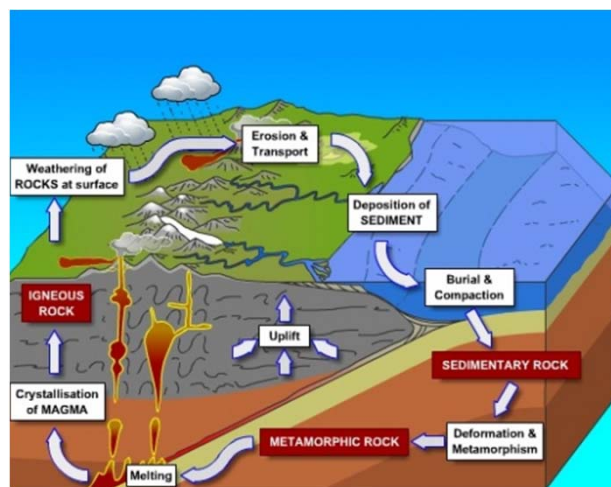
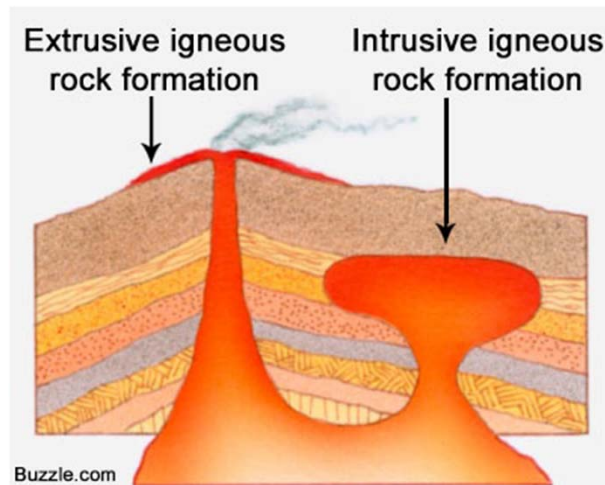


Origin of Soils

The Geological Cycle



Igneous Rocks



Igneous Rocks

Intrusive magma cools slowly, producing coarse-grained rocks such as **GRANITE**

Extrusive magma cools quickly, producing fine-grained rocks such as **BASALT**

Physical Weathering

Wind

Water

Earthquakes

Landslides

Freeze/Thaw Cycles

Growth of Ice, Salt Crystals

Growth of Plant Roots

Chemical Weathering

Oxidation – chemical addition of oxygen

Reduction – addition of hydrogen or removal of oxygen

Hydration – chemical addition of water

Carbonation – dissolution by carbonic acid

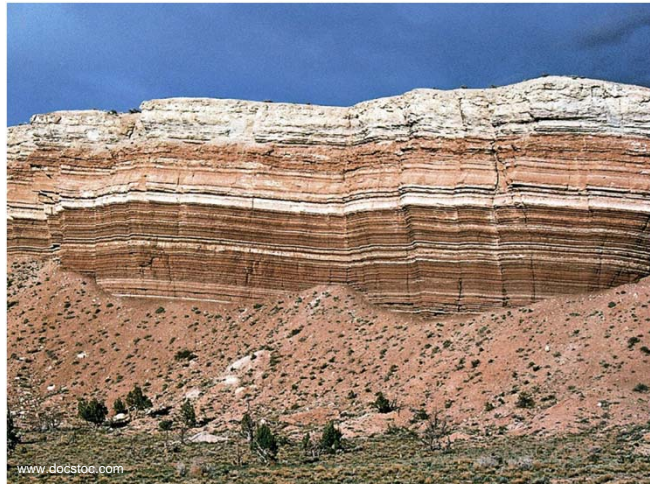
Products of Weathering

Rock Type		Soil Type
Granite	→	Silty Sands
Basalt	→	Clayey Soil
Shale / Slate	→	Clay / Silt
Sandstone	→	Sand
Limestone	→	Clay / Silt

Transportation / Deposition

Transporting Agent		Soil Type
Gravity	→	Colluvial
Water	→	Alluvial
Streams		Fluvial
Rainfall		Pluvial
Ice	→	Glacial
Wind	→	Aeolian

Sedimentary Rocks



Detrital Sedimentary Rocks

Formed when sediment consolidates under the weight of overlying soil or is cemented in place by minerals (SiO_2 , CaCO_3 , FeO , MgO)

Gravel = conglomerate (rounded) or breccia (angular)

Sand = sandstone

Silt = siltstone

Clay = shale (foliated) or mudstone (massive)

Biochemical Sedimentary Rocks

Formed by biological / chemical processes

Limestone – CaCO_3 deposited by organic or inorganic processes

Chalk – CaCO_3 deposited by single-cell animals in ocean environment

Gypsum – CaSO_4 precipitate formed by the evaporation of seawater

Rock salt – NaCl precipitate formed by the evaporation of seawater

Coal – Carbon formed from decomposing plant and animal matter

Metamorphic Rocks

Produced when rocks are changed by combination of heat, pressure, shearing stresses

Granite → Gneiss

Basalt → Schist

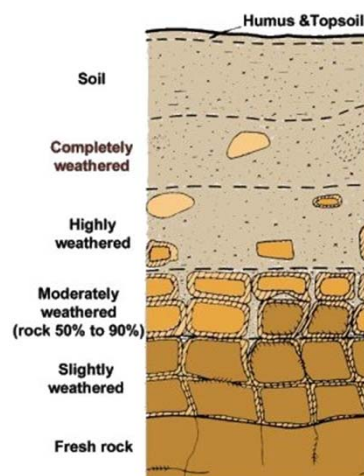
Shale → Slate → Schist

Sandstone → Quartzite

Limestone → Marble

Soil Deposits

Residual Soils



http://echo2.epfl.ch/VICAIRE/mod_3/chapt_1/main.htm

Colluvial Soils (Talus Slope)

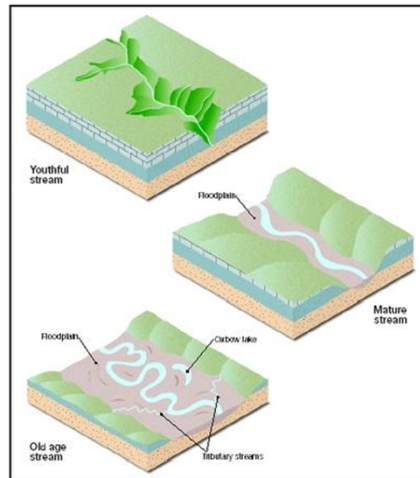


Braided Streams



<http://www.mccullyweb.com/glossary/defs/braided.jpg>

Meandering Streams



http://www.scienceclarified.com/landforms/images/ueol_03_img0108.jpg

Youthful Streams



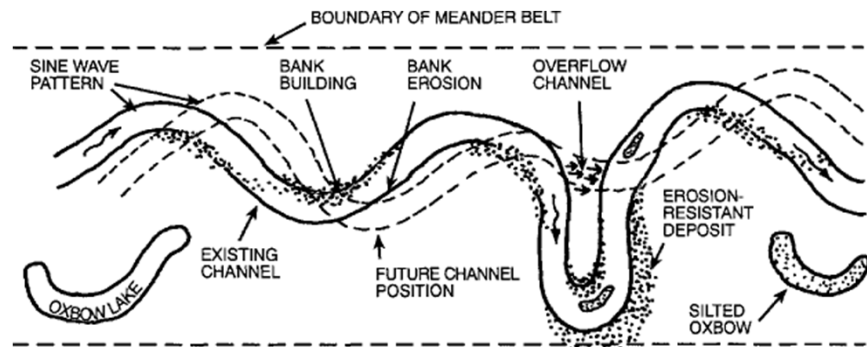
<http://www.personal.kent.edu/~cschweil/Stark/Romaniastream.gif>

Mature Streams



<http://faculty.ccc.edu/cdl/Courses/geology201/labs/streams/Streams.htm>

Meander Topography



http://www.ohiodnr.com/Portals/7/pubs/fs_gifs/stfs03fig4.gif

Old Age Streams



<http://notendur.hi.is/oi/Siberia%20photos/Meandering%20river%20on%20the%20Yamal%20tundra.jpg>

Alluvial Soil (Alluvial Fan)



<http://www.mnp.com/RMNP-Areas-HorseshoePark-AlluvialFan.html>

Alluvial Soil (River Delta)



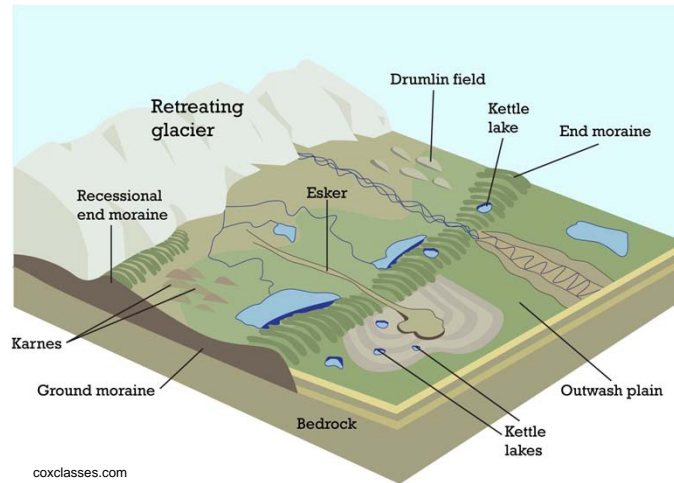
http://www.alaska-in-pictures.com/data/media/19/kenai-river-delta_1958.jpg

Lacustrine Soil (Varved Clay)



<http://www.anr.state.vt.us/DEC/GEO/images/varveswaterbury.jpg>

Glacial Soils



Glacial Till



<http://polar3.home.att.net/northpole-pics/thule/thule-glacial-rubble.jpg>

Glacial Till



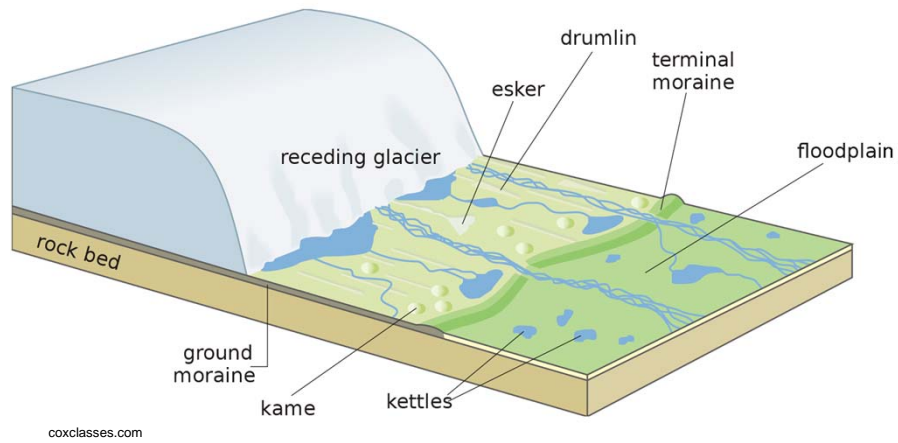
http://esse.usra.edu/articles/iceagemodule/resources/images/moraine_till_svalbard.jpg

Glacial Till

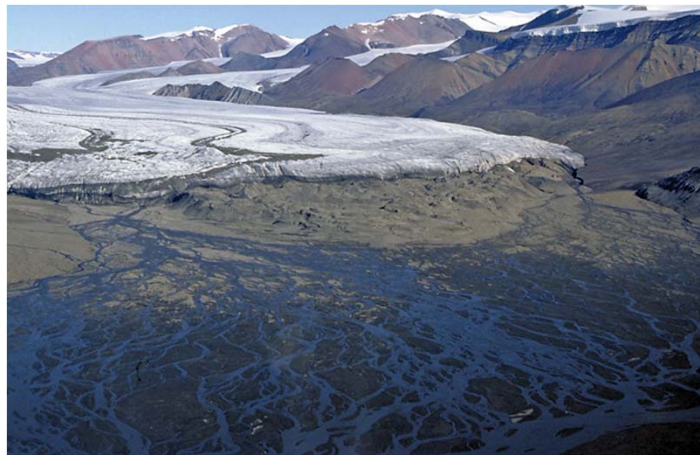


<http://www.sfu.ca/geog351fall02/gp2/geography/PROJECT/till.jpg>

Outwash Plains



Outwash Plains



<http://imgarcade.com/1/glacial-outwash-diagram/>

Aeolian Soil (Dust Storm)



Aeolian Soil (Sand Storm)



Aeolian Soil (Volcanic Ash)



Origins of Loess



<http://esp.cr.usgs.gov/info/eolian/t4.gif>

Loess in the US



<http://esp.cr.usgs.gov/info/eolian/1213.gif>

Loess



<http://www.outreach.canterbury.ac.nz/resources/geology/glossary/loess.jpg>

Loess



<http://www.uamont.edu/facultyweb/francis/soilprofiles/WIowaLoessBluffs.jpg>

Organic Soils

- Found in low-lying areas where water table is near or above the surface
- Water promotes plant growth which decomposes to form organic soils
- Tend to have a high water content
- Tend to be highly compressible
- Consolidate over time as water is expelled due to loads applied to the soil

Organic Soils (Peat Bog)



<https://www.flickr.com/photos/14716771@N05/8281432745/>