

A WATER POLLUTION INVESTIGATION
OF THE
DETROIT RIVER
AND THE
MICHIGAN WATERS OF LAKE ERIE

SECTION III
POPULATION AND MANUFACTURING TRENDS

U.S. Department of Health, Education, and Welfare
Public Health Service

Division of Water Supply and Pollution Control - Region V
Detroit River-Lake Erie Project

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INTRODUCTION

In a highly industrialized region such as the Detroit area, the discharge of wastes is closely related to population and industrial production. Estimates of population and manufacturing growth are essential for predicting future demands upon water resources due to this increased growth with resulting increase in discharge of wastes:

The State of Michigan is part of the large industrial complex of the United States known as the "manufacturing belt." The belt or "strip" comprises portions of the three Middle Atlantic States of New Jersey, New York, and Pennsylvania and of the five East North Central States of Illinois, Indiana, Michigan, Ohio, and Wisconsin. Although the State of Michigan is a vital part of this entire group of industrial states, it is even more closely associated with the five East North Central States. The analysis and description of trends of manufacturing and populations on these five states is therefore included to present a comparison with the Detroit Project area.

For the purposes of this report on population and manufacturing trends, the Project area referred to herein includes the counties of Macomb, Monroe, Oakland, and Wayne. The Detroit Standard Metropolitan Statistical Area (DSMSA) includes only Macomb, Oakland, and Wayne Counties. Monroe County has been added to this because of its contiguity to Michigan Lake Erie.

INDUSTRIAL PRODUCTIVITY

Regional Trends

In order to provide a background against which total manufacturing trends in the Detroit Project area can be seen more clearly, data for selected states

have been prepared. Table 1-III indicates the trends in value added by manufacture in the five-state region of Illinois, Indiana, Michigan, Ohio, and Wisconsin. As the dollar values shown are not in constant dollars, they are expressed as a percent of the Nation's total value added by manufacture during various years from 1939 to 1962.

As a percent of the Nation, the five-state region declined slightly but steadily from 1939 to 1958. Actual dollar values did increase, however, during this period. The 1962 five-state total of value added by manufacture as a percent of the Nation was about 29.2 as compared with 29 percent in 1958, and about 31.4 percent in 1947. Generally, the trend from 1958 to 1962 was to reverse the slightly downward trend from 1947 to 1958. In summary, for the five-state region, the basic tendency is for the region to increase in industrial activity at about the National rate.

Project Area Trends

Manufacturing activity in Michigan and the Detroit area is characterized by a high degree of concentration in durable goods manufacture (automobiles, industrial machinery, etc.). Because of the heavy dependence on such durable goods, Detroit experiences widespread fluctuations in its economy. As the United States economy experiences a downward trend, durable goods suffer a greater contraction of their market than do nondurable goods. Consumers tend to take advantage of the long life that is built into durable goods and make larger use of the stock of such goods.

The economic pattern of the Detroit area is characterized by the high degree of concentration in one single industry, namely: motor vehicle production. In recent decades, however, the automobile industry has been taking a smaller proportion of total manufacturing employment in the Detroit area - some trend in diversification of the manufacturing economy is taking place.

TABLE 1-III. VALUE ADDED BY TOTAL MANUFACTURE FOR ILLINOIS, INDIANA, MICHIGAN, OHIO, AND WISCONSIN
1939 - 1962
DOLLAR AMOUNTS IN MILLIONS

State	1939		1947		1954	
	Value Added	%N	Value Added	%N	Value Added	%N
Illinois	2201.6	8.986	6683.1	8.995	9663.8	8.232
Indiana	970.2	3.950	2970.0	3.997	4632.0	3.945
Michigan	1798.4	7.340	5200.1	6.999	8707.2	7.417
Ohio	2125.5	8.675	6358.0	8.558	10154.4	8.650
Wisconsin	<u>686.6</u>	<u>2.802</u>	<u>2171.8</u>	<u>2.923</u>	<u>3198.2</u>	<u>2.724</u>
Total	7782.3	31.763	23383.0	31.472	36355.6	30.968
State	1958		1960		1962	
	Value Added	%N	Value Added	%N	Value Added	%N
Illinois	11664.1	8.256	12652.6	7.751	12670.9	7.624
Indiana	5478.1	3.877	6259.8	3.834	7094.0	3.956
Michigan	8363.6	5.920	10864.7	6.656	11969.3	6.675
Ohio	11472.5	8.120	13841.8	8.479	14577.7	8.129
Wisconsin	<u>3959.5</u>	<u>2.802</u>	<u>4680.3</u>	<u>2.867</u>	<u>5100.2</u>	<u>2.844</u>
Total	40937.8	28.975	48299.2	29.587	51412.1	29.228

%N = Percent of Nation

Note: Dollar values have not been adjusted for price change.

Source: 1939 Census of Manufactures; Census of Manufactures, Volume III, Area Statistics, P 148-49 (for 1947 and 1954); 1958 Census of Manufactures, Area Reports for Illinois, Indiana, Michigan, Ohio, and Wisconsin; 1960 Annual Survey of Manufactures, Part 3 - East North Central Area Report. 1962 Annual Survey of Manufactures, Part 3 - East North Central Area Report.

As industrial production rises and falls, demands upon water resources change and the population fluctuates as people leave and enter the area.

While recognizing the importance of trends in all industries, emphasis is placed on what has been labeled "water-using" industries. These industries are: food and kindred products, paper and allied products, chemicals and allied products, petroleum and coal products, and primary metal industries. Industrial trends (value added by manufacture) in the Detroit SMSA for water using industries are shown in Table 2-III. Monroe County is not included in this tabulation as the information was not available.

The information in Table 2-III indicates that the Detroit SMSA's share of the Nation's total, held relatively constant from 1947 to 1954, declined sharply from 1954 to 1958, and regained a large part of the loss by 1960. However, it turned downward again in 1962. As discussed earlier, the large concentration of durable-goods industries in the Detroit area is the major cause of this wide fluctuation.

The primary metals industry showed a sharp increase in activity between 1938 and 1960. This condition, to a great extent, was due to the close relationship between that industry and the automobile industry - a substantial part of the steel produced in blast furnace and steelworks in the area is used by the automotive industry.

As indicated in Table 3-III, as a percent of the Nation, value added by total manufacture in the four-county Project area declined from 1939 to 1947, remained relatively constant from 1947 to 1954, and declined sharply from 1954 to 1958. Wayne County, which in 1958 accounted for 75 percent of the value added in the area, declined as a percent of the Nation and as a percent of the area from 1947 to 1958. Again, however, the actual dollar value showed an increase during this period.

TABLE 3-III. VALUE ADDED BY MANUFACTURE IN COUNTIES OF THE
DETROIT RIVER-LAKE ERIE PROJECT AREA, 1939 - 1962
DOLLAR AMOUNTS IN MILLIONS

County	1939			1947			1954		
	Value Added	%A	%N	Value Added	%A	%N	Value Added	%A	%N
Macomb	20.0	1.81	.081	106.4	3.60	.142	281.2	5.88	.239
Monroe	13.6	1.23	.055	44.6	1.51	.051	68.0	1.42	.058
Oakland	64.0	5.80	.261	261.5	8.84	.351	532.0	11.14	.453
Wayne	<u>1004.6</u>	91.16	<u>4.100</u>	<u>2544.8</u>	86.05	<u>3.426</u>	<u>3900.0</u>	81.56	<u>3.322</u>
Total	1102.2		4.497	2957.3		3.980	4781.2		4.072
County	1958			1960			1962		
	Value Added	%A	%N	Value Added	%A	%N	Value Added	%A	%N
Macomb	486.4	11.13	.344	577.3	10.07	.353	655.2	10.80	.365
Monroe	58.1	1.33	.041	67.9	1.19	.041	75.3	1.24	.042
Oakland	538.8	12.33	.382	866.4	15.12	.530	1007.7	16.63	.562
Wayne	<u>3287.2</u>	75.21	<u>2.327</u>	<u>4219.9</u>	73.62	<u>2.585</u>	<u>4320.0</u>	71.31	<u>2.404</u>
Total	4370.5		3.094	5731.5		3.509	6058.2		3.373

%A = Percent of Project area

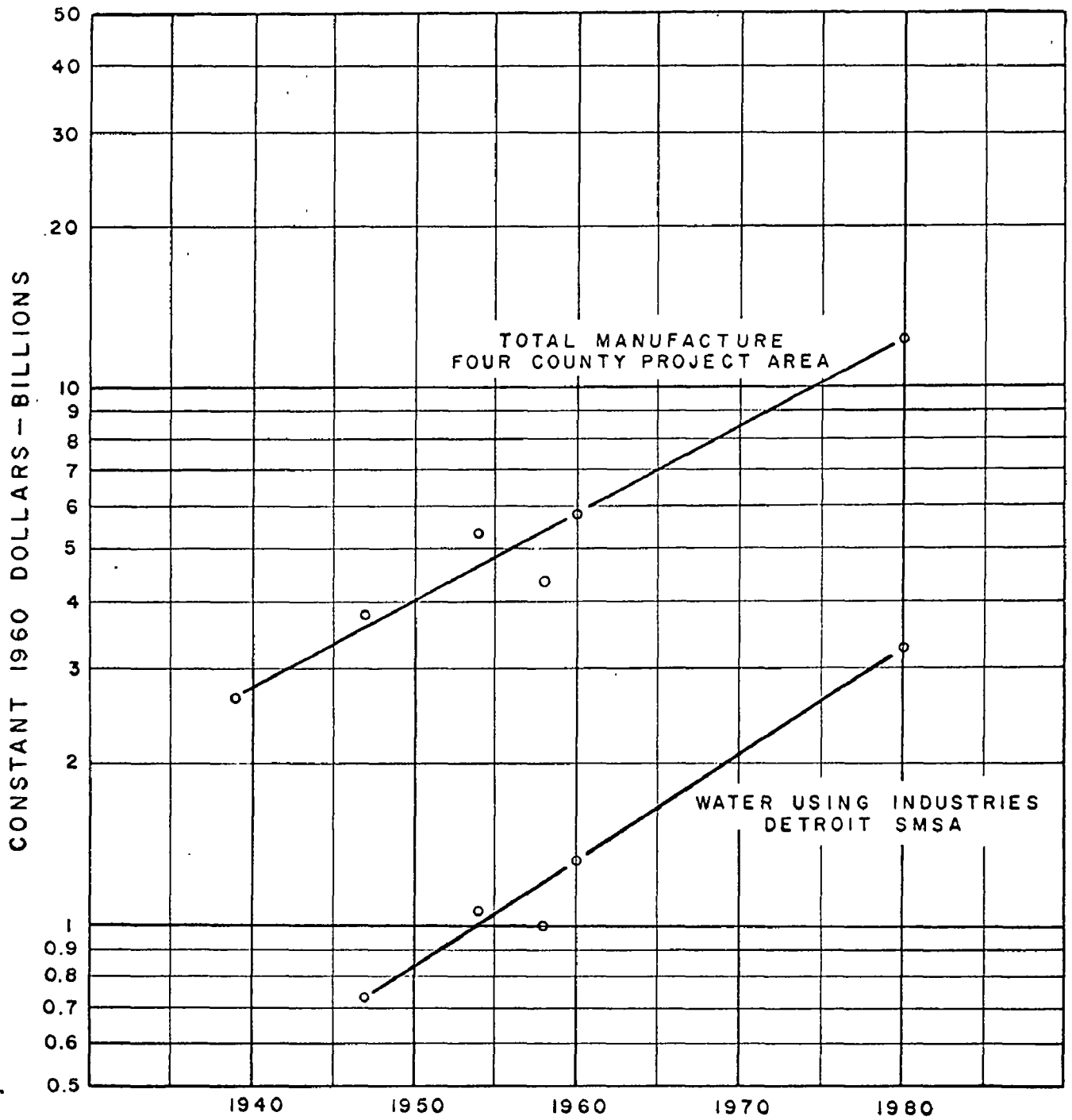
%N = Percent of Nation

Source: U.S. Census of Manufactures for years shown, except 1960 and 1962, which are from U.S. Annual Survey of Manufactures.

During 1962, value added by manufacture in the four-county Project area totaled approximately 6.1 billion - almost 4 percent of the Nation's total. The value added by manufacture was 51.0 percent of Michigan's total and 11.6 percent of the five-state total.

Dollar figures indicating value added by total manufacturing as shown in Table 3-III and for the major water-using industries as shown in Table 2-III were converted to 1960 constant dollars by use of the wholesale price index (1947-49=100). Using value added by manufacture in 1960 constant dollars as a measure of industrial activity, all manufacturing output doubled between 1939 and 1960, and output of the major water-using industries increased by eighty percent between 1947 and 1960. The growth rate of all manufacturing in the area from 1939 to 1960 was 3 3/4 percent annually compounded. The growth rate of the major water-using industries from 1947 to 1960 was 4 3/4 percent annually compounded. These predictions may be misleading in some respects, however, because at the present time the major water-using industries in the Detroit area are located on the Detroit waterfront where very little room is available for expansion. There is no evidence, however, to indicate that future industrial growth in the area will be any less than past growth. Using compound growth rates it is anticipated that total manufacturing in the area will double and the major water-using industries will increase by 150 percent between 1960 and 1980. Increases in industrial activity in the Project area are shown in Figure 1-III and Table 8-III.

These figures indicate that either demands upon the water resources of the area will increase by this amount or pollution control achieved through waste treatment and more efficient water management will lessen the impact of this predicted expansion.



DETROIT RIVER-LAKE ERIE PROJECT

TRENDS IN VALUE ADDED BY MANUFACTURE
IN PROJECT AREA

1939-1980

U.S. DEPARTMENT OF HEALTH, EDUCATION, & WELFARE
PUBLIC HEALTH SERVICE
REGION V GROSSE ILE, MICHIGAN

POPULATION GROWTH

Regional Trends

The trends in total manufacturing employment (as a percent of the Nation) in the five-state area show great similarity to the trends in value added by manufacturing. Table 4-III indicates that total manufacturing employment for the five-state region, after a slight increase from 1947 to 1954, declined sharply from 1954 to 1958. From 1947 to 1958 (omitting 1954), Michigan showed the largest decline; Illinois and Ohio showed less severe declines; the Indiana ratio was rather stable; and Wisconsin showed an increase.

Regional population trends from 1940 to 1960 are shown in Table 5-III. The total five-state population trend from 1940 to 1960 showed little change as a percent of the Nation, remaining at about 20 percent. The State of Michigan trend, however, has been to increase as a percent of the Nation even during the 1950 to 1960 decade. In contrast, Illinois declined as a percent of the Nation. All states, however, showed an actual increase in population during this period.

Project Area Trends

Manufacturing employment trends in the study area have declined sharply since 1947 both in total numbers and as a percent of the Nation. The percentage has declined to a level of 2.6 percent of the Nation as contrasted to 3.7 percent in 1947. Automation in the durable goods manufacture and the decentralization of the automobile industry probably account for this decline in employment. Employment trends are shown in Table 6-III.

As shown in Table 7-III, the total population of the four-county Project area increased from approximately 2.4 million in 1940 to 3 million in 1950 and 3.9 million in 1960. This amounts to 49 percent of the entire population of the State of Michigan. Within the Project area, the more rapid rates of

TABLE 4-III. TOTAL MANUFACTURING EMPLOYMENT OF ILLINOIS, INDIANA, MICHIGAN, OHIO, AND WISCONSIN
1939 - 1962

State	1939		1947		1954	
	Mfg. Empl. (000)	%N	Mfg. Empl. (000)	%N	Mfg. Empl. (000)	%N
Illinois	759.7	7.538	1186.1	7.756	1222.4	7.580
Indiana	340.6	3.378	548.3	3.584	587.3	3.642
Michigan	621.2	6.163	975.5	6.376	1056.5	6.551
Ohio	735.3	7.296	1194.3	7.809	1292.6	8.015
Wisconsin	254.6	2.526	405.9	2.655	439.2	2.737
Total	2711.4	26.901	4310.1	28.180	4598.0	28.525

State	1958		1960		1962	
	Mfg. Empl. (000)	%N	Mfg. Empl. (000)	%N	Mfg. Empl. (000)	%N
Illinois	1186.8	7.406	1208.8	7.227	1194.1	
Indiana	550.9	3.437	588.0	3.515	596.7	
Michigan	880.4	5.494	964.0	5.763	936.6	
Ohio	1195.1	7.464	1265.6	7.566	1222.6	
Wisconsin	438.6	2.737	465.8	2.784	469.7	
Total	4252.8	26.538	4492.2	26.855	4419.7	

%N = Percent of Nation

Source: 1939 Census of Manufactures; Census of Manufactures, Volume III, Area Statistics, P 48-49 (for 1947 and 1954); 1955 Census of Manufactures, Area Reports for Illinois, Indiana, Michigan, Ohio, and Wisconsin; 1960 Annual Survey of Manufactures, Part 3 - East North Central Area Report. 1962 Annual Survey of Manufactures, Part 3 - East North Central Area Report.

TABLE 5-III. POPULATION OF ILLINOIS, INDIANA, MICHIGAN, OHIO, AND WISCONSIN
1940 - 1960

State	1940		1950		1960	
	Population (000)	%N	Population (000)	%N	Population (000)	%N
Illinois	7897.2	5.977	8712.2	5.743	10081.2	5.621
Indiana	3427.8	2.594	3934.2	2.593	4662.5	2.600
Michigan	5256.1	3.978	6371.8	4.200	7823.2	4.362
Ohio	6907.6	5.228	7946.6	5.239	9706.4	5.411
Wisconsin	<u>3137.6</u>	<u>2.375</u>	<u>3434.6</u>	<u>2.264</u>	<u>3951.8</u>	<u>2.203</u>
Total	26626.3	20.152	30399.4	20.039	36225.1	20.197

%N = Percent of Nation's total population.

Source: U.S. Bureau of the Census population reports for years shown.

TABLE 6-III. TOTAL MANUFACTURING EMPLOYMENT IN COUNTIES OF DETROIT RIVER-LAKE ERIE PROJECT AREA, 1939 - 1960

County	1939			1947			1954		
	Manufacturing Employment Number	%A	%N	Manufacturing Employment Number	%A	%N	Manufacturing Employment Number	%A	%N
Macomb	4512	1.34	.044	14843	2.63	.096	35120	6.42	.217
Monroe	4244	1.26	.041	6820	1.22	.044	8655	1.59	.053
Oakland	16133	4.80	.158	44566	7.90	.291	57624	10.54	.357
Wayne	<u>311332</u>	92.60	<u>3.085</u>	<u>497832</u>	88.25	<u>3.257</u>	<u>310756</u>	75.57	<u>1.939</u>
Total	336221		3.328	564061		3.688	412155		2.566

County	1958			1960		
	Manufacturing Employment Number	%A	%N	Manufacturing Employment Number	%A	%N
Macomb	46757	11.37	.292	47570	10.77	.284
Monroe	6150	1.50	.038	5864	1.33	.035
Oakland	47522	11.56	.296	55959	12.67	.334
Wayne	<u>310756</u>	75.57	<u>1.939</u>	<u>332433</u>	75.23	<u>1.987</u>
	411185		2.565	441826		2.640

%A = Percent of Project area
 %N = Percent of Nation

Source: U.S. Census of Manufactures for years shown, except 1960, which is from U.S. Annual Survey of Manufactures.

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TABLE 7-III. POPULATION OF COUNTIES OF DETROIT RIVER-LAKE ERIE PROJECT AREA,
1910, 1940, 1950, 1960, 1980
(WITH PERCENT INCREASE FROM PRECEDING DECADE)

County	Persons Per Sq. Mile, 1960	1910		1940			1950		
		Total	%A	Total	% Incr.	%A	Total	% Incr.	%A
Macomb	843.7	32,606	5.04	107,638	39.5	4.42	184,961	71.8	5.98
Monroe	179.9	32,917	5.09	58,620	11.7	2.41	75,666	29.1	2.45
Oakland	787.1	49,576	7.67	254,068	20.3	10.43	396,001	55.9	12.81
Wayne	4,392.6	531,591	82.20	2,015,623	6.7	82.74	2,435,235	20.8	78.76
Total		646,690		2,435,949			3,091,863		

County	1960			1980		
	Total	% Incr.	%A	Total	% Incr. ⁽¹⁾	%A
Macomb	405,804	119.4	10.50	800,000	48.61	14.61
Monroe	101,120	33.6	2.62	175,000	36.5	3.21
Oakland	690,529	74.3	17.87	1,200,000	36.9	21.91
Wayne	2,666,297	9.5	69.01	3,300,000	11.9	60.27
Total	3,863,750			5,475,000		

(1) Average percent increase per decade since 1960.

%A = Percent of Project area.

Source: Populations for the years 1910 - 1960, from U.S. Department of Commerce, Bureau of the Census; 1980 projections for Macomb, Monroe, Oakland, and Wayne Counties from "1970 and 1980 Population Projections," Detroit Metropolitan Area, Regional Planning Commission, Population and Housing Committee, February 1963.

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growth have been in Oakland and Macomb Counties, which together accounted for more than a half-million increase between 1950 and 1960. Between 1950 and 1960, the City of Detroit, which is in Wayne County, declined in population from 1,849,568 to 1,670,114. At the same time, however, Wayne County increased from 2,435,235 to 2,666,297.

In 1940, Wayne County comprised 82.7 percent of the four-county study area; whereas in 1960 it was 69 percent. On the other hand, the Macomb County percent increased from 4.4 to 10.5 during the same period and Oakland County increased from 10.4 to 17.9 percent. Monroe County increased in percent from 2.4 to 2.6.

In 1980, the population of the Project area is expected to reach 5.5 million, representing an increase since 1960 of 41.5 percent. Wayne County will still be the largest county by far but its percent change in population in the area will continue to show a decline. The Project area, although slowing down in its rate of growth, grew considerably more rapidly than the national rate between 1940 and 1950 and slightly more rapidly than the national rate between 1950 and 1960.

Population of the four-county Project area as of April 1, 1963 is distributed as follows: Macomb 473,000, Monroe 109,000, Oakland 735,000, and Wayne 2,672,000; for a total of 3,989,000. Estimated population of this area by the year 1980 is distributed as follows: Macomb 800,000, Monroe 175,000, Oakland 1,200,000, and Wayne 3,300,000, for a total of 5,475,000. Figure 2-III graphically depicts population trends in the Project area from the year 1910 to 1980.

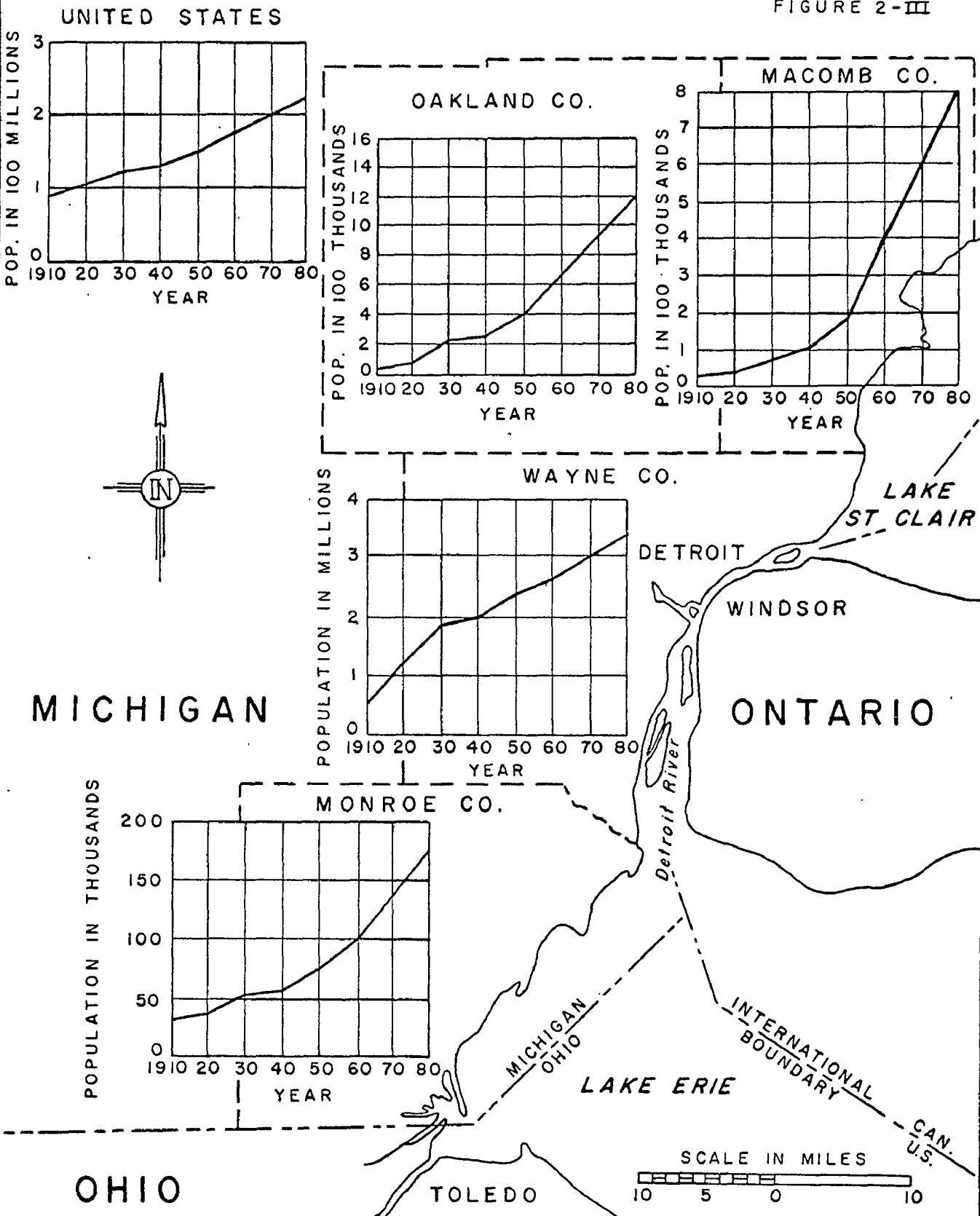
TABLE 8-III. SUMMARY OF POPULATION AND MANUFACTURING GROWTH
TRENDS IN DETROIT RIVER-LAKE ERIE PROJECT AREA

<u>Year</u>	<u>Population</u>
1910	646,690
1940	2,435,849
1950	3,091,863
1960	3,863,750
1980	5,475,000

<u>Year</u>	<u>Value Added by Total Manufacture *</u>
1939	\$2,630,000,000
1947	\$3,640,000,000
1954	\$5,181,000,000
1958	\$4,381,000,000
1960	\$5,731,000,000
1980	\$12,000,000,000

<u>Year</u>	<u>Value Added by Water-Using Industries *</u>
1947	\$717,000,000
1954	\$1,049,000,000
1958	\$1,000,000,000
1960	\$1,298,000,000
1980	\$3,234,000,000

* In constant 1960 dollars



DETROIT RIVER-LAKE ERIE PROJECT

**POPULATION TRENDS
IN FOUR COUNTY PROJECT AREA**

U.S. DEPARTMENT OF HEALTH, EDUCATION, & WELFARE
PUBLIC HEALTH SERVICE
REGION V GROSSE ILE, MICHIGAN

Conclusions

1. It is predicted that between the period of 1960 and 1980 total manufacturing in the Project area will increase by 100 percent.
2. It is further predicted that during this same period major water-using industries in the Project area will increase by 150 percent.
3. The four-county Project area is estimated to increase in population from 3.9 million in 1960 to 5.5 million in 1980. This represents a 40 percent increase during this 20-year period.
4. The predicted rate of industrial growth is greater than the predicted rate of population increase during the period 1960-80.
5. These predicted increases in population and industrial growth indicate greater demands will be placed upon the water resources of the area, particularly from the standpoint of water supply and waste discharge into the Detroit River.
6. Unless effective pollution control is achieved through waste treatment and/or more efficient water management, water quality in the Detroit River and Lake Erie can be expected to deteriorate from existing levels.
7. Appropriate water pollution control measures will be required if the needs of the expanding populace and industrial development are to be met and the water resources of the area protected.