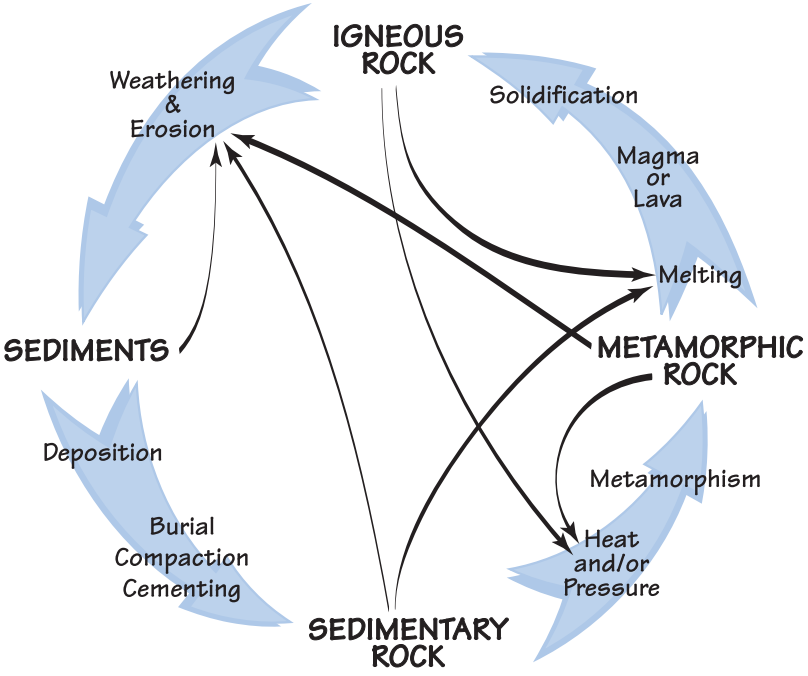
Rocks of the Northeastern US: *a brief review*

There is an amazing diversity of rocks exposed at the surface in the Northeast. The rocks record a 1 billion year history of colliding plates, inland oceans, deposition, erosion, uplift, igneous intrusions and extrusions and glacial activity. The different rock types of the region influence the topography and tell us where to look for certain fossils and natural resources. The rocks exposed on the surface in the Northeast are there because of the unique geologic story of the region. Each type of sedimentary, igneous and metamorphic rock forms in a particular environment under particular conditions *(Figure 2.1)*.

Igneous Rocks of the Northeast

granite *diorite*
anorthosite *diabase*
basalt *gabbro*
pegmatite



Sediments of the Northeast (not consolidated into rocks)

gravel *sand*
silt *clay*

Metamorphic Rocks of the Northeast

slate *phyllite*
schist *gneiss*
marble *quartzite*
serpentinite

Sedimentary Rocks of the Northeast

limestone *dolomite*
sandstone *siltstone*
shale *conglomerate*
coal

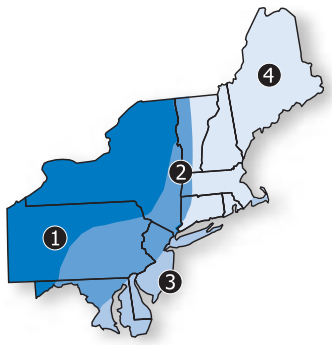


Figure 2.1: The rock cycle.

Rocks

Sedimentary rocks form from the breakup of pre-existing rocks. Weathering and erosion by wind, water or chemical action breaks up sedimentary, igneous and metamorphic rocks to form loose sediments. Sediments are transported downstream by rivers and dumped into the ocean or are deposited somewhere along the way. Compaction of the sediments usually happens through burial by more sediments. As fluids work their way through the spaces between the sediments, cementing-minerals are left behind to form hardened sedimentary rocks: sandstones, siltstones and shales. Sedimentary rocks may also form by evaporation of water, leaving behind deposits of evaporites such as halite and gypsum. Deposits of calcium carbonate, usually formed through the accumulation of calcium carbonate skeletal material (such as clams and corals), create the sedimentary rocks limestone and dolostone.

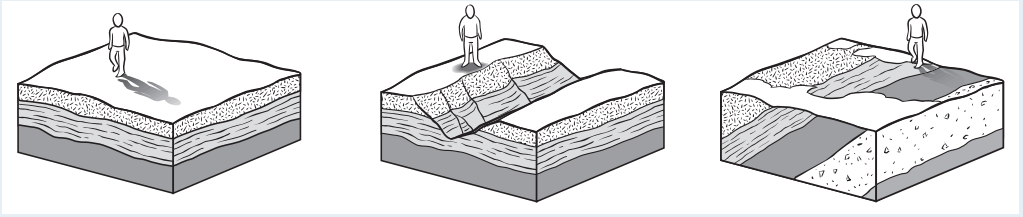
Sediments		Sedimentary Rocks
gravel	→	*conglomerate*
sand	→	*sandstone*
silt	→	*siltstone*
clay	→	*shale*

Finer Grain Size ↓

calcium carbonate	→	*limestone*
calcium magnesium carb	→	*dolostone*

Why do we see different kinds of rocks at the surface?

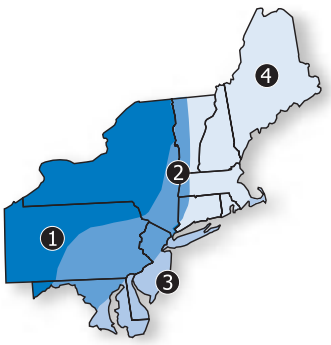
As you walk across the surface of the Earth, you will observe an amazing variety of rock types. If all rocks were flat-lying layers and there was no erosion, then we would only see one type of rock exposed on the surface. Often, though, rocks have been worn away (eroded) and now underlying layers are exposed at the surface. Layers of rock may also be tilted, folded or faulted to reveal underlying rocks at the surface. Figures by J. Houghton.



When rocks are flat-lying layers and there is no erosion, folding or faulting, the person walking across the surface sees only one rock type.

When rocks are worn away (often by streams), the person walking across the surface sees the underlying layers of rock exposed.

When rocks are folded or tilted, the person walking across the surface sees several layers of rock exposed.



Igneous rocks form from the cooling of hot molten rock. If the molten rock is below the surface, it is called magma. Rocks with large crystals indicate there was plenty of time for the crystals

Igneous Rocks

Magma (large crystals)		Lava (fine crystals)
granite		*rhyolite*
diorite	*diabase*	*andesite*
gabbro		*basalt*
anorthosite		

more iron & magnesium ↓

to grow as the magma cooled slowly below the Earth's surface. Molten rock that breaks through the crust to the surface (usually through a volcano) is lava. Lava cools quickly as the heat escapes to the atmosphere, producing igneous volcanic rocks with very tiny crystals or no crystals at all.

Metamorphic rocks form from pre-existing sedimentary, igneous and metamorphic rocks that are exposed to increases in temperature and pressure. This can occur from plate movements, very deep burial, or contact with molten rock. The minerals within the rock recrystallize and realign, forming a much harder rock. Some examples of metamorphic rocks are given below:

Parent Rocks	Metamorphic Rocks
shale	*slate*
slate	*phyllite*
phyllite	*schist*
peridotite	*serpentinite*
sandstone	*quartzite*
limestone	*marble*
anorthosite	*metanorthosite*
gabbro	*metagabbro*
granite	*gneiss*
shale/sandstone	*gneiss*

As you read through this chapter, keep in mind that you should be able to predict the type of rocks in any given region by understanding the events in geologic history that have affected the area. When the plates collided, the compression and friction melted the crust. The rising magma formed igneous intrusions that crystallized below the surface, producing igneous rocks with large crystals such as granite. The rising magma may have broken through the surface as volcanoes, creating volcanic rocks such as basalt. The colliding plates buckled the crust (creating metamorphic rocks), forming an ocean basin to the west of the mountains. The basin filled with shedding sediment from the newly-formed mountains, producing thick sequences of sedimentary rock. Where the plates diverged, as in the Triassic period when Pangea separated, the crust rifted in many places, creating basins filled with sediment that became sedimentary rock. The rifting gave rise to volcanic activity, creating volcanic rocks.

Bedrock vs. Surficial Sediments

The bedrock of the Northeast is covered with a thin layer of recently deposited sediments and soil. This chapter deals mainly with the older bedrock, formed over the last billion years. The bedrock links more closely with the events in geologic history discussed in the preceding chapter. Surficial deposits are discussed in more detail in the next chapter (Glaciers).