

GRAND RIVER BASIN

Draining 705 square miles, the Grand River gathers in morainal hills around the southern end of the Grand River Finger Lake Plain. The river meanders northward picking up drainage from relatively small tributaries to the west include Swine Creek, Phelps Creek, and Hoskins Creek with drainage areas of 30.9, 29.2, and 26.9 square miles, respectively. Larger tributaries join the Grand River from the east including Rock Creek with drainage area of 70.7 square miles and Mill Creek with drainage area of 103 square miles. At the north end of the Grand River Finger Lake Plain, the river turns west and meanders toward Painesville in a relatively deep, flat bottom valley in the Lake Escarpment. Paine Creek and Big Creek with drainage areas of 28.9 and 50.1 square miles flow into the river from the south along the Lake Escarpment. At Painesville, the river cuts north across the narrow Erie Lake Plain to its mouth in the lake.

Physiography

The Grand River Basin occupies nearly all of the Grand River Finger-Lake Plain located in the western part of the Grand River Low Plateau. The broad trough-like preglacial valley that the river flows north in is filled with surficial lacustrine deposits and till. Relief in the Finger-Lake Plain is very low as is the gradient of the river. Tributaries joining the Grand River from the west descend into the valley at relatively steep gradient while those flowing in from the east have more moderate gradient. The lower westward reach of the Grand River flows in a deep gorge along the Portage Escarpment to Painesville where it crosses the narrow Erie Lake Plain. Paine Creek and Big Creek that join the Grand River along its westward course, originate north of Chardon in the Killbuck Glaciated Pittsburgh Plateau.

Geology

The surface rocks along the Erie Lake Plain are shales of Devonian age. These rocks continue at the surface south of the Portage Escarpment toward the midpoint of the basins. South and east, sandstone and shales of Mississippian age are at the surface. Although the Berea sandstone yields some ground water to streams, it is the Sharon Conglomerate that yields large quantities. The shales yield little ground water to streams. The overburden of glacial drift covering the basin as a whole is relatively impermeable. Two recessional moraines cross the area, and there are some local deposits of outwash material.

Soils

Mahoning soil is dominant in the northern and eastern parts of the Grand River Low Plateau where the main tributaries east of the Cuyahoga River are located. Mahoning soil developed from clay loam and clayey till and has slow permeability. Plateau soil is also common. It has a fragipan that is very slowly permeable. Soils in the Grand River Finger Lake Plain developed from medium- to fine-textured till and lacustrine deposits. They have slow permeability. Soils developed in loamy outwash at various places have rapid permeability. For the most part, however, soils in Grand River Low Plateau of the tributary basins have slow permeability that impeded ground water recharge.

Land Use

Lake Erie tributaries east of the Cuyahoga River are in two major land resource areas, the Erie Fruit and Truck Area and the Eastern Ohio Till Plain. The Erie Lake Plain and Lake Escarpment from Cleveland to Conneaut are moderately to highly developed. Land southward of the Portage Escarpment in the Grand River Low Plateau is mainly rural. The Erie Lake Plain from Euclid to Mentor is highly developed with open space confined mainly to metro parks along tributaries to the lake. From Painesville to Ashtabula and Conneaut the lake plain and escarpment are less intensely developed. Commercial horticulture and nurseries are common in the area. Dairy, pasture and cropland are common in the till areas of the main tributary basins east of the Chagrin. The Grand River Basin also has extensive wetlands.

Water Development

Communities along Lake Erie from Cleveland to Conneaut are supplied with water from the lake. Source of supply for the communities distant from the lake includes both surface water and ground water. The Grand River is source of supply for Rock Creek. Roaming Rock Lake on Rock Creek serves as source of supply for Roaming Shores. Sand and gravel lens in glacial drift supply Orwell. Chardon has wells near Bass Lake at the head of the Chagrin River. Chagrin Falls obtains supply from Cleveland.

Flow Characteristics

Actual mean annual runoff of the Grand River is likely around 18 inches. Areas with large amounts of snow pack and extensive wetlands present limitations for the hydrograph separation techniques used to derive mean base-flow indices. Overall, the Grand River has relatively low base flow.

The 10-percent duration flows of streams in the area are relatively high indicating that high water is not uncommon. The relatively low 2-year recurrence interval flood-peak discharge of 15 cfs per square mile for Grand River at Madison reflects the attenuating effects of the Finger Lake Plain. The watershed of Hoskins Creek upstream of Hartsgrove is a relatively flat till plain with extensive wetlands. This explains the 37.6 cfs per square mile peak discharge of Hoskins Creek versus 69.5 cfs per square mile for nearby Phelps Creek that gathers in the end moraine where the terrain is hilly and the relief is greater.

Figure 50: Grand River Watershed

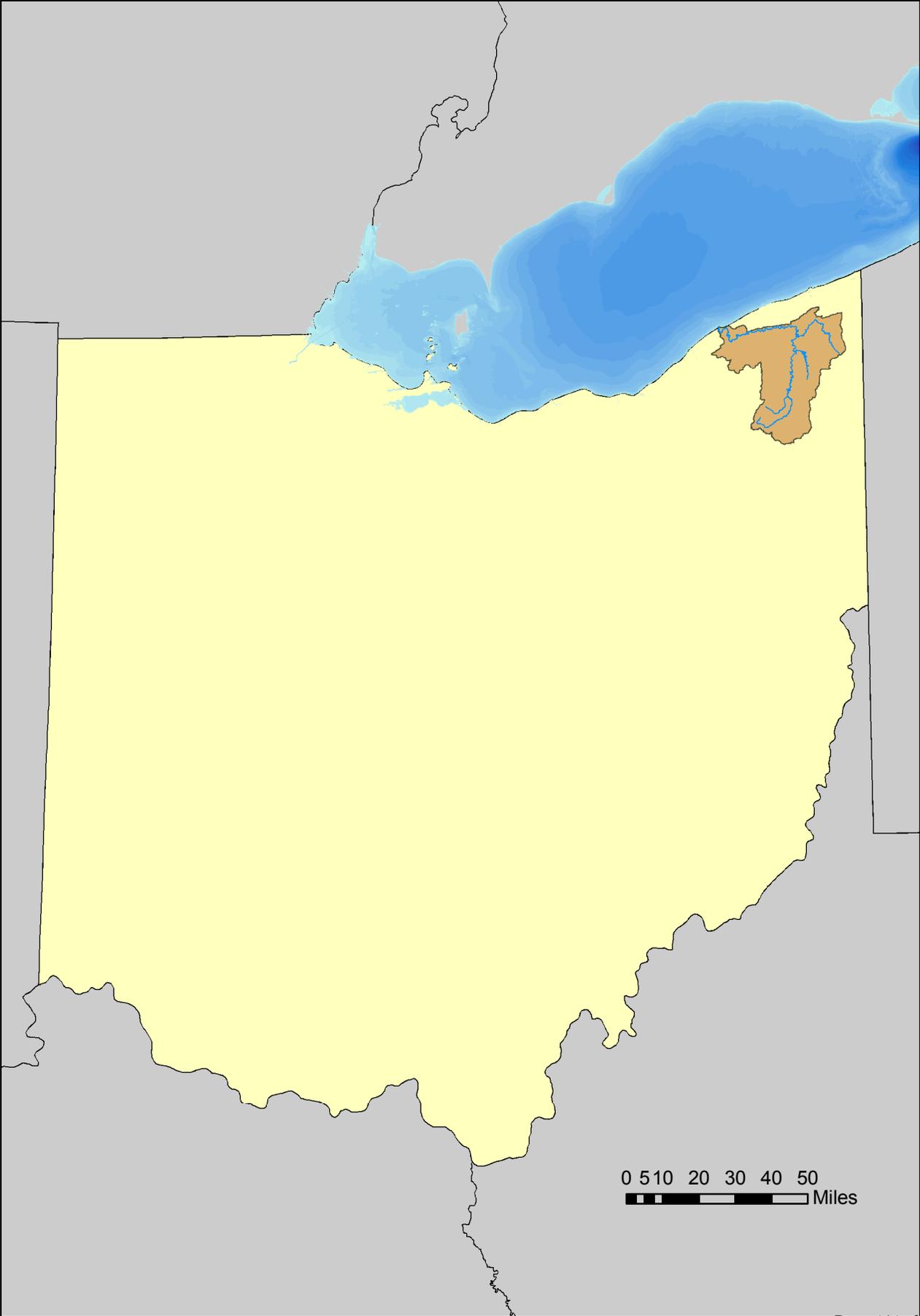


Figure 51: Grand River Watershed Land Cover

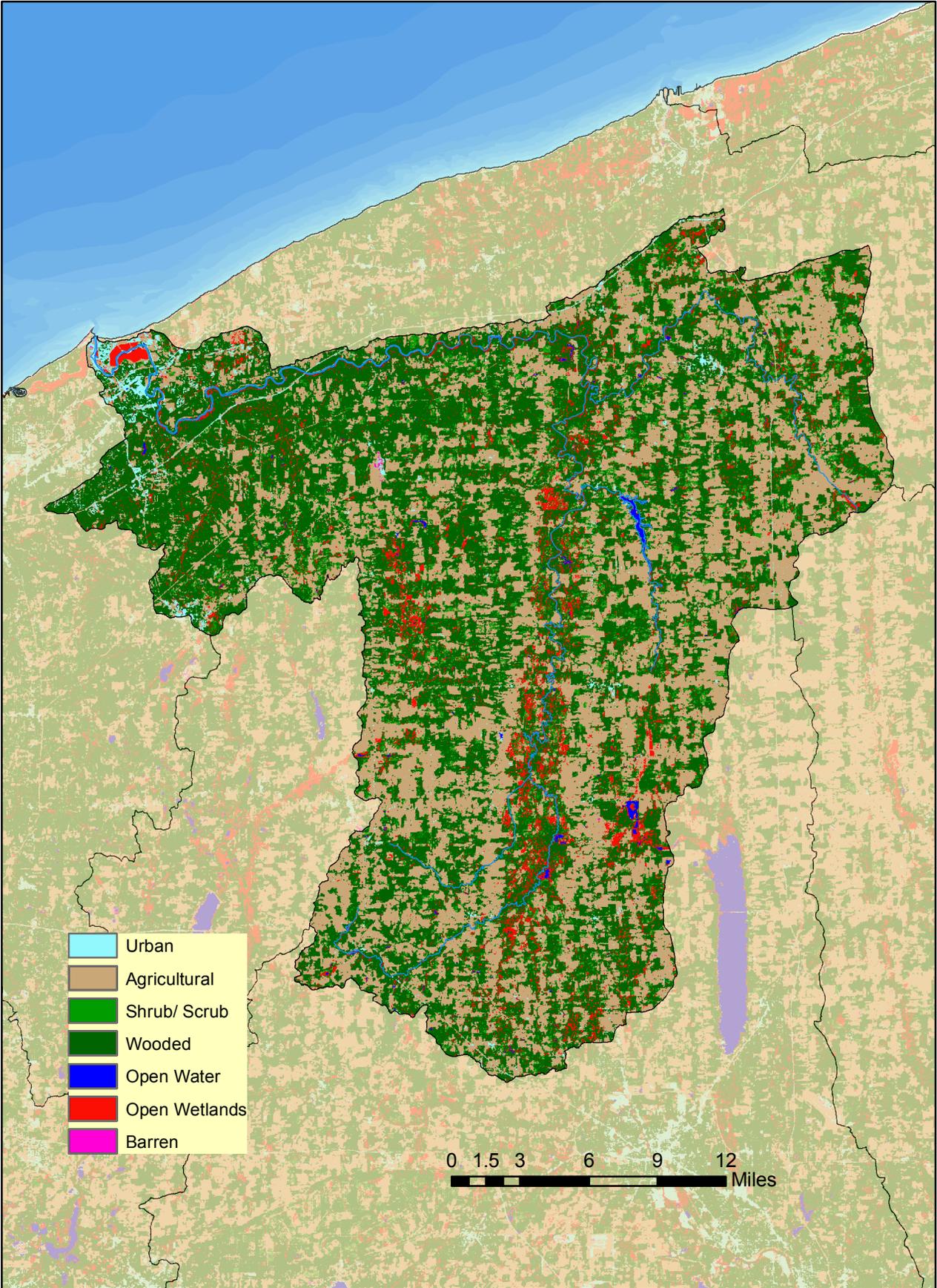


Figure 52: Grand River Watershed Protected Lands

