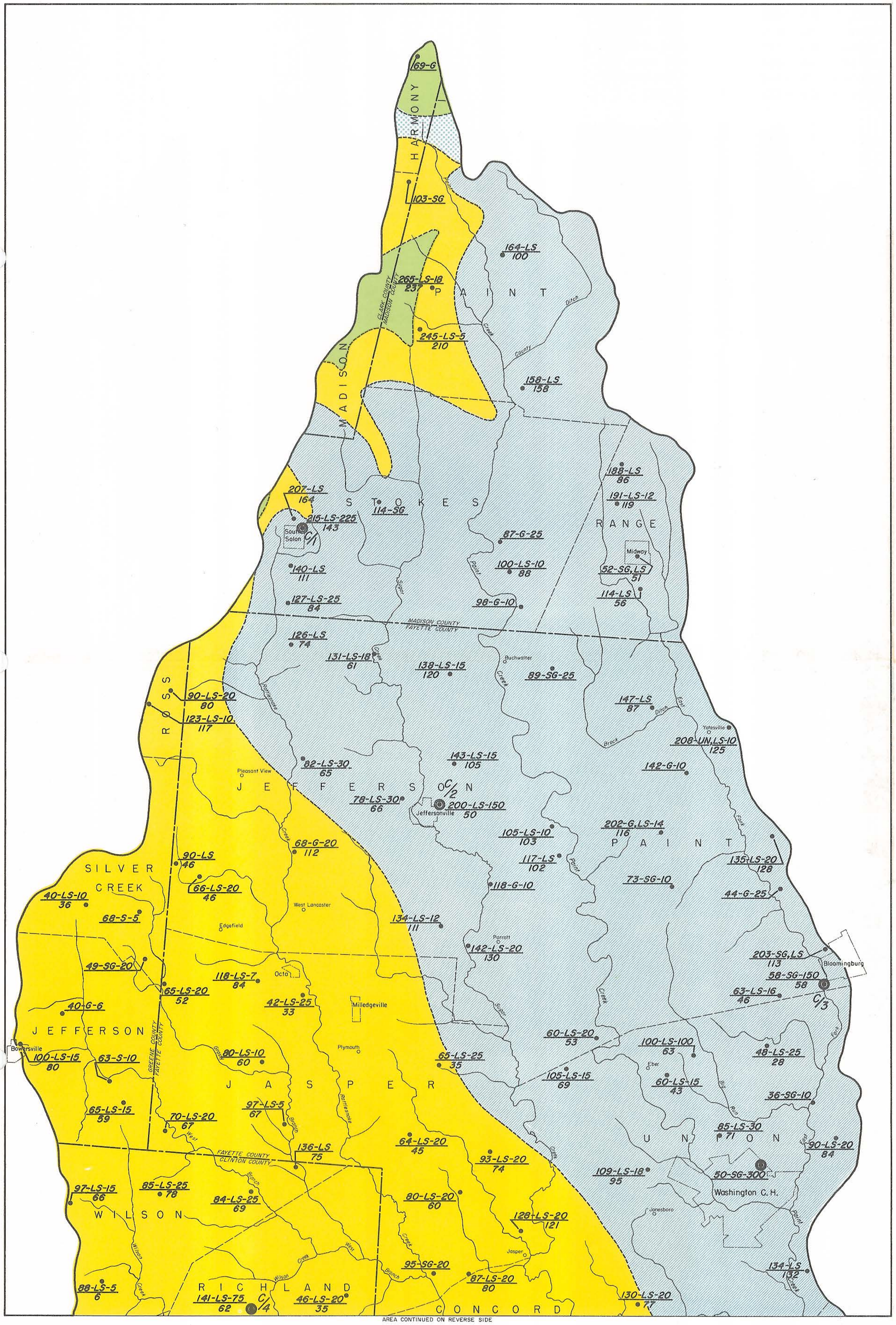


AREA CONTINUED ON REVERSE SIDE

Underground water owes its origin to that portion of the precipitation which seeps into and saturates the cracks, crevices, and pore spaces in the earth's crust. The earth's crust thusly serves as a vast reservoir for the transmission and temporary storage of underground water. However, the quantity of water available to drilled wells depends on the size, kind, and number of water-bearing pores or cracks in the earth's crust. Since these physical characteristis of the geologic formations govern the quantity of water available, a variation in the geology presents a change in the availability of underground water.

The geologic formations which occur near the surface in the Upper Paint Creek basin are of sedimentary origin. They comprise two general classes, (1) consolidated layers of limestone and shale, and (2) the unconsolidated deposits of clay, sand, and gravel. Water occurs in the cracks and crevices of limestone. Some limestone formations are soluble in percolating waters. Therefore, the ability of limestone to be dissolved and transmit water freely depends on the chemical composition of the specific formation. Shale is basically consolidated clay. It may be saturated with water yet the physical characteristics of this rock hinders the flow of water freely. Shale is usually not considered as a water-bearing formation. In deposits of sand and gravel, water occurs in the pore spaces or openings between the individual grains or particles of rock. The permeability, thickness, and regional extent of the water-bearing formation determine the quantity of water available.

With the exception of the extreme southern portion of the basin, the water-bearing formations are relatively uniform throughout the basin. The accompanying table includes brief descriptions of the rocks and of their water-bearing characteristics.

The entire basin is underlain with limestone formations. Regionally, these limestone and dolomitic formations are the principal aquifer. However, owing to the gradual thinning and change in the chemical composition of the limestone formations from north to south, and the overlying shale formations, wells developed in the southern third of the basin yield relatively meager quantities of ground water.

The northern two-thirds of the basin is underlain with limestone formations which have a potential yield adequate for small and large industrial supplies. Municipal wells developed in the upper third of the basin yield as much as 225 gallons per minute at depths exceeding 200 feet. Farm and domestic wells are drilled to an average depth of 110 feet and have an average yield of about 15 gallons per minute.

Few wells are developed in the overlying unconsolidated glacial deposits. Isolated sand and gravel aquifers in morainal deposits, especially in the vicinity of Bloomingburg, have reported yields of as much as 150 gallons per minute. However, the regional yield of these isolated deposits is less than 15 gallons per minute at depths of less than 90 feet. Exceptionally thick unconsolidated deposits are encountered in wells developed in the extreme northern tip of the basin. These deposits which fill an ancient drainage channel yield adequate domestic supplies. The bedrock, which is more than 300 feet beneath the surface, is the Ordovician shale and limestone formations. These formations are considered to yield little or no ground water. The overburden adjacent to this deep buried valley is more than 200 feet thick. Wells drilled into the underlying Silurian limestone may yield as much as 75 gallons per minute.

The limestone formations beneath the central portion of the basin have a potential yield of not more than 100 gallons per minute. The bedrock in this portion of the basin ranges from 6 to more than 115 feet beneath the surface. The average depth of domestic wells is about 85 feet and yields of as much as 25 gallons per minute can be expected.

Owing to the limited thickness of the limestone formations and the relatively thick overlying shale formations, yields from drilled wells in the southern third of the basin are limited to less than 15 gallons per minute. In a large portion of this area drilled wells yield less than 2 gallons per minute and many wells are logged as dry.

The unconsolidated deposits in this basin offer extremely limited areas for the development of ground water supplies. The permeable deposits beneath the limited, narrow floodplain adjacent to Paint Creek, near Greenfield, have proven yields of as much as 100 gallons per minute. Wells for the village are developed in shallow sand and gravel at the contact with the limestone bedrock.

The deposits which fill the relatively shallow channel of Clear Creek have a potential yield of as much as 75 gallons per minute. Yields of 5 to 25 gallons per minute are anticipated from wells drilled in the unconsolidated deposits adjacent to Rattlesnake Creek and the area surrounding Rocky Fork Reservoir. Based upon preliminary glacial mapping and the limited data from drilled wells, these unconsolidated deposits have a much greater potential yield than the surrounding bedrock.

Records of logs of more than 1100 wells in this basin are on file with the Ohio Division of Water. The location of more than 190 typical wells are shown on the map. The map shows the potential underground-water resources of the Upper Paint Creek basin. Detailed studies, test drilling, and pumping tests are necessary to fully define and understand hydrogeologic characteristics of the glacial and bedrock aquifers.

QUALITY OF UNDERGROUND WATER

Partial analyses of samples of raw water from five municipal systems are shown in the following table. The analysis for the Village of South Solon (C-1) shows an exceptionally high iron content of 4.5 ppm, although the hardness for all samples is relatively low for limestone aquifers. The variability of the chemical constituents in samples from somewhat similar aquifers is exemplified in the iron content for wells C-3 and C-5.

Well Number	C-1	C-2	C-3	C-4	C-5
Depth (Ft.)	215	200	50	141	20-36
Water-bearing formation	Limestone	Limestone	Sand and Gravel	Limestone	Sand and Gravel
	Parts per million				
Iron (Fe)	4.5	1.1	2.5	0.2	0.0
Dissolved solids	789.	500.	525.0	619.	445.
Total hardness	520.	390.	430.	420.	380.
pH	7.3	7.5	7.6	7.4	7.35

GENERALIZED STRATIGRAPHIC SEQUENCE OF THE ROCKS IN THE UPPER PAINT CREEK BASIN

System or Series		Group or Formation	Character of Material	Water-Bearing Characteristics
Quaternary	Recent		Clay, silt, and sand deposited on the floodplains of the principal valleys.	Thin and relatively impermeable. Small yields may be developed from dug wells..
	Pleistocene		Lenses of sand and gravel deposited in the relatively shallow buried valleys.	Potential ground water yields depend on thickness, permeability and source of recharge.
			Generally clayey till interbedded with thin lenses of sand and gravel. These materials were deposited at edge of glacier as moraines.	Where favorable conditions exist yields may exceed 75 gallons per minute. Farm and domestic water supplies are often developed in the lenses of sand and gravel.
Devonian		Ohio	Black carbonaceous shale.	Poor source of underground water.
Silurian		Bass Island	Thin to massive impure dolomite.	Municipal and industrial wells have developed more than 200 gpm in Bass Island formations. Yields from the Niagaran formations range from less than 5 to more than 75 gpm.
		Niagaran	Thin to massive bedded dolomite with layers of shale and limestone in the lower portion.	
Ordovician		Richmond Maysville	Calcareous shales with thin beds of limestone.	Yields of less than 3 gpm can be expected.

FILE INDEX
M-13 AND 14

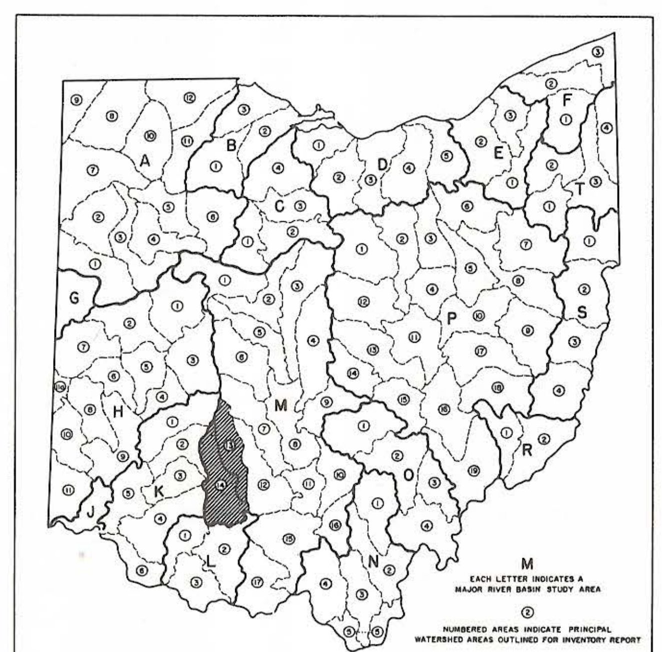
OHIO DEPARTMENT OF NATURAL RESOURCES, DIVISION OF WATER
1562 W. First Ave., Columbus 12, Ohio

OHIO WATER PLAN INVENTORY
1962

UPPER PAINT CREEK BASIN

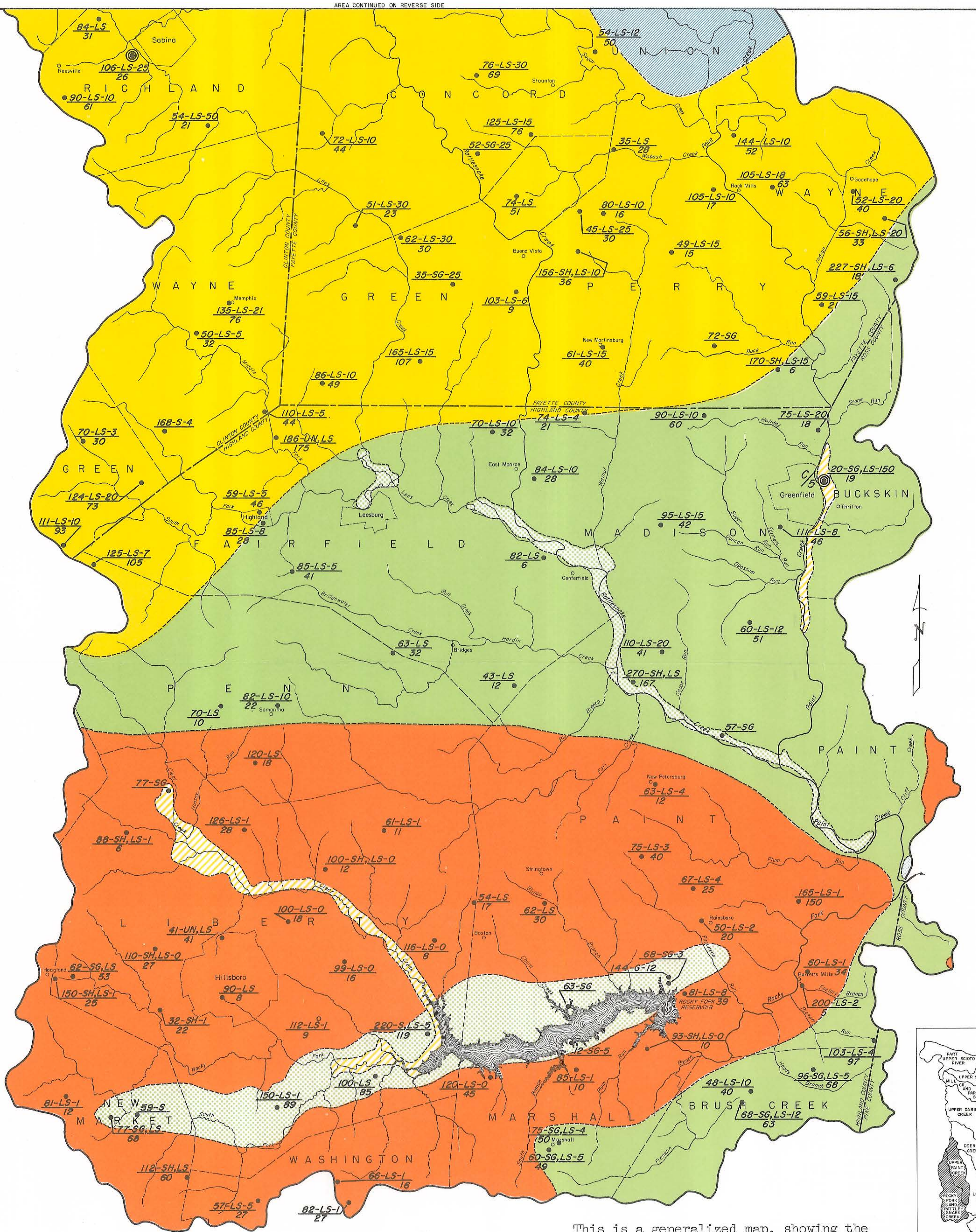
UNDERGROUND WATER RESOURCES

Prepared by JAMES J. SCHMIDT, Geologist,
Ohio Division of Water



OUTLINE MAP SHOWING DISTRIBUTION OF RIVER BASIN AND WATERSHED AREAS IN OHIO FOR STUDY IN THE WATER INVENTORY PROGRAM

AREA CONTINUED ON REVERSE SIDE



AREAS IN WHICH YIELDS OF 100 TO 500 GALLONS PER MINUTE CAN BE DEVELOPED

Industrial and municipal ground-water supplies are developed in limestone formations. Farm and domestic wells are often developed in the relatively thick glacial deposits above the bedrock.

Permeable layers of sand and gravel deposited beneath a portion of the principal drainage valley.

Thin lenses of sand and gravel interbedded in thick clayey till. These deposits, which fill an ancient drainage channel, yield adequate domestic supplies. However, industrial supplies may be developed in the underlying limestone.

AREAS IN WHICH YIELDS OF 25 TO 100 GALLONS PER MINUTE CAN BE DEVELOPED

Limestone, covered with an average of 65 feet of glacial drift. Adequate domestic supplies are developed from sand and gravel layers in the drift. Small industrial yields may be obtained from the underlying limestone.

Relatively shallow deposits of sand and gravel adjacent to perennial drainage systems yield in excess of 100 gallons per minute.

AREAS IN WHICH YIELDS OF 5 TO 25 GALLONS PER MINUTE CAN BE DEVELOPED

Glacial drift covers shales and thin limestones. The thick drift yields domestic supplies in the northern portion of the basin. However, the thin limestones are the principal water-bearing formations in the southern portion of the basin.

Irregular thin lenses of sand and gravel interbedded between thick layers of clayey till. Large diameter dug and drilled wells yield less than 10 gallons per minute.

AREAS IN WHICH YIELDS OF LESS THAN 5 GALLONS PER MINUTE CAN BE DEVELOPED

Interbedded layers of shale and thin limestone covered with clay. Poor source of underground water.

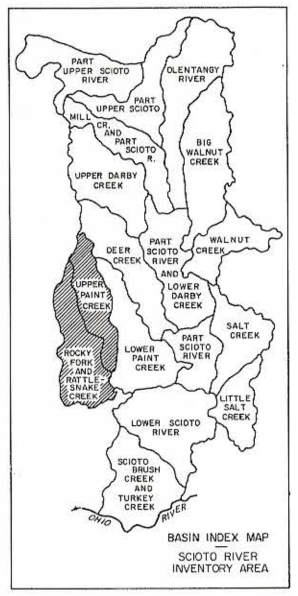
EXPLANATION OF SYMBOLS

• Domestic well	S Sand	LS Limestone
◎ Municipal well	G Gravel	SH Shale
	UN Clay, sand, gravel	

C/2 Chemical analysis in text.

Total depth (Ft.) - Water-bearing formation - Yield (gpm)
Depth to bedrock (Ft.)

This is a generalized map, showing the potential underground-water resources, based on data presently available. Detailed studies and exploratory drilling are needed to fully define the hydrologic characteristics of the buried valleys and bedrock aquifers.



MAP OF THE
UPPER PAINT CREEK BASIN
SHOWING
AVAILABILITY OF UNDERGROUND WATER

PUBLISHED BY - STATE OF OHIO, DEPARTMENT OF NATURAL RESOURCES, DIVISION OF WATER

SCALE IN MILES