GREAT MIAMI RIVER BASIN

The Miami River drains 5,385 square miles, of which 1,437 square miles are in Indiana, mainly in the Whitewater River Basin. The highest point in Ohio (1,550 feet above mean sea level) is in the Miami River drainage near Bellefontaine, and the lowest point in the state (about 430 feet above mean sea level, low water level in the Ohio River at the Indiana line) is just below the mouth of the Miami River.

Physiography

The entire basin is in the Till Plains. The level to gently rolling plain is broken by the wide valleys of the major streams. Toward Cincinnati the topography is hilly and more dissected, but is not as rugged as some other parts of southern and southeastern Ohio. The principal terrain features north of Middletown are the kames, eskers, and end moraines left by the glaciers.

Geology

The bedrock units exposed in the basin consist of limestone, dolomite, and shale of Ordovician and Silurian age. These strata are relatively dense and do not allow for the storage of large volumes of ground water. In the northern part of the basin, where the Silurian dolomites prevail, ground-water storage may influence streamflow to a minor degree.

The glacial drift is deep over the upper part of the basin, exceeding 300 feet in places, but thinning toward the south. The glaciers left extensive deposits of washed material, particularly outwash, valley-train deposits, kames, eskers, and kame moraines. Many deep preglacial or interglacial stream valleys are filled with permeable sands and gravels.

Soils

The soils in the basin are derived from glacial deposits of both early and late Wisconsin age. Miamian, Celina, Crosby, and Kokomo are the dominant soils of the late Wisconsin till area, and Russell, Xenia, and Fincastle are the principal soils of the early Wisconsin area. Classification of these soils depends on the drainage condition under which they developed. The less well-drained soils are relatively impermeable. Rather extensive terrace and alluvial soils occur, generally with good drainage and high permeability. Eldean, Ockley, and associated soils are prevalent on the terraces. Genesee soils are the dominant alluvial soils.

Water Development

Flood-control works of the Miami Conservancy District include five detention dams (dry reservoirs except during flood periods) that have automatic outlets. The dams provide flood protection for Dayton and other cities along the Miami River. In 1972, the Corps of Engineers completed Buck Creek Reservoir on Buck Creek at Springfield.

The City of Dayton obtains its water supply from large well fields along the Miami River and Mad River.

Flow Characteristics

The amount of ground-water storage, the controlling factor influencing the low-flow characteristics of streams, is greatest in the upper part of the Miami River Basin, and diminishes toward the south. It is of interest to note that as early as 1896, a geologist with the U. S. Geological Survey (Leverett) recognized the influence of ground-water discharge on streamflow. Leverett states (U. S. Geological Survey, Monogram 41, 1902) that "The streams in this basin (Miami River Basin) seldom reach a very low stage in seasons of drouth, for the valleys are usually filled with gravelly or sandy deposits which furnish strong springs. Even in the small tributaries, water bearing beds outcrop along the banks or bluffs."

Above Dayton three principal streams, Stillwater River, Miami River, and Mad River, all of which converge at Dayton to form the main valley, drain the basin. Of the three branches, Stillwater River has the lowest index of dry-weather flow and Mad River the highest. Throughout most of its course, Stillwater River follows a preglacial valley containing moderately permeable outwash deposits. Above Covington the Stillwater lies between two moraines, and although it flows through a till plain, its tributaries extend into the morainal areas to the north and south. The morainal material is largely till but sufficiently extensive sand and gravel deposits are present to support the fairly good sustained flow in the Stillwater River.

The effects of morainal deposits are clearly shown on Greenville Creek. This stream is of ice-front origin and parallels the southern edge of the Union Moraine from Covington to the Indiana line. The dry-weather flow index at Bradford is double that of the Stillwater River above the mouth of Greenville Creek.

Below Covington the chief source of the sustained flow in the Stillwater River is the outwash and valley train deposits in the valley. Ground-water contribution from the limestone and dolomite that form the valley walls is relatively small.
Above Dayton the sustained flow in the Miami River is relatively high. With the exception of a short reach above Piqua, the channel is cut into valley fill of glacial origin. At the col above Piqua, the channel is cut into the bedrock. The sustained flow is maintained largely from ground-water flow originating in the extensive kame moraine, end moraine, and kame terrace deposits above Quincy in Logan County. Downstream from Piqua the chief source is form high-level terrace deposits.

The tributary, Loramie Creek, has a poor sustained flow. The area drained is till plain in which most of the surface materials are dense and impermeable. It is believed that Loramie Reservoir has little effect on the flow of Loramie Creek. The same holds true for Indian Lake at the head of the Miami River.

The greatest contribution to the sustained flow of the Miami River is received from the Mad River. The Mad River occupies a broad trough-like valley of preglacial and interglacial origin and most of its course lies between the morainal ridges deposited by the Miami and Scioto lobes of the Wisconsin glacier. The surface material in the interlobate area consists of extensive permeable drift such as kames, kame terraces and

end moraines accompanied by high-level outwash in the uplands and valley train in the main valleys. At no other place in the state is there such an accumulation of permeable material and, as a result, the Mad River has some of the highest median- and low-flow indices of all the streams in Ohio. Similar conditions prevail in the area drained by Buck Creek and Beaver Creek although glacial drift in this area is less gravelly in nature and tends to be more dominantly till. Regional discharge from limestone contributes some ground water to sustain base flows of the Mad River.

Analyses of the gaging records for the Mad River show that the greatest influx of ground water occurs between Urbana and Springfield. This is due mainly to flow from Buck Creek and partly from greater ground-water influx along the river between Urbana and Springfield. The Mad River (similar to the Miami River at Piqua) has a short reach where it is shallow to limestone just west of Springfield. Between Springfield and Dayton there is a decrease in the index of flow. Miscellaneous discharge measurements made in this area in 1948 revealed that many of the tributary streams are dry during dryweather periods.

From Dayton to Hamilton there is a general decrease in the dry-weather flow indices of the Miami River except at Miamisburg where the effects of municipal and industrial wastewater return flows from Dayton are noticeable. Municipal and industrial water supplies are derived from gravel deposits along the Miami River and Mad River in Dayton and discharged as wastewater upstream of the Miamisburg gage. Part of the water supply is diverted to the Little Miami River through the wastewater system. Tributaries such as Wolf Creek and Twin Creek have moderate sustained flows and tend to maintain the low flow in the Miami River.

Figure 53: Great Miami River Watershed

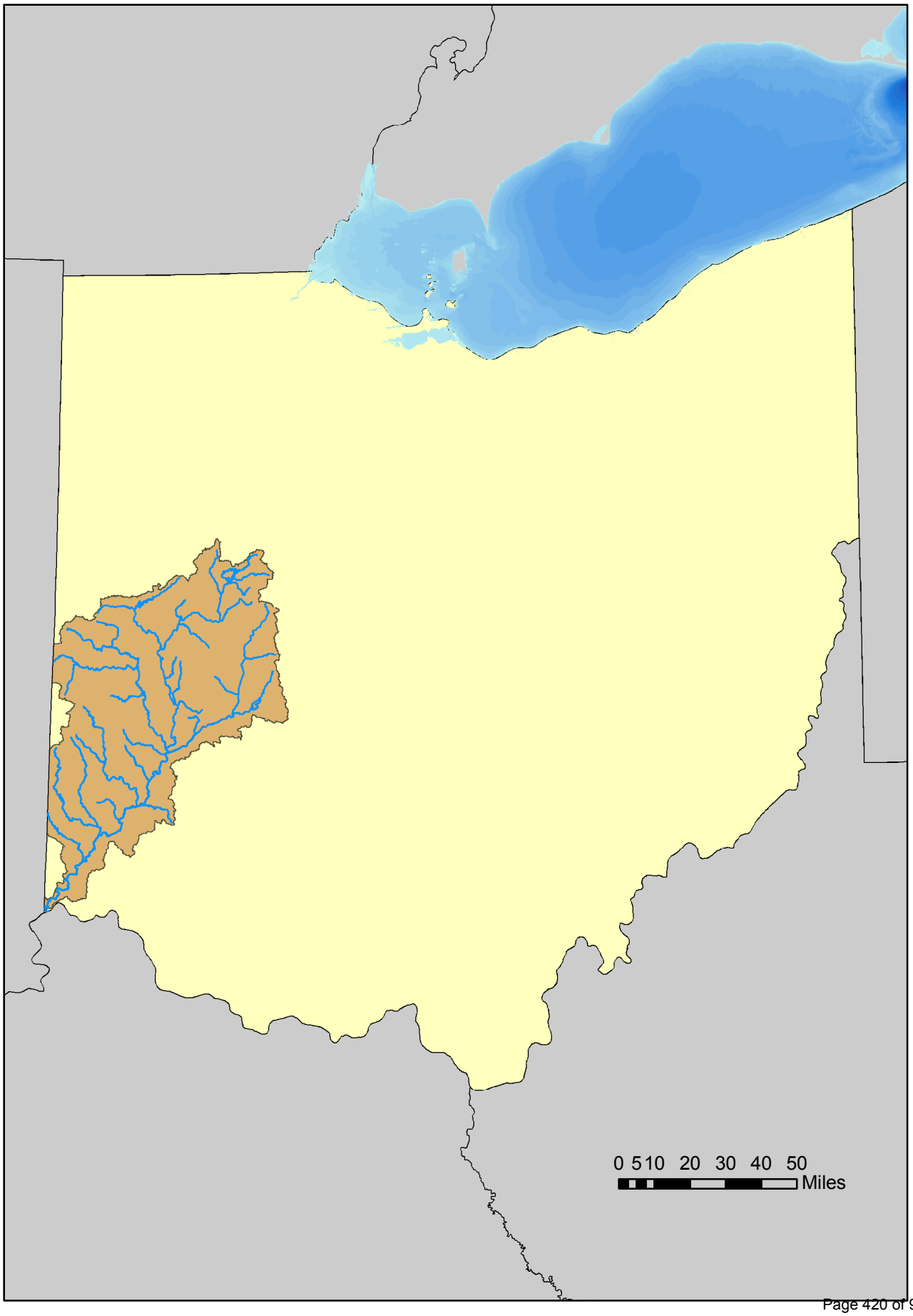

Figure 54: Great Miami River Watershed Land Cover

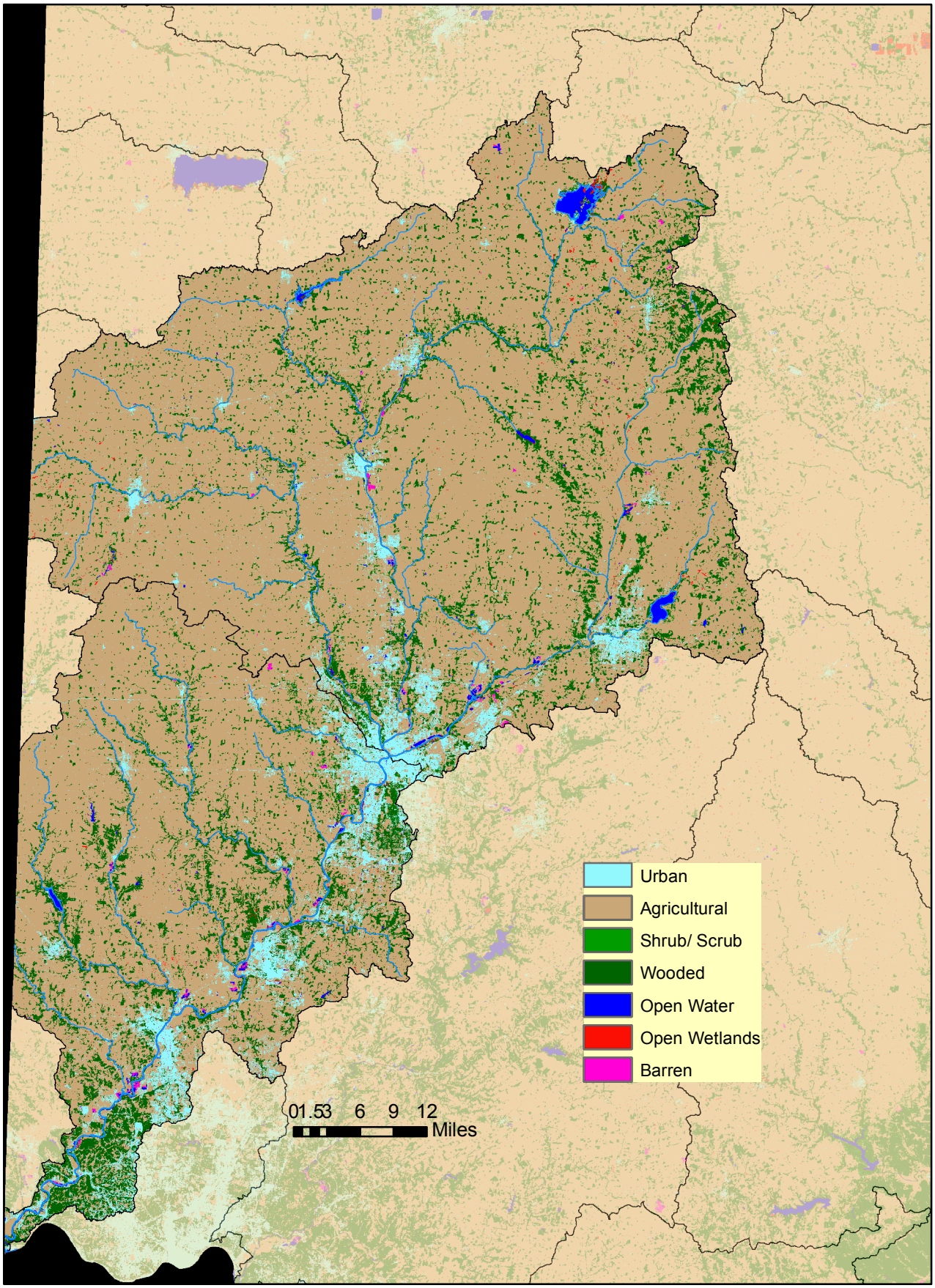
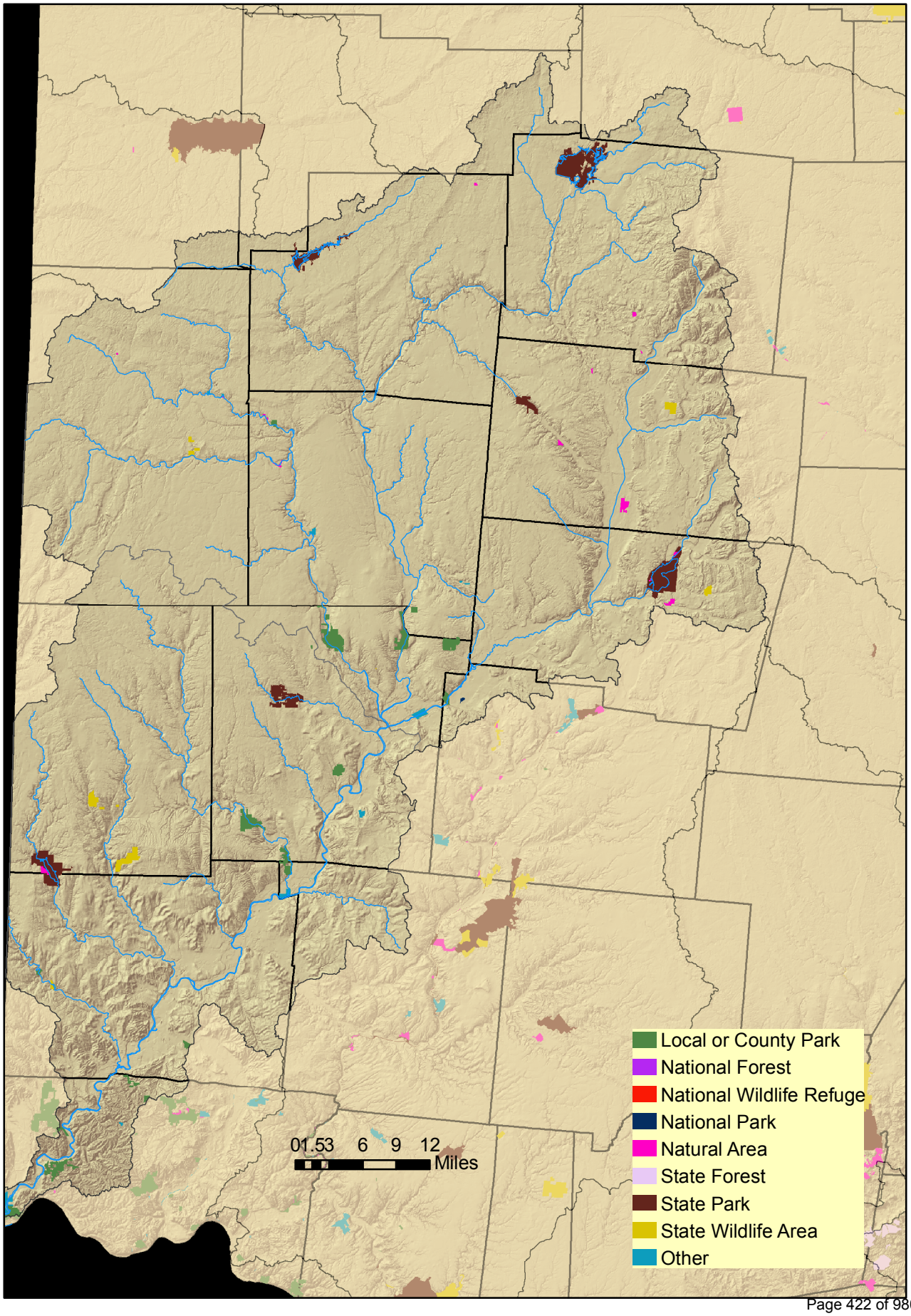
Figure 55: Great Miami River Watershed Protected Lands