INTRODUCTION

The term “Coal Measures” or “Pennsylvania Series” was introduced by Williams (1891, p. 83) in reference to the coal-bearing rocks in Pennsylvania. The Pennsylvanian was a subdivision of the Carboniferous System, defined by Conybeare and Phillips (1822) in England and Wales. Weller (1906) was the first to use “Pennsylvanian” in Illinois, although “Pennsylvanian,” “Coal Measures,” and “Upper Carboniferous” were used interchangeably in early reports. North American geologists gradually adopted the Pennsylvanian as a system, recognizing that Mississippian and Pennsylvanian rocks differ in fundamental ways and are separated by a regional unconformity. By international agreement, the Pennsylvanian was reclassified in 2004 as the Pennsylvanian Subsystem of the Carboniferous System (Heckel 2004).

The Pennsylvanian Subsystem in the United States commonly is divided into five series: Morrowan (oldest), Atokan, Desmoinesian, Missourian, and Virgilian (Figure 10-1). Also, the Pennsylvanian is divided into Lower (equivalent to Morrowan), Middle (Atokan and Desmoinesian), and Upper (Missourian and Virgilian) Series (Peppers 1996).

Pennsylvanian rocks contain the bituminous coal resources of Illinois, the largest of any state (Chapter 14, Coal). They also have yielded 13% of Illinois’ cumulative oil and gas production (Chapter 15, Oil and Gas) and are an important source of limestone and of clay and shale used in brick-making (Chapter 17, Industrial Minerals).

The Permian Period was named by British geologist R. I. Murchison in 1841. The period takes its name from the city of Perm near the Ural Mountains of Russia, near which rocks of this age are extensively exposed. Permian sedimentary rocks are widespread in the southern U.S. midcontinent, especially in west Texas, where the North American standard Permian section was assembled. The only known Permian rocks in Illinois are igneous rocks in the southern part of the state, but evidence suggests that sedimentary layers of this age formerly covered much of Illinois. The cyclic character of Permian strata, which is comparable to underlying Pennsylvanian rocks, is not consistent with deposition in a small basin (Kehn et al. 1982).

The Absaroka sequence was named for the Absaroka Mountains in Wyoming (Sloss et al. 1949). Originally the sequence included Pennsylvanian rocks, but the upper limit was not specified. Sloss (1963) defined the upper contact as the unconformity that underlies Middle Jurassic strata in the Rocky Mountains and Gulf Coast. The sequence is divided into Absaroka I, II, and III subsequences (Sloss 1988). The Absaroka I extends from latest Mississippian, approximately 330 million years before present, through Wolfcampian (Early Permian) time 268 million years ago. The rock record of the Absaroka sequence in Illinois is entirely Absaroka I, comprising Pennsylvanian sedimentary rocks and Lower Permian intrusive igneous rocks (Figure 10-1). This chapter covers Absaroka I only; Chapter 11 deals with Absaroka II and III and younger sequences identified by Sloss (1963).

GEOLOGICAL HISTORY

Near the end of Mississippian time, glaciation in the southern hemisphere caused the sea to withdraw from the Illinois Basin. Rivers eroded a series of deep, parallel, southwest-trending valleys into the exposed sea floor. The ancestral Rocky Mountain Orogeny commenced around the same time, having impacts as far east as Illinois (McBride and Nelson 1999). Many faults and folds developed in Illinois, strongly influencing sedimentation.

As the sea level rose in early Morrowan time, incised valleys of Illinois were drowned and filled with sediment. Initial sediments included large volumes of pebbly, quartz-rich sand carried by rivers from the northeastern United States and southeastern Canada. Apparently derived from older Paleozoic sedimentary rocks, these deposits constitute the Caseyville Formation (Nelson 1989). Sea level rose and fell repeatedly in concert with tectonic activity in Illinois, producing multiple episodes of valley cutting and filling.

By Atokan time, sediments had accumulated in most of Illinois, and the drowned-valley topography was gradually leveling. Precambrian crystalline rocks were being eroded in the northern and central Appalachian Mountains, supplying mica, feldspar, rock fragments, and clay to Illinois sediments. Peat-forming swamps, which developed along