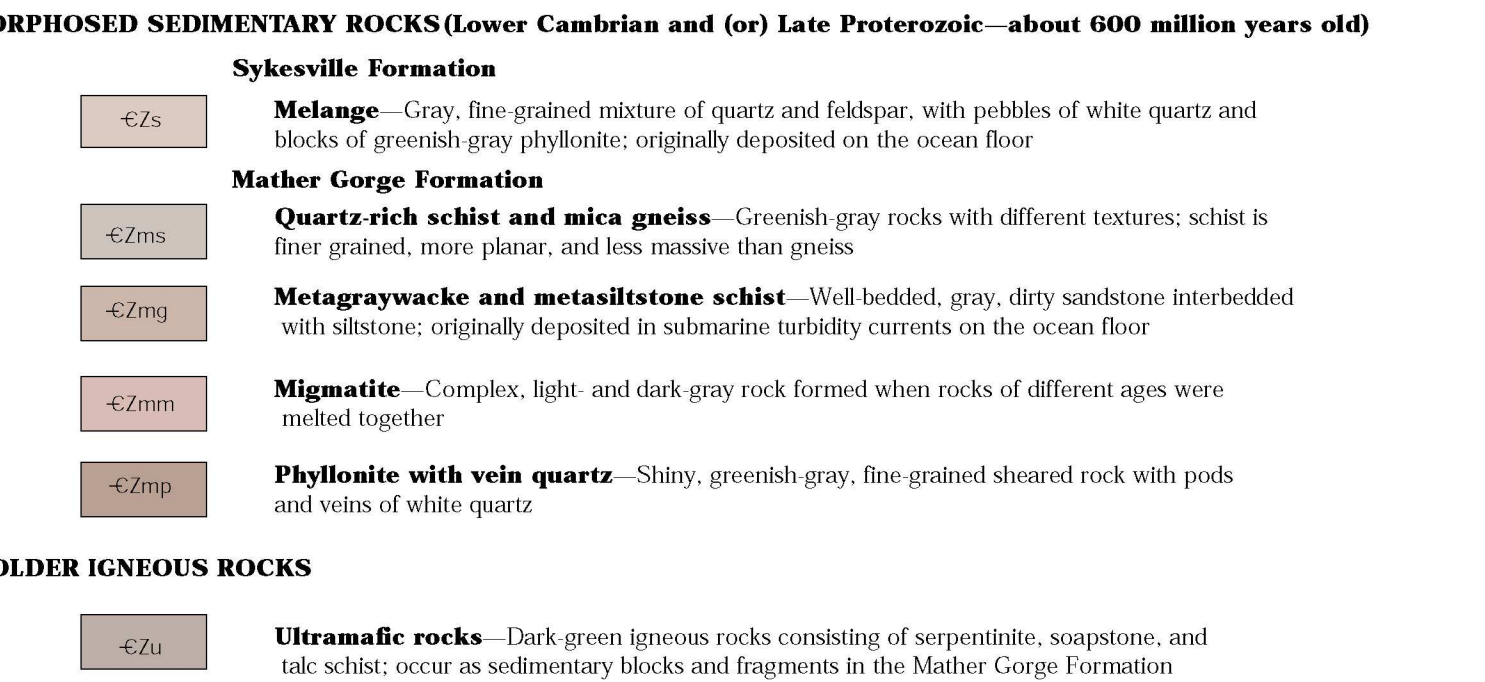
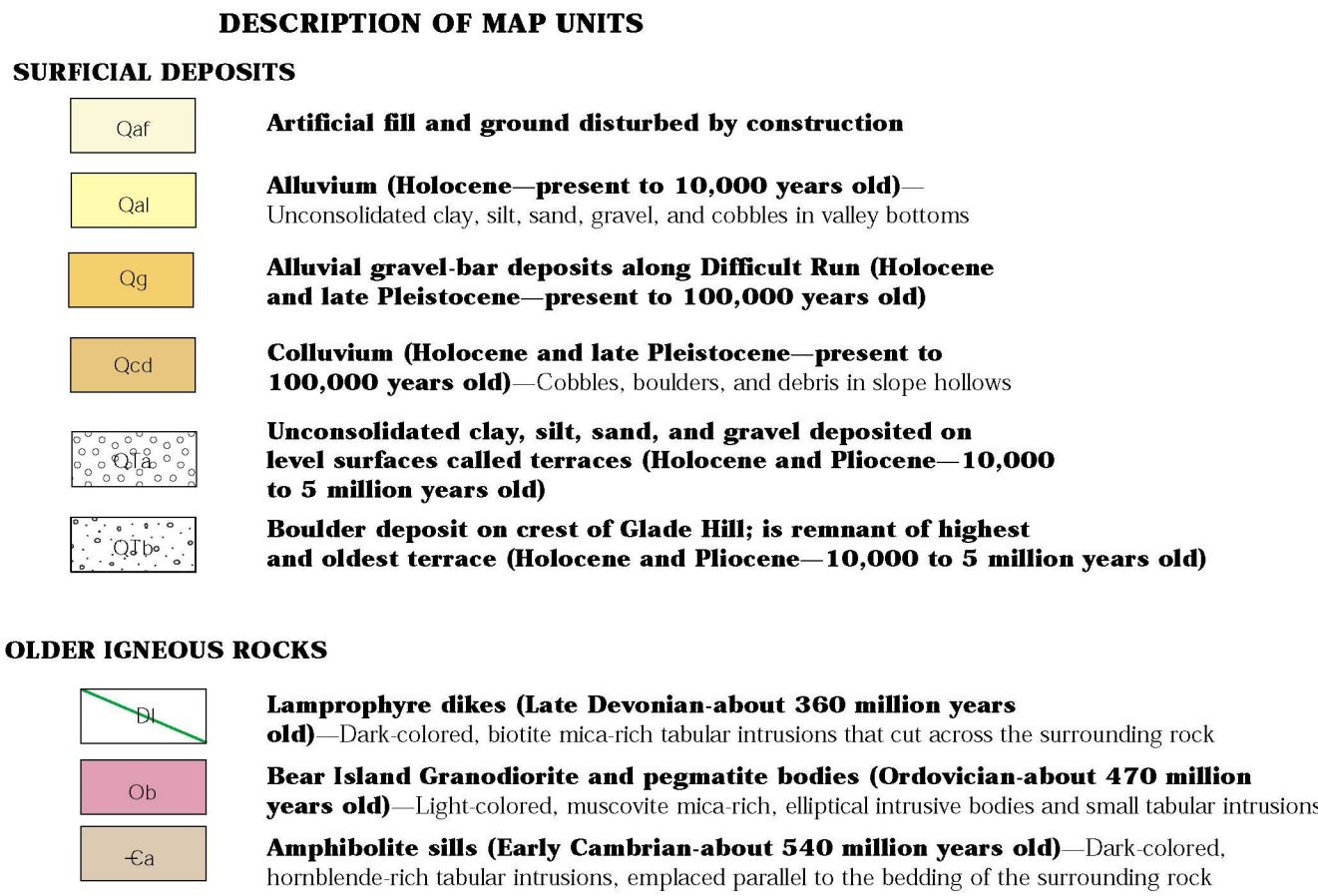
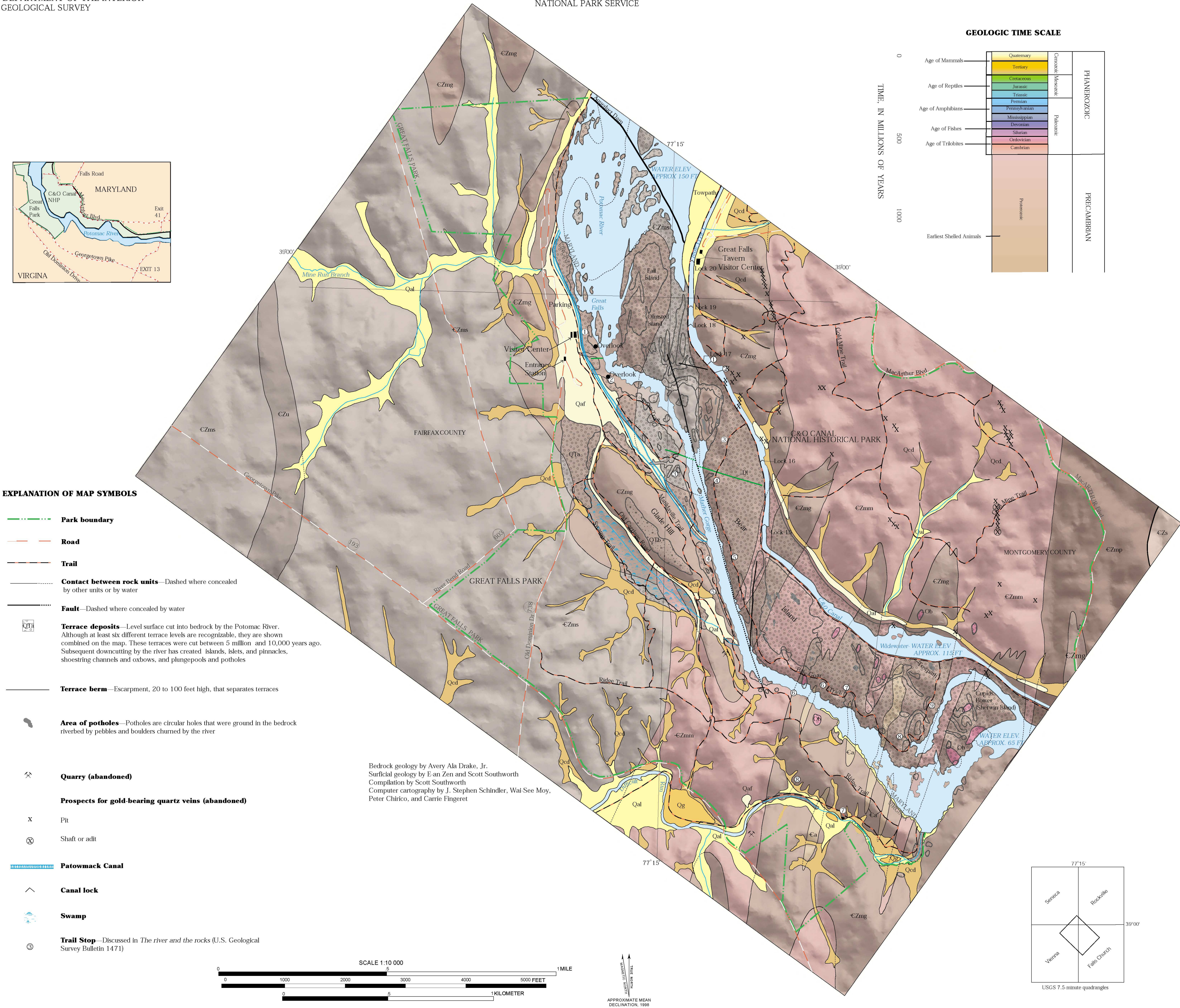




INTRODUCTION

This geologic map shows the types of rock and landforms of the Potomac River Gorge within the Piedmont physiographic province of the Central Appalachian region. The map was produced from information collected by geologists over a period of more than 25 years (Reed and Reed, 1969; Drake and Lee, 1989; Drake and Froelich, 1997; and Drake and others, 1999). The data were computerized to make a geographic information system (GIS) for the National Park Service and to provide a color map for park visitors. Readers are referred to *The River and the Rocks* (U.S. Geological Survey Bulletin 1471, by Reed and others, 1980) because it more fully describes the geology of the area.

BEDROCK GEOLOGY

Most of the metamorphosed sedimentary rocks of the area are named the Mather Gorge Formation, after the rocks exposed there. They lack fossils but are interpreted to be about 600 millions years old. These rocks were originally deposited as sand, silt, and mud in an ancient sea, called the Iapetus Ocean, which existed before the Atlantic Ocean. Large blocks and fragments eroded from an older igneous rock (map unit Czu) were mixed with the sediments. Igneous rocks—hot, molten rocks deep below the Earth's surface—were injected up into the sedimentary rocks at various times in the geologic past. These igneous rocks, and their times of emplacement, include amphibolite (about 540 million years ago), granodiorite and pegmatite (about 470 million years ago), and lamprophyre (about 360 million years ago).

The sedimentary rocks were changed by heat and pressure (metamorphosed) and deformed during several collisions of the Earth's continental plates that resulted in the formation of the Appalachian Mountains. Metamorphism changed the sedimentary and igneous rocks into schist and gneiss (map unit CZms) and migmatite (map unit CZmm). Hot solutions of silica were injected as veins of white quartz into the rocks, and crystals of muscovite (white mica), biotite (black mica), garnet, staurolite, and kyanite grew as the rocks cooled. Some of the vein quartz nearby in Maryland was extensively prospected and mined for glass from 1861 to 1951; note the abandoned prospect sites on the map. The metamorphosed rocks are tightly folded, they are well layered with mica-rich foliation planes, and locally they contain close spaced fractures.

LANDSCAPE EVOLUTION

The landscape of the area is mostly the result of erosion by the Potomac River during the past 5 million years. As the Potomac river flows to the southeast, it cuts obliquely across several types of north trending bedrock units. The river follows the trend of joints (cracks) and faults along the straight river course in Mather Gorge.

Level surfaces called terraces, which have been cut into bedrock at different elevations by the Potomac River, form conspicuous features of the landscape. The terraces are actually remnants of old flood plains of the downcutting Potomac. There are at least six recognizable terrace levels, but they are all shown combined in order to be more readable at the map scale. The highest and oldest terrace is on the crest of Glade Hill in Great Falls Park, where a deposit of river boulders of quartzite and diabase is found (unit QTb). The Great Falls Park entrance, parking lots, picnic area, visitor center, and Patowmack Canal are on the second highest and next oldest terrace. Here the Potomac River was downcutting into the bedrock. Glade Hill was an island. There are at least one more of our younger terrace levels within the gorge. Downcutting by the Potomac River into these terraces has created islands, islets, pinnacles, meandering channels, oxbows, plungepools, and potholes. The erosional features are best seen on Bear Island. The C&O Canal utilizes an abandoned channel of the Potomac River at Widewater that in part creates Bear Island. Alluvial stream deposits are best preserved along parts of Difficult Run, whereas most alluvial deposits along the Potomac River have been removed during floods. The bedrock terraces provide excellent exposures of Piedmont bedrock and the fascinating landforms eroded into them.

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