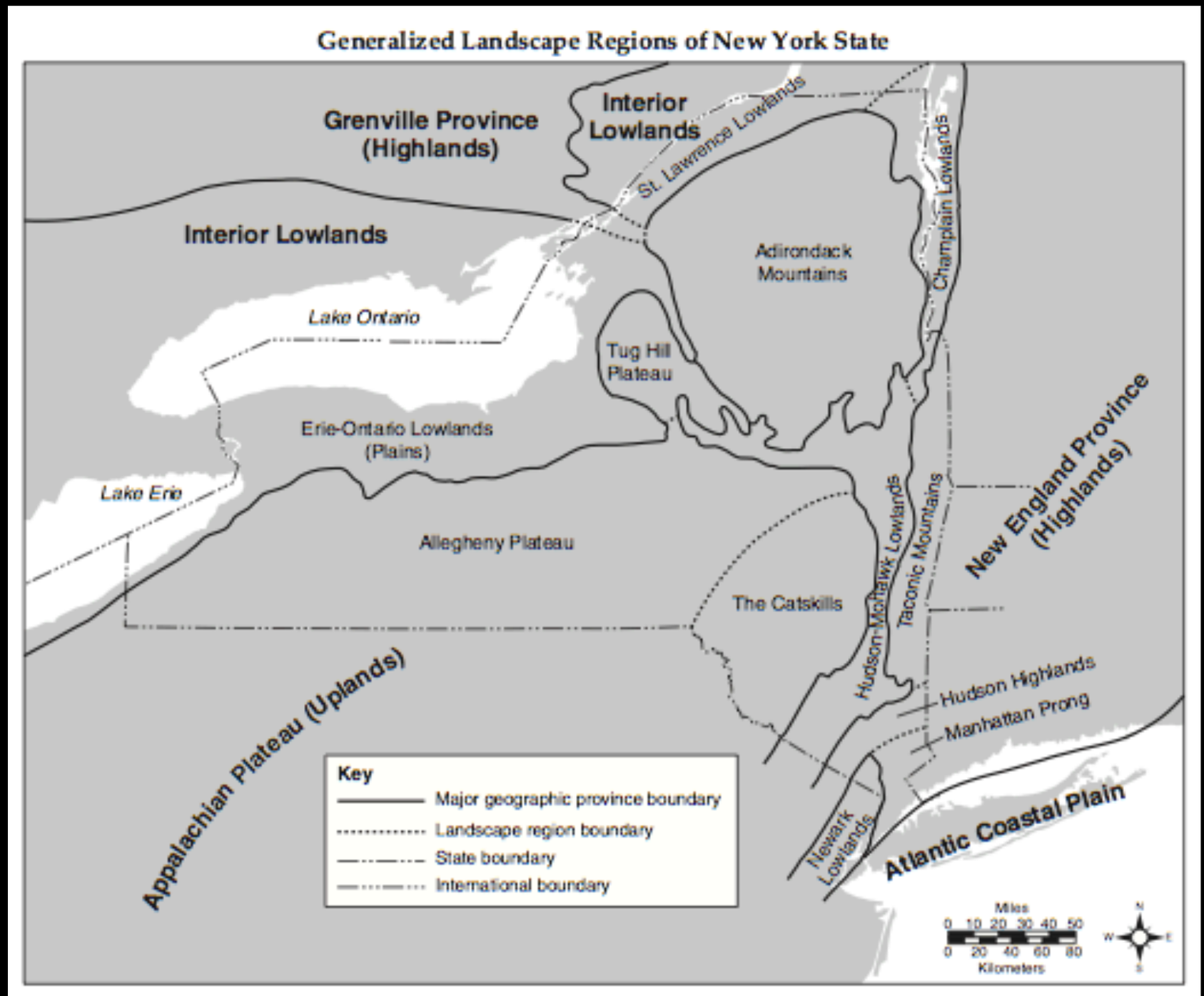
Adirondack Mountains

Adirondack Mountains

Tug Hill Plateau -

landscape region formed during the *Ordovician*

- Composition: sedimentary rock
- Elevation: medium



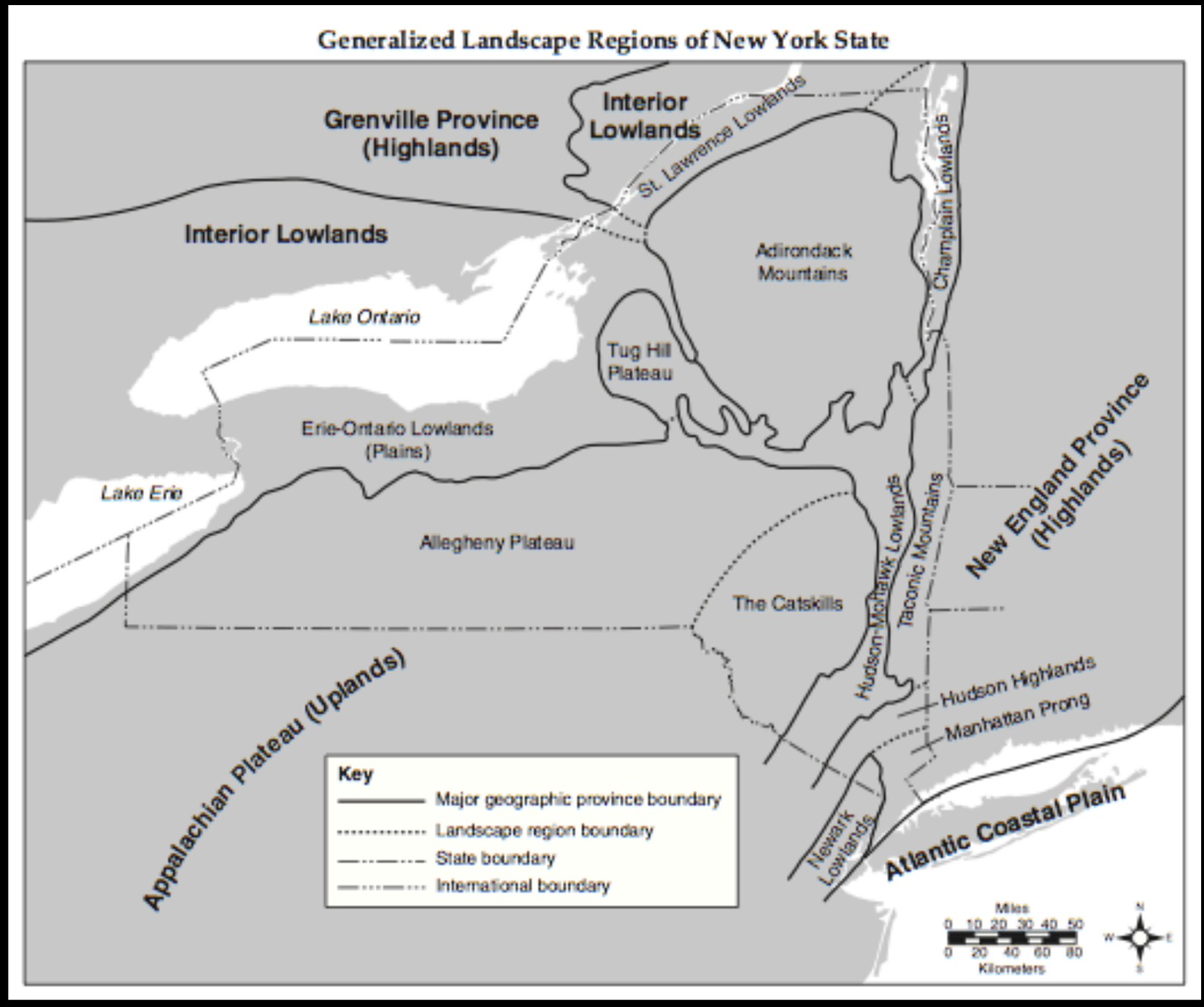
Tug Hill Plateau -

Tug Hill Plateau -

Erie-Ontario Lowlands -

landscape region formed during the *Silurian*

- Composition: sedimentary rock
- Elevation: low



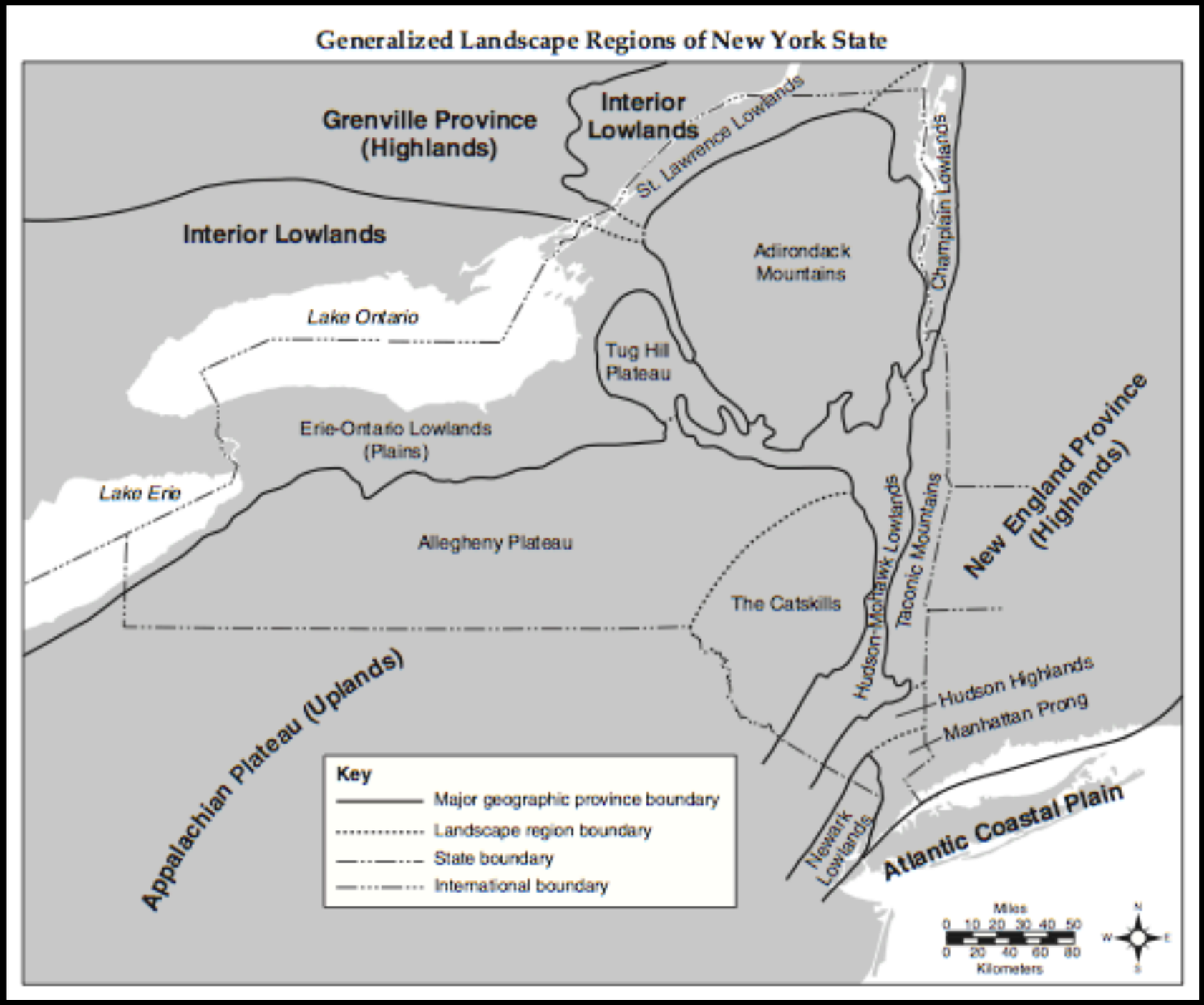
Erie-Ontario Lowlands

Erie-Ontario Lowlands

St. Lawrence Lowlands -

landscape region formed during the *Ordovician and Cambrian*

- Composition: sedimentary rock
- Elevation: low



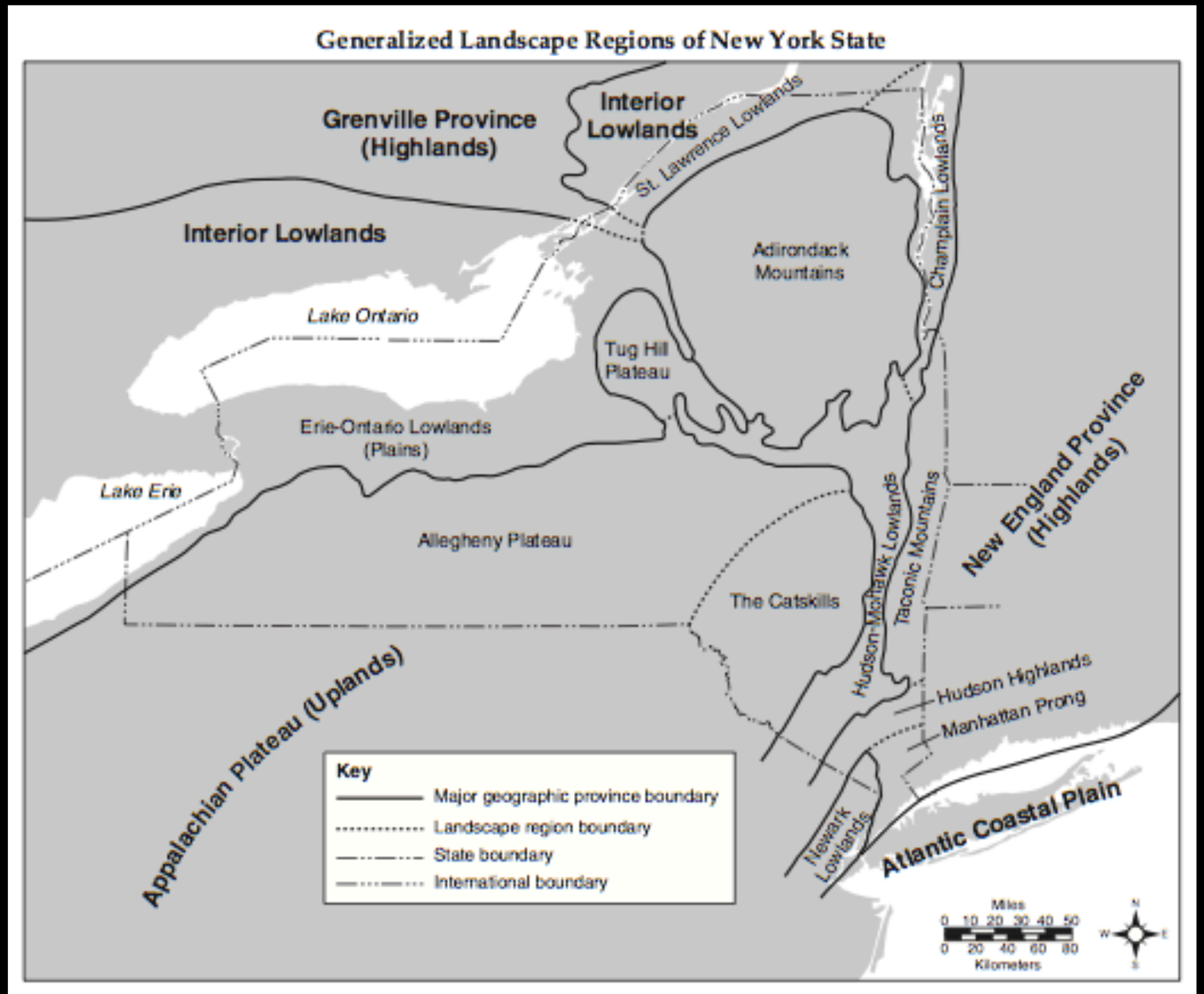
St. Lawrence Lowlands -

St. Lawrence Lowlands -

<u>Allegheny Plateau / Catskills -</u>

landscape region formed during the *Devonian*

- Composition: sedimentary rock
- Elevation: medium



Allegheny Plateau / Catskills

Allegheny Plateau / Catskills