Mineral Resources of the Inland Basins: Region 2

Mineral Deposit Processes

The major mineral deposits of the Inland Basins region include sulfide and nonsulfide minerals associated with hydrothermal processes, and salt formed as sedimentary precipitates. Occurrences of lead and zinc deposits (often in association with barite and fluorite deposits) are widespread throughout much of the Appalachian Basin, but are larger and more abundant in the Valley and Ridge province, where thrust faults and other structures provided pathways for fluid migration and sites for ore deposit formation. The hydrothermal fluids that formed these deposits may have originated in the thrust sheets of the Acadian and Alleghanian mountain building events to the east. A vast reservoir of sedimentary rocks was deposited in the Inland Basins region, mostly in the Paleozoic inland sea. Extensive deposition of evaporite salts in the sallow sea at the northern end of the Appalachian Basin occurred during the Silurian, and locally at other times.

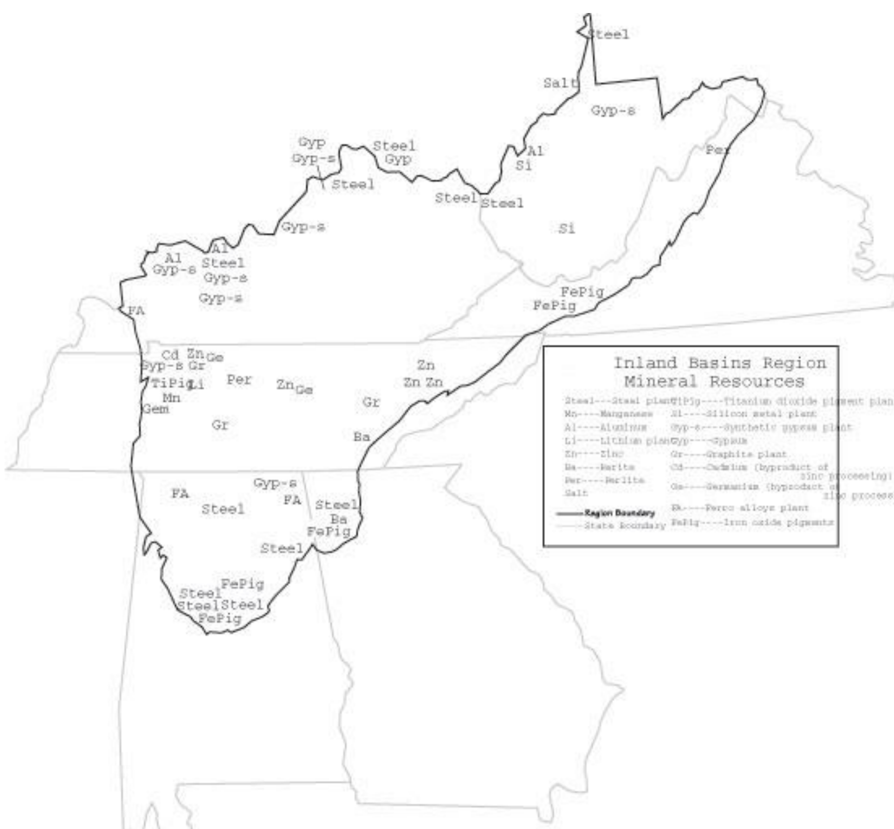

Figure 5.14: Principal current mineral-producing localities of the Inland Basins Region. Figure adapted from [1998 United States Geological Survey State Mineral Information].

Weathering and erosion have also been important processes in the formation of mineral deposits in the Appalachian Basin. Chemical weathering of limestone and dolostone have formed numerous small deposits of iron, manganese, and bauxite at the surface, and concentrated lower grade hydrothermal deposits of barite.

Metallic Mineral Deposits

Extensive deposits of lead, zinc, fluorite, and barite minerals occur in Cambrian and Ordovician dolostones along the eastern margin of the Valley and Ridge from south of Bethlehem, Pennsylvania, through western Virginia and eastern Tennessee, and into northern Georgia. Important mining districts include the Austinville-Ivanhoe District of Virginia and the Mascot-Jefferson District of Tennessee (Figure 5.15). The last of the Virginia mines closed in 1984, but mining continues in eastern Tennessee, and barite is still mined from the lower grade lead-zinc deposits of the Cartersville District in northern Georgia. These deposits vary widely in their relative proportions of lead and zinc sulfides, pyrite and chalcopyrite, fluorite and barite. They generally develop as a result of hydrothermal fluids migrating along zones of higher permeability, bedding, karst, fractures and faults.

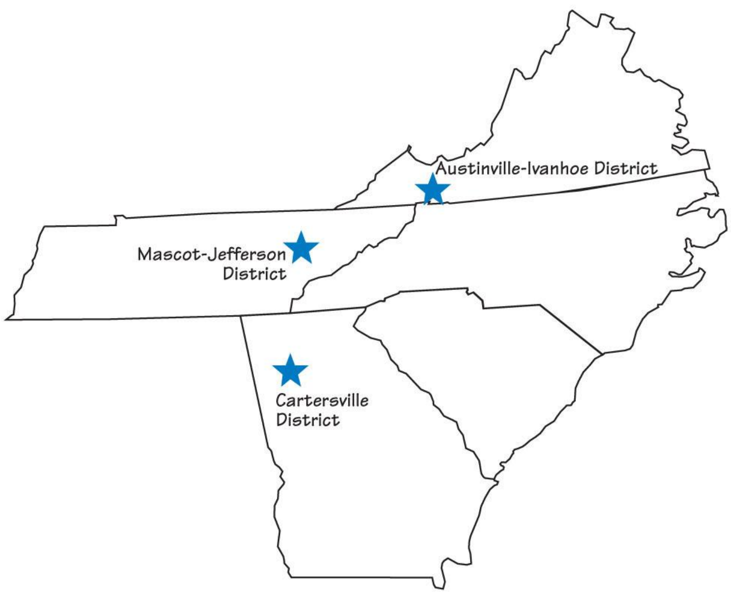

Figure 5.15: Significant lead, zinc, fluorite, and barite deposits are found in Virginia, Tennessee, and Georgia.

Historic Wythe County, VA, Mine

Production ended at the oldest continuously operating mines in the United States on December 31, 1981. New Jersey Zinc Company permanently closed the lead and zinc works in southern Wythe County, Virginia, ending a 225-year history that included a vital role in two early chapters in United States history.

The Wythe County lead mines were opened in 1756 by Colonel John Chiswell, a British officer who discovered the lead deposits while hiding in a cave near the New River to escape pursuing Indians. The mines were an important source of lead shot ammunition for the Colonial Army during the American Revolution. The workings were expanded from 1775-1781 to meet the growing demand of the Continental army.

The mines were also a critical resource for the Confederacy during the Civil War. Essential war mineral resources included salt, iron, niter (saltpeter), and lead to make bullets. Reports suggest that about 3,500,000 pounds of lead were produced at the Wythe County mines during the Civil War, amounting to one- third of the estimated 10,000,000 pounds of lead consumed by the entire Confederacy in the manufacture of 150,000,000 cartridges.

Widespread deposits of sedimentary iron in the Inland Basins region range in age from Cambrian to Pennsylvanian. The most extensive iron ore deposits in the Southeast are the middle Silurian Clinton Formation deposits and equivalents that extend along the eastern side of the Appalachian Basin from New York to Alabama (Figure 5.16). Iron weathered from the eroding Taconic Mountains was deposited in various forms along the edge of the ancient seaway to the west, and occurs as oxides, carbonates, and silicates in sandstones, shales, and limestones. Weathering increases the grade of the ores and makes them more easily mined. The Clinton iron ores are especially rich and thick near Birmingham, Alabama, where the dominant iron mineral is hematite.

Early Iron Furnaces

The first iron furnaces in the Southeast were built around 1765 in Virginia. Small furnaces appear in North Carolina in 1780, Tennessee and West Virginia in 1790, Kentucky in 1791, and in Alabama in 1815. The furnaces mined small iron deposits of various types locally, and obtained charcoal for fuel from the surrounding forests. The forges produced simple cast and wrought iron implements for local consumption.

Numerous small secondary iron deposits occur throughout the Inland Basins region. Most are the products of weathering, formed as iron oxide was concentrated as a residuum from carbonate rocks that were chemically weathered and eroded away. Some iron deposits are gossans, residual iron oxide deposits formed by the weathering of sulfide deposits at the surface. Small deposits of both types were mined in every state in the Southeast during the 1700s and 1800s to supply local forges that turned out small quantities of iron and steel for local markets.

Non-Metallic Mineral Deposits

Extensive evaporite deposits formed during the late Silurian in the shallow tropical sea at the northern end of the Appalachian Basin, and are present in the below the surface in northern West Virginia. Mississippian age halite deposits occur below the surface around Saltville, Virginia, where salt was first discovered in the Southern Appalachians in 1840 in a mine shaft at a depth of 215 feet.

Natural brines present as ancient seawater trapped in porous sedimentary rocks (aquifers) are present throughout the Inland Basins and contain in excess of 15% dissolved salts within 2000 feet of the surface throughout eastern Ohio, western West Virginia, and northeastern Kentucky. Rock salt is extracted by solution mining in the Saltville area of western Virginia. Although representing only a small fraction of total United States salt production, the proximity of salt, coal, and petroleum resources with good railroad and river access has resulted in the growth of an extensive chemical industry in West Virginia between Wheeling and Huntington along the Ohio River and in the Kanawha Valley.

Figure 5.16: The Clinton Iron Ore Formation extends through several Southeast states along the Appalachian Basin.

Kanawha Valley

Natural brines springs in the Kanawha Valley, near Charleston, West Virginia, formed salt licks that were extensively utilized by animals and later exploited by Native Americans, who boiled the brines to obtain salt. The Kanawha Licks near the town of Malden, West Virginia, became the center of a major colonial salt industry in the early 19th Century. Salt, a powerful antibacterial, was a critical commodity for curing butter and meats in the absence of refrigeration.

The Kanawha Valley salt industry reached a peak production of 3,224,786 bushels in 1846, and was one of the largest salt manufacturing centers in the United States. The Kanawha Valley was flooded in 1861 and severely damaged during the Civil War.

Demand for chemical products during World War I revitalized the Kanawha brine industry with the opening of the Warner-Klipstein Chemical Company plant in South Charleston in 1914 to produce chlorine and caustic acid. Now the Westvaco Chlorine Products Corporation, it is the largest chlorine producer in the world. Today West Virginia hosts three principal salt-producing companies: two in Marshall County and one in Tyler County. Most of the salt is consumed by a variety of chemical companies that have developed along the Kanawha River. Large reserves of subsurface halite remain.

Source: http://www.geology.teacherfriendlyguide.org/index.php/minerals-se/region-2-inland-basins

Picconi, J. E. 2003. The Teacher-Friendly Guide to the Geology of the Southeastern U.S. Paleontological Research Institution, Ithaca, NY.