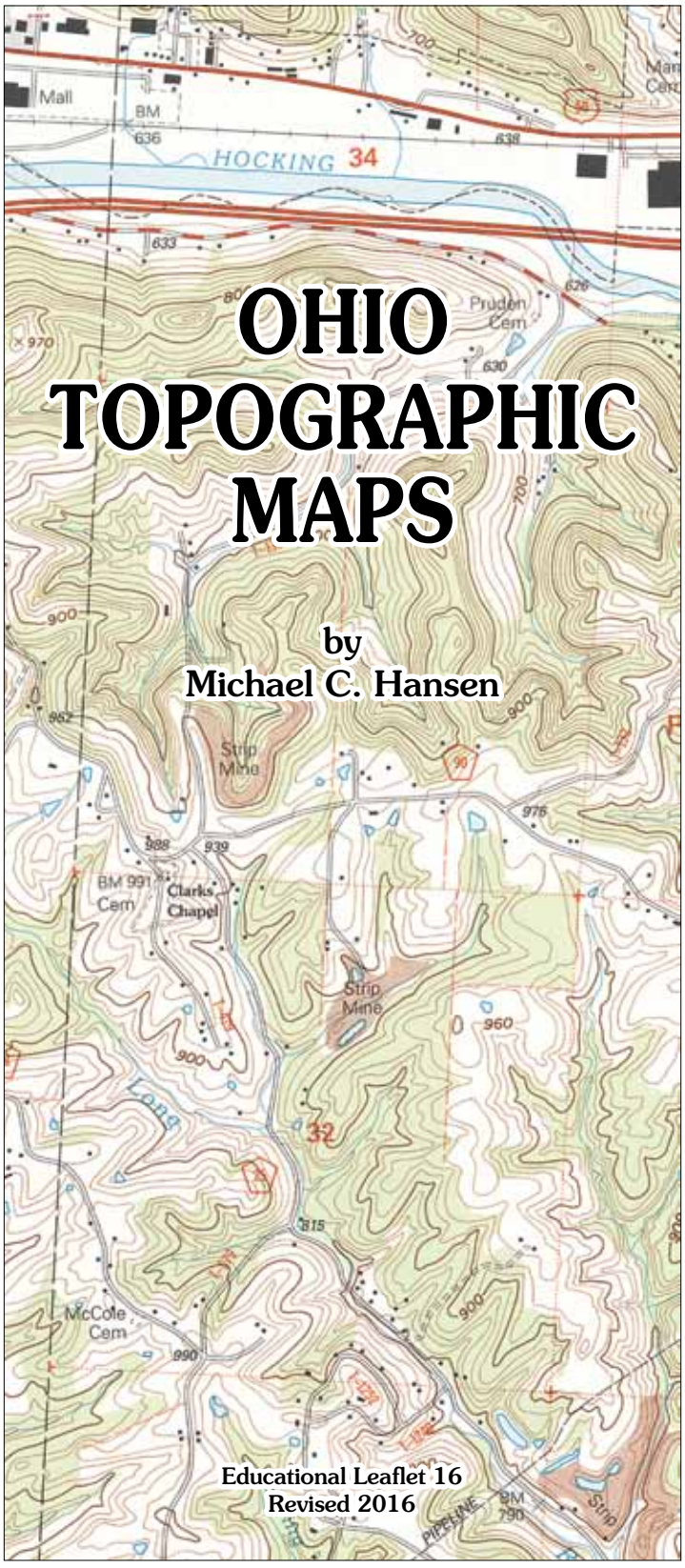


OHIO TOPOGRAPHIC MAPS

Topographic maps show the shape and elevation of the land surface by means of contour lines. They also show political boundaries; cultural features, such as roads, railroads, buildings, gravel pits, strip mines, and quarries; and natural features, such as streams, lakes, and vegetational cover. Topographic maps are useful, and indeed vital, for many businesses and industries; planners; and outdoor enthusiasts, including fishermen, boaters, hunters, campers, and hikers.

Topographic maps have been published by the U.S. Geological Survey (USGS) for most areas of the United States. Topographic maps (commonly called *topo maps* or *topo sheets*) for Ohio are produced in cooperation with state agencies, including the Ohio Department of Natural Resources (ODNR) and the Ohio Department of Transportation.

Ohio was one of 10 states that initiated a topographic mapping program with the USGS in 1902. By 1918, this program had been completed in the state; Ohio was the first state to have complete map coverage at a scale of 1:62,500 (15-minute quadrangles), or 1 inch equals 1 mile. By the 1950s, it was apparent that updated, large-scale topographic maps of the state were necessary to meet the needs of business, industry, transportation, recreation, and many other users. In 1958, the State of Ohio entered into a cooperative financial agreement with the USGS to map the state at a scale of 1:24,000 (7.5-minute quadrangles), or 1 inch equals 2,000 feet. By 1964, all 788 quadrangles for Ohio had been mapped. Ohio became the first state in the nation to have complete map coverage at the new scale.

SCALE

Maps are small, convenient portraits of comparatively large areas of Earth's surface. They are drawn so that a unit of measurement, such as an inch, on the map represents a certain number of inches on the ground. This relationship is commonly expressed as a ratio, such as 1:500,000, which means that one inch on the map represents 500,000 inches (about 8 miles) on the ground. The first number in this ratio is always 1; however, the second number depends on the map scale. The larger the second number, the smaller the scale of the map; that is, maps that show large areas of Earth's surface are small-scale maps, and those

that show comparatively small areas are large-scale maps. Each map has bar scales (generally at the bottom of the map) that show the map distance in miles, feet, meters, and kilometers.

The most common scales in use for Ohio topographic maps are 1:24,000; 1:62,500; 1:100,000; 1:250,000; and 1:500,000. Of these maps, the large-scale 1:24,000 (7.5-minute) maps are by far the most popular. Each map depicts an area of the state that represents 7.5 minutes of longitude and 7.5 minutes of latitude, or about 6.5 miles by about 8.7 miles (a total area of about 56 square miles). At this scale, 1 inch on the map represents 2,000 feet on the ground. Because they have four sides, the maps are referred to as *quadrangles*.

Each 7.5-minute quadrangle map has a name, generally derived from a prominent town or feature within the quadrangle. The quadrangle name is printed in the upper right and lower right corners of the map. Names of adjacent quadrangles are given in parentheses on each side and at each corner of the map. Newer maps show the names of adjacent quadrangles in a diagram at the bottom of the map. The index map on the reverse of this brochure shows the names and locations of the 7.5-minute quadrangles in Ohio.

Topographic maps of the 15-minute series, at a scale of 1:62,500 (1 inch equals 1 mile), were widely used in the first half of the twentieth century. The 15-minute maps are now out of print, although copies may be examined in the offices of the ODNR Division of Geological Survey; photographic copies of these maps can be purchased from the division. The 15-minute quadrangles are primarily of historical interest because they show natural and cultural features as they were at the time each map was prepared, mostly in the early 1900s, including locations of many towns, schools, roads, and railroads that no longer exist.

The ODNR Division of Geological Survey offers a topographic map at a scale of 1:62,500 for each of Ohio's 88 counties. These maps were prepared by photographically reducing and compositing the appropriate 1:24,000-scale quadrangle maps that cover each county. The maps, therefore, depict the detail available on the 1:24,000 maps but present it at a smaller scale. The 1:62,500 maps are reproduced as black-line paper copies and are available only from the ODNR Division of Geological Survey.

Smaller-scale topographic maps are becoming very popular. Maps in the 1:100,000 series are metric—elevations and contours are in meters, rather than feet. The 1:100,000-scale (1 centimeter equals 1 kilometer) maps cover 30 minutes of latitude by 60 minutes (1°) of longitude. These maps show less detail than do the 7.5-minute quadrangles but cover a larger (about 32 times as much) area. These maps, of which there are 34 for the state, are prepared and published by the USGS.

The 1:250,000-scale (1 inch equals about 4 miles) maps, of which there are 12 for Ohio, are regional maps published by the USGS. They show less detail than do the larger-scale maps but give an overview of a large, multicounty area. Each map covers 1° of latitude and 2° of longitude. Maps in this series are in English units (feet and miles), except for the Clarksburg quadrangle, which is metric.

The smallest-scale topographic map of Ohio is at a scale of 1:500,000 (1 inch equals about 8 miles) and shows the generalized topography and cultural features of the entire state. This map is particularly useful for a comparative overview of the various regions of the state. A shaded relief map of Ohio at 1:500,000 scale also is available; this map shows the variation in topography by means of shading as well as contour lines. Both 1:500,000-scale maps are published by the USGS.

ELEVATION, RELIEF, AND CONTOURS

Elevation refers to height of the land surface above sea level, whereas *relief* refers to height of a location above the surrounding land surface. The highest elevation in Ohio is 1,549 feet at Campbell Hill near Bellefontaine in Logan County; however, the relief in this area is only about 200 feet. The greatest relief, but not the highest elevation, is in Monroe County in southeastern Ohio, where hilltops rise some 400 feet above the surrounding valley bottoms.

Precise elevations of points are shown on topographic maps by *benchmarks*, which are designated by the letters BM, the symbol x, or a triangle and a number representing the elevation of the point in feet (or meters) above sea level. A benchmark is a precisely surveyed spot, marked on the ground by a round, brass plate set in concrete, that is of vital importance to surveyors and should never be destroyed or damaged. Measured elevations of many road intersections also are shown on the maps.

Relief, or the shape of the land surface, is three dimensional but is shown on a two-dimensional topographic map by means of *contour lines*, which are printed in brown. Each contour line connects points of equal elevation and, therefore, follows the shape of the land surface. The spacing between lines, or difference in elevation, is known as the *contour interval*. In Ohio, contour intervals for 7.5-minute quadrangle maps range from 5 feet in relatively flat areas of low relief, such as parts of northwestern Ohio, to 20 feet in hilly areas of high relief, such as in southeastern Ohio. Widely spaced contour lines indicate a relatively flat surface, whereas closely spaced lines indicate a steep slope or even a vertical cliff. Every fifth contour line is an *index contour*

and is printed as a heavier line that has the elevation inscribed on it. The contour interval is always given at the bottom center of each map.

COORDINATE SYSTEMS

Latitude and Longitude

A coordinate system provides a means of locating a point on Earth's surface. The best known and most commonly used system of reference coordinates is latitude and longitude. *Lines of longitude* (or *meridians*) are a series of circles around Earth that pass through the North and South Poles. The zero meridian, known as the *prime meridian*, is, by international agreement in 1884, the meridian that passes through Greenwich, England. There are 360 meridians, each separated by 1° of longitude. The 180° meridian is known as the International Date Line. Because meridian lines converge toward the poles and diverge toward the Equator, the distance between meridians is greatest at the Equator. Ohio lies between 80° and 85° west longitude.

Lines drawn parallel to the Equator are known as *lines of latitude*. There are 90 lines of latitude, each separated by 1°, in each hemisphere (north and south). The Equator is at 0° latitude and the poles are at 90° north or south latitude. Ohio lies between 38° and 42° north latitude.

To achieve more precise locations, each degree of latitude or longitude can be subdivided into 60 minutes, abbreviated by the prime symbol (′), and each minute can be subdivided into 60 seconds, abbreviated by the double prime symbol (″). For latitude, each degree measures about 69.2 miles, each minute about 1.15 miles, and each second about 101 feet. These same distances apply to degrees of longitude at the Equator but decrease toward the poles because meridians converge toward the poles. For example, the distance between meridians at 40° north latitude, which passes through central Ohio, is 53.1 miles.

Latitude and longitude numbers are shown at each corner of a topographic map, and one or more subdivisions are shown between corners as black tick marks along the margins of the map, as well as by crosshairs (+) within the map. Any point on a map can be located by a unique set of latitude and longitude coordinates. For example, the Ohio Statehouse in downtown Columbus is at 39°57′41″ north latitude, 82°59′57″ west longitude.

Township and Range

The township-and-range coordinate system is a grid of perpendicular lines. The basic unit is the *section*. In the standard system, a section is a square, 1 mile on each side (1 square mile or 640 acres), and there are 36 sections, six on each side, in a township. East–west boundary lines are called *township lines* and north–south boundary lines are called *range lines*. Section lines are printed in red on the 7.5-minute quadrangle maps. Township lines are designated by their positions north or south of a base line, and range lines are designated by their positions east or west of a meridian. For more precise locations, sections can be divided into quarter sections, which in turn can be subdivided into additional quarter sections. For example, a map location may be assigned coordinates of SE$^1/_4$ NE$^1/_4$ sec. 5, T 4 S, R 8 W.

The township-and-range system (the national rectangular system) developed at the time of westward expansion after the American Revolution and became characteristic in states west of Ohio. Variations of this system, such as 5-mile-square townships, were used only in portions of Ohio, which was an experimental area for early surveying schemes. No other state has so many different kinds of original surveys!

Universal Transverse Mercator

The Universal Transverse Mercator (UTM) grid is a metric rectangular coordinate system adopted by the U.S. Army in 1947 for worldwide use on military maps. This system divides Earth into 60 numbered zones of 6° longitude each. South-to-north zones encompass 8° of latitude each and are designated by letters. These grid zones subdivide into squares that measure 100,000 meters per side and then further divide into smaller and smaller grid squares in order to locate a place on Earth's surface. The UTM 1,000-meter grid ticks are printed in blue along the margins of 7.5-minute topographic maps published after 1957. The UTM 10,000-meter grid is printed in black on the 1:100,000 and 1:250,000 topographic maps.

Ohio Coordinate System

The state plane coordinate systems were established by the U.S. Coast and Geodetic Survey (now the National Geodetic Survey) as a network of rectangular coordinates that could be used by surveyors and others to precisely locate points for legal descriptions in property surveys. Many other agencies and businesses use this system, also known as the *x-y coordinate system*.

To maintain accuracy and compensate for Earth's curvature, Ohio is divided into two zones—a north zone and a south zone. The boundary dividing these zones follows county lines across the central part of the state. Coordinates are given as distances in feet from estab-

lished base lines. The position in an east–west direction is known as the *x-coordinate*; the position in a north–south direction is known as the *y-coordinate*. The 10,000-feet grid ticks for the Ohio Coordinate System are printed in black along the margins of the 7.5-minute topographic maps. The 1:100,000-scale maps have a 25,000-feet grid, and the 1:250,000-scale maps have a 100,000-feet grid.

MAGNETIC DECLINATION

Earth's magnetic pole does not always coincide precisely with its geographic pole. A compass will point to magnetic north, which may differ slightly from true, or geographic, north. Topographic quadrangle maps indicate the amount of variance, or *declination*, by means of a small diagram at the bottom margin of the map. The diagram indicates the amount of variance from true north as calculated for the center of the quadrangle.

Declinations in Ohio are always west of true north. The amount of declination constantly is changing by small amounts; therefore the magnetic declination printed at the bottom of the map is accurate only for the year noted. The National Geodetic Survey (**ngs.noaa.gov**) provides up-to-date declinations for particular areas.

MAP SYMBOLS

Standard symbols indicate a large variety of features, both cultural and natural, on topographic maps. In addition, groups of features are characterized by standard colors. Black is used for cultural features, such as civil boundaries, roads, and buildings; blue is used for bodies of water, such as lakes and rivers; brown is used for topography and disturbed areas, such as strip-mined lands; green is used for vegetation, such as woodlands, orchards, and vineyards; red is used for major highways and public land survey systems; pink (gray on newer maps) is used to designate urban areas; and purple is used to designate new features added to the map during revision by aerial photography, such as new roads, lakes, buildings, and surface mines.

A brochure produced by the USGS and available from the ODNR Division of Geological Survey lists all these symbols. The brochure also is available for free download from the USGS website at **pubs.usgs.gov/gip/TopographicMapSymbols**.

HOW TO OBTAIN TOPOGRAPHIC MAPS

The ODNR Division of Geological Survey is one of the nation's largest suppliers of USGS topographic maps but sells only those maps that cover Ohio or portions of the state. The following topographic maps are available from the ODNR Division of Geological Survey. To help locate the quadrangle name for the area of interest, please use the index map on the last page of this leaflet.

- 7.5-minute (1:24,000-scale) topographic quadrangles for Ohio.
- 30 x 60-minute (1:100,000-scale) topographic quadrangles for Ohio, **folded only**.
- 1° x 2° (1:250,000-scale) topographic maps for Ohio.
- Topographic map of Ohio (1:500,000 scale).
- Shaded relief map of Ohio (1:500,000 scale).

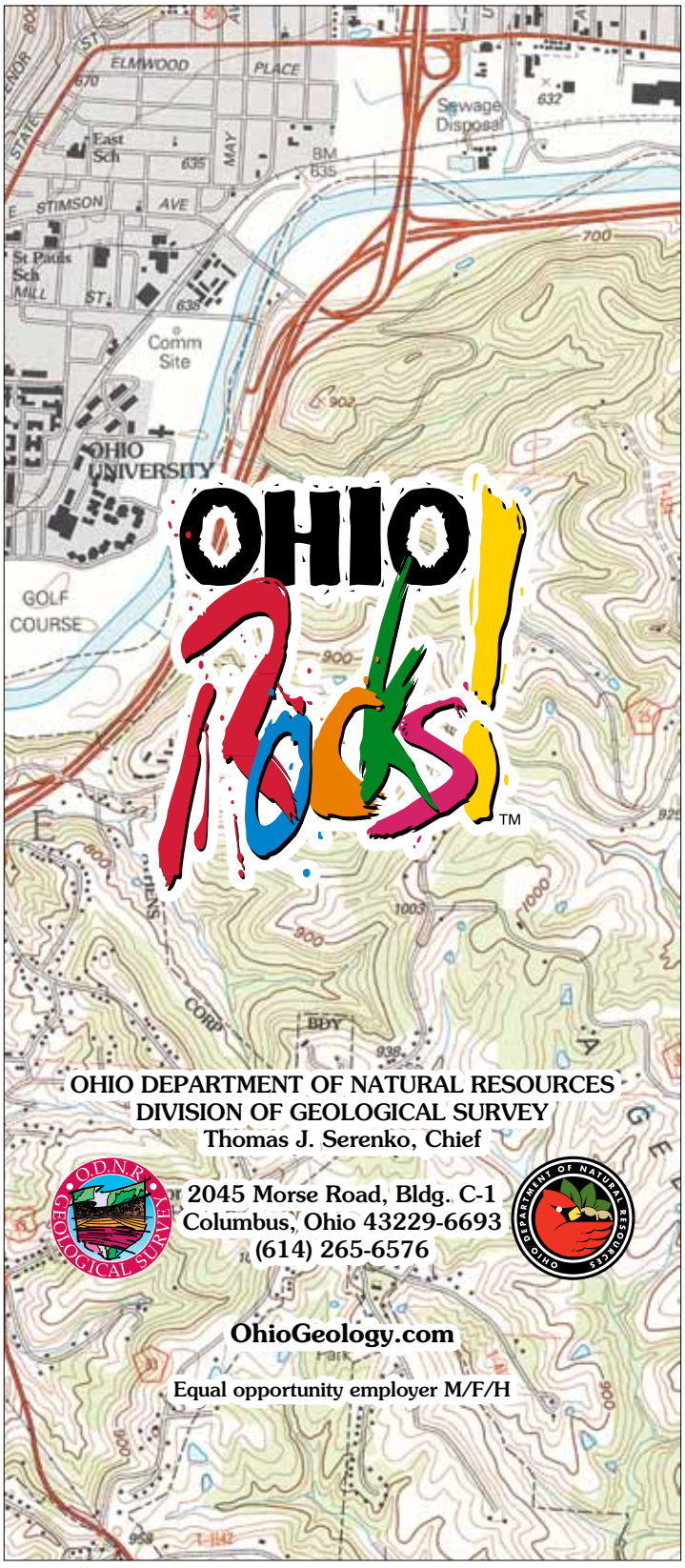
The ODNR Division of Geological Survey does not offer discounts on topographic map orders. State of Ohio sales tax will be included on orders delivered to an Ohio address. Shipping and handling charges will be applied to all mail orders. Orders for fewer than six maps will be sent folded in an envelope unless an additional fee is included for a mailing tube. Orders for more than six maps must be shipped in a mailing tube.

For pricing information and to order Ohio topographic maps, please contact:

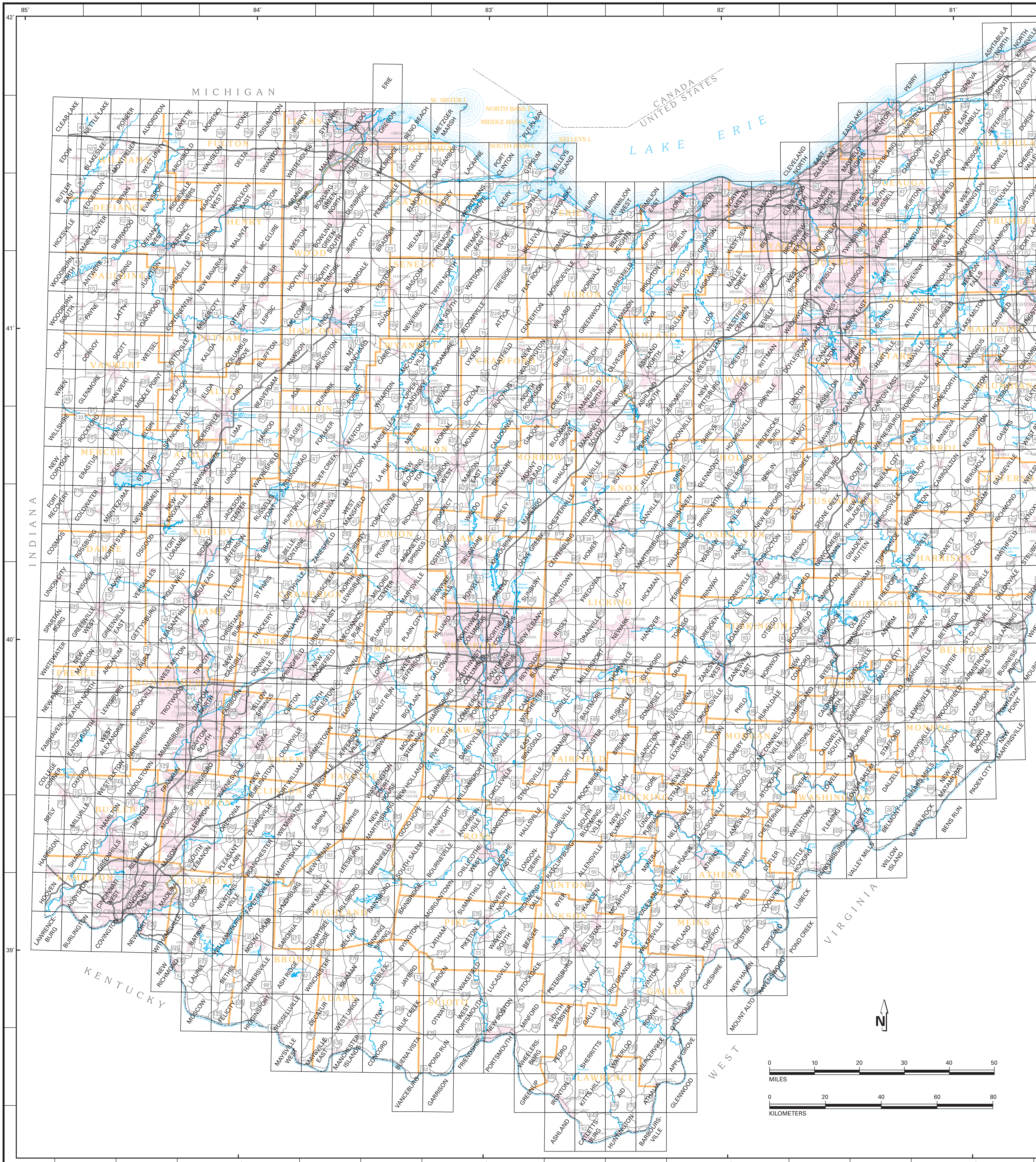
ODNR Division of Geological Survey
Geologic Records Center
2045 Morse Road, Bldg. C-1
Columbus, OH 43229-6693
Telephone: (614) 265-6576
Fax: (614) 447-1918
E-mail: geo.survey@dnr.state.oh.us
Website: **ohiogeology.com**

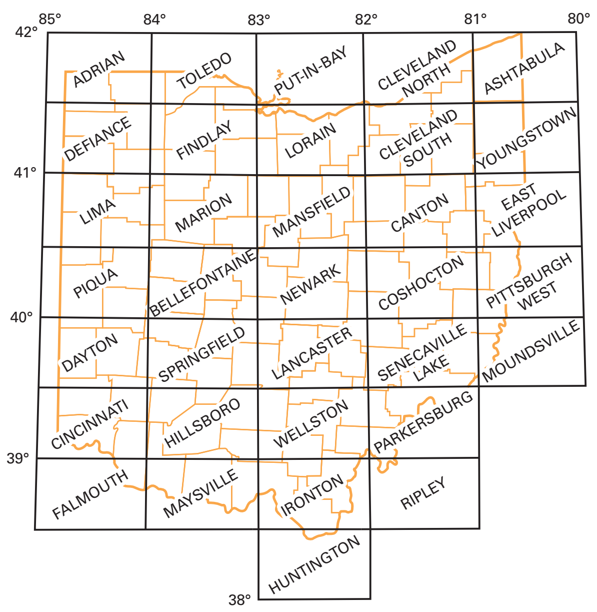
To obtain topographic maps for areas other than Ohio, please contact:

U.S. Geological Survey
Information Services
DFC Box 25286
Denver, CO 80225
Telephone: 1-888-ASK-USGS (1-888-275-8747)
Fax: (303) 202-4710
E-mail: usgsstore@usgs.gov
Website: **store.usgs.gov**

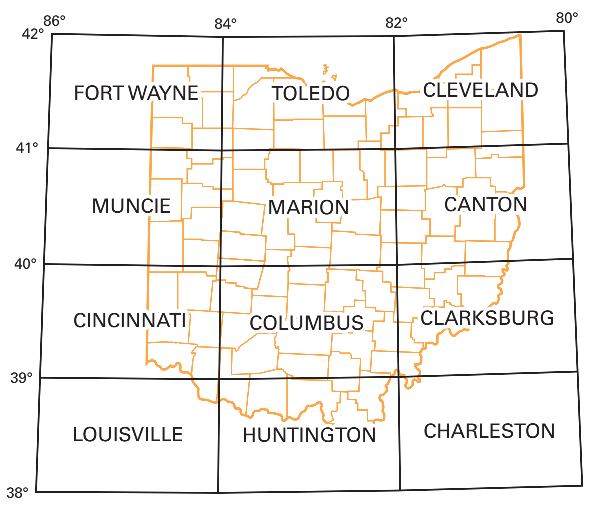


INDEX TO 7.5-MINUTE (1:24,000) TOPOGRAPHIC MAPS OF OHIO





Maps published at the scale of 1:100,000



Maps published at the scale of 1:250,000