



# GEOFACTS No. 23

OHIO DEPARTMENT OF NATURAL RESOURCES • DIVISION OF GEOLOGICAL SURVEY

## A BRIEF SUMMARY OF THE GEOLOGIC HISTORY OF OHIO

GEOLOGIC PERIOD <sup>1</sup> (million years ago)	SETTING	LIFE FORMS	ROCKTYPES	ECONOMIC PRODUCTS
<b>Quaternary</b> 2.6 mya–Present	Two-thirds of Ohio was covered by mile-thick ice during glacial periods.	<ul style="list-style-type: none"> <li>• many large mammals such as mastodons, mammoths, giant beavers, and ground sloths, as well as modern plants and animals, including humans</li> </ul>	<ul style="list-style-type: none"> <li>• glacial till, clay, silt, sand, gravel</li> <li>• form the surface sediments in northern and western Ohio</li> </ul>	<ul style="list-style-type: none"> <li>• common clay products (clay)</li> <li>• material for road construction and cement (sand, gravel)</li> <li>• Sand and gravel are also important aquifers</li> </ul>
<b>Mesozoic &amp; Tertiary</b> 251–2.6 mya	Ohio was above sea level, and weathering erosion and nondeposition prevailed.	<ul style="list-style-type: none"> <li>• no known record, but dinosaurs probably roamed Ohio during the Mesozoic</li> </ul>		
<b>Permian</b> 299–251 mya	During early Permian time, southeastern Ohio was a coastal-plain swamp. Ohio lay about 5° north of the Equator. The swamp eventually was filled by influx of deltaic sand and mud. Later Permian time was characterized by uplift and erosion.	<ul style="list-style-type: none"> <li>• sparse freshwater fossils such as snails, clams, fishes</li> <li>• marine fossils rare</li> <li>• sparse land fossils include plants, amphibians, reptiles</li> </ul>	<ul style="list-style-type: none"> <li>• sandstone, shale, freshwater limestone, coal</li> <li>• form the surface rocks in southeasternmost Ohio</li> </ul>	<ul style="list-style-type: none"> <li>• crushed stone (limestone)</li> <li>• electric power (coal)</li> </ul>
<b>Pennsylvanian</b> 318–299 mya	Ohio in Pennsylvanian time was a relatively flat coastal-plain swamp in equatorial latitudes. Fluctuations in sea level resulted in alternating terrestrial, freshwater, and marine deposits.	<ul style="list-style-type: none"> <li>• land plants abundant</li> <li>• terrestrial and freshwater life included amphibians, reptiles, freshwater clams</li> <li>• marine life included crinoids, snails, cephalopods, brachiopods, fishes</li> <li>• trilobites rare</li> </ul>	<ul style="list-style-type: none"> <li>• sandstone, conglomerate, shale, clay, limestone, coal, flint, ironstone</li> <li>• form the surface rocks in eastern Ohio</li> </ul>	<ul style="list-style-type: none"> <li>• building stone, crushed stone for construction and industrial uses such as glass manufacturing, oil and gas (sandstone)</li> <li>• crushed stone for construction and cement (limestone)</li> <li>• pottery and common clay products (shale, clay)</li> <li>• electric power (coal)</li> <li>• during the 1800s Ohio was a major iron-producing state</li> </ul>
<b>Mississippian</b> 359–318 mya	During latest Devonian and early Mississippian time, dark organic muds gave way to fluvial and deltaic silts and sands. Ohio lay in equatorial latitudes. During late Mississippian time, a shallow sea deposited limy sediments. During latest Mississippian time the seas retreated, leaving a sparse rock record.	<ul style="list-style-type: none"> <li>• brachiopods, clams, crinoids, fishes</li> <li>• land plants increasingly abundant</li> </ul>	<ul style="list-style-type: none"> <li>• sandstone, siltstone, conglomerate, shale, limestone</li> <li>• form the surface rocks in northwestern and east-central Ohio</li> </ul>	<ul style="list-style-type: none"> <li>• building stone, crushed stone for construction and industrial uses, oil and gas (sandstone)</li> <li>• crushed stone for construction and cement (limestone)</li> <li>• common clay products (shale)</li> <li>• Ohio has been a major producer of building stone from the Mississippian Berea Sandstone for over 150 years</li> </ul>
<b>Devonian</b> 416–359 mya	Most of Ohio was dry land during early Devonian time, although the sea still covered eastern Ohio. Ohio was in equatorial latitudes. During Middle Devonian time, warm, shallow seas deposited limy sediments. Layers of muddy sediments and some volcanic ash during late Middle Devonian time signaled renewed volcanic activity and mountain building east of Ohio. During late Devonian time, the Ohio sea became stagnant; circulation was poor, and the water was generally anoxic (lacking oxygen). Thick layers of black, organic-rich, uranium-bearing mud were deposited in these “stinking seas.”	<ul style="list-style-type: none"> <li>• coral reefs, bryozoans, brachiopods, trilobites, cephalopods, clams, crinoids, ostracodes</li> <li>• first major appearance of sharks and bony fishes during Middle Devonian</li> <li>• true land plants appear</li> </ul>	<ul style="list-style-type: none"> <li>• limestone, dolomite, shale, sandstone</li> <li>• form the surface rocks in northwestern Ohio, through central Ohio, and along the Lake Erie shore</li> </ul>	<ul style="list-style-type: none"> <li>• crushed stone for construction and cement, aglime (limestone &amp; dolomite)</li> <li>• synfuels and natural gas (shale, sandstone, limestone)</li> </ul>

GEOLOGIC PERIOD <sup>1</sup> (million years ago)	SETTING	LIFE FORMS	ROCK TYPES	ECONOMIC PRODUCTS
<b>Silurian</b> 443–416 mya	At the beginning of Silurian time, Ohio was dry land subject to erosion. Then warm, shallow seas returned. Ohio lay 20° south of the Equator. Middle Silurian seas were deeper and covered Ohio; reef environments were common. Late Silurian seas were shallower and formed evaporite (salt-bearing) basins in northern Ohio.	<ul style="list-style-type: none"> <li>• coral reefs abundant, also echinoderms, clams, brachiopods, cephalopods</li> </ul>	<ul style="list-style-type: none"> <li>• limestone, dolomite, shale, gypsum</li> <li>• form the surface rocks in western Ohio</li> <li>• salt and sandstone (eastern Ohio) present in the subsurface</li> </ul>	<ul style="list-style-type: none"> <li>• crushed stone for construction and cement, aggregate, oil and gas (limestone, dolomite, sandstone)</li> <li>• road salt (salt)</li> <li>• wallboard (gypsum)</li> </ul>
<b>Ordovician</b> 488–443 mya	A warm, shallow sea (deeper in eastern Ohio) similar to the Bahamas covered Ohio, which lay 20° south of the Equator. The western part of Ohio, at times, emerged as low muddy islands. Limy sediments were dominant. Volcanic activity and mountain building to the east of Ohio produced periodic layers of ash over the entire state and muddy deltaic sediments in eastern Ohio. The sea deepened during later Ordovician time, covering all of the state. At the close of Ordovician time, continental glaciation in the southern hemisphere lowered sea level and the seas retreated.	<ul style="list-style-type: none"> <li>• bryozoans abundant, also brachiopods, cephalopods, trilobites, horn corals, snails, clams, echinoderms, graptolites</li> <li>• Ohio is world famous for its fossiliferous Ordovician rocks in the Cincinnati area</li> </ul>	<ul style="list-style-type: none"> <li>• limestone, shale</li> <li>• form the surface rocks in southwestern Ohio</li> <li>• dolomite in subsurface</li> </ul>	<ul style="list-style-type: none"> <li>• crushed stone (limestone)</li> <li>• oil and gas (limestone, shale)</li> <li>• in 1884 the first giant U.S. oil field was discovered in Ordovician rocks in northwestern Ohio</li> <li>• limestone in the Cincinnati area formerly was a source of building stone</li> </ul>
<b>Cambrian</b> 542–488 mya	Marine seas gradually flooded the Precambrian land surface and covered Ohio by late Cambrian time, initially depositing sands, then silts, muds, and limy muds. Ohio lay 10° south of the Equator. Toward the end of Cambrian time, limy sediments accumulated in a shallow marine sea in an arid climate.	<ul style="list-style-type: none"> <li>• marine life abundant, but few fossils known from Ohio because knowledge is limited to core samples</li> <li>• trilobites reached their peak diversity during the late Cambrian</li> </ul>	<ul style="list-style-type: none"> <li>• sandstone, shale, dolomite</li> <li>• present in subsurface only</li> </ul>	<ul style="list-style-type: none"> <li>• oil and gas (sandstone, dolomite)</li> </ul>
<b>Precambrian</b> 4.6 billion–542 mya	Between 1.4 and 990 million years ago, volcanic activity, crustal rifting, and filling of basins formed by rifting took place. Between 990 and 880 million years ago, a mountain range formed in eastern Ohio. Between 880 and 544 million years ago, these mountains were eroded, reducing the landscape to a gently rolling surface.	<ul style="list-style-type: none"> <li>• none known from Ohio</li> <li>• algae and lower invertebrates found in areas other than Ohio</li> </ul>	<ul style="list-style-type: none"> <li>• igneous, metamorphic, and metasedimentary rocks</li> <li>• present only at great depths—2,500 to 13,000 feet beneath the surface</li> </ul>	<ul style="list-style-type: none"> <li>• no current production</li> </ul>

<sup>1</sup>Time assignments are based on U.S. Geological Survey Fact Sheet 2010-3059, *Division of Geologic Time—Major Chronostratigraphic and Geochronologic Units*, 2010, available at <<http://pubs.usgs.gov/fs/2010/3059/>>.

