QUALITY OF WATER

EXPLANATION

Ion concentration

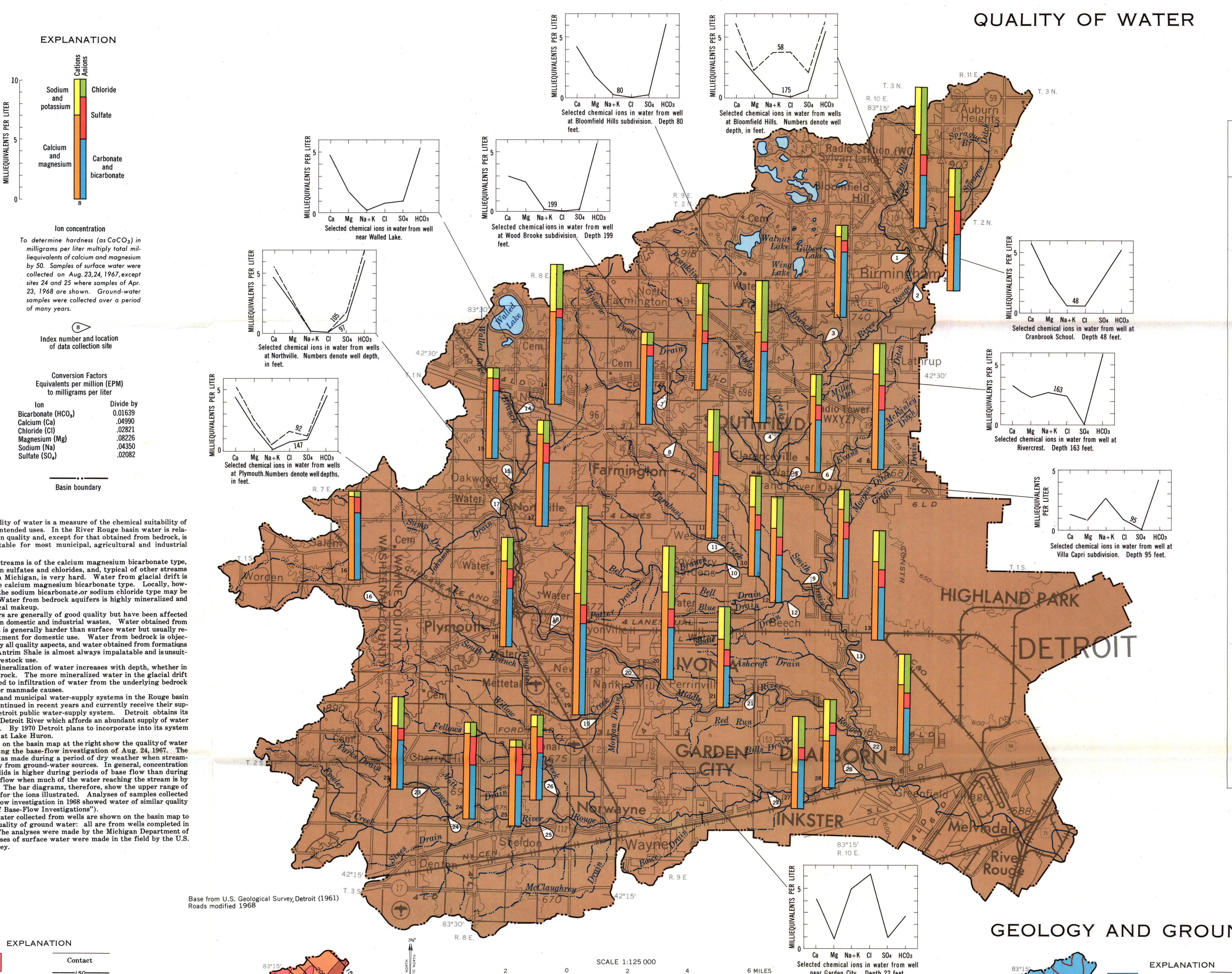
To determine hardness (as $CaCO_3$) in milligrams per liter multiply total milliequivalents of calcium and magnesium by 50. Samples of surface water were collected on Aug. 23,24, 1967, except sites 24 and 25 where samples of Apr. 23, 1968 are shown. Ground-water samples were collected over a period of many years.

Index number and location of data collection site

Conversion Factors
Equivalents per million (EPM) to milligrams per liter

Ion	Divide by
Bicarbonate (HCO_3)	0.01639
Calcium (Ca)	.04990
Chloride (Cl)	.02821
Magnesium (Mg)	.08226
Sodium (Na)	.04350
Sulfate (SO_4)	.02082

Basin boundary



Chemical quality of water is a measure of the chemical suitability of the water for intended uses. In the River Rouge basin water is relatively uniform in quality and, except for that obtained from bedrock, is chemically suitable for most municipal, agricultural and industrial supplies.

Water from streams is of the calcium magnesium bicarbonate type, is locally high in sulfates and chlorides, and, typical of other streams in southeastern Michigan, is very hard. Water from glacial drift is generally of the calcium magnesium bicarbonate type. Locally, however, water of the sodium bicarbonate or sodium chloride type may be encountered. Water from bedrock aquifers is highly mineralized and varies in chemical makeup.

Surface waters are generally of good quality but have been affected by pollution from domestic and industrial wastes. Water obtained from the glacial drift is generally harder than surface water but usually requires less treatment for domestic use. Water obtained from bedrock is objectionable in nearly all quality aspects, and water obtained from formations older than the Antrim Shale is almost always impalatable and is unsuitable even for livestock use.

In general, mineralization of water increases with depth, whether in the drift or bedrock. The more mineralized water in the glacial drift can be attributed to infiltration of water from the underlying bedrock due to natural or manmade causes.

Most private and municipal water-supply systems in the Rouge basin have been discontinued in recent years and currently receive their supply from the Detroit public water-supply system. Detroit obtains its water from the Detroit River which affords an abundant supply of water of good quality. By 1970 Detroit plans to incorporate into its system a supply intake at Lake Huron.

Bar diagrams on the basin map at the right show the quality of water in streams during the base-flow investigation of Aug. 24, 1967. The investigation was made during a period of dry weather when streamflow was chiefly from ground-water sources. In general, concentration of dissolved solids is higher during periods of base flow than during periods of high flow when much of the water reaching the stream is by overland flow. The bar diagrams, therefore, show the upper range of concentrations for the ions illustrated. Analyses of samples collected during a base-flow investigation in 1968 showed water of similar quality (see "Results of Base-Flow Investigations").

Analyses of water collected from wells are shown on the basin map to illustrate the quality of ground water: all are from wells completed in glacial drift. The analyses were made by the Michigan Department of Health. Analyses of surface water were made in the field by the U.S. Geological Survey.

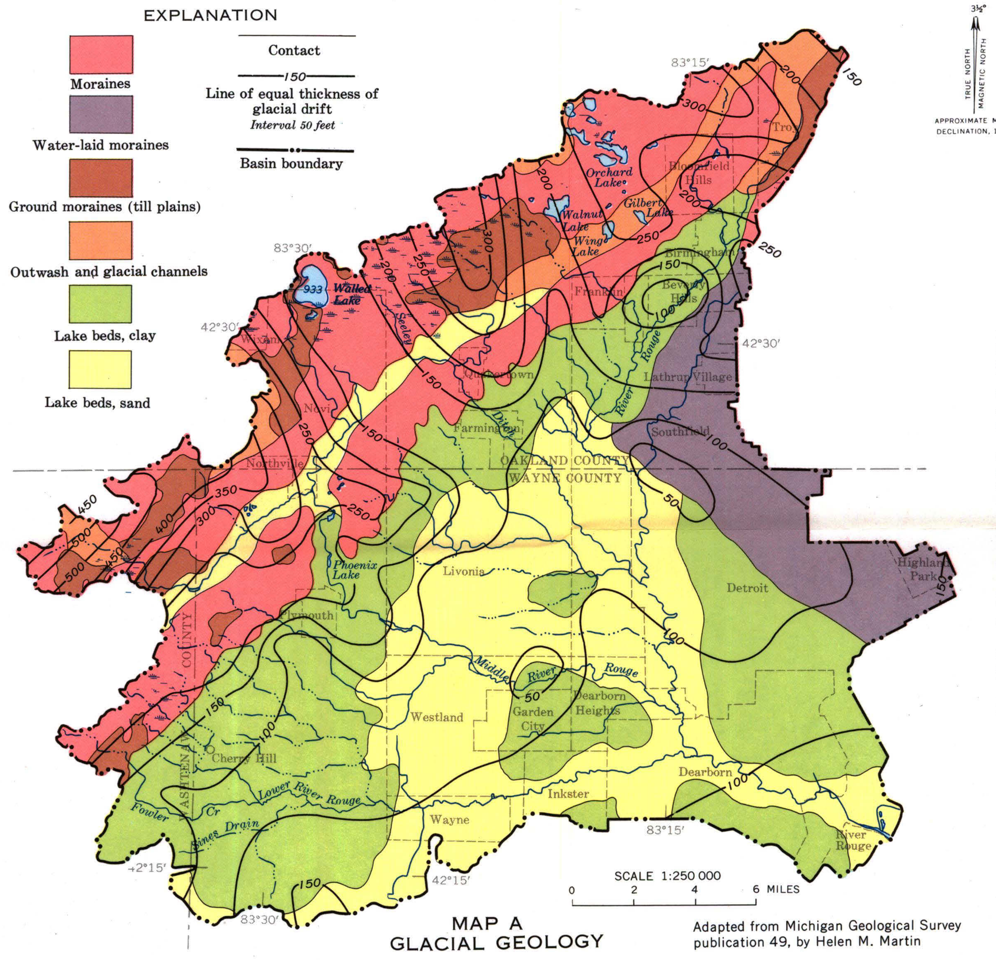
BASE-FLOW INVESTIGATIONS PROVIDE A BASIS FOR DETERMINING THE OCCURRENCE, DISTRIBUTION, MAGNITUDE, AND QUALITY OF DRY-WEATHER STREAMFLOW.

The two sets of measurements, made during periods when surface runoff due to antecedent precipitation was minimal, represent conditions during high and low base-flow. The measurements indicate that streams draining the moraine, outwash, and sandy lake bed areas to the northwest maintain higher base flows than do streams draining the large areas of clay lake beds to the south and east (see map A). Franklin Branch has significantly higher base flows which may reflect, in part, interflow from the Clinton River basin to the north. Tarabusi Creek also was higher flow as may be attributed to more permeable clay soils or to significant contributions to streamflow from the sandy lake bed part of the basin. The Lower River Rouge has the lowest base-flow runoff reflecting the proportionately larger area of impermeable clayey lake beds.

Analyses of water samples collected during the investigations show that dissolved solid concentrations, as indicated by specific conductance, are generally higher during lower base-flows. Streams draining the more industrial and urbanized areas to the southeast, however, generally experience higher concentrations of dissolved solids during higher base flow.

Stream	Index No. on map	Location: sec.	¼	town-ship	range	Drainage area (sq. mi.)	Date	Discharge (cfs)	(cfsm)	Chloride (Cl)	Sulfate (SO_4)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Hardness as ($CaCO_3$)	Specific Conductance (micromhos)	pH	Temperature (°C)
River Rouge Tributary	1	26	NE	2N	10E	21.5	8/24/67	1.41	0.066	201	82	264	0	386	1190	7.7	16
							4/23/68	10.6	.493	125	105	276	0	356	810	7.9	
River Rouge	2	36	NW	2N	10E	36.9	8/24/67	3.10	.084	125	95	282	0	387	955	8.0	17
							4/23/68	16.9	.458	107	124	298	0	404	810	8.1	12
Franklin Branch	3	9	NW	1N	10E	15.4	8/24/67	2.56	.166	47	44	323	5	332	690	8.4	14
							4/23/68	11.8	.766	62	60	278	0	300	580	8.2	13
Pebble Creek	4	30	NE	1N	10E	10.3	8/24/67	.62	.060	182	37	361	0	376	1140	8.2	15
							4/23/68	5.35	.519	130	62	324	0	356	840	8.0	12
River Rouge	5	32	SW	1N	10E	87.9	8/23/67	6.71	.076	89	59	262	0	311	710	8.2	17
							4/22/68	49.9	.568	104	86	300	0	358	760	8.0	14
Evans Ditch	6	28	SE	1N	10E	9.49	8/23/67	1.49	.157	125	96	298	0	393	1010	8.1	19
							4/23/68	3.29	.347	161	111	371	20	456	1000	8.6	12
Minnow Pond Drain	7	15	SW	1N	9E	9.18	8/24/67	.07	.008	142	53	233	0	313	890	8.0	17
							4/23/68	3.62	.394	47	74	314	0	319	580	8.2	13
Upper River Rouge	8	27	NW	1N	9E	17.5	8/24/67	1.33	.076	40	44	340	4	330	660	8.3	14
							4/23/68	10.1	.577	53	63	317	0	341	590	8.0	13
Upper River Rouge	9	20	N½	1S	10E	22.2	8/24/67	2.05	.092	97	65	301	0	368	890	7.7	16
							4/23/68	14.8	.667	80	71	327	0	366	820	8.0	13
Bell Branch	10	13	NW	1S	9E	20.2	8/24/67	.62	.031	115	58	234	0	286	790	7.9	16
							4/22/68	7.44	.368	122	92	273	0	354	900	8.1	15
Tarabusi Creek	11	12	SW	1S	9E	6.68	8/24/67	.90	.135	127	90	318	0	395	1010	8.1	16
							4/22/68	4.91	.735	114	78	269	8	344	890	8.4	12
Bell Branch	12	20	SW	1S	10E	40.8	8/24/67	2.86	.070	119	69	243	0	309	855	7.7	16
							4/23/68	13.2	.324	125	92	293	0	369	955	8.0	12
River Rouge	13	27	SW	1S	10E	187	8/24/67	18.3	.098	118	67	219	0	326	900	7.6	17
							4/23/68	78.3	.419	—	—	—	—	—	—	—	—
Walled Lake Branch	14	22	NE	1N	8E	9.75	8/24/67	.005	.0005	132	36	434	8	387	1090	8.4	20
							4/23/68	8.39	.861	65	67	227	0	259	500	8.1	16
Walled Lake Branch	15	35	SW	1N	8E	22.1	8/24/67	.81	.037	31	49	343	0	334	665	8.2	19
							4/23/68	14.1	.638	58	73	276	0	304	555	8.1	15
Johnson Drain	16	24	SE	1S	7E	11.5	8/24/67	.38	.033	19	60	342	0	343	640	7.9	16
							4/23/68	6.05	.526	64	63	310	2	358	740	8.3	13
Johnson Drain	17	3	SE	1S	8E	26.1	8/24/67	2.08	.080	68	77	315	3	378	790	8.3	15
							4/23/68	12.7	.487	70	110	315	3	384	780	8.3	15
Middle River Rouge	18	25	SW	1S	8E	60.7	8/24/67	7.49	.123	93	80	287	6	355	850	8.5	20
							4/23/68	39.1	.644	41	84	293	5	358	800	8.3	14
Willow Creek	19	7	NE	2S	9E	6.74	8/24/67	10	.015	292	74	459	0	503	1800	8.0	17
							4/23/68	2.22	.329	131	68	330	0	351	1000	7.6	12
Tonquish Creek	20	4	NW	2S	9E	24.2	8/24/67	1.09	.045	185	74	256	4	360	1100	8.4	18
							4/23/68	8.97	.371	122	87	303	0	363	900	8.0	12
Middle River Rouge	21	6	NW	2S	10E	99.9	8/24/67	12.1	.121	126	66	205	0	279	845	7.6	18
							4/23/68	54.6	.547	51	40	279	0	304	840	8.1	14
River Rouge	22	Land Grant 665		2S	10E	307	8/23/67	—	—	114	59	235	0	288	820	7.6	—
							4/23/68	—	—	118	76	288	0	355	910	8.2	21
Lower River Rouge	23	28	SW	2S	8E	9.01	8/24/67	.17	.019	93	46	249	4	265	715	8.4	18
							4/23/68	2.44	.271	49	73	264	0	301	655	7.9	14
Fowler Creek	24	28	SW	2S	8E	12.0	8/24/67	0	0	—	—	—	—	—	—	—	—
							4/23/68	2.38	.198	42	116	276	0	355	710	8.1	13
Lower River Rouge	25	25	SW	2S	8E	37.5	8/24/67	.28	.007	74	91	227	0	—	900	8.0	17
							4/23/68	10.1	.269	108	114	262	0	330	820	8.0	14
Fellows Creek	26	25	NE	2S	8E	16.0	8/24/67	.12	.008	67	64	240	0	306	660	8.0	14
							4/23/68	4.64	.290	70	82	244	0	316	700	8.0	13
Lower River Rouge	27	19	S½	2S	10E	83.2	8/24/67	2.07	.025	93	49	249	0	—	765	7.6	17
							4/23/68	21.0	.252	104	104	271	6	360	900	8.3	15
Lower River Rouge	28	Land Grant 665		2S	10E	91.9	8/23/67	3.38	.037	69	51	266	0	—	700	7.7	20
							4/23/68	21.5	.234	108	106	284	0	366	915	8.0	21

GEOLOGY AND GROUND WATER



MAP A
GLACIAL GEOLOGY

Adapted from Michigan Geological Survey publication 49, by Helen M. Martin

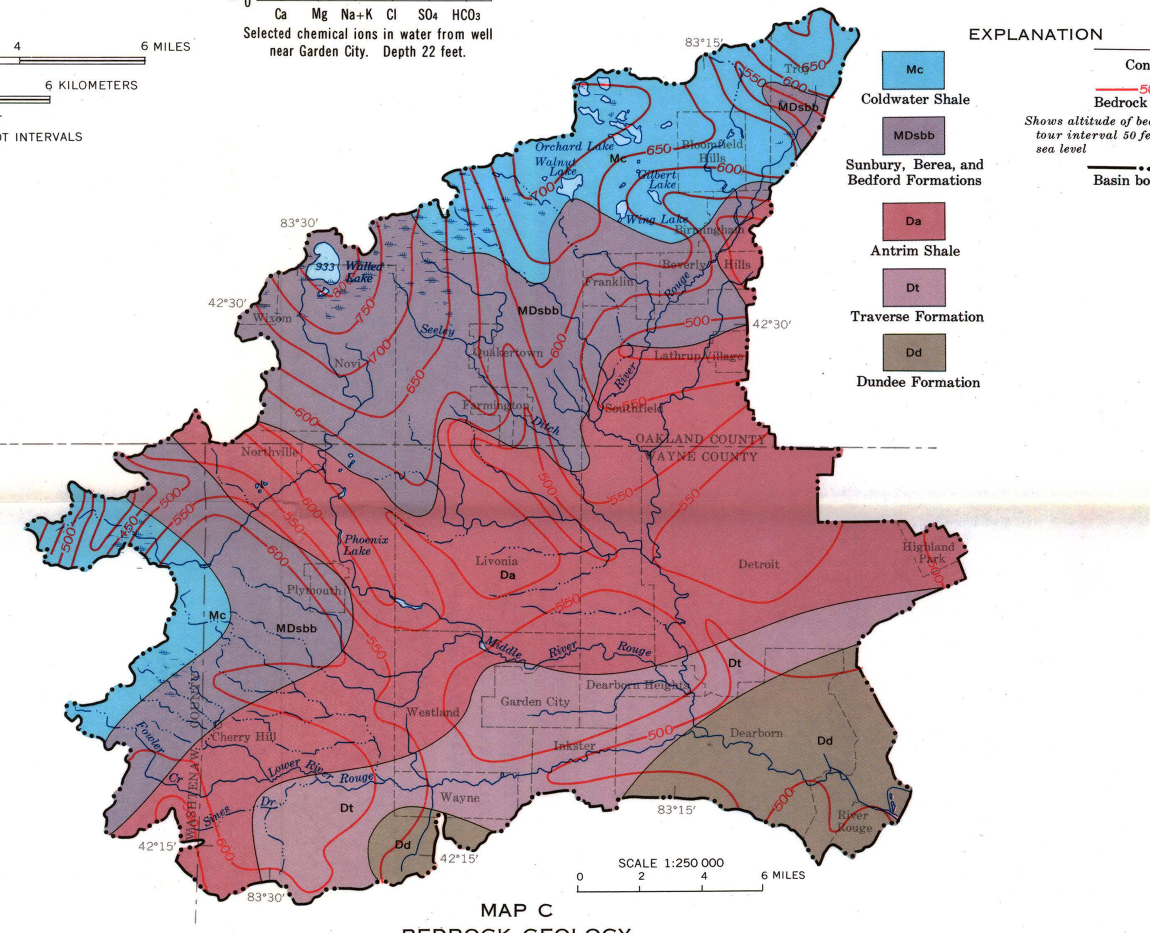
Small to moderate quantities of water are available nearly everywhere in the River Rouge basin from wells completed in the glacial drift or bedrock aquifers. The glacial drift, map A, is composed of clay, silt, sand, gravel, and stones deposited by glaciers and glacial melt waters. The relative proportions, degree of sorting, and thickness of these materials control the availability of water from the drift aquifers. Sands and gravels will generally yield larger quantities of water than deposits of clays, silts, or fine sand.

The more favorable water-bearing rocks in the glacial drift are not extensive and therefore limit the aquifer as a source of abundant water supply. Water in the drift is a relatively shallow depths and is easily accessible throughout the basin, thus these rocks are important in water-supply considerations.

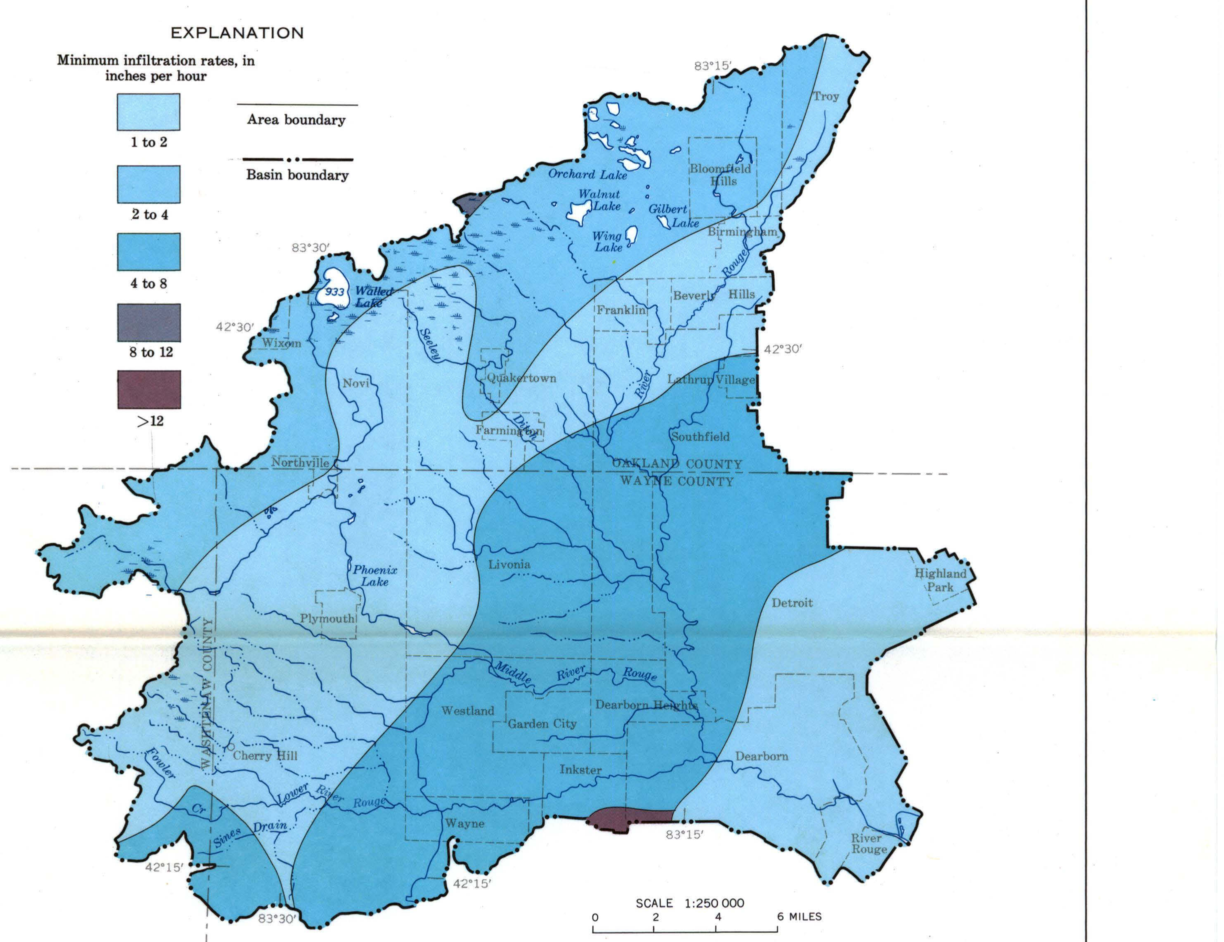
Map B illustrates the general availability of water in the glacial drift. Areas to the north and west will usually yield larger supplies to wells. Wells located near perennial streams may induce recharge from the stream and thereby yield supplies greater than those indicated.

The bedrock formations, map C, are sedimentary rocks of Mississippian and Devonian age, and consist of shale, sandstone, and limestone. The formations dip to the northwest and range from about 50 to 500 feet below land surface.

Wells drilled in bedrock usually yield water that is too highly mineralized for most uses, rendering the aquifers less important as a source of water supply. The cool temperatures, about 12° C, of water from the bedrock, however, make it useful for cooling purposes. The potential yield of wells in the bedrock, map D, is small although occasionally wells yielding large supplies may be encountered.

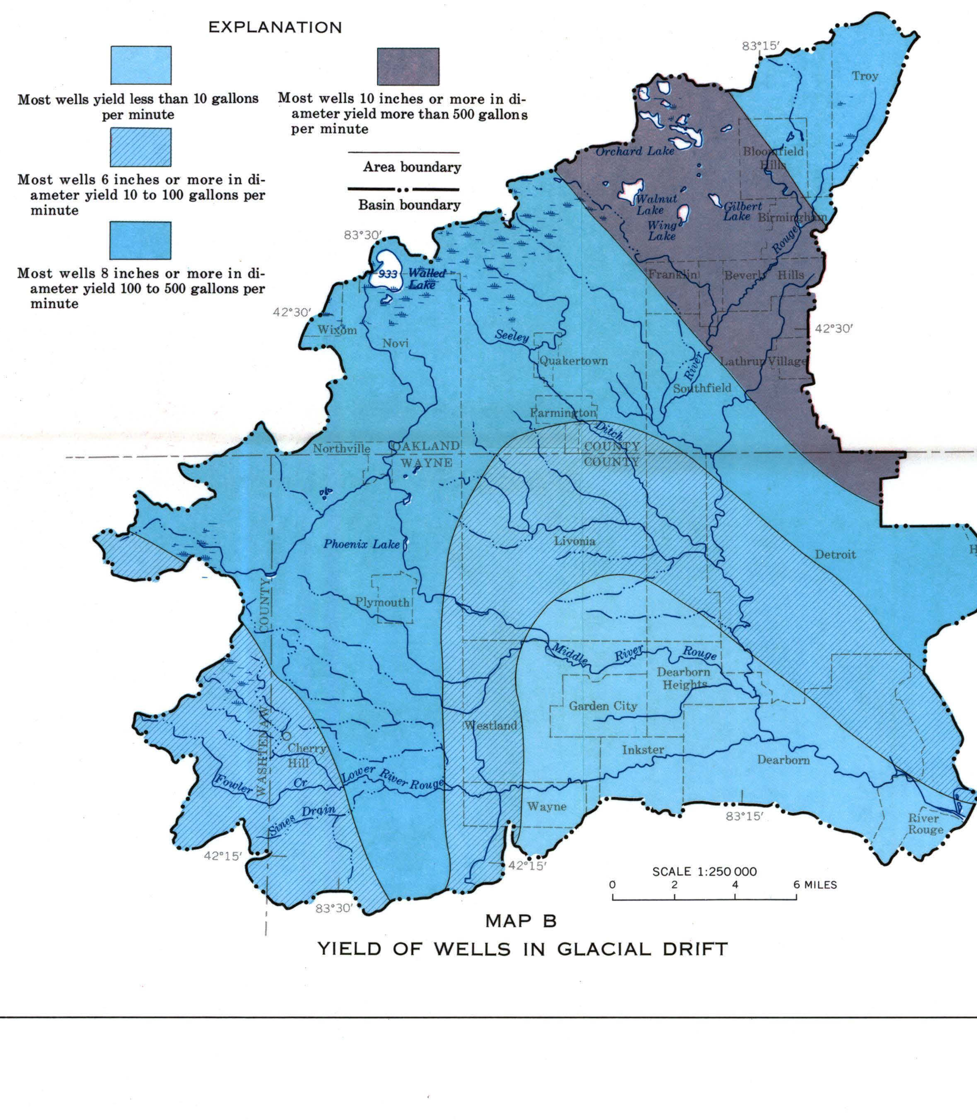


MAP C
BEDROCK GEOLOGY

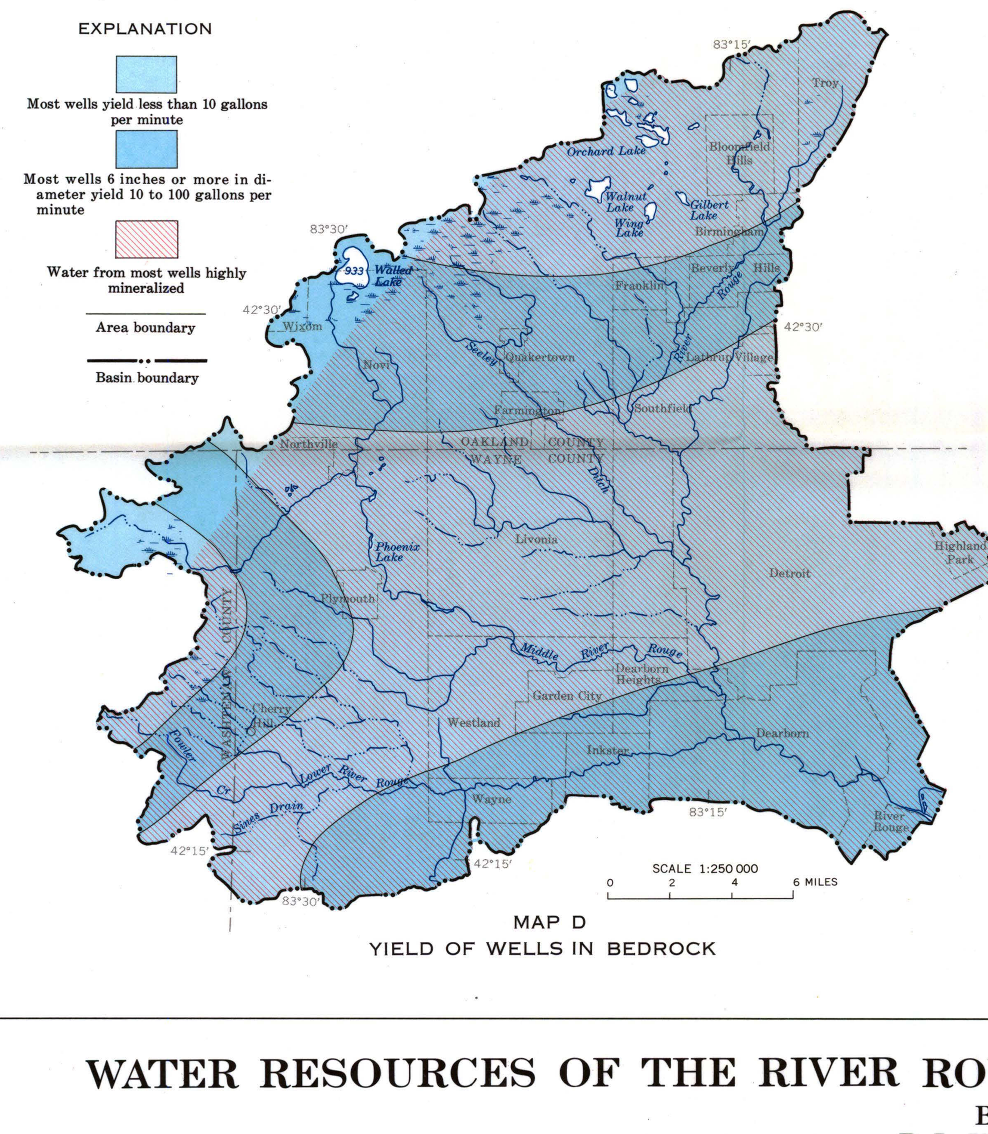


MINIMUM INFILTRATION RATES PROVIDE A BASIS FOR ANALYZING DRAINAGE CHARACTERISTICS OF SOILS

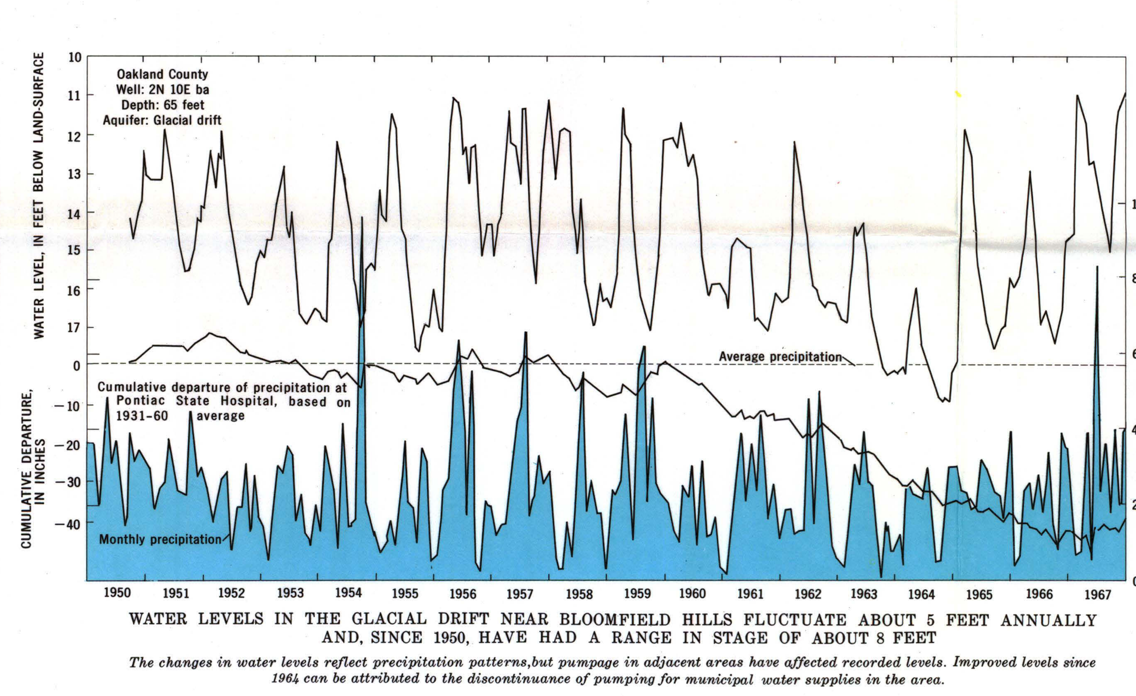
Infiltration or absorption is an important factor in the reduction of surface runoff, and as a consequence reduces peak flows after storms. Also, it is by infiltration that water becomes available for vegetation and for the replenishment of ground water. Infiltration values were determined by the Soil Science Department, Michigan State University, for Michigan Agriculture Project 418. The infiltration rates are for surface horizons of soils covered with sod and were determined with a water head of 2 inches. Because they were determined with a head of water they may be greater than if the water were from natural rainfall. The map is a generalization based on a statewide sampling program of a number of soil types. Within a given area there are soils with properties outside the designated range, but the limits set are for the predominant soils.



MAP B
YIELD OF WELLS IN GLACIAL DRIFT

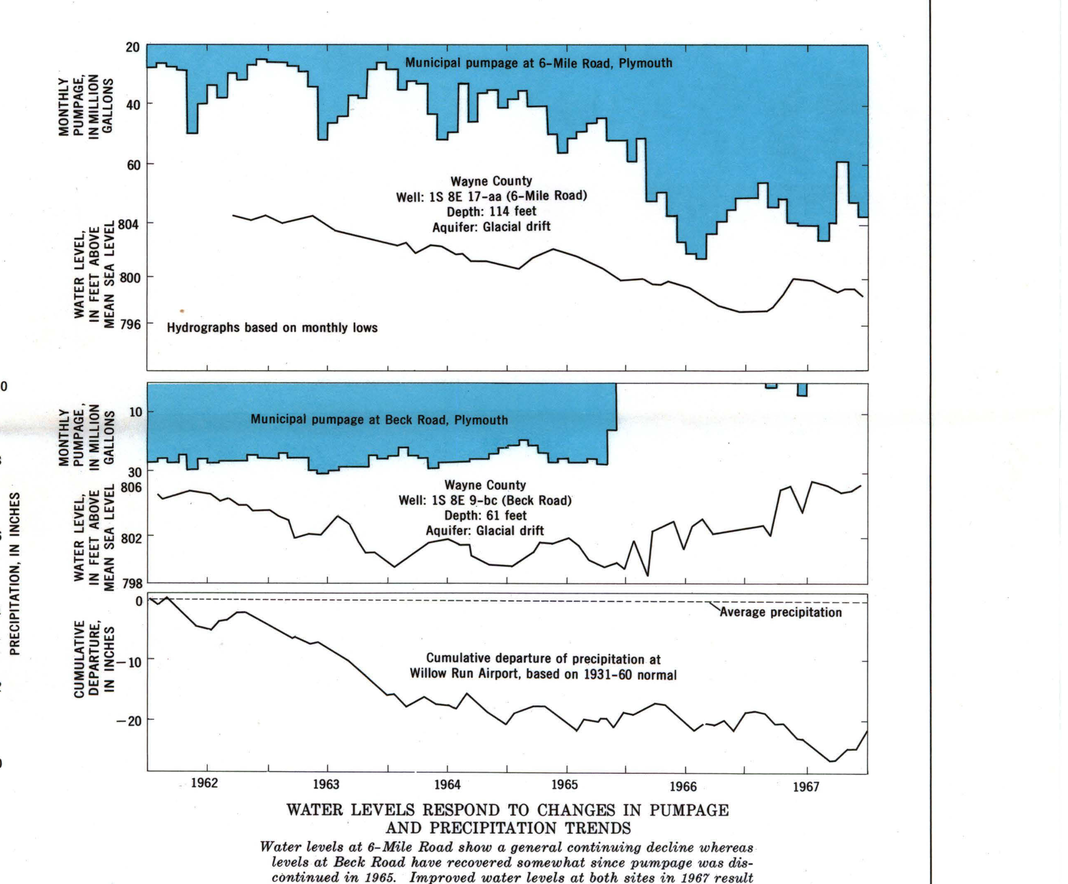


MAP D
YIELD OF WELLS IN BEDROCK



WATER LEVELS IN THE GLACIAL DRIFT NEAR BLOOMFIELD HILLS FLUCTUATE ABOUT 5 FEET ANNUALLY AND, SINCE 1950, HAVE HAD A RANGE IN STAGE OF ABOUT 8 FEET

The changes in water levels reflect precipitation patterns, but pumpage in adjacent areas have affected recorded levels. Improved levels since 1961 can be attributed to the discontinuance of pumping for municipal water supplies in the area.



WATER LEVELS RESPOND TO CHANGES IN PUMPAGE AND PRECIPITATION TRENDS

Water levels at 6-Mile Road show a general continuing decline whereas levels at Beck Road have recovered somewhat since pumpage was discontinued in 1965. Improved water levels at both sites in 1967 result from above average precipitation. The Willow Run station shows below average precipitation, however, other nearby weather stations show rainfalls to be well above average.

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D.C.—1971

WATER RESOURCES OF THE RIVER ROUGE BASIN, SOUTHEASTERN MICHIGAN

By
R. L. Knutilla

1971

Explanatory pamphlet accompanies map