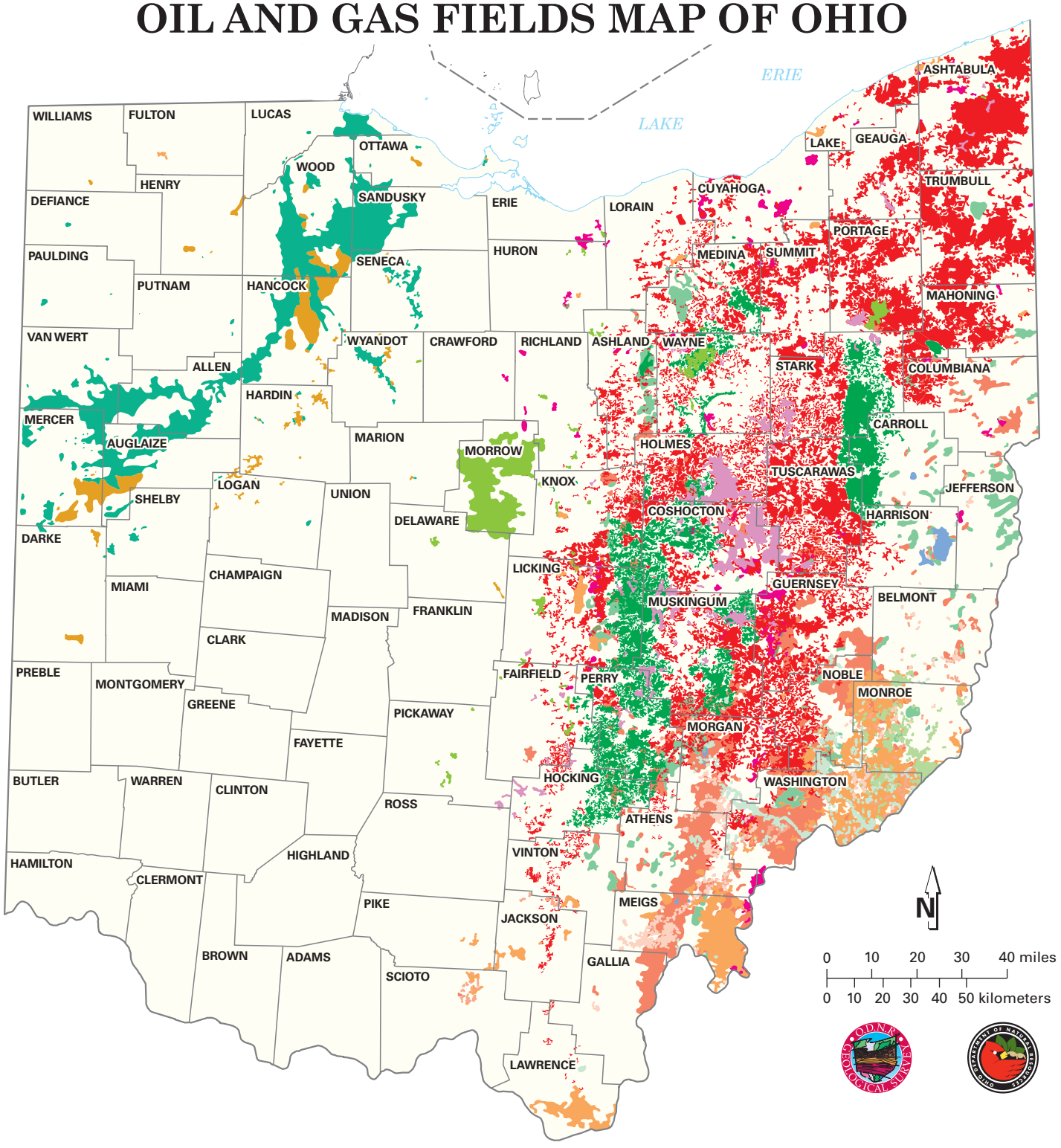
STATE OF OHIO • DEPARTMENT OF NATURAL RESOURCES • DIVISION OF GEOLOGICAL SURVEY

OIL AND GAS FIELDS MAP OF OHIO



EXPLANATION

OIL FIELD | GAS FIELD | COALBED METHANE

PRODUCING HORIZON(S) GROUPED BY STRATIGRAPHIC INTERVAL

- Pennsylvanian undifferentiated sandstones and coals
- Mississippian undifferentiated sandstones and Maxville Limestone
- Devonian Berea Sandstone and Cussewago Sandstone
- Devonian Ohio Shale and siltstones
- Silurian-Devonian "Big Lime" interval
- Silurian "Clinton/Medina" sandstone and "Packer Shell"
- Ordovician fractured shale, Trenton Limestone, Black River Group, and Wells Creek Formation
- Cambrian-Ordovician Knox Dolomite

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Ohio has a rich history of oil-and-gas production that began nearly 150 years ago. The first well drilled in the state for the specific purpose of producing petroleum was completed in Mecca Township of Trumbull County in late 1859, just a few months after Colonel Edwin Drake's famous oil well was completed near Titusville, Pennsylvania. Within a few years, several hundred wells had been "dug" in and around Mecca. This new industry attracted thousands of tourists to Mecca as well as many prospectors hoping to strike it rich. Through the years, this scenario would often be repeated. As oilmen made discoveries, existing towns swelled, new towns sprang up overnight, and fortunes were quickly made and lost. Communities that prospered during the height of production commonly fell on hard times when the wells eventually dried up. Findlay (Hancock County), Lima (Allen County), Macksburg (Washington County), and Toboso (Licking County) are just a few of many Ohio towns that experienced this cycle. Most boomtowns would weather the collapse of the oil-and-gas industry in their communities and go on to prosper through the pursuit of new economic opportunities, while a few shrank to mere shadows of their former selves or vanished altogether. In any case, oil-and-gas production in Ohio, like canal building, steel production, and manufacturing, has left an indelible mark on the development of the state.

The commercial discovery of oil and gas in northwestern Ohio in 1884 initiated a 20-year oil-and-gas boom that would be responsible for the growth of many towns and cities in that portion of the state. Production was from the Trenton Limestone in the Lima-Indiana oil-and-gas fields. The Ohio portion of this trend, which extends as a broad arc across Lucas, Wood, Hancock, Allen, and Van Wert Counties and into northeastern Indiana, produced more than 380 million barrels (BBL) of oil and approximately 2 trillion cubic feet (CF) of gas; more than 23 million BBL of oil were produced in 1896 alone. Ohio was the leading oil-producing state in the nation from 1895 to 1903.

While Ohio oil-and-gas production has never again reached the levels attained in 1896, petroleum producers have worked continuously since that time to steadily identify and develop oil-and-gas resources across Ohio. To date, more than 220,000 productive oil-and-gas wells have been drilled in the state, more than 60,000 of which are presently in operation. Most producing wells in the state are referred to as "stripper" wells—meaning they produce less than 10 BBL of oil (or 56,000 CF of natural gas) per day, although some highly productive wells are still found and developed. Cumulatively, Ohio's petroleum industry has produced more than 1 billion BBL of oil and 9 trillion CF of natural gas since 1860.

Commercial quantities of oil and gas have been found in 69 of Ohio's 88 counties; however, most current production is from the eastern third of the state. Historically, oil and gas have been produced from more than 30 individual geologic formations (primarily limestone, dolomite, shale, and sandstone) ranging in age from Late Cambrian (488 million years before present [YBP]) through Late Pennsylvanian (299 million YBP), and at depths from as shallow as 50 feet to as deep as 10,300 feet.

Oil and natural gas are generally believed to have formed through geochemical alteration of decayed organic remains (mostly plant life and marine organisms) that have been deeply buried and subjected to high temperatures and pressures. Once formed, these hydrocarbons commonly migrate with other formation fluids (i.e., brine or salt water) through fractures and voids in bedrock until trapped or until escaping to the surface as a natural seep. It is the trapped occurrences of hydrocarbons that energy companies seek and produce.

Hydrocarbons, being lighter than water, float on top of formation fluids and occasionally accumulate in *structural traps,* such as the higher portions of deeply buried domal or anticlinal structures and the upper margins of sealed fault systems. In other instances, hydrocarbons occasionally accumulate in *stratigraphic traps* where rock strata laterally transition from a porous and permeable state to a nonporous or impermeable state. Most of Ohio's oil-and-gas resources are produced from stratigraphic traps, although a significant amount of resources also are produced from structural traps.

A good example of structural trapping can be seen on the map in northwestern Ohio where the large north–south-oriented oil fields of Wood County follow the trend of the Bowling Green Fault system and the northwest–southeast-oriented fields of Wyandot County follow the trend of the Outlet Fault system. Within these fault systems, tectonic forces have fractured and displaced the Ordovician-age (444–488 million YBP) Trenton Limestone, thereby allowing hydrocarbons to migrate along fractures and accumulate where displaced and overlying impermeable rocks prevented further migration.

An example of a large stratigraphic trap system can be seen on the map in northeastern Ohio where a series of "Clinton" sandstone fields extend from Ashtabula County to Wayne County, and then southward to the Hocking County area. These fields represent an area where the reservoir rock, the Silurian-age (416–444 million YBP) "Clinton"/Medina Sandstones transitions from a relatively porous sandstone in the east-southeast to a nonporous dolomite and shale to the west-northwest. Hydrocarbons migrating upward and westward out of the Appalachian Basin have accumulated along this trend and are a very attractive exploration target.

Recently, the application of horizontal drilling combined with multistage hydraulic fracturing has resulted in a drilling boom for unconventional gas and oil resources in the Ordovician-age Utica-Point Pleasant interval. In Ohio, the first producing Utica-Point Pleasant well was drilled in 2011 and currently there are approximately 925 wells drilled to this prolific oil-and-gas producing horizon. For more information, visit the Division of Geological Survey website at **www.OhioGeology.com**.

MAP SOURCE

This is a page-size version of Division of Geological Survey Map PG-1: *Oil and Gas Fields Map of Ohio*. This map, and its associated Geographic Information System (GIS) and database files, replace the Division's 1996-vintage *Ohio Oil and Gas Fields Map Series* (released as Digital Chart and Map Series 13 through 21). Earlier Ohio oil-and-gas-fields maps also were published by the Division in 1888, 1909, 1928, 1948, 1953, 1960, 1964, and 1974. Map PG-1 is the first digital oil-and-gas-fields map of Ohio to have unique field identifiers and a summary database linked with the digitized boundaries. The conversion into the GIS-based PG-1 map and database allows easier access to this digital compilation and most importantly, allows the oil-and-gas-fields maps and data to be readily related to other geologic and geographic GIS layers. Creation of Map PG-1 and its database was accomplished in part through work performed under the following USDOE-funded cooperative agreements: the Appalachian Basin Gas Atlas project, the TORIS (Tertiary Oil Recovery Information System) project, and the Midcontinent Interactive Digital Carbon Atlas and Relational DataBase (MIDCARB) project.