



## Non-Mineral Resources of the Exotic Terrane Region 4

The Exotic Terrane region has a variety of non-mineral resources, many similar to those of the Appalachian/Piedmont region because of the rock types these regions share. Coal is even found in the Exotic Terrane region in the Narragansett and Boston basins, though it is not currently mined (Figure 7.12).

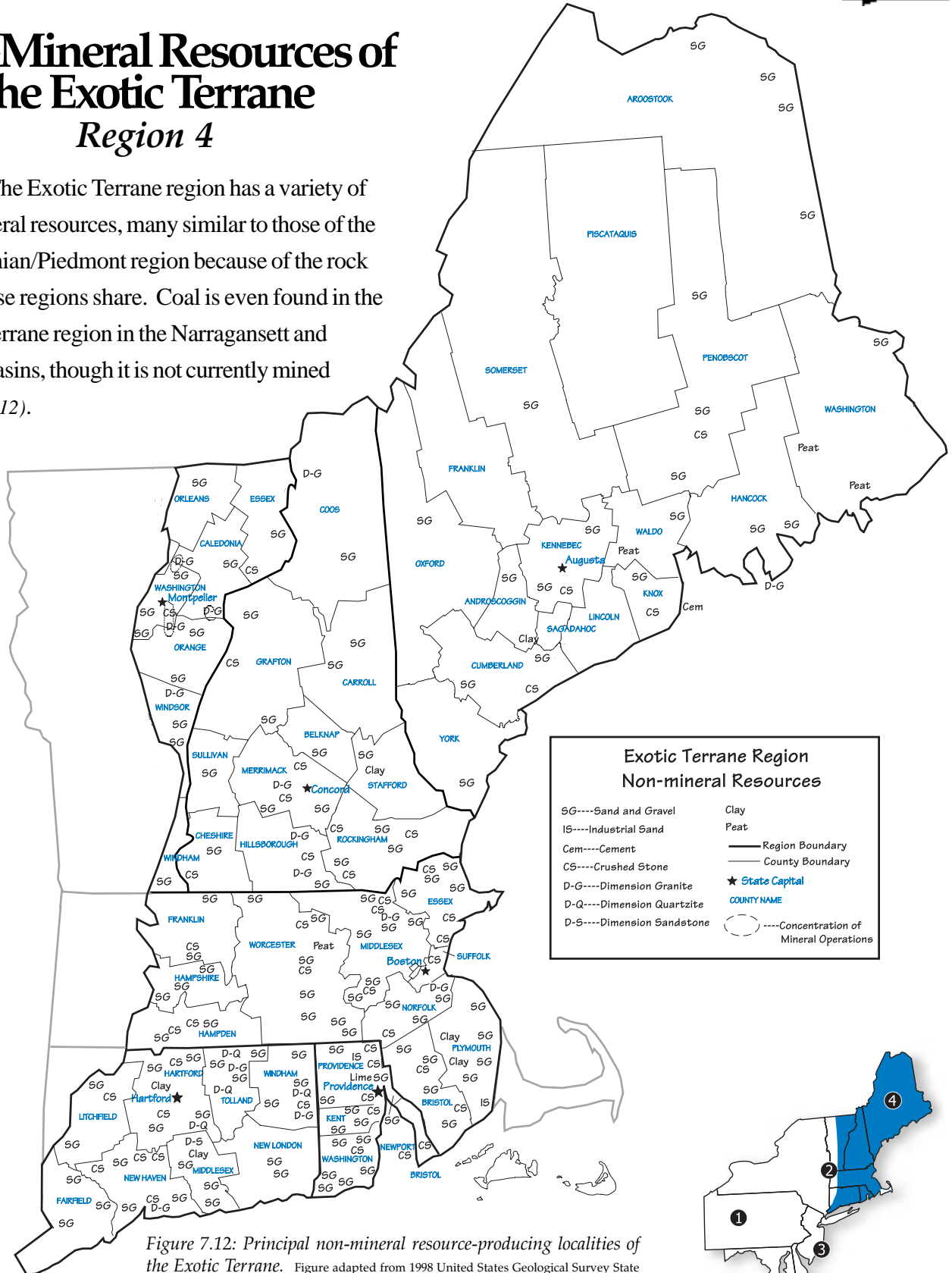


Figure 7.12: Principal non-mineral resource-producing localities of the Exotic Terrane. Figure adapted from 1998 United States Geological Survey State Mineral Information, <http://minerals.usgs.gov/minerals/pubs/state/>





# Non-Mineral Resources

## *Sedimentary Rock*

The sedimentary rock non-mineral resources of the Exotic Terrane are similar to those of the Appalachian/Piedmont and Inland Basin regions. Brownstone is quarried from the *rift basin* in the Connecticut River Valley; clay and shale are mined from glacial deposits and marine shales of the Silurian and Devonian; and cement and crushed rock are produced from a variety of rock types to be used in the construction industry.

## *Igneous Rock*

Granites, formed from intrusions of magma during the Taconic and Acadian mountain-building events, appear all over the Exotic Terrane region. It is quarried throughout the region for use in buildings and monuments, though the demand is not as great as it was in the past. Granite is more expensive to quarry than the much softer marbles found in Vermont, and the issue of transportation raises costs even higher. Though New Hampshire is known as the Granite State for its abundance of granite of varying ages, Barre, Vermont is known as the granite center of the world. The famous *Barre Granite*, formed from an intrusion of magma into overlying rock during the Acadian mountain-building event, is a uniform light gray that takes an excellent polish and is widely used for monuments.

## *Metamorphic Rock*

Quartzite is being actively quarried from Silurian and Devonian metamorphic rock in Connecticut. Quartz is derived from sandstone deposited in the Iapetus Ocean. The sandstone became compressed, metamorphosed and attached to the continent when Baltica collided with North America. When sandstone is metamorphosed, it recrystallizes to become *quartzite*.

## *Fossil Fuels*

*Coal* is found in the Narragansett Basin of Rhode Island and Massachusetts. The coal was formed during the Pennsylvanian when the collision of North America and Baltica compressed the Avalonia microcontinent caught in the middle. The collision buckled the crust to form small basins that gradually filled in with sediment. Accumulations of dead plant material in the swampy basins provided the proper conditions for minor amounts of bituminous coal to form, though there are not large enough amounts to make mining profitable.



see *Non-Mineral Resources*, p.160, for more on *rift basin* resources.



see *Geologic History*, p. 7 and 12.



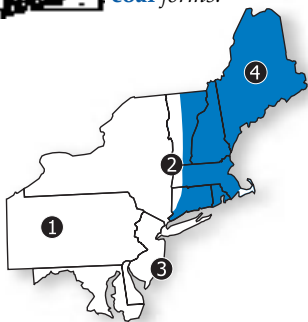
see *Rocks*, p.51, for more on the *Barre Granite*.

Barre, Vermont is the home of the famous Rock of Ages Quarry, which quarries the *Barre Granite*.

*Quartzite* is quarried for use as a building and decorative stone.



see *Non-Mineral Resources*, p.156, for more on how *coal* forms.





## Glacial Deposit Resources *of the Northeast*

All four regions of the Northeast share a common source of non-mineral resources: the deposits left by glaciers of the most recent ice age. For the last 1.8 million years, a continental ice sheet originating in northern Canada has advanced and retreated over North America. Around 20,000 years ago, a warming climate put the glaciers in retreat, bringing the Northeast to its current interglacial period. Deposits associated with the massive, moving and melting ice remain today as valuable non-mineral resources in the Northeast. The glaciers covered the northern parts of all four regions of the Northeast as far south as northern Pennsylvania, New Jersey and Long Island.

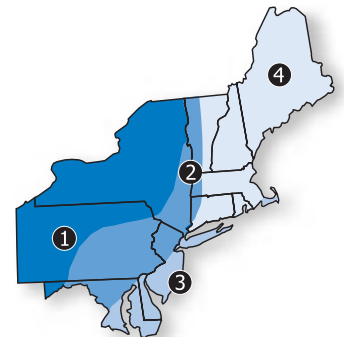
The main non-mineral resources resulting from the last glacial advance are clay, peat, soil, sand and gravel. As the glaciers moved over the surface of the Northeast, they scraped and gouged the landscape. The numerous lakes dotting the Northeast resulted from the vigorous scouring activity of the glaciers. Much of the clay mined today in the Northeast comes from the bottom of these glacier-formed lakes. Used in bricks and pottery, the glacial clays are an important natural resource of the Northeast. Clay is also commonly used in place of heavier stone and gravel to make a lightweight concrete. As the glacial lakes filled and later drained to become bogs and swamps, organic material accumulated at the bottom. Bogs and swamps are ideal environments for the accumulation of dead plants. Kept wet and buried by more dead plant material, the stagnant water of a bog provides little if any oxygen for bacteria to completely decompose the plant material as it would on the forest floor or in a flowing stream. The resulting peat, a precursor to coal, is mined and used as mulch and as a soil conditioner.

The glaciers also left deposits on the surface on which the Northeast *soils* have developed. In combination with the underlying bedrock, the glacial deposits contribute good and bad characteristics to the soil (from the perspective of cultivation). Till, the unsorted mix of sand, silt, clay and gravel that was deposited by melting glaciers, developed into impermeable soils that cannot properly drain water. The unsorted material has no spaces between particles, leaving nowhere for water to drain. Likewise, clay deposits from glacial lakes are also impermeable, being uniformly composed of very small, flat clay particles. Glacial outwash

see *Glaciers*, p.64.



*Soil* is an important natural resource because the cultivation of crops is dependent on soil type.





# Non-Mineral Resources

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deposits of sand and gravel, on the other hand, are generally well sorted and thus well-drained.

The soils developed in the Northeast are a direct result of the underlying rock type and transported glacial sediment. Glacial clay, till, sand and gravel blanket much of the region and affect the permeability of soil. Also, the reason why New Englanders find so many rocks in their farms and gardens is because the glacial till became incorporated into the soil. The till has since become incorporated into the famous stone walls of New England.

Perhaps the most important resource left to the Northeast by the glaciers is sand and gravel. Dominating the natural resource economies of many of the Northeast states, sand and gravel is an extremely abundant, easily mined natural resource of the area. Naturally broken rock the size of sand and gravel was dumped all over the Northeast landscape by the glaciers. As the glaciers advanced over the landscape, their vigorous scraping action incorporated boulders, gravel, sand, silt and clay from the underlying bedrock and already loose sediment into the moving ice. Each time the glaciers stopped moving forward or backward, melting ice deposited drift and till in front of and to the sides of the glacier, creating mounds (called moraines) of sand and gravel. Significant *deposits* of sand and gravel were produced by deltas formed by glacial streams and in valleys filled by retreating glaciers. Sand also accumulated in snake-like tunnels beneath the ice, in which sand was deposited by flowing subglacial streams; these sinuous deposits of sand are called eskers. Glacial sand and gravel are easily mined because the glacial deposits are all at the surface and there is little if any processing involved. Sand and gravel composed of chunks of limestone, dolostone, sandstone, metamorphic and igneous rocks are mostly used for construction purposes. Shale and siltstone, being softer rocks, are generally too weak for construction, and are more often used together with lime in making concrete.



see *Glaciers*, p.61,  
for more on glacial  
deposits.

