United States
Environmental Protection
Agency

Region 5
230 South Dearborn Street
Chicago, Illinois 60604

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EPA

Environmental Management Report

Attachment A

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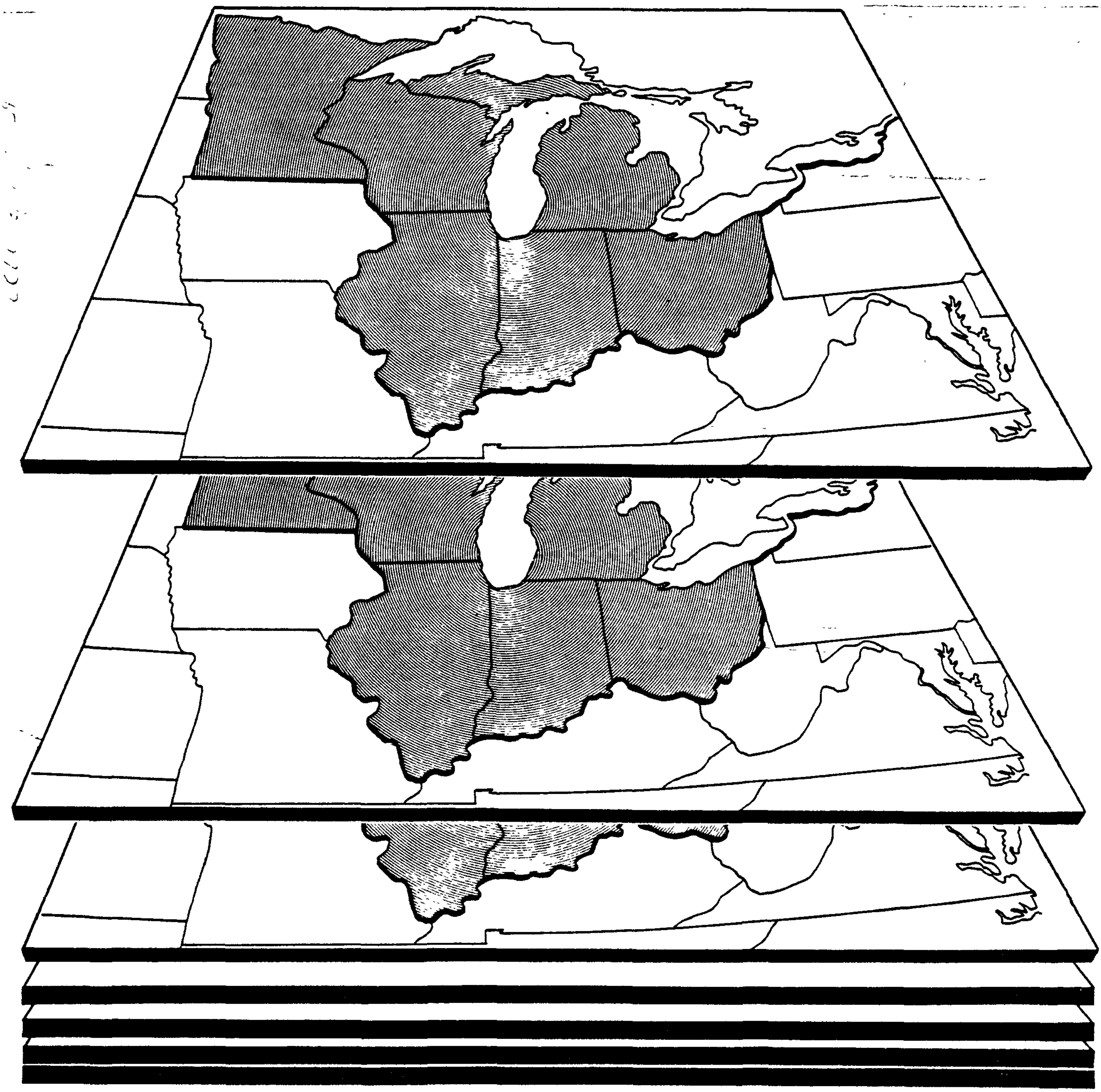

REGION V ENVIRONMENTAL MANAGEMENT REPORT

ATTACHMENT A

REFERENCE AND SUPPORT MATERIALS

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ATTACHMENT A

AIR

AIR QUALITY OVERVIEW

Figures A-1 to A-7 (see Part 1) present maps that give an overview of the Region's major air quality problems. These are discussed on a pollutant-by-pollutant basis below.

Ozone (O_3)

The ozone problems which are shown in Figure A-1 (see Part 1) are the most serious air quality problems in Region V.

The most severe ozone problems in the Region continue to occur in the Chicago/NW Indiana/SE Wisconsin, Detroit, and Milwaukee areas. These areas are required to attain the standard by 1987. However, nonattainment problems also continue in Portage and Summit Counties in Ohio (Akron area); and control implementation problems occur in St. Joseph and Elkhart Counties (South Bend area) in Indiana.

In 1978, 155 of the 524 Region V counties were designated primary nonattainment for ozone. Strategies to reduce ozone concentrations in these areas impacted over 75% of the Region's population. By 1980, of the 84 counties still monitored, 33 contained at least one site over the primary standard. In 1981, of the 89 counties with monitors, 22 contained at least one site over the primary standard. Regionally, by 1980 just over 21% of the total population resided in primary nonattainment areas.

Region V ozone trends from 1978-1980 are summarized as follows:

- Number of sites with increasing concentrations	6 (5.9%)
- Number of sites with decreasing concentrations	39 (38.6%)
- Number of sites with no change	56 (55.5%)

This summary illustrates a short-term decrease which appears to be due to a combination of factors: reduction in precursor emissions, less conducive meteorological conditions for ozone formation, and ozone monitor calibration changes (causing up to a 15% drop in observed concentrations). Detroit, Cincinnati, Cleveland, Milwaukee, St. Louis, and Louisville have all shown significant downward ozone trends. It should also be noted that RACT regulations covering many point sources did not become effective until the end of 1982.

While substantial improvement in ozone levels has occurred in Region V since 1977-1978, at least two areas, Portage and Summit Counties in Ohio and St. Joseph and Elkhart Counties in Indiana, are projected not to meet the standard by the 1982 statutory deadline. A substantial portion of the attainment demonstration in these areas is dependent on reduced emissions achieved through FMVCP. The major factors responsible for failure of the in-use vehicle control program to provide its share of emission reductions are the lower than expected turn-over of the used car fleet, emission control system deterioration, improper maintenance, Description of Figure A-1: Region V Problem Areas for Ozone

Illinois:

1. All of Cook, DuPage, Kane, Lake, McHenry, and Will Counties
2. All of Madison, Monroe, and St. Clair Counties

Indiana:

1. All of Lake and Porter Counties
2. All of Elkhart and St. Joseph Counties
3. All of Clark and Floyd Counties

Michigan:

1. All of Macomb, Oakland, and Wayne Counties

Minnesota:

No Areas

Ohio:

1. All of Portaqe and Summit Counties

Wisconsin:

1. All of Kenosha, Milwaukee, Ozaukee, Racine, and Waukesha Counties

For a more detailed analysis, please see 40 CFR 81.301 through 40 CFR 81.356 and subsequent Federal Register notices up to February 1, 1983.

component failure, and tampering and fuel switching.

The Chicago/NW Indiana/SE Wisconsin, Milwaukee, and Detroit areas are required to meet the standard by the final statutory deadline of 1987. The Clean Air Act currently requires that these areas implement I/M by no later than January 1, 1983. None of these areas have yet met this requirement.

Total Suspended Particulate (TSP)

The TSP problems in Region V, shown in Figure A-2 (see Part 1), are among the most serious of the air quality problems. The potential health impact from TSP is indicated by the 16 areas still showing violations of the primary standard.

The most severe TSP problems in the Region occur in the Chicago/N.W. Indiana, Detroit, and Cleveland urban areas. In addition, the following counties, or parts thereof, were not in attainment by their statutory deadline of December 31, 1982: Macon, St. Clair, and Madison Counties in Illinois; Clark County in Indiana, Hennepin County in Minnesota; and, Columbiana, Jefferson, Mahoning, Richland, and Sandusky Counties in Ohio.

In many of these areas, violations are associated with the steel industry and power generation. While TSP emissions have decreased from 1970 to the present, due mostly to the control of traditional industrial stack and process fugitive emissions and fuel conversion (from coal to oil and natural gas), ambient levels have not decreased as much in recent years because low level fugitive emissions from industry and wind blown dust have not decreased.

In 1975, 24% of the 947 TSP monitoring sites exceeded the annual primary standard and 7% of these sites exceeded the 24-hour primary standard. By 1981, the number of monitors exceeding the annual primary standard was reduced to 8% of 955 total sites. Similarly, the percentage of monitors exceeding the 24-hour primary standard was reduced to 3% of the 955 sites. The populations exposed to primary standard violations stood at just under 17% in 1980, compared to over 20% in 1975.

These recent decreases in primary standard exposure are significant when we consider that:

- many urban areas had already achieved their largest decreases in TSP levels between 1970 and 1975;

- improvement in the monitoring network after 1978, resulted in relocation of monitors to peak concentration areas (or "hot spot" special-purpose monitoring), and thus, reducing the number of TSP sites in clean air areas; and,

- industrial fugitive dust regulations have only just become effective at the end of 1982.

Description of Figure A-2: Region V Problem Areas for Total Suspended Particulates

PRIMARY PROBLEM AREAS:

Illinois:

1. Cook County: most of the City of Chicago and communities south and southwest of the City
2. Macon County: City of Decatur
3. Madison County: Townships of Chouteau and Godfrey
4. St. Clair County: western portion of the County

Indiana:

1. Clark County: southern portion of the County
2. Lake County: northern portion of the County
3. Porter County: area approximated by the Community of Burns Harbor
4. Marion County: most of the County

Michigan:

1. Wayne County: most of the City of Detroit and Communities south of the City

Minnesota:

1. All of Hennepin County

Ohio:

1. Columbiana County: eastern portion of the County
2. Jefferson County: eastern portion of the County
3. Cuyahoga County: most of the City of Cleveland and several of the surrounding communities
4. Mahoning County: east-central portion of the County
5. All of Richland County
6. All of Sandusky County

Wisconsin:

No Areas

(Description of Figure A-2 cont'd)

SECONDARY PROBLEM AREAS:

Illinois:

Adams County:	west-central portion of the County
Bureau County:	most of the County
Cook County:	almost all of the County, aside from the Primary Area
Kane County:	northeastern portion of the County
Kankakee County:	most of the County
Will County:	most of the County
DuPage County:	entire County
Kendall County:	entire County
Lake County:	entire County
DeKalb County:	most of the County
Jefferson County:	north and central portion or the county
Jo Daviess County:	most of the County
Woodford County:	most of the County
Knox County:	entire County
Peoria County:	entire County
Tazewell County:	entire County
LaSalle County:	west-central portion of the County
McClean County:	central portion of the County
Macon County:	portion of the County north of the Primarv Area
Madison County:	most of the County, aside from the Primary Area
Monroe County:	northeastern portion of the county
St. Clair County:	most of the County, aside from the Primary Area
Massac County:	central portion of the County
Menard County:	central portion of the County
Putnam County:	central portion of the County
Rock Island County:	along most of the State border, in the area of the City of Moline
Whiteside County:	most of the eastern portion of the County
Williamson County:	central portion of the County
Winnebago County:	most of the County

Indiana:

Dearborn County:	Township of Lawrenceburg
DuBois County:	Township of Bainbridge
St. Joseph County:	northeast portion of the County
Vanderburgh County:	central portion of the County
Vigo County:	a small portion of the City of Terre Haute

Michigan:

Bay County:	area approximated by the City of Bay
Calhoun County:	area approximated by the City of Albion
Delta County:	area approximated by the City of Escanaba
Emmet County:	area approximated by the City of Petoskey
Genesse County:	most of the City of Flint
Ingham County:	area approximated by the City of Lansing
Kent County:	area approximated by the City of Grand Rapids
Lapeer County:	area approximated by the City of Imlay
Macomb County:	area approximated by the City of New Haven

(Description of Figure A-2 cont'd)

Manistee County:	area approximated by the City of Manistee
Mason County:	area approximated by the Township of Golden
Midland County:	area approximated by the City of Midland
Monroe County:	northeastern portion of the County
Muskegon County:	area approximated by the City of Muskegon
St. Clair County:	area approximated by the City of Port Huron
Saginaw County:	area approximated by the City of Saginaw
Wayne County:	northeastern portion of the County

Minnesota:

Goodhue County:	City of Red Wing
Koochiching County:	City of International Falls
St. Louis County:	most of the City of Duluth
St. Louis County:	portions of three townships in the Iron Range
Ramsey County:	City of St. Paul

Ohio:

Belmont County:	eastern portion of the County
Jefferson County:	eastern portion of the County, aside from the Primary Area
Columbiana County:	eastern portion of the County, aside from the Primary Area
Monroe County:	northeastern portion of the County
Tuscarawas County:	entire County
Butler County:	eastern portion of the County
Montgomery County:	much of the southern portion of the County
Preble County:	southwestern portion of the County
Clark County:	eastern portion of the County
Miami County:	northern portion of the County
Logan County:	entire County
Cuyahoga County:	most of the County, aside from the Primary Area
Franklin County:	central portion of the County
Hamilton County:	south-central portion of the County
Lake County:	north-central portion of the County
Summit County:	most of the County, except for the northern and southern portions
Medina County:	entire County
Lawrence County:	southern portion of the County
Lorain County:	north-central portion of the County
Lucas County:	north-central portion of the County
Seneca County:	entire County
Allen County:	entire County
Wyandot County:	entire County
Mahoning County:	northeastern portion of the County
Trumbull County:	southern portion of the County
Muskingum County:	entire County
Scioto County:	southern and eastern portion of the County
Gallia County:	entire County
Jackson County:	entire County
Stark County:	central portion of the County
Washington County:	entire County

(Description of Figure A-2 cont'd)

Wisconsin:

Brown County:	most of the City of Green Bay
Columbia County:	most of the Township of Pacific
Dane County:	most of the City of Madison
Douglas County:	most of the City of Superior
Kenosha County:	most of the City of Kenosha
Manitowoc County:	most of the City of Manitowoc
Marathon County:	City of Brokaw
Milwaukee County:	most of the City of Milwaukee
Racine County:	portion of the City of Racine
Rock County:	portion of the City of Beloit
Waukesha County:	portion of the City of Waukesha
Winnebago County:	portions of the Cities of Neenah and Oshkosh
Wood County:	portion of the City of Marshfield

For a more detailed analysis, please see 40 CFR 81.301 through 40 CFR 81.356 and subsequent Federal Register notices up to February 1, 1983.

There exists uncertainties over how the eventual promulgation of the inhalable particulate standard will affect the overall TSP problem. However in order for control strategies to be developed for the inhalable particulate standard, there is a need for inhalable particulate monitoring in order to assess the nature and extent of the problem; determination of source contributions, i.e., emission factors; evaluation of control technology effectiveness; and, establishment of schedules for compliance.

The resolution of the TSP problem is complicated by the following factors:

° TSP sources are suffering extreme economic hardship because of the area's dependence on industrial production; as a result, public and private sources are less likely to voluntarily install costly controls. In fact, several sources have been unwilling to cooperate in meeting their statutory requirements.

° At the same time steel production, which is a major factor in creating TSP emissions, is at an extremely low ebb with many sources physically shutdown. A revival of economic activity could result in a significant increase in emissions and consequent rise in unhealthful air quality levels and increased population exposure.

° Parts of the SIP that regulate iron and steel mill sources have not yet been finally approved; therefore, industry is reluctant to comply with still-uncertain requirements.

Carbon Monoxide (CO)

Though the CO problem areas in Region V are not as widespread as other air quality problems, they still represent a major health concern to the exposed populations. The areas of excessive CO levels of most concern in the Region occur in Chicago, Illinois; Detroit, Michigan; Indianapolis, Indiana; and, St. Paul, Duluth, and St. Cloud, Minnesota. Also experiencing high CO levels based on 1981 monitoring data are Minneapolis and Rochester, Minnesota; East Chicago, Indiana; and Akron, Ohio. With the exception of Chicago, these CO nonattainment problems are concentrated along heavily traveled corridors or near major intersections. In Chicago, the nonattainment problem appears to be more uniform in the downtown area as well as being concentrated along heavily traveled corridors in the adjoining areas.

The major source of CO contamination is the incomplete combustion of fossil fuels. This primarily occurs from the approximately 30 million vehicles operating in the Region. Additional CO emissions occur when cold weather inhibits the complete combustion of fuels even further, especially during cold starts. This is significant in Region V, which has a large population with many vehicles in the northern portion of the Region. Progress has been made in dealing with the CO problem through the implementation of FMVCP. Furthermore, progress has also been made through the increased use of smaller cars which offer better gasoline mileage.

Description of Figure A-3 in Part 1: Region V Problem Areas for Carbon Monoxide

Illinois:

1. Cook County downtown ("Loop Area" portion of the City of Chicago)

Indiana:

1. Lake County: City of East Chicago
2. Marion County: downtown portion of the City of Indianapolis

Michigan:

1. Wayne County: northeast portion of the City of Detroit

Minnesota:

1. Ramsey County: City of St. Paul
2. St. Louis County: City of Duluth
3. Stearns County: City of St. Cloud

Ohio:

No Areas

Wisconsin:

No areas

For a more detailed analysis, please see 40 CFR 81.301 through 40 CFR 81.356 and subsequent Federal Register notices up to February 1, 1983.

The number of total exceedances of the eight-hour standard decreased sharply from 831 in 1975 to just 99 in 1981 while the exceedances of the one-hour standard also decreased from nine to one in the same time period. However, the percentage of monitors exceeding either standard increased from 38% (28/73) in 1975 to 40% (31/78) in 1981. Further examination of the data reveals that while counties with monitors experiencing exceedances in 1975 showed fewer exceedances in 1981, many counties that were monitored in 1975 with no exceedances are now showing exceedances in 1981. One possible cause of this phenomenon is the population movement from major urban centers to suburban locations, spreading the CO problem over a larger area. However in many downtown areas, 1982 concentrations exceeded 1980/1981 concentrations throughout the Region probably due to adverse meteorology.

Sulfur Dioxide

Poor sulfur dioxide (SO_2) air quality is generally not considered a major problem in Region V; that is, most of the high population areas are not routinely exposed to levels of SO_2 greater than the ambient health standards. Figure A-4 (see Part 1) displays the areas that continue to have nonattainment problems for SO_2.

The present SO_2 air quality problems are, for the most part, confined to limited areas near certain major fossil fuel burning facilities (i.e., power plants, refineries, pulp and paper mills, and industrial boilers). The known SO_2 problem areas in the Region are noted below:

- Five areas have had monitored violations of the SO_2 NAAQS during the 1980's: Dakota Co. (Pine Bend area) in Minnesota; Brown (Green Bay), Marathon, and Oneida (Rhinelander) Co. in Wisconsin; and Lake Co. in Indiana. Lake County has had running violations and a history of high ambient concentrations.

- Eight SO_2 nonattainment problem areas do not have fully approved control strategies that assured attainment of the standards by the statutory deadline of December 31, 1982. These areas are: Brown and Milwaukee Counties in Wisconsin; Lake, LaPorte, Marion and Wayne Counties in Indiana; and, Peoria and Tazewell Counties in Illinois.

The most important of these problems is in Green Bay. In this area, monitored levels continue to be above the primary (health related) standards and are occurring in high population areas. The three other areas with monitored problems are in relatively isolated areas and are caused by one or two major sources. In most of the problem areas, the States/EPA are in an advanced stage of regulation development which should remedy the potential problems (with the exceptions of Wayne County, Indiana for which there has been no recent action by the State; and Oneida County, Wisconsin which is a newly discovered problem area). There are 28 officially designated SO_2 nonattainment counties in the Region that already have fully approved control strategies which are either presently attaining the standards (and could be redesignated) or should attain the standards upon final compliance by the affected sources with their control strategy.

There has been a marked improvement in the Region's SO_2 air quality levels; for example:

° Areas with monitors recording standard violations have been reduced from 39 (during the 1970's) to 5 presently.

° Counties with designated nonattainment areas have been reduced from 44 in 1978 to 28 in 1982 (including projected redesignations mentioned above).

Also, a close look at past monitoring data shows great improvement in urbanwide SO_2 levels in Chicago and Cleveland since the early 1970's. For example, SO_2 violations (some as high as twice the SO_2 primary standards) observed at 16 different monitors in Chicago have been eliminated. The past SO_2 problems in Chicago and Cleveland can be attributed to the general consumption of high sulfur content fuels by residential and commercial users for space heating and by industries for steam and power requirements. The Region's improvement in SO_2 air quality levels has, as expected, been accompanied by a decrease in total Regional SO_2 emissions (declining since the late 1960's) and in Regional utility SO_2 emissions (declining since the mid 1970's). The decline in utility SO_2 emissions is also caused by the New Source Performance Standards which requires that newer cleaner units displace older less effective units, and by alternative energy sources (e.g., nuclear power).

Control strategies for sources within Region V have, for the most part, consisted of one or more of the following elements:

° Fuel conversions (from higher to lower sulfur content coal or oil, from oil to natural gas)

° Taller stacks (and/or combination of stacks for a higher effective stack height), especially for utilities. Higher release heights lessen the local air quality impact.

° Load restrictions (i.e., legal constraints on equipment operation levels).

° Control equipment (i.e., coal-washing which provides sulfur removal prior to coal combustion; flue gas desulfurization which removes SO_2 from flue gases). With the exception of refineries (flue gas scrubbing) and a few utilities (coal washing), the retrofit of control equipment has not been widely used by sources in the Region to lessen their SO_2 impact in deference to fuel switching and taller stacks.

Future regulatory efforts for SO_2 will focus on finalizing the control strategies for the remaining problem areas (and any newly identified areas) in the Region. In each instance, sophisticated air quality modeling analyses have or are being performed in order to determine specific emission limitations for each major source. In this manner, the potential for SO_2 standard violations will be remedied for these areas. Our reliance on modeling to assess ambient impacts from major stationary sources is necessary to overcome the limitations (spatial and temporal) in monitoring

Description of Figure A-4 in Part 1: Region V Problem Areas for Sulfur Dioxide

PRIMARY PROBLEM AREAS:

Illinois:

1. Peoria County: southwestern portion of the County
2. Tazewell County: west-central portion of the County

Indiana:

1. Lake County: northern portion of the County
2. La Porte County: northwestern portion of the County
3. Marion County: entire County
4. Vigo County: entire County
5. Wayne County: eastern portion of the County

Michigan:

No Areas

Minnesota:

1. Dakota County: entire County

Ohio:

1. Coshocton County: south-central portion of the County

Wisconsin:

1. Brown County: portion of the City of Green Bay
2. Milwaukee County: portion of the City of Milwaukee

SECONDARY PROBLEM AREAS:

Illinois:

Tazewell County: west-central portion of the County, aside from the Primary Area

Indiana:

No Areas

Michigan:

Ingham County: area approximated by the City of Lansing data alone. The principal obstacle in resolving the Region's SO_2 problem are the enormous costs associated with reducing SO_2 emissions at utilities and other major sources. An important factor which assists SO_2 control efforts is the present national and international concern over long-range pollutant transport and acid deposition. The absence of a legislative remedy for these concerns has focused much attention on the SO_2 control efforts in Region V and elsewhere.

Nitrogen Oxides (NO_x)

The NO_x problem in Region V is potentially of major significance because of its association with hydrocarbons as a precursor to ozone formation. The most severe NO_x problem in Region V occurs in the Chicago area. In addition, there are moderate problems in Indianapolis, Indiana, and Youngstown and Steubenville, Ohio.

From 1975 to 1977 only 4-5 sites in the Region exceeded the primary annual standard; however, 11 sites in 1978, and 18 sites in 1979, all in the Chicago area, exceeded the standard. Then, in 1980 only three sites, all in Cook County, exceeded the standard. In 1981 no sites exceeded the standard. In 1982 1-2 sites appear to have exceeded the standard. The phenomenon of an increasing trend in the period 1977-1979 for NO_x is not limited to Chicago but to the Region as a whole (including Cleveland, Akron, and Canton, Ohio and Indianapolis, Indiana). Although other cities showed an increasing trend during this time, the standard was not exceeded.

Due to the lack of NO_x emissions trend data, it is difficult to explain the exact causes of the observed NOx concentration trends. However it appears that NO_x emissions are increasing regionally because of increases in the fuel consumed by power plants and growth in vehicle miles traveled. While this increasing trend is cause for concern, it is important to note that only 3% of NO_x measurements at 933 sites, with data that meets sampling criteria, exceeded the health related standard. The 1977 emission inventory indicates that in urban areas, such as Chicago, Cincinnati and Indianapolis, both point and mobile sources are significant emitters of NO_x, with point sources contributing approximately 40-50 percent of the total NO_x emissions. In these urban areas, the two biggest sources of NOx are motor vehicles and combustion of bituminous coal at electric generation facilities.

NO_x emissions from light duty motor vehicles was expected to decrease with time due to the impact of FMVCP. This emission reduction should occur throughout Region V. However, there is little emissions trends data available for stationary sources. Most emissions trend data in Region V has assumed that stationary source emissions from NOx would remain relatively constant from 1977 to 1987. However, this assumption may not be correct because of a possible coal consumption increase due to the switch from oil to coal. Illinois' 1982 SIP indicates a 5% drop in NO_x emissions from point sources due to increased reliance on nuclear plants. This increase in emissions may be sufficient to counteract the emissions decrease from the implementation of FMVCP.

Moreover, the proposed modification of the statutory automobile emission standard to a less stringent NO_x standard for 1985 and later trucks may cause a number of areas to approach the standard in the 1990's.

(Description of Figure A-4 cont'd)

Minnesota:

Anoka County:	entire County
Carver County:	entire County
Hennepin County:	entire County
Ramsey County:	entire County
Scott County:	entire County
Washington County:	entire County
Olmstead County:	City of Rochester

Ohio:

Clermont County:	Township of Pierce
Columbiana County:	Township of Unity and the Cities of East Palestine and East Liverpool
Cuyahoga County:	eastern portion of the County
Gallia County:	northeastern portion of the County
Jefferson County:	east-central portion of the County
Lake County:	northwestern portion of the County
Lorain County:	north-central portion of the County
Lucas County:	eastern portion of the County
Morgan County:	eastern portion of the County
Summit County:	northeastern and central portion of the County
Washington County:	northwestern and southwestern portions of the County

Wisconsin:

Dane County:	portion of the City of Madison
Marathon County:	City of Brokaw

For a more detailed analysis, please see 40 CFR 81.301 through 40 CFR 81.356 and subsequent Federal Register notices up to February 1, 1983.

Lead (Pb)

Since 1972, Region V has been monitoring the ambient level of lead in areas generally centered around secondary lead smelters and areas of high vehicular traffic. There has been a downward trend of ambient lead concentration based on a maximum quarterly average in all six Region V States since 1973. The trend indicates that several areas that were originally in violation of the lead standard are now showing compliance with the standard. The major reason for the reduced level of lead may be due to the implementation of FMVCP which includes the phase down of the use of lead in gasoline. However, there are smaller areas that show continuing violations of the standard. These problem areas (Figure A-6, Part 1) have been identified and are located in Granite City, Illinois and St. Paul, Minnesota. Another potential problem area is in Northwest Indiana in the cities of Hammond and East Chicago. The two actual problem areas, plus the potential Northwest Indiana problem area are discussed below.

° Granite City, Illinois

Readings from monitors around the Tara Corp plant in Granite City showed violations of the lead standard. The maximum reading recorded, averaged over a quarter period, was 7.27 ug/m^3 in the 4th quarter of 1981, more than 4 times the standard. Investigation of the problem pointed to the nearby Tara Corp plant, a secondary lead smelter and a large pile of scrap batteries and lead-bearing waste material located adjacent to the Tara Corp facility. The State is very concerned about the problem and has initiated a multi-faceted study of the sources that impact on health and the environment. Region V is providing contractor assistance to conduct laboratory studies of samples. Illinois plans to have all data evaluated by March 1983 and to submit a lead SIP for the area shortly thereafter.

° St. Paul, Minnesota

The monitor in the vicinity of Gould, Inc. Study area has shown a serious violation of the ambient lead standard for the 1st quarter of 1982. The reading recorded by the monitor, averaged over a quarter period, was 7.97 ug/m^3 more than 5 times the standard. Possible sources of the violation at Gould are currently being investigated. A re-evaluation of the study area and a revision of the operating permit for Gould addressing this problem are now being performed by the State. The lead SIP and the proposed operating permit for Gould are scheduled for submission in April 1983.

° Northwest Indiana

In 1982 a new monitoring site in the Hammond area at Kennedy Avenue and Borman Expressway indicated a violation of the Pb standard (1.72 ug/m^3). There are no point sources located within 5 miles of this monitor. This morning site is more moible sources oriented because it is located on a major expressway/roadway. In addition the monitoring site in East Chicago indicated a violation of the Standard (1.67ug./m^3)

in 1979. This violation is associated with emissions from the steel industry. However, the more recent deceases in the ambient lead level monitored in this area maybe due to the decline in iron and steel production. Indiana plans to submit a draft SIP by May 1983 and a final SIP by September 1983.

The principal barrier to lead problem control in Region V is that several States have not submitted a plan to implement the lead standard. The Ohio and Michigan SIPS have been approved by EPA. The SIP for Illinois has been approved for all areas except Granite City. Indiana, Minnesota, Wisconsin, and Illinois (Granite City) are still in the process of developing their implementation plans. Until the recent threat of sanctions against States lacking lead SIPs was proposed, completion of these SIPs was a low priority. Also, there was a perception that lead is generally a problem being resolved by the Federal Motor Vehicle Control Program. Presently Region V is rendering technical assistance to the States toward the submission of their lead SIPs.

Description of Figure A-5 in Part 1: Region V Problem Areas for Nitrogen Oxides

Illinois:

1. Cook County: area approximated by the City of Chicago

Indiana:

No Areas

Michigan:

No Areas

Minnesota:

No Areas

Ohio:

No Areas

Wisconsin:

No Areas

For a more detailed analysis, please see 40 CFR 81.301 through 40 CFR 81.356 and subsequent Federal Register notices up to February 1, 1983.

Description of Figure A-6 in Part 1: Region V Problem Areas for Lead

Illinois:

1. Madison County: lead smelting and battery industrial areas of Granite City.

Indiana:

No Areas

Michigan:

No Areas

Minnesota:

1. Ramsey County: lead smelting and battery industrial area of the City of St. Paul

Ohio:

No Areas

Wisconsin:

No Areas

Radiation

A. Radiological Emergency Response Plans

EPA evaluates the capability of State and County governments to adequately protect the population and the environment in the 10 mile emergency planning zone (EPZ) around a nuclear station (Fig. A-7, Part 1). All of the Region V States have demonstrated a capability to make the required assessment and provide protection for the population at risk for one or more nuclear stations in the State. The assessment involves calculating and projecting the direction, size, and radiation content of the radioactive plume. Based upon the calculated plume size and direction, actions such as relocation of people are recommended to the local county government. A verification assessment in the plume area is made by radiological teams dispatched with equipment to measure the actual airborne and deposited radioactivity. Extensive effort has been made to assist Region V States to develop accident assessment capability through EPA training courses. A listing of County RERPs not approved by the Regional Assistance Committee is given in Part 2 under the Priority 1 ranking.

B. Industrial Radiation Sites

Region V has increasingly become involved with industrial radiation sites. Many of these sites are inactive. Some were once registered or licensed by either the Nuclear Regulatory Commission (NRC) or the States. Some operated before enactment of either the Atomic Energy Act or Federal or State regulations.

To illustrate the scope of the problem Region V is dealing with and the difficulties which have been encountered, site-specific discussions follow. An attached map, Figure A-8, identifies the locations of the sites.

1. Kerr-McGee Facility--West Chicago, Illinois

   Starting in 1931 this site extracted thorium from monazite ore for gas mantle manufacture. The site was licensed in the 1950's by the Atomic Energy Commission (later the NRC). In 1973 when the site closed, substantial contamination problems were identified onsite and in numerous offsite areas of the City of West Chicago. The company prepared a plan for permanent onsite burial of facility wastes which led to NRC issuance of a draft Environmental Impact Statement (EIS) in May, 1982 advocating temporary onsite burial. The NRC disclaims jurisdiction over numerous sites and substantial volumes of wastes in the community because it believes they were deposited before the Atomic Energy Act. EPA reviewed the NRC's draft EIS and rated it unacceptable because of the omission of offsite wastes in the decommissioning plan. The problem is further complicated by apparent overlapping jurisdictions between the EPA and the NRC, especially with regard to mixed media contamination by chemicals and radioactive materials. EPA is considering action under Section 106 of CERCLA with regard to offsite wastes for which NRC disclaims jurisdiction.

2. Skiljan Residence/Dial Services Manufactuing Company - Cleveland, Ohio
Luminous Processes - Ottawa, Illinois

Both Dial Services and Luminous Processes were radium dial painting operations. The Skiljan residence was contaminated with radium wastes from Dial Services. All of these sites are being handled through CERCLA: In the former case through emergency provisions for planned removal and in the latter case through prioritization under remedial action provisions. All sites are clearly contaminated with radium and require remedial action. Radiation sites, even small ones, are extremely expensive to clean up because of high transportation and disposal costs for wastes. Because of the large volumes of low-level radioactive material involved only one of the three available commerical low-level radioactive waste disposal sites, Richland, Washington, will even consider taking these wastes.

3. Lindsay Light Company Building - Chicago, Illinois
Keleket X-ray Corporation Building - Cincinnati, Ohio

Lindsay Light manufactured gas light mantles from thorium compounds between 1910 and 1936, before radiation was regulated or health effects were well understood. The building was surveyed in 1980-81 by Region V and the Occupational Safety and Health Administration (OSHA) and was found to be contaminated, although fully occupied. The matter was referred to the Illinois Department of Nuclear Safety which has stronger regulations but they have elected not to proceed further. It is the assessment of Region V that further decontamination is clearly required.

Keleket manufactured radiation instruments in the 1950's. A radium source they were using ruptured, contaminating parts of the building. The building was decontaminated adequately for the 1950's but was re-surveyed by Region V in 1981 and found to be unfit for unrestricted use. The building sits empty and no decomtamination has proceeded.

Both sites have remained unresolved because there are not direct legal means to secure decontamination. Moreover, decontamination criteria have not yet been specifically developed by EPA. Actual cleanup of both sites will be expensive because of transportation and disposol costs for large volumes of low-level radioactive wastes. Where to affix responsibility for cleanup and cleanup costs is not clear under existing statutes, particularly since present owners were not the parties responsible for the contamination.

4. Historical Sites of Radioactive Materials Usage

Before enactment of the Atomic Energy Act and institution of Federal and State regulation, the usage of radioactive materials, principally radium, was often casual and marked by unawareness of possible health effects. Region V has instituted a seek and find effort to locate old radium and thorium gas mantle sites in order to survey them and determine whether they remain contaminated by past operations. This effort is hindered by the lack of clear cut contamination criteria by which to perform surveys, by the lack of direct authority to institute cleanup, and by a shortage of funds and disposal sites required for cleanup. This effort has just begun and manpower will be determined by the number of sites discovered.

5. Active Industrial Operations

Some industries use ores that contain radioactive materials as a contaminant, often at levels below that defining them as source material. However, there is information available that processing actions and waste disposal may, nevertheless, create a potential radioactive materials hazard. Region V has instituted an exploratory effort to look at selected industrial sites and assess whether potential problems might exist. Specifically targeted will be the titanium extraction industry, refractory industries using zircon sands, and feldspar mines. EPA authority derives from RCRA so long as none of the materials can be classed as source or by-product material.

Description of Figure A-7: Region V Areas Requiring Radiological Emergency Response Plans for Nuclear Sites

RERP PLANS UNDER REVIEW:

Illinois:

1. De Witt County
2. Lake County
3. Ogle County
4. Rock Island and Whiteside Counties

Indiana:

1. Jefferson County

Michigan:

1. Bay, Midland, and Saginaw Counties
2. Monroe and Wayne Counties

Minnesota:

1. Dakota and Goodhue Counties
2. Houston County
3. Sherburne and Wright Counties

Ohio:

1. Clermont County
2. Columbiana County
3. Lake County

Wisconsin:

1. Dunn and Pierce Counties
2. Kenosha County
3. Kewaunee and Manitowoc Counties
4. La Crosse and Vernon Counties

SUBMITTED TO HEADQUARTERS FOR APPROVAL:

Illinois:

No Areas

Indiana:

No Areas

(Description of Figure A-7 cont'd)

Michigan:

Emmet and Charlevoix Counties
Allegan, Berrien, and Van Buren Counties

Minnesota:

No Areas

Ohio:

Lucas and Ottawa Counties

Wisconsin:

No Areas

FEDERALLY APPROVED PLANS

Illinois:

Grundy, Kendall, La Salle, and Will Counties

The State of Illinois RERP plan has been approved at the Federal level.

Indiana:

No Areas

Michigan:

No Areas

Minnsota:

No Areas

Ohio:

No Areas

Wisconsin:

No Areas

Acid Rain:

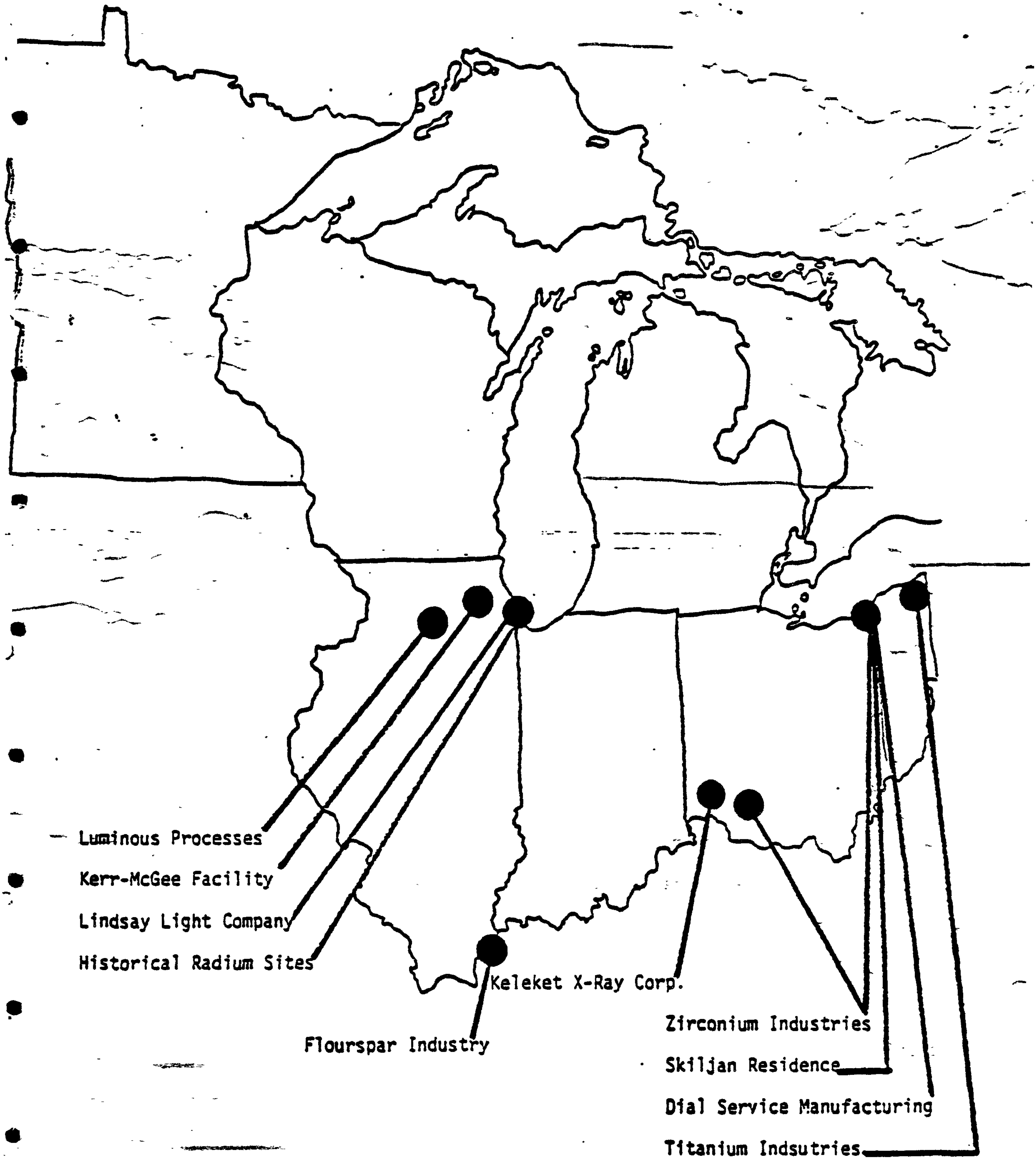
Acid rain is the common catch-phase used to denote the broader phenomenon of the wet and dry deposition of atmospheric acid materials. It is a problem that transcends state and national borders and was first recognized as an environmental threat in Scandinavia in the 1960's. The long-range transport of acid precursor emissions from the industrialized areas of England and Europe are blamed for making fishless thousands of lakes in Sweden as well as possibly damaging forests, soils, and farmland.

Acid rain originates principally from the release of sulfur oxides (SO) and nitrogen oxides (NO_x). These pollutants are transformed through a series of complicated reactions into surfuric acid and nitric acid that are then scavenged from the atmosphere. In the Northeast U.S. almost two-thirds of the acidity level is due to sulfuric acid; thus, indicating the importance of SO_2 emissions. While natural SO_2 emissions are significant on a global scale, they account for only 4-10% of the emissions in eastern North America. A map showing the distribution and relative magnitude of SO_2 emissions in eastern North America is presented in Figure E-1. In 1980 over 80% (22.4 million tons) of all North American man-made SO_2 emissions were released east of the Mississippi River. Region V States accounted for 7.3 million tons, roughly one-third of the total emissions. Individually, the States of Ohio, Indiana, and Illinois rank as number one, two, and six, respectively, of these 38 states and provinces.

The majority of SO_2 emissions are released from coal-fired power plants. Approximately three-fourths of Region V's SO_2 emissions are from such plants. Four of Region V's plants are ranked in the top six of utility sources in the country, including Ohio Power Gavin, the largest utility SO_2 emitter. The ranking of utility SO_2 sources and a map showing the location of the top 30 Region V power plants are presented in Figure E-2. A few examples demonstrate the wide discrepancy in state-wide SO_2 emissions in Region V. Ohio Power (OP) Gavin emitted more SO_2 than the entire State of Minnesota in 1980. Also in 1980, OP Gavin and Public Service Indiana (PSI) Gibson emitted more than the State of Wisconsin and OP Gavin, PSI Gibson, and Columbus and Southern Ohio Electric (CSOE) Conesville emitted more than the State of Michigan.

As can be seen in Figures E-1 and E-2, there is an especially high density of SO_2 emissions in the Ohio River Valley area. Over 40% of the power plants in this area are located in Region V. Most of these plants, as well as many others in Region V, have tall stacks. Emissions from tall stacks are subject to long-range transport since elevated release heights increase pollutant residence times in the atmosphere, which in turn increase the distance pollutants can be carried. It is because of the large numbers, the high density, and the upwind location of the tall stack power plants, that Region V has been accused of contributing to acidity levels in the Northeast U.S. and eastern Canadian water systems.

Figure A-8: INDUSTRIAL RADIATION SITES



Numerous sources in Region V have been the subject of lawsuits filed by several Northeastern states. These suits charge, among other things, that the cumulative impact of SO_2 emissions from specific Midwestern sources are adversely affecting air quality in the Northeast. These alleged adverse impacts include acid deposition. As a result of lawsuits filed by New York and Pennsylvania, EPA held a Section 126 hearing in Washington, D.C., on June 18-19, 1981. EPA is still evaluating the information presented at that hearing and has not yet issued a finding. Region V has also been consistently challenged by many Northeastern states and Canada on relaxations of SO_2 emission limitations for certain sources.

Much of the concern on the part of the Northeastern States and Canada stems from a growing body of scientific research that suggests that acid rain may have the potential for or has already caused substantial environmental damage. Such effects include acidification of lakes, rivers, and ground waters, with resultant damage to fish and other inhabitants of the water system; acidification and demineralization of soils; reduction of forest productivity; damage to crops; deterioration of man-made materials; and degradation of drinking water systems. These effects may result from cumulative exposure of short-term peak acidity episodes such as the shock loadings experienced in the spring. Acids accumulated over the winter are released quickly in concentrated amounts (the first 10% of snow melt water contains 90% of the soluble ions) when the fry, the most vulnerable stage for fish, have just hatched.

The effects may be especially pronounced in eastern North America because this area is being impacted by the highest precipitation acidity levels (see Figure E-3) and much of the region is underlaid by carbonate-poor granite bedrock. Thus, it is poorly buffered and vulnerable to acid deposition (see Figure E-4). Just as most environmental hazards have their own biologicial monitors, fishless lakes may be the monitor for acid rain. The fishless condition of several streams in Nova Scotia and over 100 lakes in both the Adirondacks and Ontario is being blamed on acid rain; or more precisely, to the presence of toxic metals (e.g., mercury, aluminum, manganese) which are mobilized in soil after acid rainfall. Leaching and runoff subsequently transfer these metals to streams and lakes. It should be recognized, however, that harmful effects occur long before all fish have disappeared from a lake.

The economics of acid rain damage can also be substantial. A recent National Academy of Sciences (NAS) report estimated that acid rain caused damage costing $5 billion to materials, forests, agriculture, aquatic ecosystems, health, and drinking water systems in the eastern third of the U.S. in 1978 alone. The New England River Basins Commission pegged economic loses in the NE/Adirondack region of New York from acid rain at $250-500 million per year, exclusive of health effects. Millions of dollars in fishing revenue are jeopardized in the Northeast and Canada. High acidity also threatens Canada's forests, an $11.5 billion/year industry which employs more than 10% of the Canadian labor force.

The potential for acid rain damage is not limited to the Northeast and Canada. The northern portions of Michigan, Minnesota, and Wisconsin are also very sensitive areas. According to a recent Office of Technology Assessment (OTA) report, up to 80% of the lakes and streams in the upper Midwest are at risk. This has generated a considerable amount of concern in these three Region V States.

The State of Wisconsin is actively involved in a joint one-year acid deposition research project with the Public Service Commission, a group of Wisconsin utilities, and the Wisconsin Paper Council. Together these four parties have banded together to form a Joint Acid Deposition Technical Review Committee. The current project will attempt to assess the degree, extent, and effects of acid deposition in Wisconsin; identify the sources of acid deposition; and identify and review the effectiveness of emission control options.

In response to the state-adopted Acid Precipitation Act of 1980, Minnesota performed a one-year investigation of acid precipitation as it relates to Minnesota. The final report from this review identified many lakes located primarily in the northeast part of the State as being sensitive or potentially sensitive to acid deposition. The report stated, however, that no evidence of direct fish kills resulting from lake or stream acidification presently exists for Minnesota waters. In March 1982, the State passed a stronger acid rain act (Minnesota Acid Deposition Control Act of 1982) requiring: the publication of a list of sensitive areas by January 1983; the adoption of acid deposition standards in the sensitive areas by January 1, 1985; the adoption of a control plan considering both in-state and out-of-state sources to meet these standards by January 1986; and the compliance by in-state sources with the control plan by January 1990. The act also requires interim progress reports to the State legislature. Minnesota's statutory efforts are unprecedented nationally.

On a national scale, much of EPA's efforts to date have focused on research. EPA's official position has been to recommend only that research be accelerated. Under the current Clean Air Act, there is no direct mandate to reduce SO_2 emissions based solely on acid rain impacts. As for the various bills requiring large reductions in SO_2 emissions being considered by Congress in their review of the Act, the Administration does not support them in view of the many uncertainties surrounding acid rain (see "Principal Barriers" on Acid Rain, Part 2).

EPA is actively involved in several acid rain research projects. EPA is one of the lead agencies in the Interagency Task Force established by Congress in the Federal Acid Precipitation Act of 1980 to develop and implement a ten-year research program to investigate acid rain. EPA is also participating in the technical workgroups established by the Memorandum of Intent between the U.S. and Canada concerning transboundary air pollution signed August 5, 1980. Other research efforts include supporting many monitoring networks such as The Natural Atmospheric Deposition Program (NADP), the Multistate Atmospheric Power Production Pollution Study and the Great Lakes Atmospheric Deposition Network (GLAD). In addition, there are also numerous other research projects being performed by or through EPA laboratories or offices. EPA's funding for this research has progressed from $4 million in FY 1978 to $9 million in FY 1982. Total government expenditure on acid rain research in FY 1982 was over $18 million, with more than $22 million committed for FY 1983.

As mentioned earlier, the need for Federal regulatory action on acid rain is currently being considered by Congress in its review of the Clean Air Act. Several acid rain bills have been proposed ranging from those requiring a reduction of SO_2 emissions by 10 million tons per year to those only stressing further research.

The projected annual costs of a 10-million ton emission reduction by 1990 range from $3-7 billion and the cumulative capital costs ranging from $13-26 billion. Seventy percent of these costs would be incurred by ten States, five of which are in Region V.

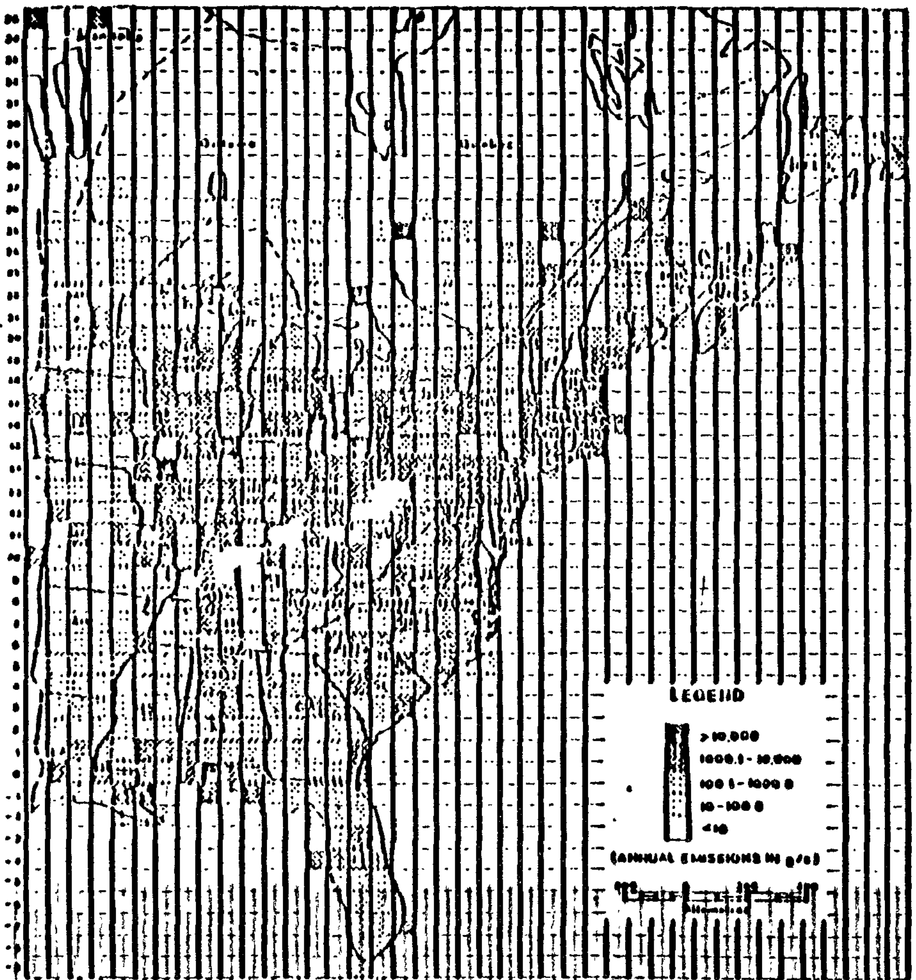
Several Region V utility companies have estimated tremendous increases in utility bills: American Electric Power (63%), Ohio Edison (40%), Public Service Indiana (50%), and Central Illinois Public Service (18%).

Furthermore, a 10 million ton reduction has been estimated to produce a severe loss of coal-mining jobs (9,000-38,000 by 1990) in Illinois, Ohio, western Kentucky, and northern West Virginia. This is because it is expected that utilities would shift coal supplies rather than install scrubbers. It has been suggested, however, that these coal shifts (and subsequent job losses) could be mitigated by delaying the reduction deadline date until after 1995 when new technologies, such as fluidized bed combustors and dry scrubbers, may be available for utility size operation.

Since there is a lack of complete scientific understanding of the transport, transformation, and removal process, Region V's position reflects one of the major themes of the Administration; sound science provides the most suitable basis for effective regulations.

Figure E-1:

SO_2 Geographic Distribution



Source: U.S.A. emissions from SURE II data base. Canadian emissions from Environment Canada.

RANKING OF ENVIRONMENTAL PROBLEMS - AIR

In developing this ranking, the Region used the following criteria:

° air quality levels and trends
° population exposed

The most significant air quality problems in Region V are prioritized below:

PRIORITY 1:

a. O_3 primary nonattainment or maintenance target areas:

Chicago	- Cook, Lake, Will, DuPage, Kane, McHenry Counties, Illinois
SE Wisconsin	- Racine and Kenosha Counties, Wisconsin
NW Indiana	- Lake and Porter Counties, Indiana
Detroit	- Oakland, Macomb and Wayne Counties, Michigan
Milwaukee	- Milwaukee, Waukesha and Ozaukee Counties, Wisconsin
E. St. Louis	- Madison, St. Clair and Monroe Counties, Illinois
Louisville	- Clark and Floyd Counties, Indiana
Akron	- Portage and Summit Counties, Ohio

b. TSP primary nonattainment or maintenance target areas:

Chicago	- Industrial area of Cook, Will and DuPage Counties, Illinois
NW Indiana	- Industrial area of Lake and Porter Counties, Indiana
Detroit	- Industrial area of Wayne County, Michigan
Cleveland	- Industrial area of Cuyahoga County, Ohio
Steubenville	- Industrial area of Jefferson and Columbiana Counties, Ohio
Granite City	- Industrial area of Madison County, Illinois
Louisville	- Industrial area of Part of Clark County, Indiana

c. CO primary nonattainment or maintenance target areas:

Chicago	- Urban areas of Cook County, Illinois
NW Indiana	- Urban areas of Lake County, Indiana
Detroit	- Urban areas of Wayne County, Michigan
Indianapolis	- Urban areas of Marion County, Indiana
St. Paul	- Urban areas of Dakota County, Minnesota
St. Cloud	- Urban areas of Stearns County, Minnesota
Duluth	- Urban areas of St. Louis County, Minnesota

d. SO_2 primary nonattainment areas:

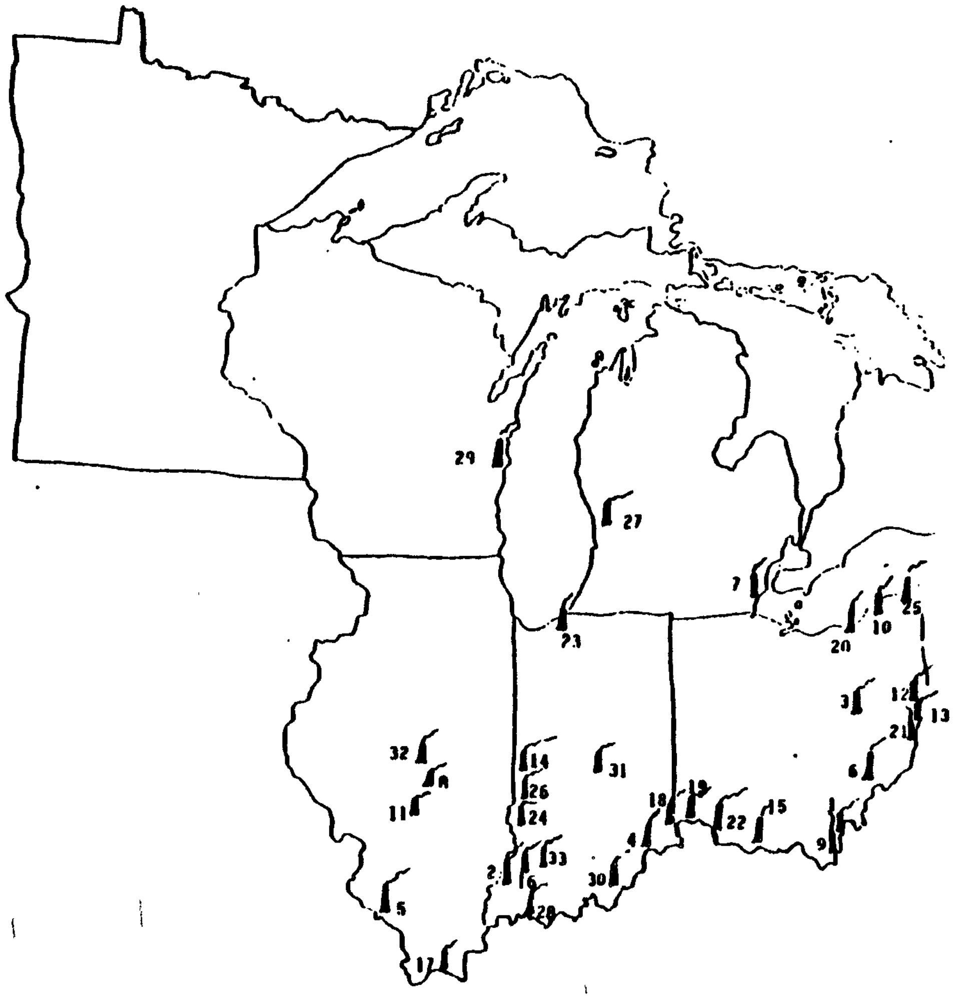
Illinois:

Peoria County:	southwestern portion of the City of Peoria
Tazwell County:	west-central portion of the County

Indiana:

Lake County:	entire County
LaPorte County:	northwestern portion of the County

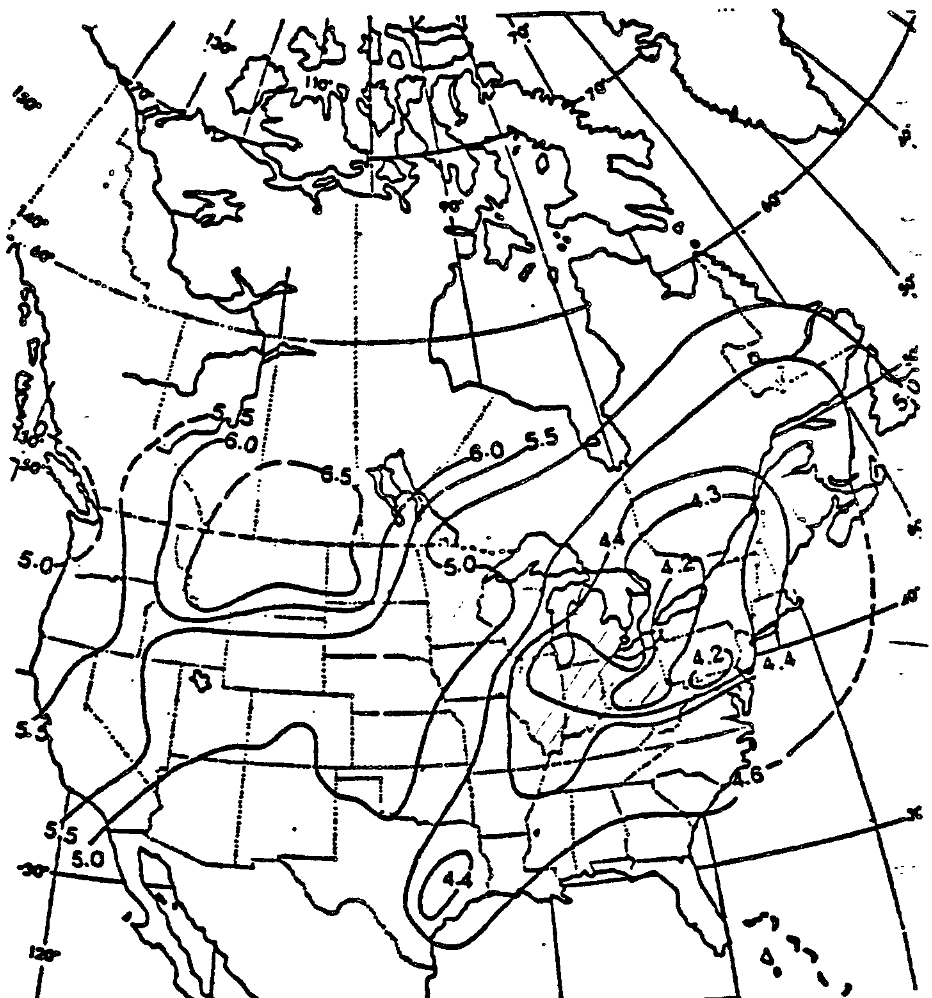
Figure E-2: Region V Utility SO_2 Sources



Major SO_2 Source

Map Number	Plant Name	State	SO_2 Emissions (1000 tons)
1	Gavin	Ohio	376.4
2	Gibson Station	Indiana	305.6
3	Conesville	Ohio	302.4
4	Clifty Creek	Indiana	288.2
5	Baldwin	Illinois	259.3
6	Muskingum	Ohio	244.0
7	Monroe	Michigan	233.9
8	Kincaid	Illinois	205.5
9	Kyger Creek	Ohio	202.3
10	Eastlake	Ohio	155.0
11	Coffen	Illinois	137.3
12	Sammis	Ohio	137.0
13	Cardinal	Ohio	126.0
14	Cayuga	Indiana	115.9
15	Stuart	Ohio	112.0
16	Petersburg	Indiana	108.5
17	Joppa	Illinois	100.1
18	Tanners Creek	Indiana	94.9
19	Miami Fort	Ohio	89.5
20	Avon Lake	Ohio	89.5
21	Burger	Ohio	84.7
22	Beckjord	Ohio	84.4
23	Michigan City	Indiana	75.4
24	Breed	Indiana	71.0
25	Ashtabula	Ohio	68.5
26	Wabash River	Indiana	66.0
27	Campbell	Michigan	65.5
28	Culley/Warrick	Indiana	63.7/120.0
29	Edgewater	Wisconsin	58.0
30	Gallagher	Indiana	59.5
31	Stout	Indiana	50.1
32	Hallman	Illinois	49.9
33	Frank E. Ratts	Indiana	49.8

Figure E-3:



Annual Average pH of Precipitation in North America During 1979 Based On Observations By Canadian APN and CANSAP Networks and American MAP3S and NADP Networks. (Note: An isoline is dashed where uncertainties in its position are great due to lack of data.)

Figure E-4

Regions in North America with lakes which may be sensitive to acid precipitation, using bedrock geology as an indicator.[25]

Minnesota:

Dakota County: entire County

Ohio:

Coshocton County: south-central portion of the County

Wisconsin:

Brown County: City of Green Bay
Milwaukee County: portion of the City of Milwaukee

e. NO_x primary nonattainment area:

Cook County: Portions of the County

f. Lead primary nonattainment or maintenance target areas:

Minnesota:

Ramsey County: Portion of City of St. Paul

Illinois:

Madison County: Portion of Granite City

g. Radiation Industrial Radiation Site and Counties without approved Radiological Emergency Response Plans are:

Kerr McGee Industrial Radiation Site

Counties with Radiological Emergency Response Plans Not Approved by Regional Assistance Committee:

Illinois Counties: De Witt, Lake, Whiteside, Rock Island, Ogle

Indiana County: Jefferson

Ohio Counties: Clermont, Columbiana, Lake

Michigan Counties: Wayne, Monroe, Midland, Bay, Saginaw

Wisconsin Counties: Manitowoc, Kewaunee, La Crosse, Vernon, Kenosha, Pierce, Dunn

Minnesota Counties: Sherburne, Wright, Houston, Goodhue, Dakota

h. Acid Rain

i. Air Toxics

PRIORITY 2:

All other primary nonattainment areas for all pollutants and industrial radiation sites not listed under priority 1:

a. O_3 Primary Nonattainment areas:

Illinois Counties: Kankakee, Kendall, La Salle, Peoria, Sangamon, Tazewell, Williamson, DeKalb, Grundy, Boone, Adams

Indiana Counties: Marion, St. Joseph, Elkhart

Michigan Counties: Allegan, Barry, Bay, Berrien, Branch, Calhoun, Clinton Easton, Genesse, Gratiot, Hillsdale, Huron, Ingham, Ionia, Jackson, Kalamazoo, Kent, Lapeer, Lenawee, Marquette Midland, Monroe, Montcalm, Muskegon, Ottawa, Saginaw, St. Joseph, Sanilac, Shiawassee, Tuscola, Van Buren, Cass, Washtenaw, Livingston, St. Clair

Ohio Counties: Allen, Ashland, Ashtabula, Belmont, Brown, Carroll, Champaign, Clark, Clinton, Columbiana, Darke, Delaware, Erie, Fairfield, Fayette, Franklin, Fulton, Geauga, Greene, Hancock, Harrison, Henry, Highland, Hocking, Holmes, Huron, Jefferson, Knox, Lawrence, Licking, Logan, Lucas, Madison, Mahoning, Marion, Montgomery, Morrow, Ottawa, Perry, Pickaway, Preble, Richland, Ross, Scioto, Seneca, Shelby, Summit, Trumbull, Tuscarawas, Union, Wayne, Wood

Wisconsin Counties: Brown, Columbia, Dane, Sheboygan, Vilas

b. TSP Primary Nonattainment areas:

Illinois Counties: Du Page, La Salle, Monroe, Peoria, Rock Island, Tazewell, Will, Jo Daviess, Knox, Macon, Madison, St. Clair

Indiana Counties: Dearborn, Dubois, Vigo, Marion

Michigan Counties: Calhoun, Genesee, Marquette, Monroe, Saginaw

Minnesota Counties: Anoka, Carver, Dakota, Ramsey, Scott, St. Louis, Washington, Hennepin

Ohio Counties: Belmont, Butler, Franklin, Hamilton, Lake, Lawrence, Lorain, Lucas, Miami, Monroe, Montgomery, Scioto, Stark, Summit, Trumbull, Mahoning, Richland, Sandusky,

Wisconsin Counties: Columbia, Milwaukee, Rock, Waukesha

c. CO Primary Nonattainment areas:

Illinois Counties: Peoria, Rock Island

Minnesota Counties: Anoka, Benton, Carver, Dakota, Hennepin, Olmsted, Scott, Washington

Ohio Counties: Franklin, Montgomery

d. SO_2 Primary Nonattainment areas:

Michigan County: Ingham

Minnesota Counties: Anoka, Carver, Hennepin, Olmsted, Ramsey, Scott, St. Louis, Washington

Ohio Counties: Clermont, Columbiana, Cuyahoga, Jefferson, Lake, Lorain, Lucas

Wisconsin Counties: Dane, Marathon

e. NO_x

No Additional areas

f. Lead

No Additional areas

g. Industrial Radiation Sites Not Listed Under Priority 1:

Illinois:

1. Luminous Processes
2. Lindsay Light Company
3. Historical Radium Sites
4. Flourspar Industry

Ohio:

1. Keleket X-Ray Corporation
2. Zirconium Industries
3. Skiljan Residence
4. Dial Service Manufacturing
5. Titanium Industries

PRIORITY 3:

a. All secondary nonattainment areas for TSP and SO_2.

b. All regionally approved counties requiring RERPs which are not federally approved:

Michigan:

Allegan County
Berrien County
Charlevoix County

Emmet County
Van Buren County

Ohio:

Lucas County
Ottawa County

REGION V ENVIRONMENTAL MANAGEMENT REPORT

ATTACHMENT A

LAND

HAZARDOUS WASTE MANAGEMENT

Nine facilities have withdrawn their Part A applications in lieu of filing Part B (4 each, storage-only; 3 each, treatment; 1 each, incinerator; and 1 each, land disposal). Also, while several permits have been drafted, and the public hearing process has begun, no permits have been formally issued or denied. The first Region V public hearing on a proposed RCRA permit was held in Ohio on November 17, 1982.

Part B applications will continue to be called on a periodic basis throughout the year -- a total of 54 land disposal facility Part B applications is to be called in during the last half of FY 1983, at the rate of 6 to 10 applications per month.

Under the cooperative arrangement mechansim, State staff will be assisting in the reviews of Part B applications. Program output targets, which the States committed to in their FY 1983 grant proposals, include assistance to Region V staff in the review of 178 Part B's for storage and treatment facilities, 28 incinerators, and 18 land disposal facilities.

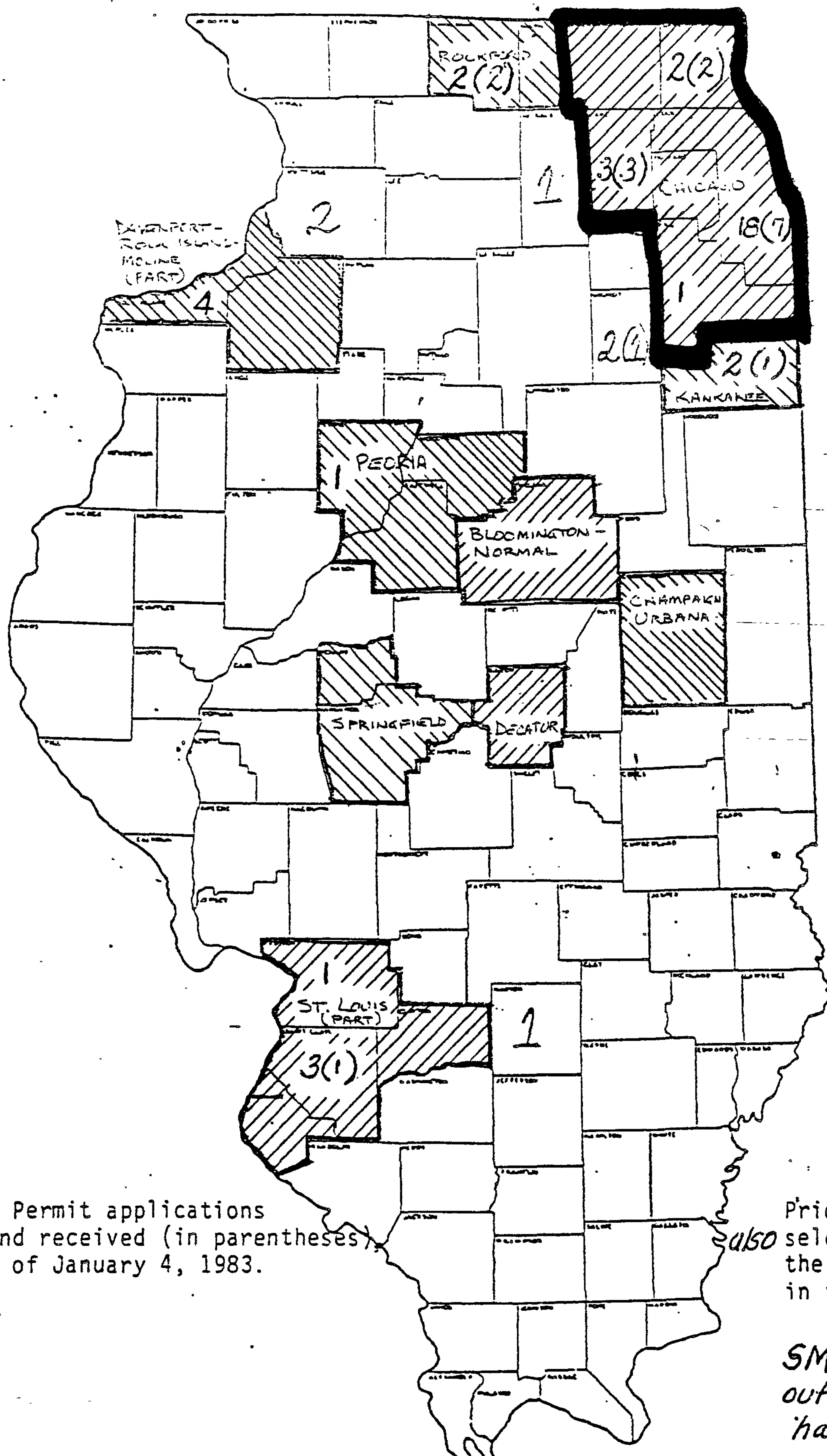
The interim status standards (ISS) include operational, facility design, monitoring, reporting and process requirements. All TSDF's undergo routine ISS inspections and compliance monitoring while in interim status. During FY 1981, inspections uncovered numerous violations of the ISS. Most of these violations were of the procedural, reporting, or administrative variety. To a lesser extent, violations also were of the actual waste management standards, such as: "inadequate aisle space", and "leaking drums." In FY 1982, inspections revealed improving compliance with the procedural and administrative requirements. Also, during FY 1982, additional requirements came into play, such as groundwater monitoring and reporting, and financial responsibility requirements; compliance efforts focussed on these, as well.

In FY 1983, compliance emphasis will contine to be on the groundwater and financial responsibility requirements, as well as on insuring that the requested permit applications (Part B), are submitted on time, and are complete. Approximately, 1000 compliance inspections at Treatment, Storage, and Disposal Facilities and 1100 compliance inspections at Generators/Transporters are projected to be completed in FY'83 within Region V.

As in the assistance review of Part B applications, State staff will be conducting these inspections. The mechanism will again be the Cooperative Arrangement, whereby these inspections will be conducted for the U.S. EPA by State staff, or will be conducted under the State's own jurisdiction, if the State has been granted interim authorization to conduct the program in lieu of the U.S. EPA. In either instance, the investment of State staff time is meeting output commitments is extensive.

Additional information is just beginning to be generated as a result of analysis of data from the financial responsibility requirements contained in the ISS and data from the groundwater monitoring and reporting requirements. This latter requirement may be the starting point for a system to provide surrogate measures of ambient impact. Right now, groundwater data is being used, to prioritize the call-in of land disposal facility Part B applications noted above. This data is not yet fully usable in any other way.

ILLINOIS

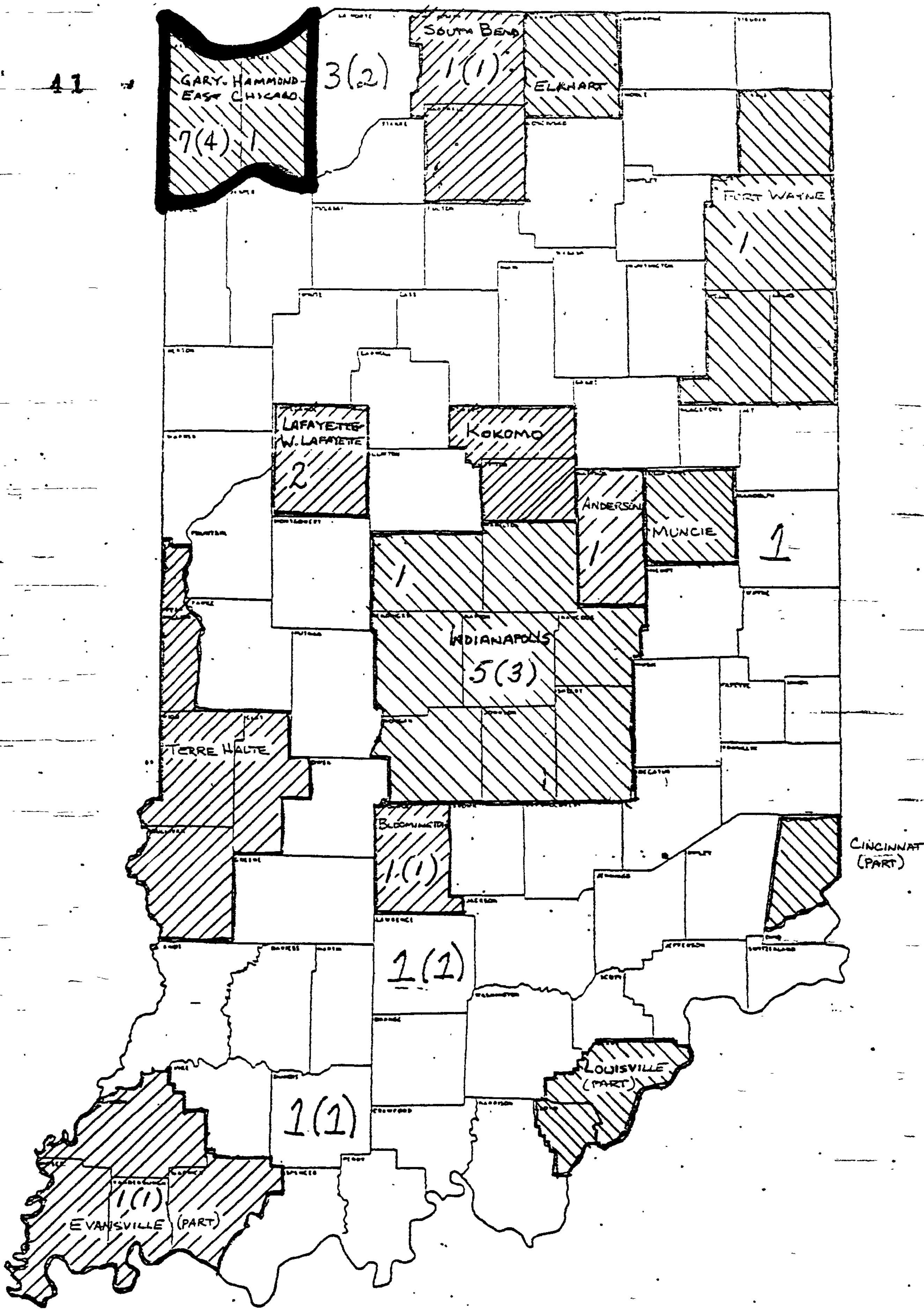


Part B RCRA Permit applications called-in, and received (in parentheses), by county, as of January 4, 1983.

Priority geographic area selected for emphasis by the Air program are outl in red

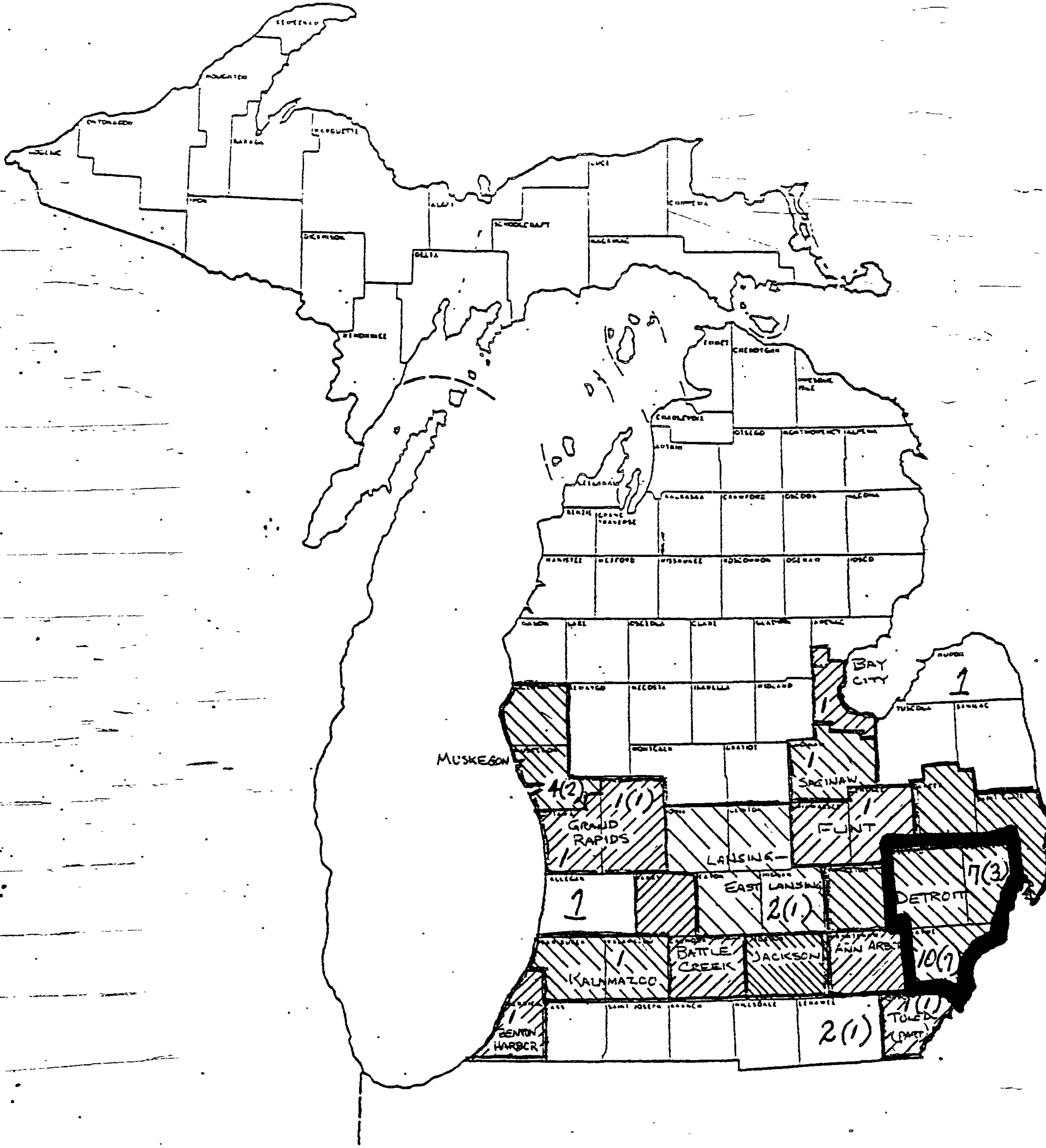
SMSA's are outlined and hatched.

41

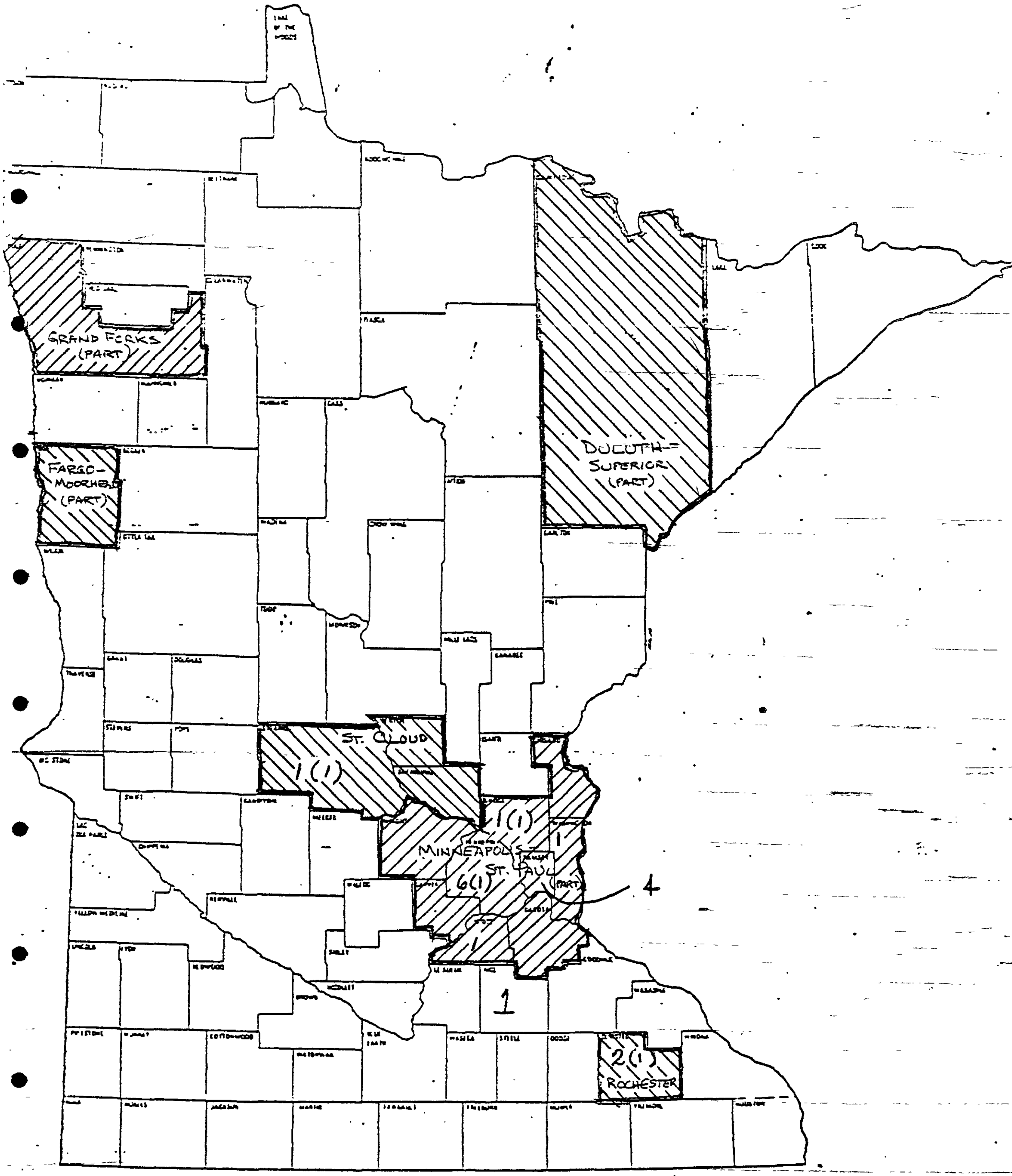


Gary-Hammond-East Chicago
7(4) 1
3(2)
South Bend
1(1)
Elkhart
Fort Wayne
1
Lafayette W. Lafayette
2
Kokomo
Anderson
1
Muncie
1
1
Indianapolis
5(3)
Terre Haute
Bloomington
1(1)
Cincinnati (part)
1(1)
Louisville (part)
1(1)
1(1)
Evansville (part)

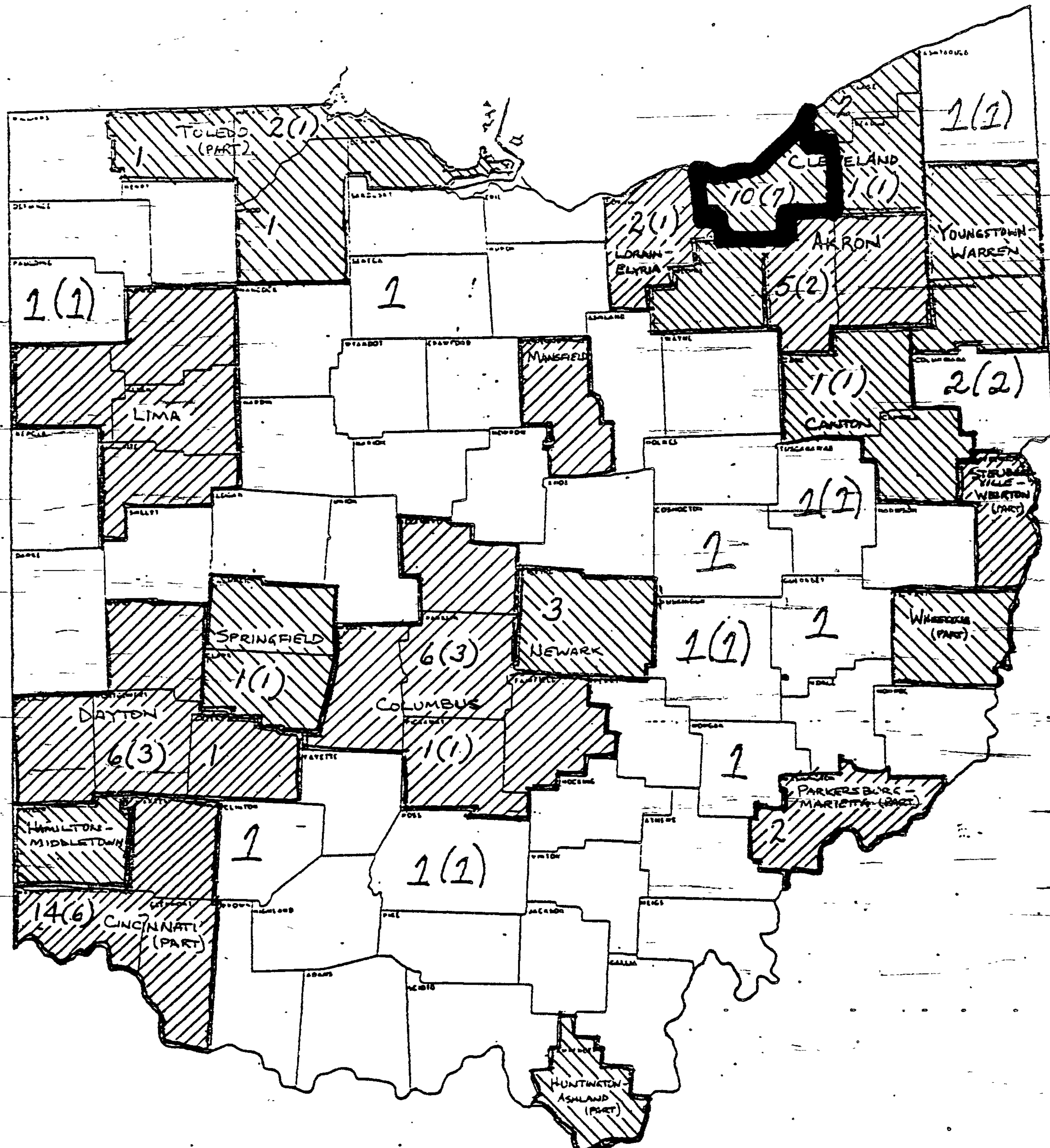
MICHIGAN


BAY CITY
1
MUSKEGON
4(2)
1(1)
GRAND RAPIDS
1
SAGINAW
1
FLINT
1
LANSING
EAST LANSING
2(1)
1
DETROIT
7(3)
10(7)
KALAMAZOO
1
BATTLE CREEK
JACKSON
ANN ARBOR
1
BENTON HARBOR
2(1)
1(1)
TOLEDO (PART)

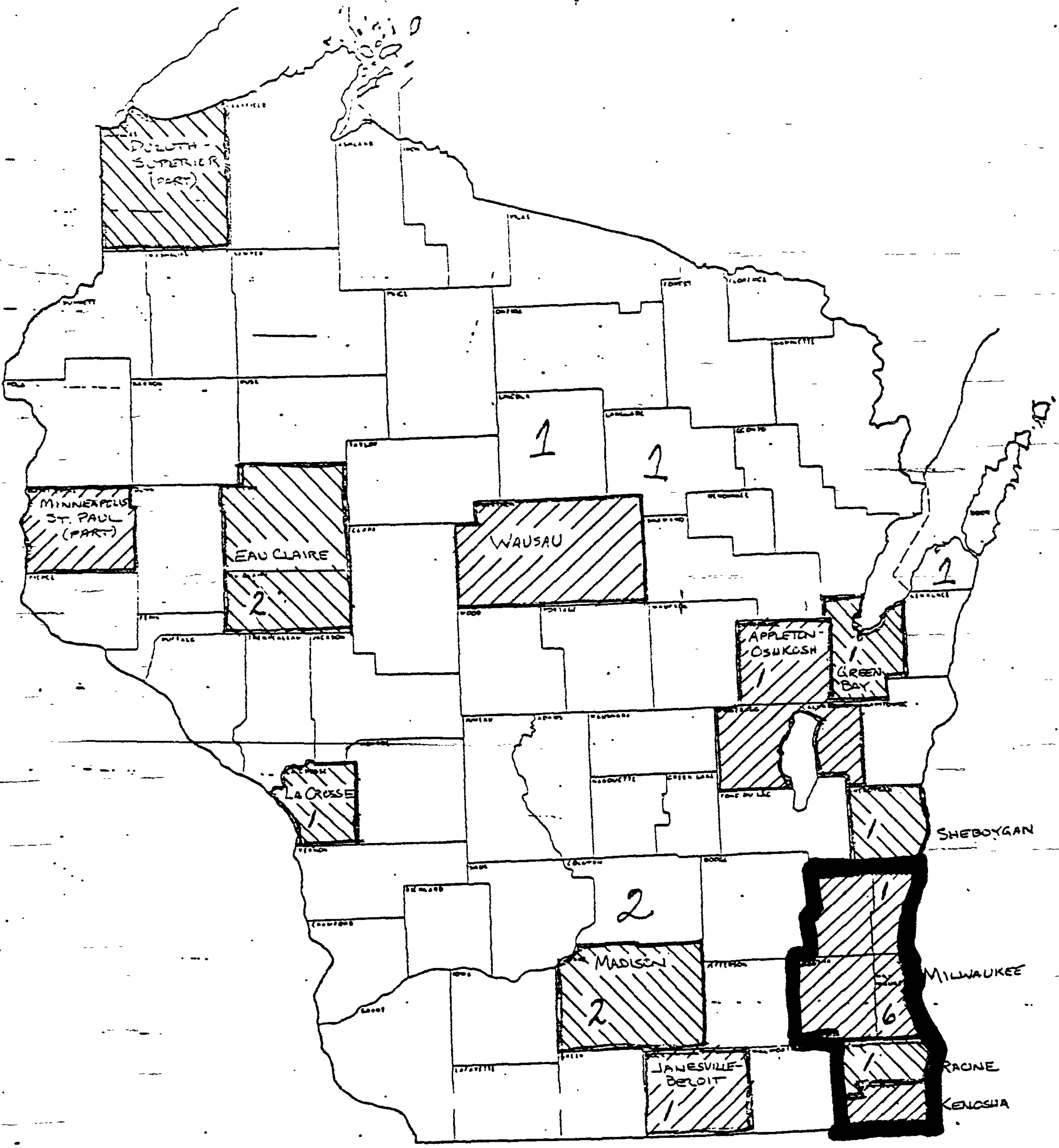
MINNESOTA



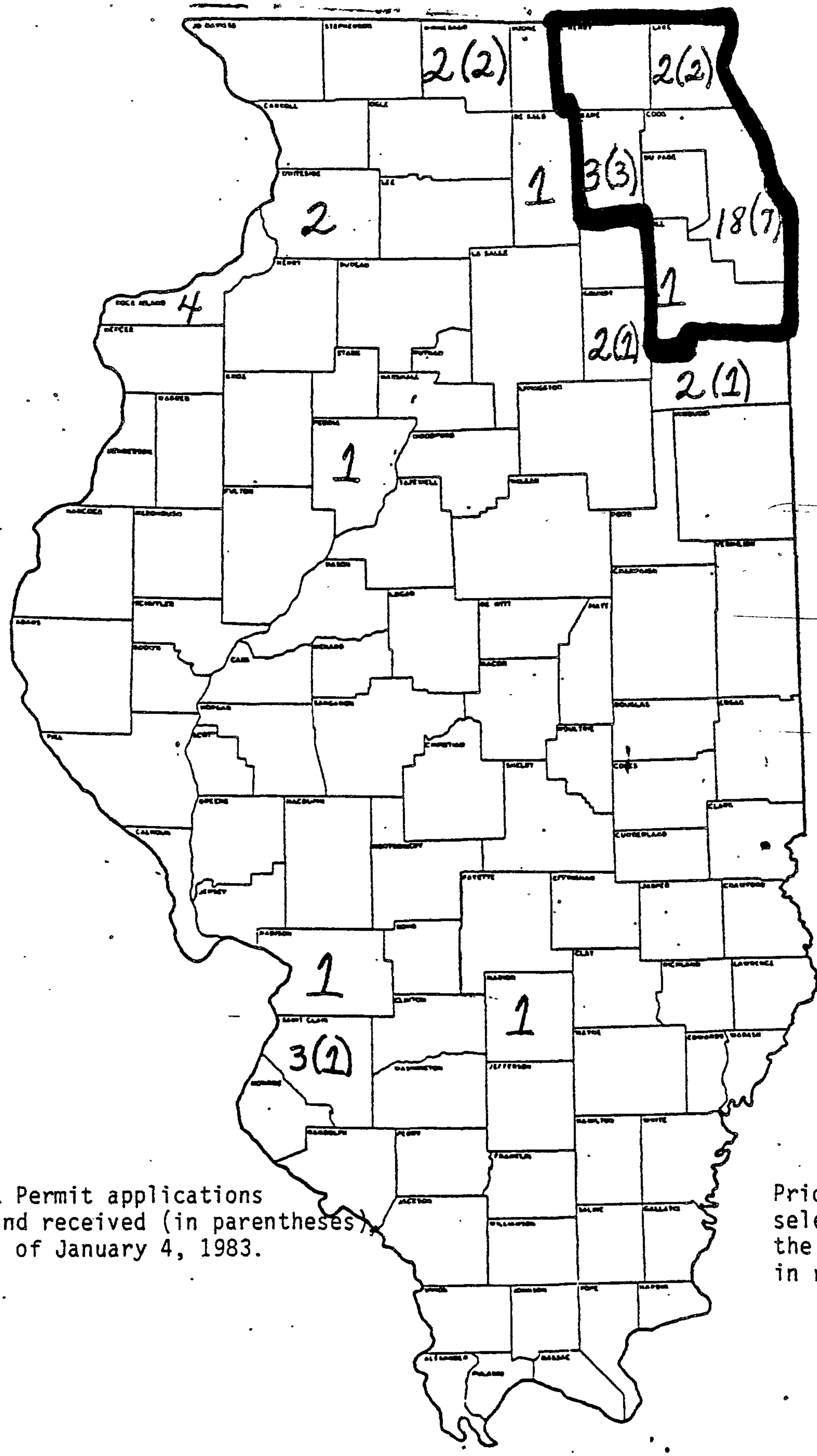
GRAND FORKS (PART)
FARGO-MOORHEAD (PART)
DULUTH-SUPERIOR (PART)
ST. CLOUD
1(1)
MINNEAPOLIS-ST. PAUL
6(1)
1(1)
1
(PART)
4
1
1
2(1)
ROCHESTER


TOLEDO (PART)
2(1)
1
1
1(1)
1
CLEVELAND
10(7)
1(1)
1(1)
2(1)
LORAIN-ELYRIA
AKRON
5(2)
YOUNGSTOWN-WARREN
MANSFIELD
LIMA
1(1)
2(2)
CANTON
1(1)
STEUBENVILLE-WEIRTON (PART)
1
SPRINGFIELD
1(1)
6(3)
3
NEWARK
1(1)
1
WHEELING (PART)
COLUMBUS
DAYTON
6(3)
1
1(1)
1
PARKERSBURG-MARIETTA (PART)
2
HAMILTON-MIDDLETOWN
1
1(1)
14(6)
CINCINNATI (PART)
HUNTINGTON-ASHLAND (PART)

WISCONSIN

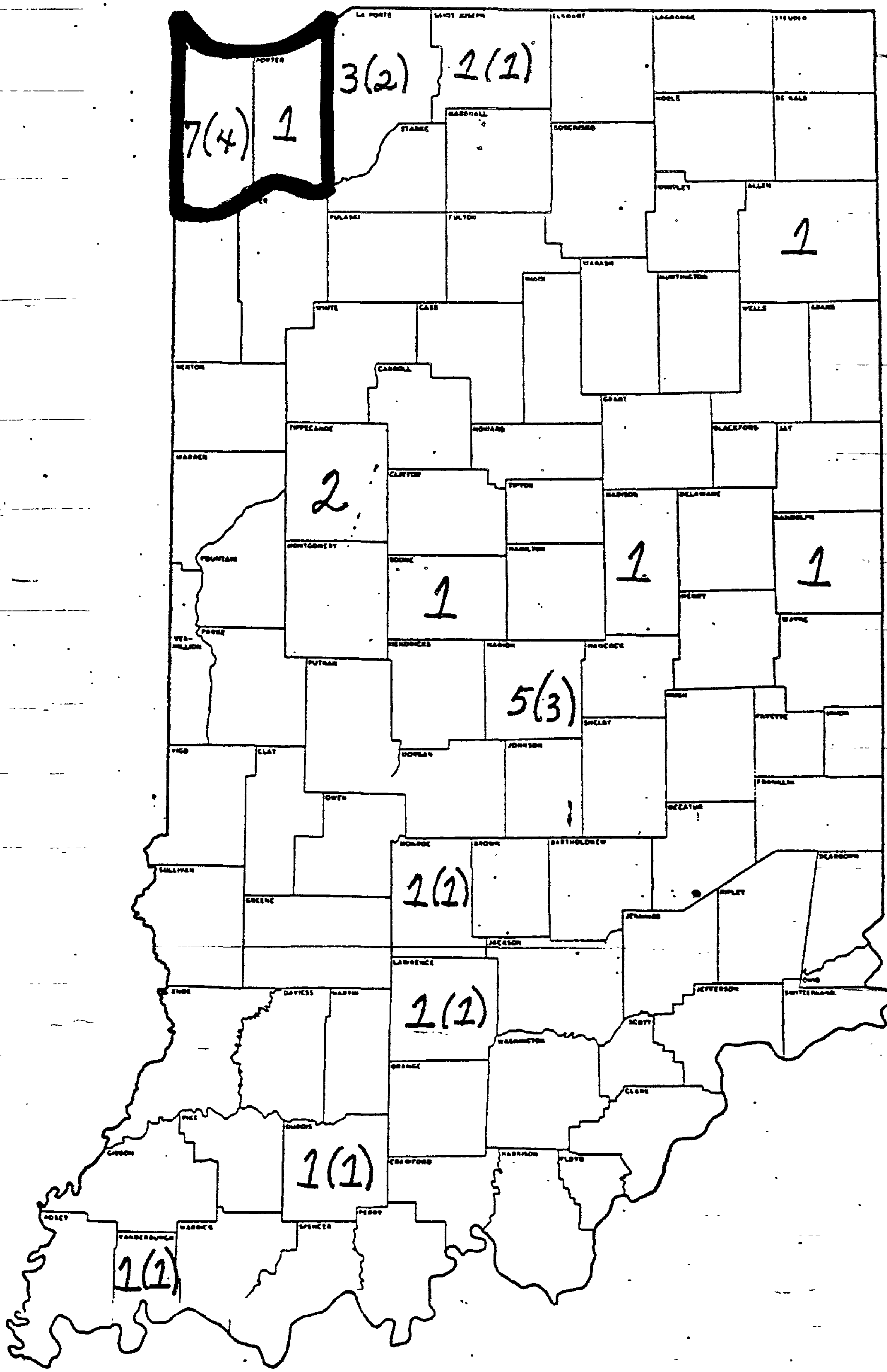

DULUTH-SUPERIOR (PART)
MINNEAPOLIS ST. PAUL (PART)
EAU CLAIRE
2
1
1
WAUSAU
1
APPLETON-OSHKOSH
1
1
GREEN BAY
LA CROSSE
1
1
SHEBOYGAN
2
1
MADISON
2
MILWAUKEE
6
JANESVILLE-BELOIT
1
1
RACINE
KENOSHA

ILLINOIS

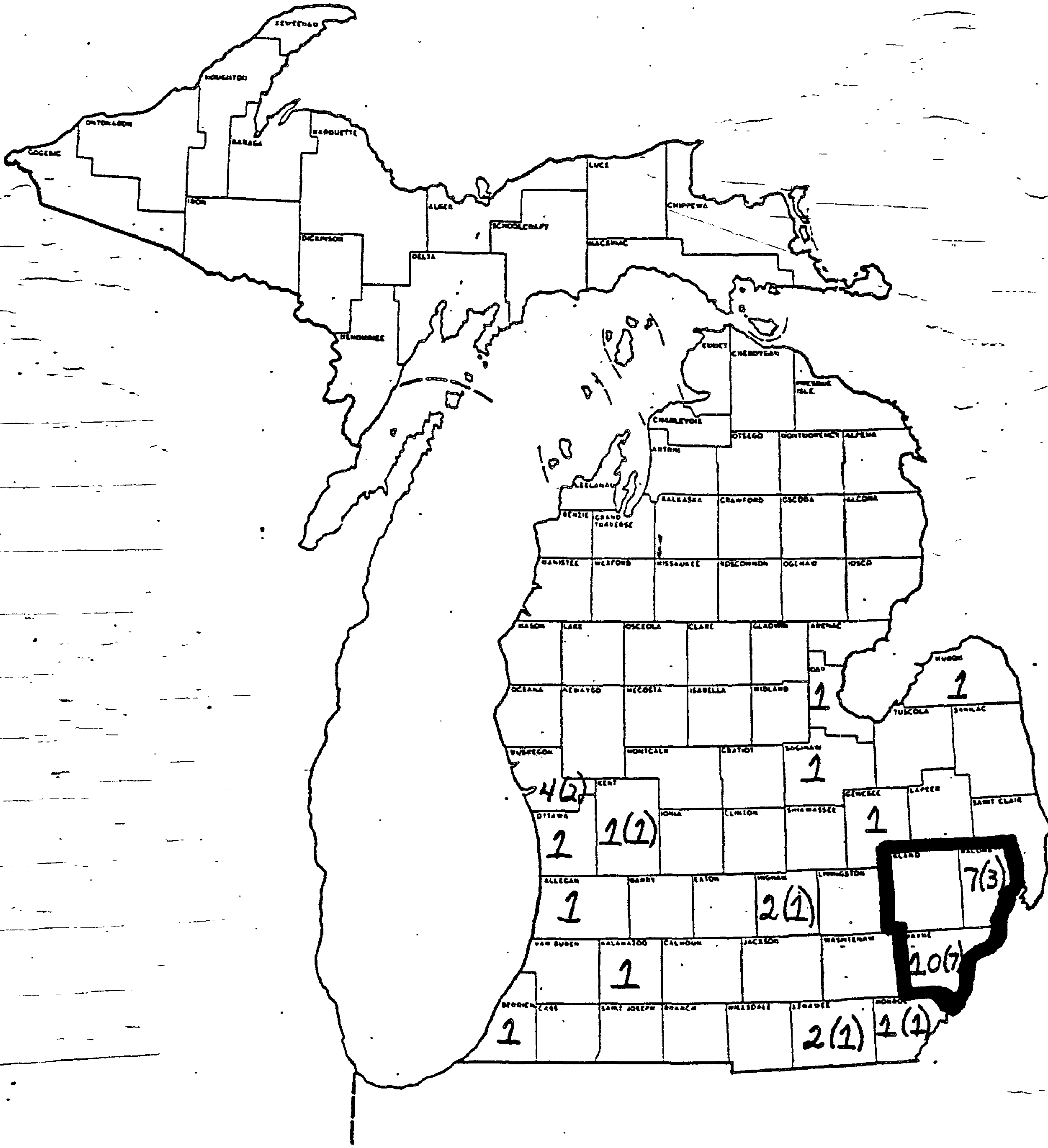


Part B RCRA Permit applications called-in, and received (in parentheses), by county, as of January 4, 1983.

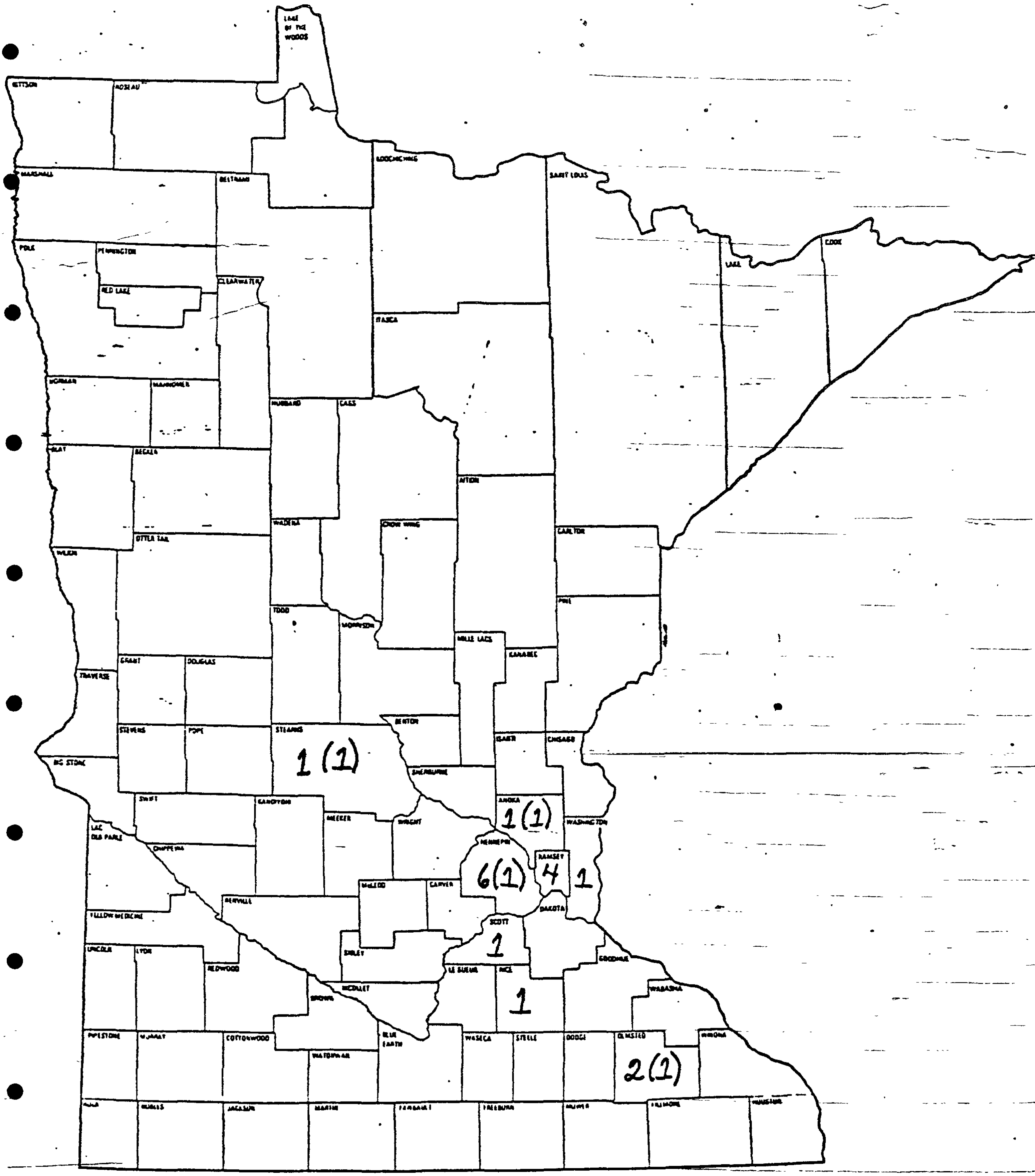
Priority geographic areas selected for emphasis by the Air program are outli in red


7(4)
1
3(2)
1(1)
1
2
1
1
1
5(3)
1(1)
1(1)
1(1)
1(1)

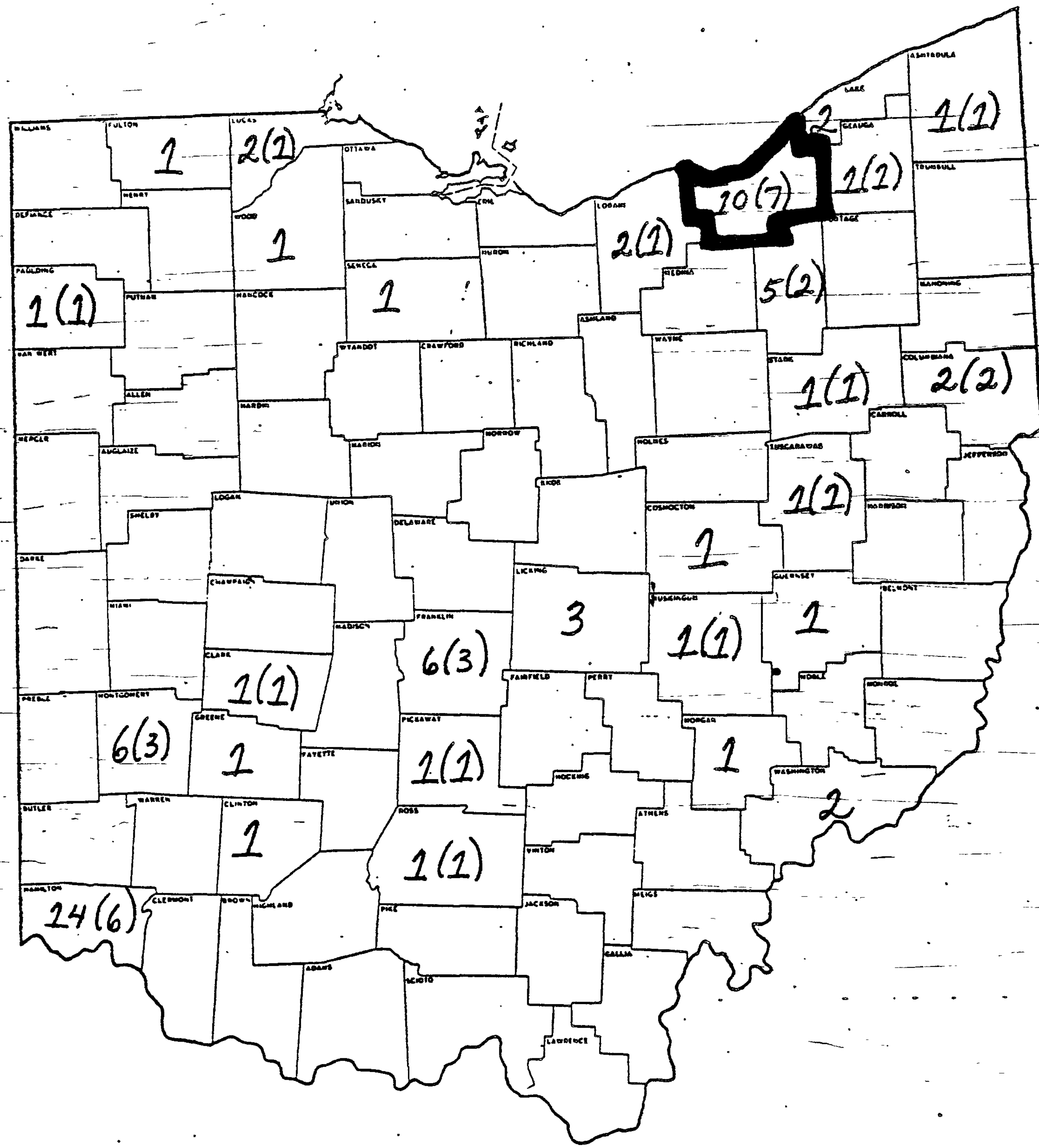
MICHIGAN



MINNESOTA



OHIO



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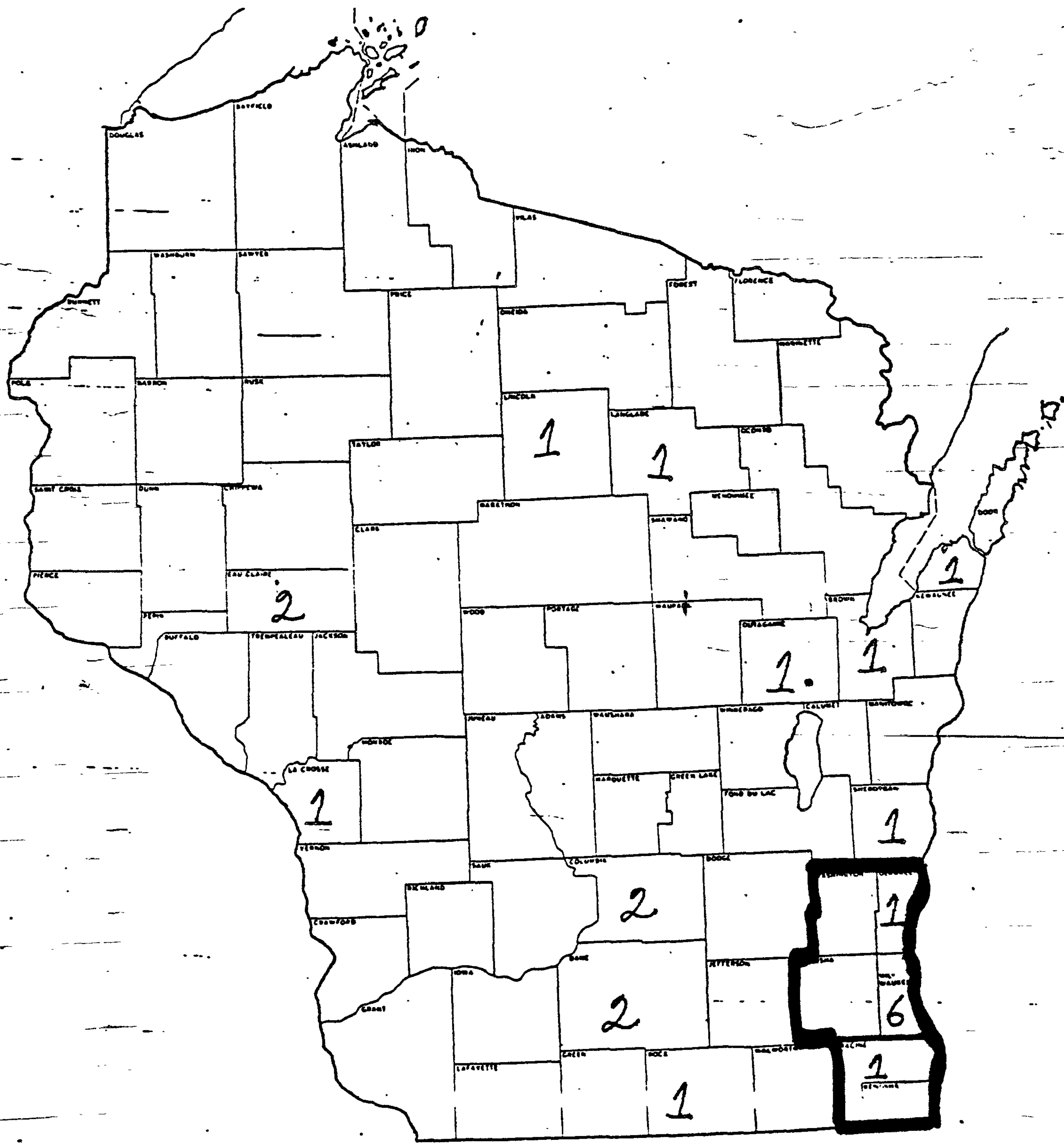
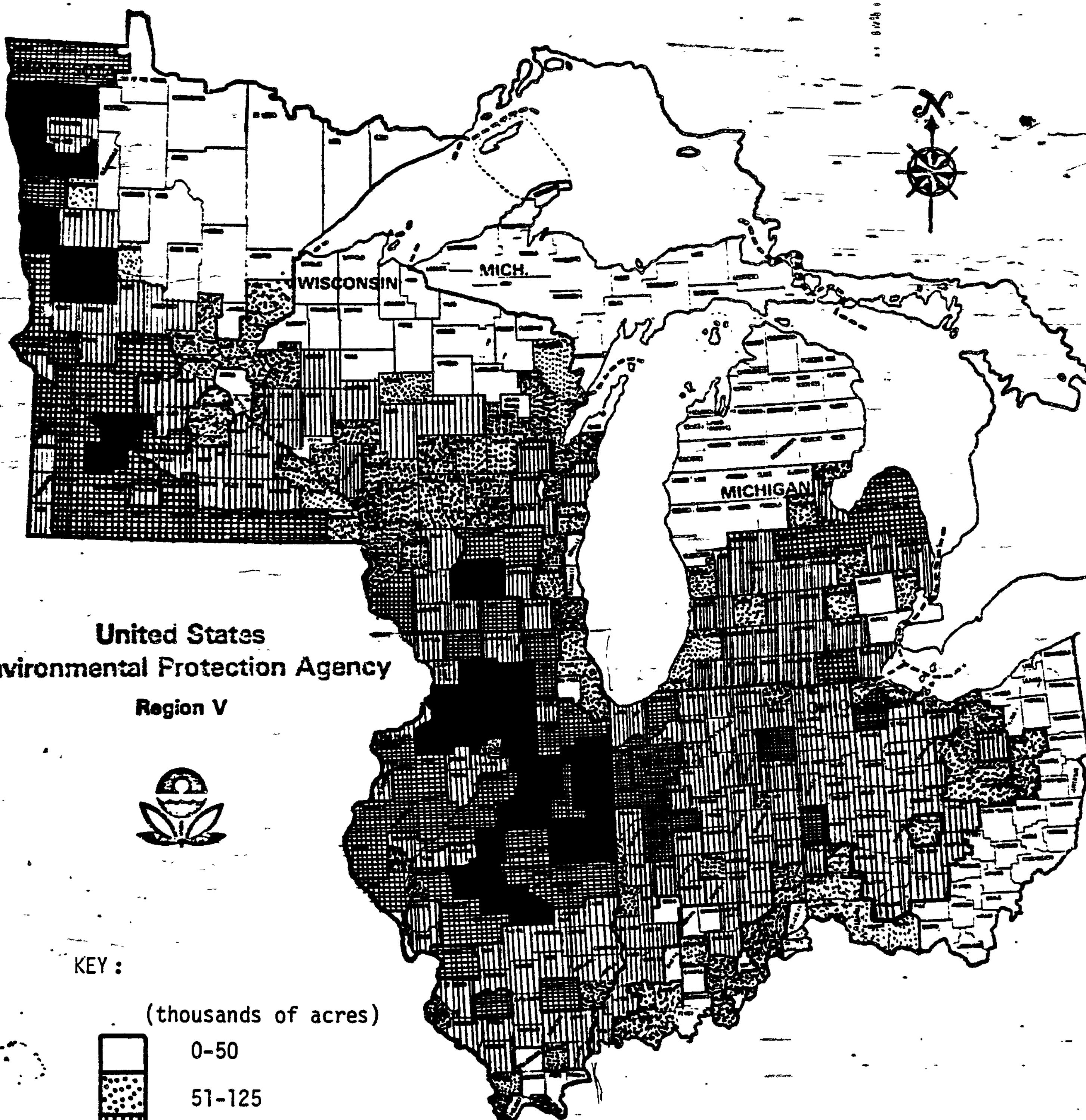


WMD/PS/ATT A-1

AGRICULTURAL ACREAGE TREATED WITH PESTICIDES

REGION V



KEY:

(thousands of acres)

0-50

51-125

126-250

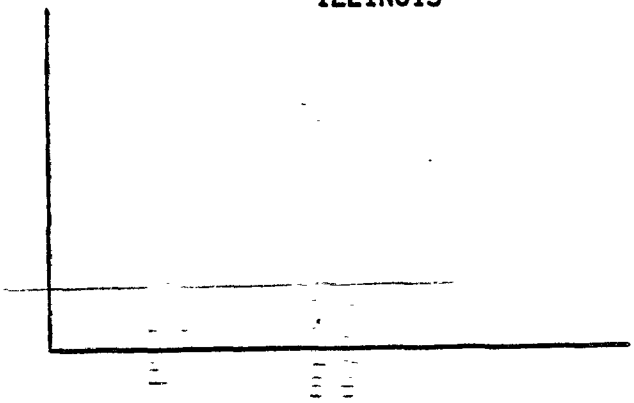
251-400

over 400

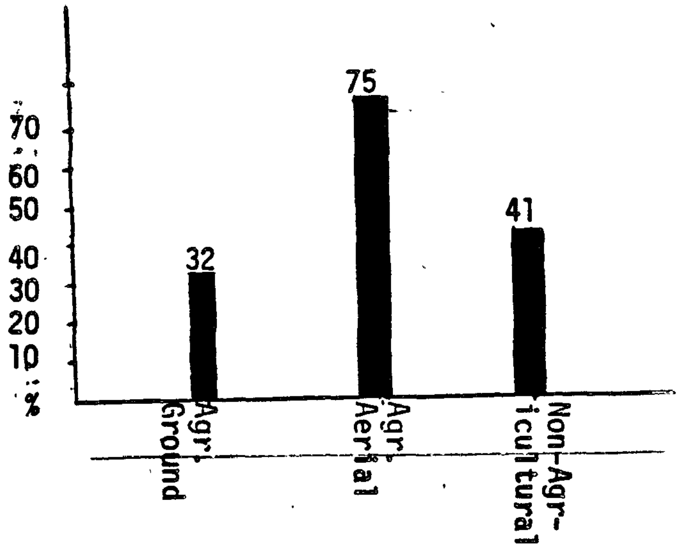
WMD/PS/ATT A-2

PESTICIDE USE INVESTIGATIONS
VIOLATIVE RATES

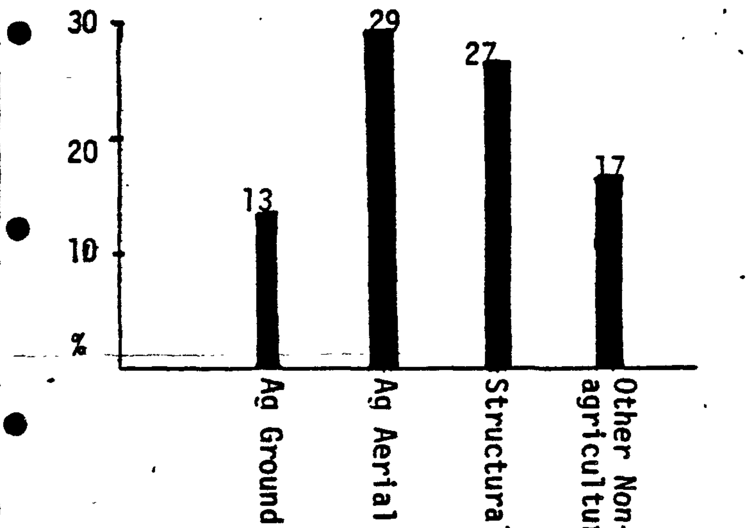
ILLINOIS



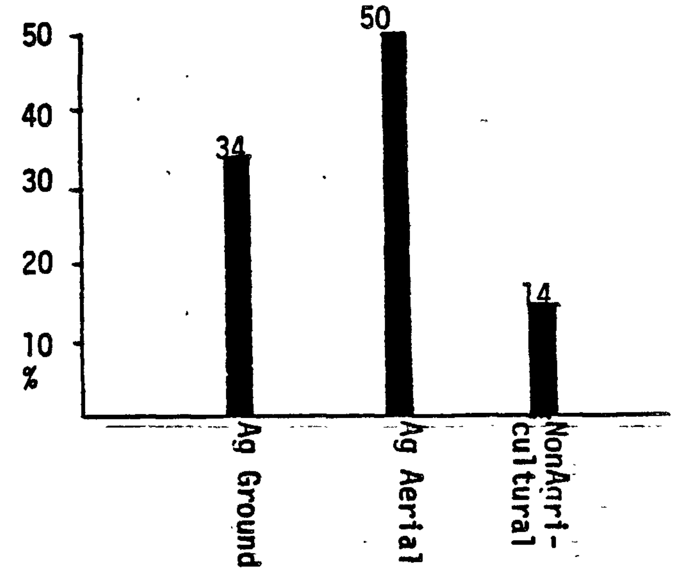
INDIANA (FY 81&82)



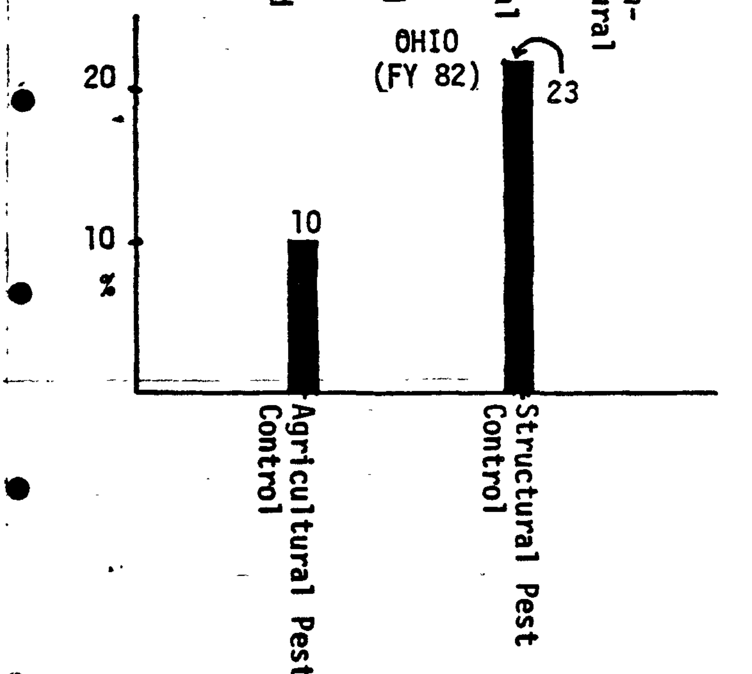
MICHIGAN (FY 81 and 82)



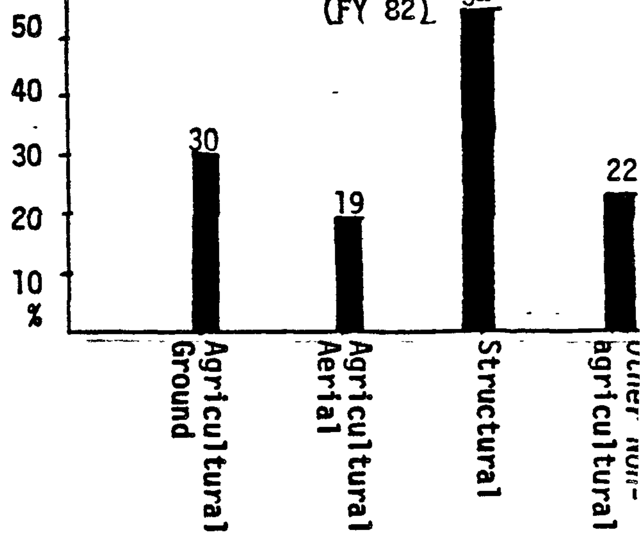
MINNESOTA (FY 82)



OHIO (FY 82)

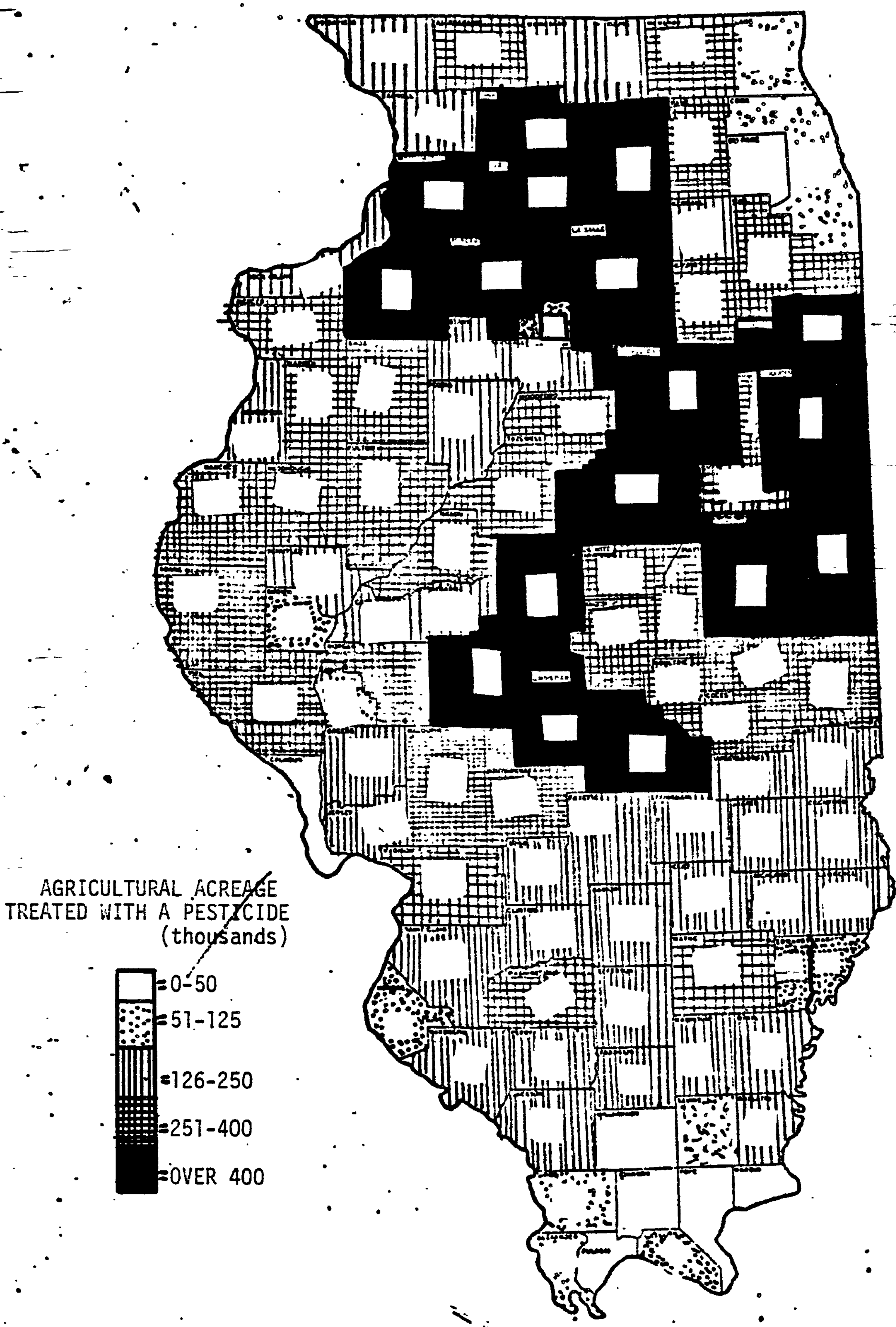


WISCONSIN (FY 82)



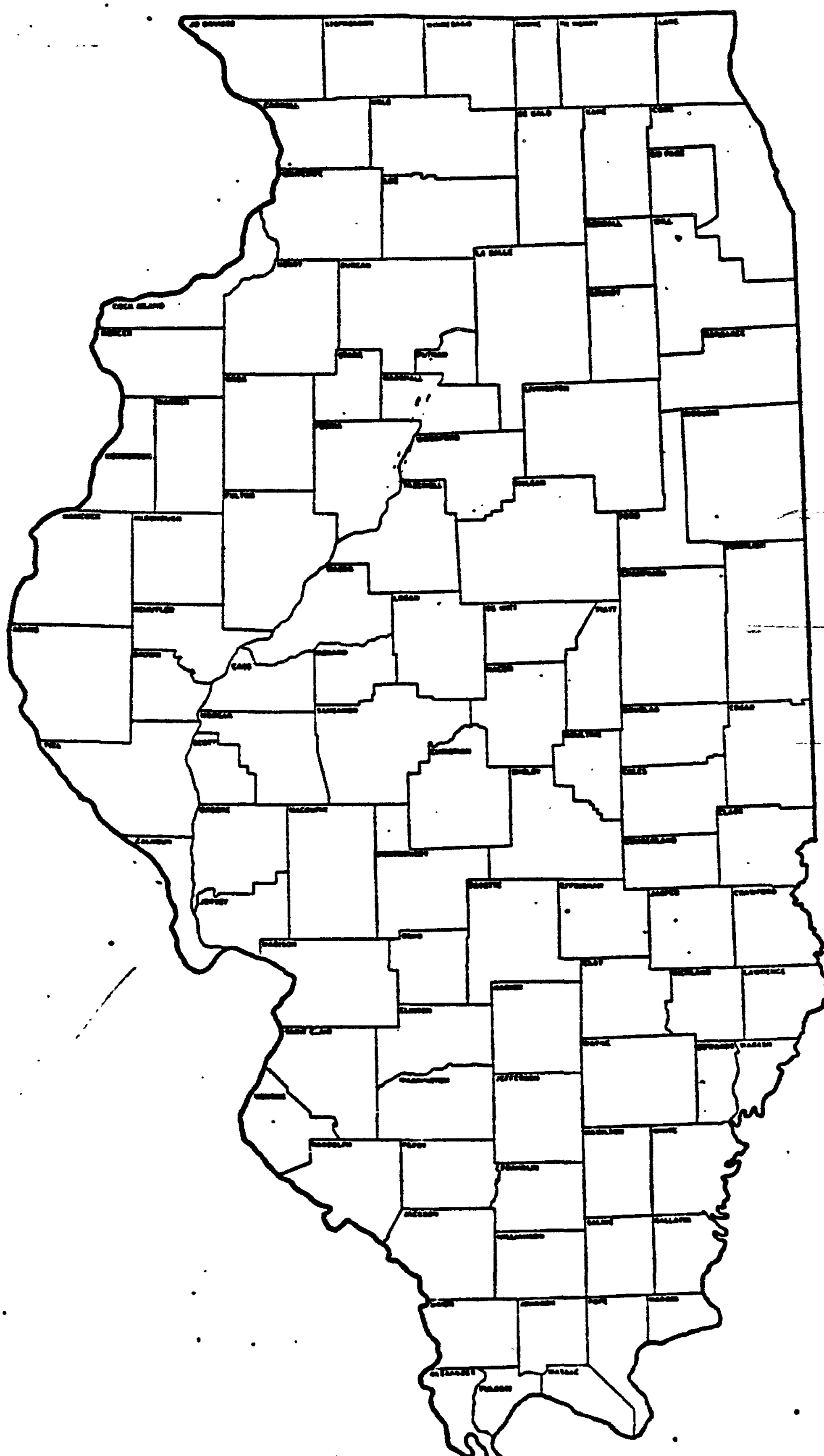
AGRICULTURAL INCIDENTS - FISCAL YEAR 1982

ILLINOIS



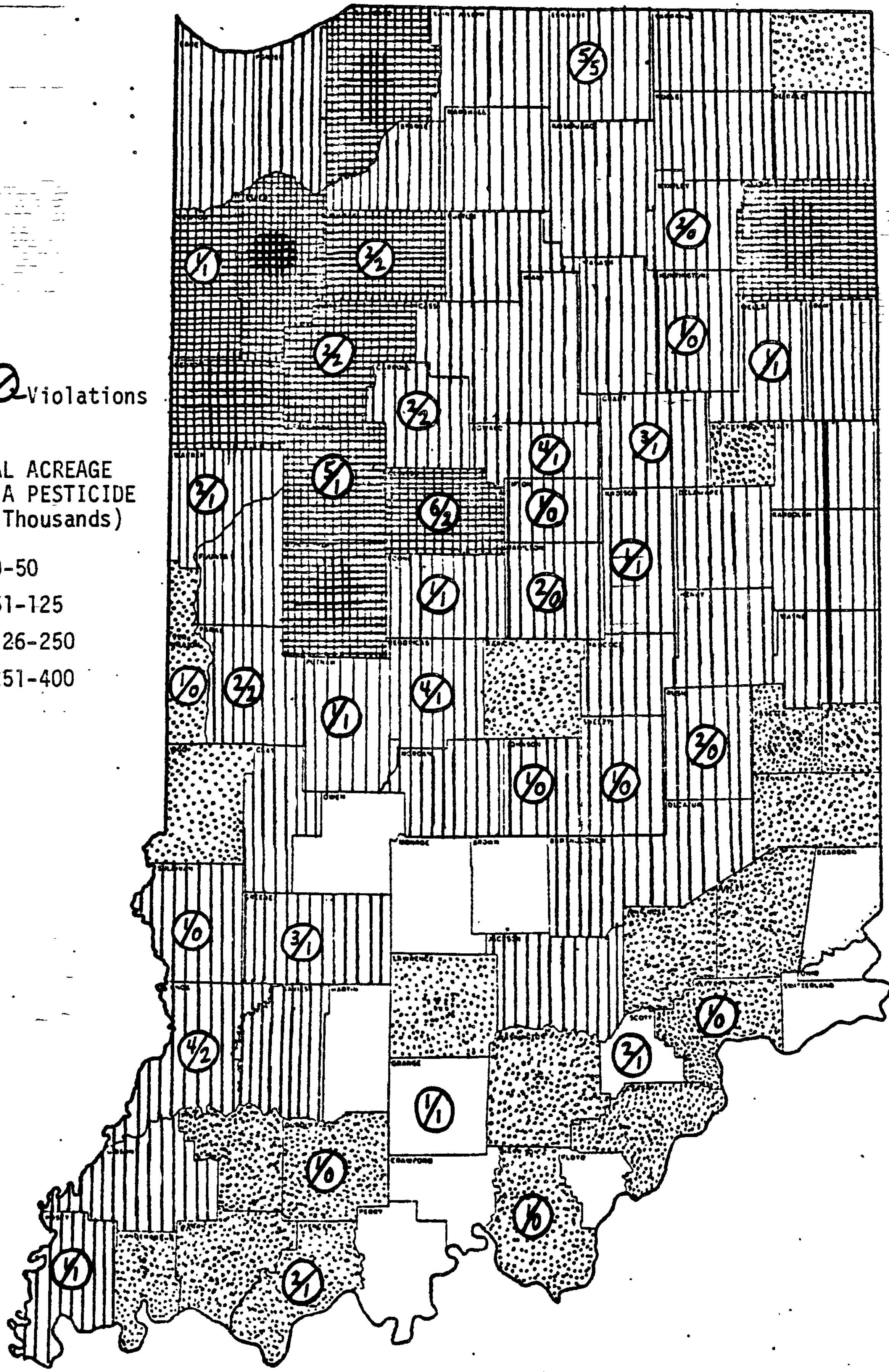
NONAGRICULTURAL INCIDENTS - FISCAL YEAR 1982

ILLINOIS



INDIANA

WMD/PS/ATT -5 AGRICULTURAL INCIDENTS - FISCAL YEARS 1981 and 1982



KEY:

Incidents / Violations

AGRICULTURAL ACREAGE TREATED WITH A PESTICIDE (in Thousands)

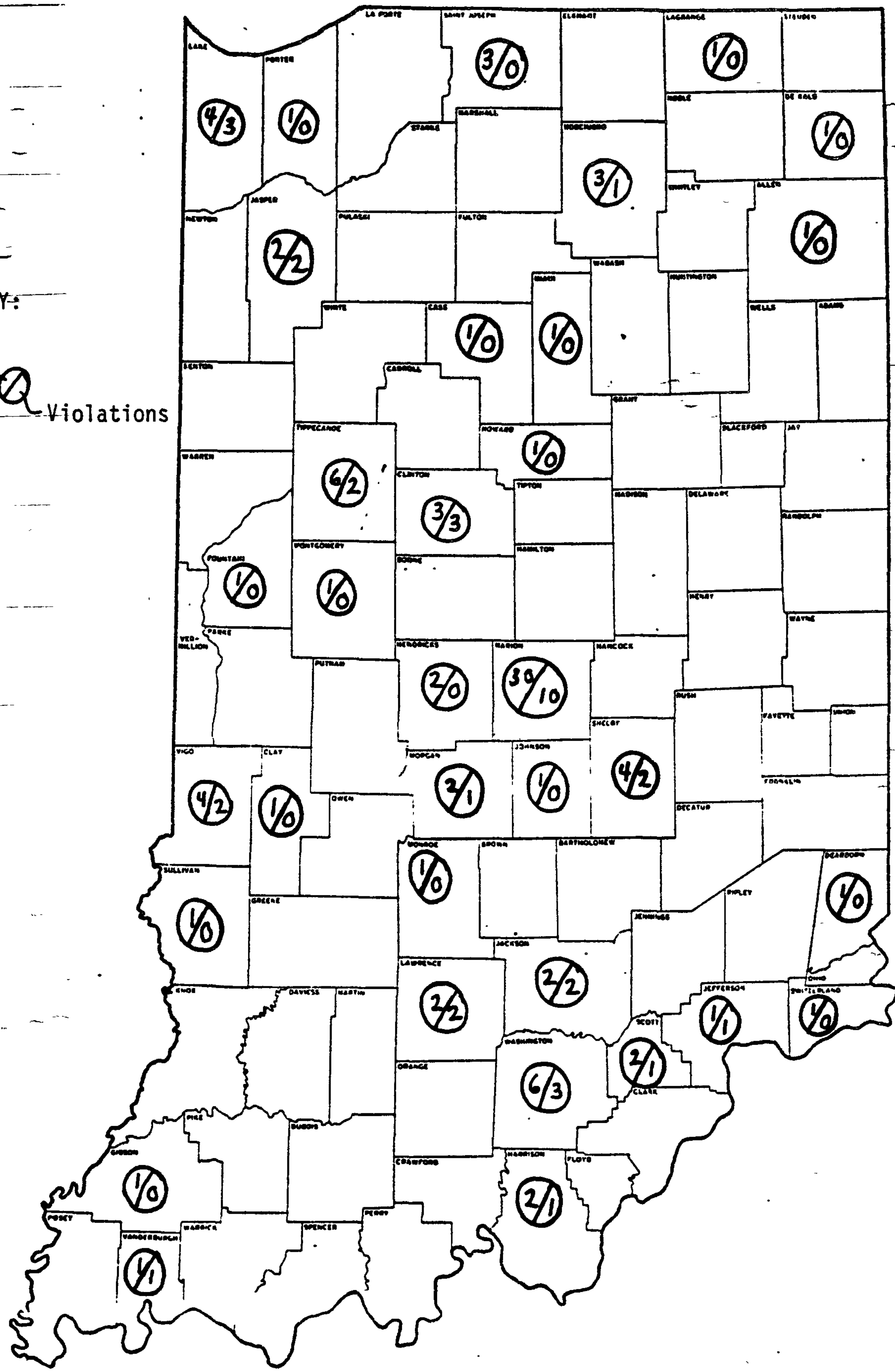
- 0-50
- 51-125
- 126-250
- 251-400

WMD/PS/ATT-6

NONAGRICULURAL INCIDENTS - FISCAL YEAR 81&82 INDIANA

KEY:

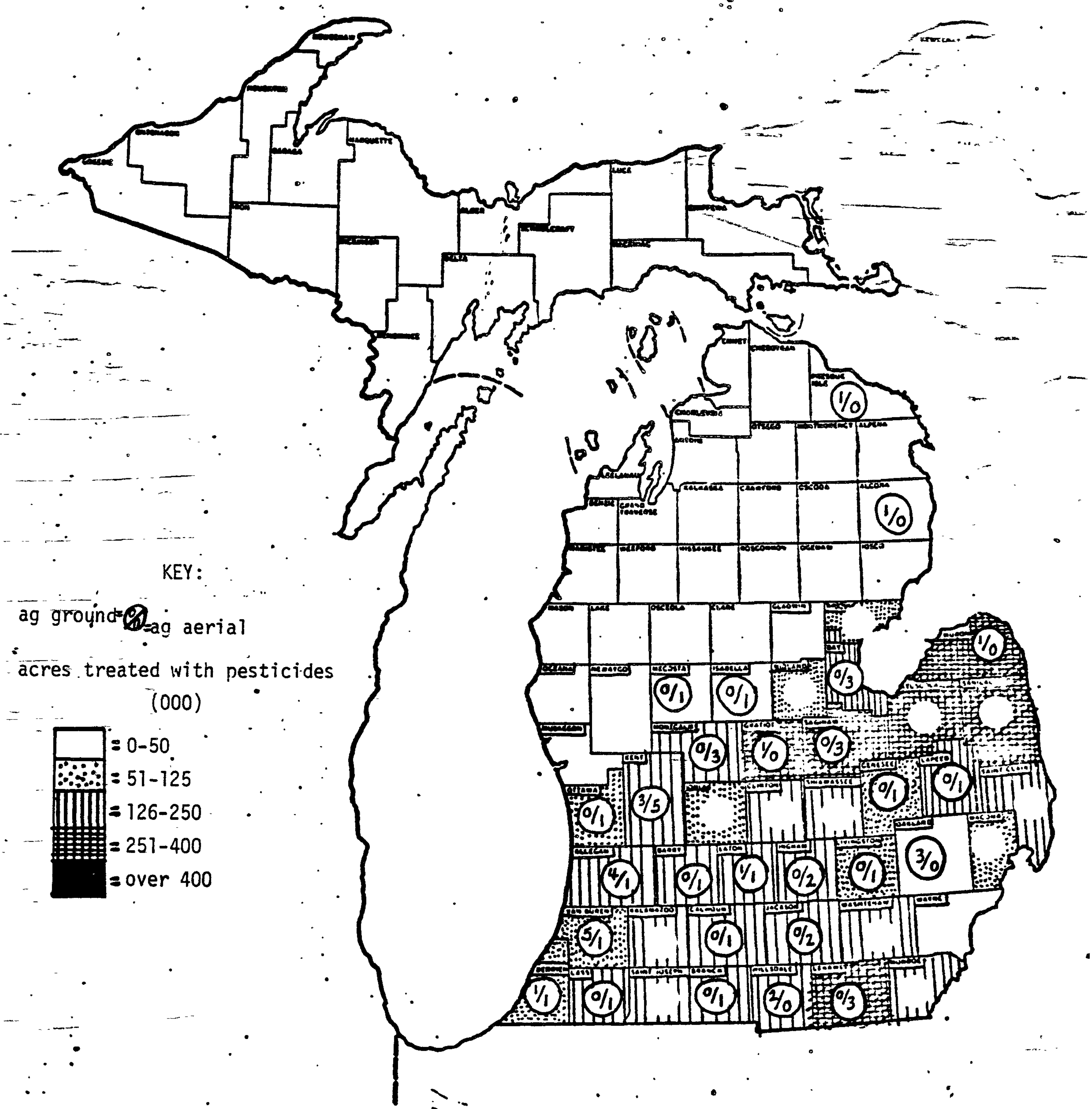
Incidents / Violations



WMD/PS/ATT A-7

MICHIGAN

AGRICULTURAL INCIDENTS
FISCAL YEARS 1981 AND 1982



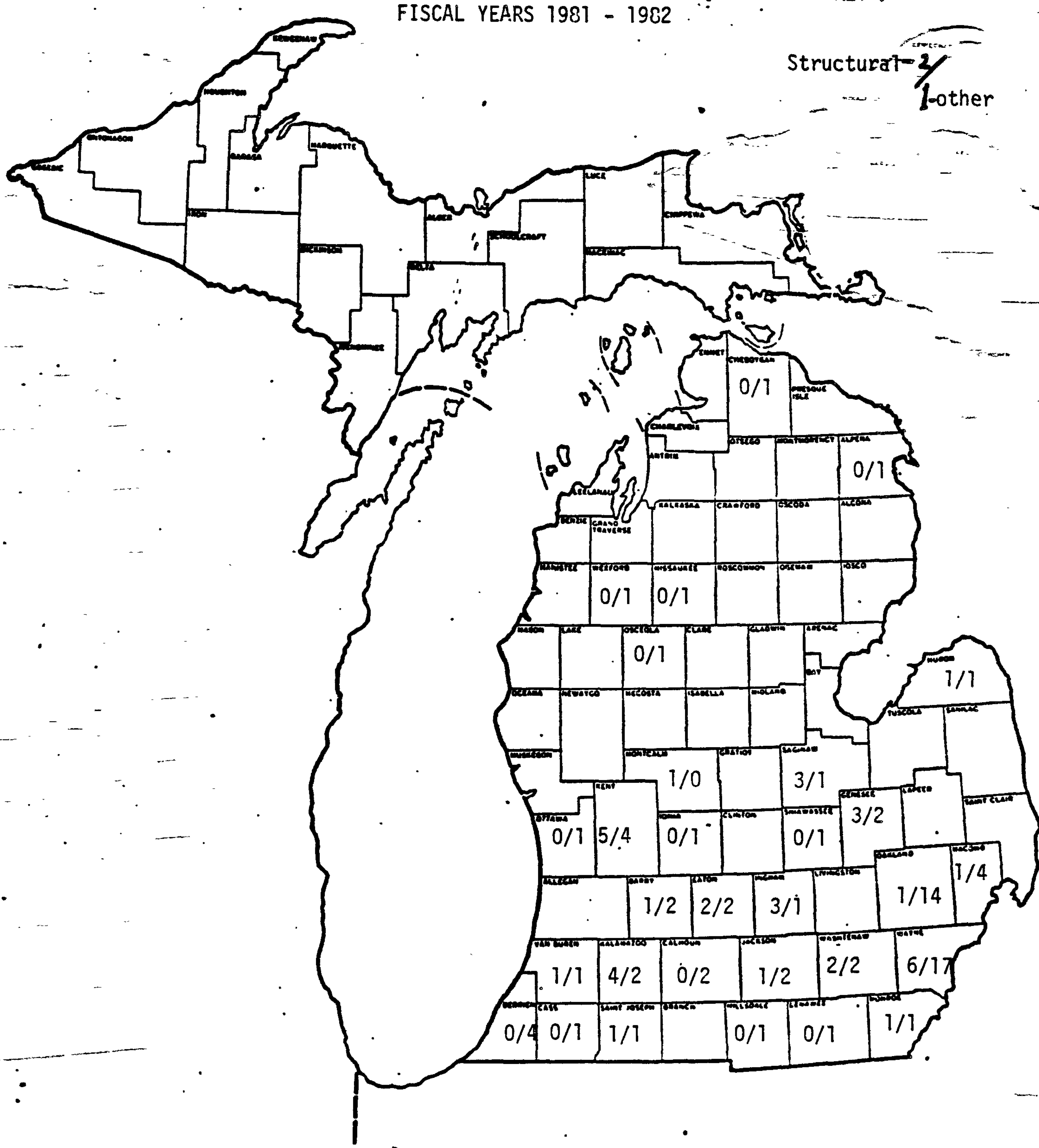
WMD/PS/ATT A-8

MICHIGAN

NONAGRICULTURAL INCIDENTS
FISCAL YEARS 1981 - 1982

KEY :

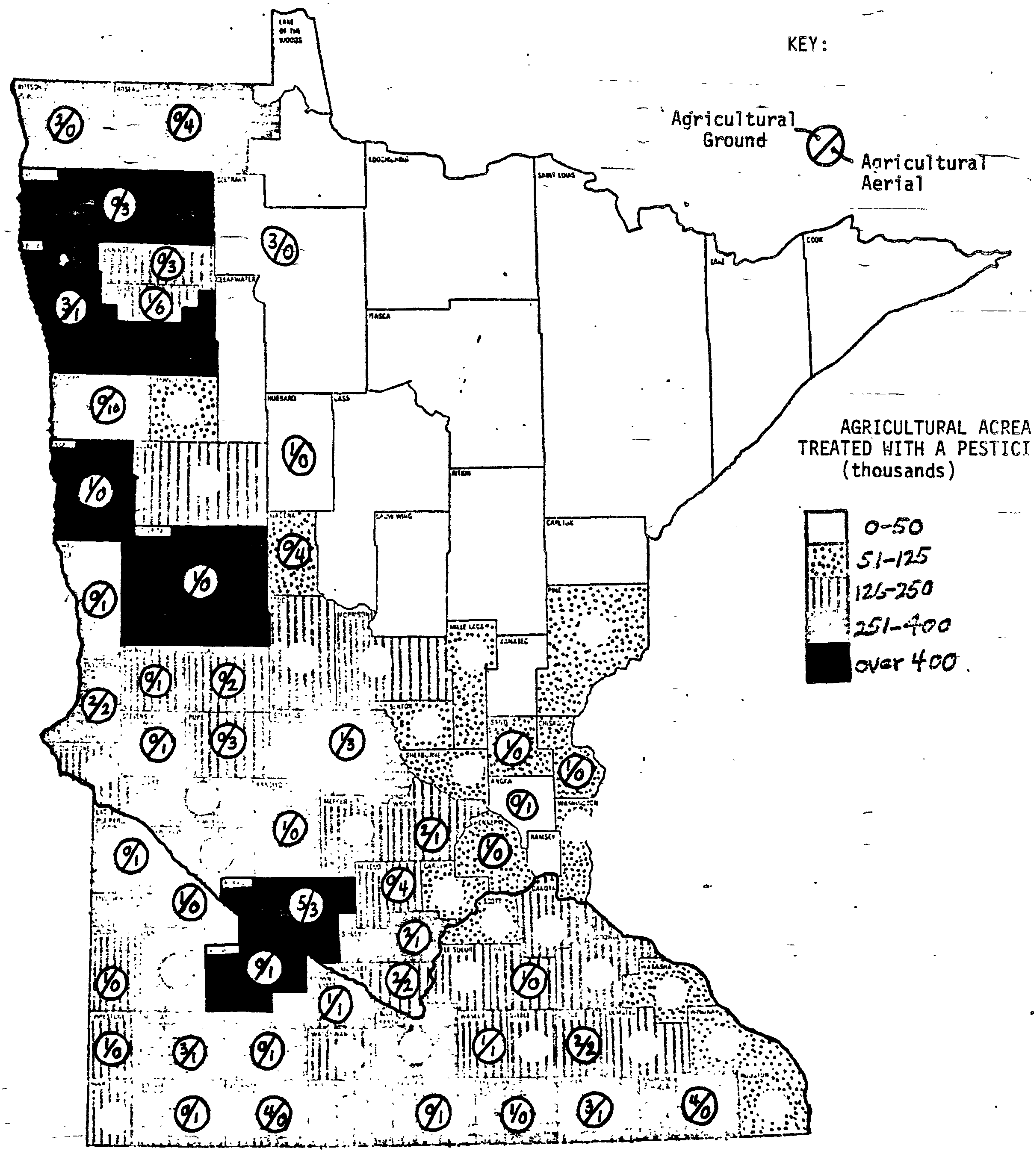
Structural 2/1 other



WMD/PS/ATT. A-9

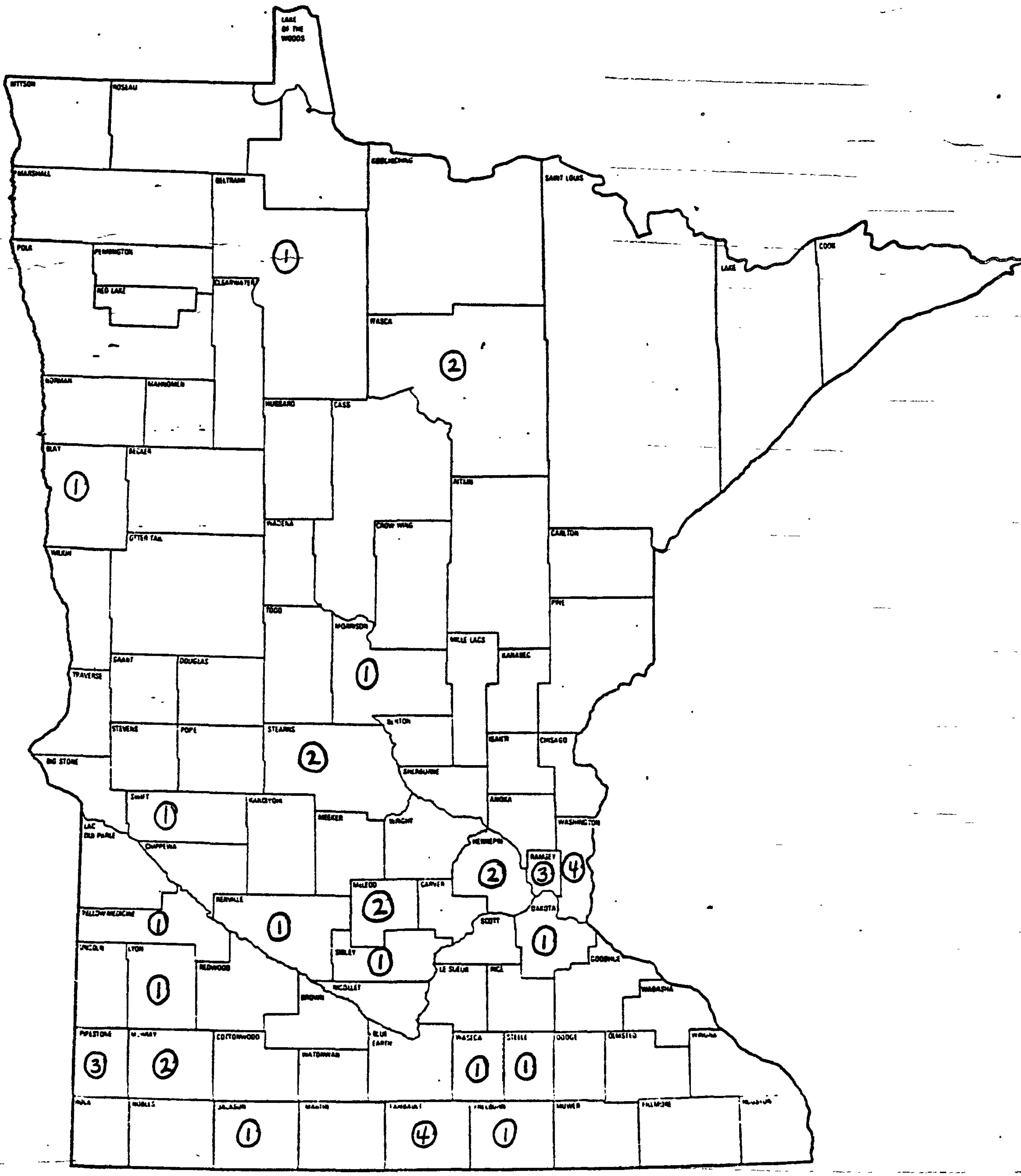
AGRICULTURAL INCIDENTS - FISCAL YEAR 1982

MINNESOTA



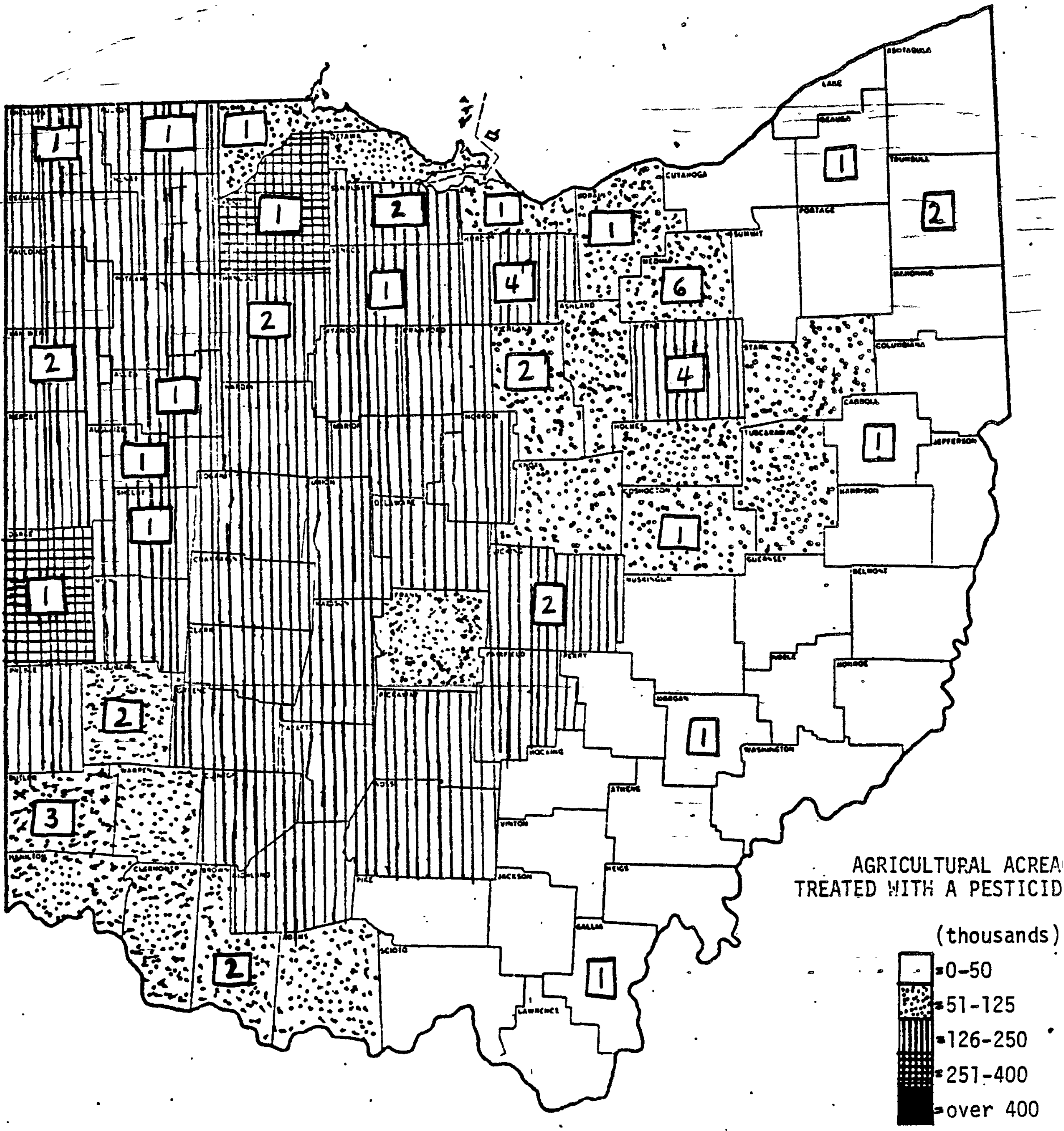
NONAGRICULTURAL INCIDENTS - FISCAL YEAR 1982

MINNESOTA



AGRICULTURAL INCIDENTS - FISCAL YEAR 1982

OHIO

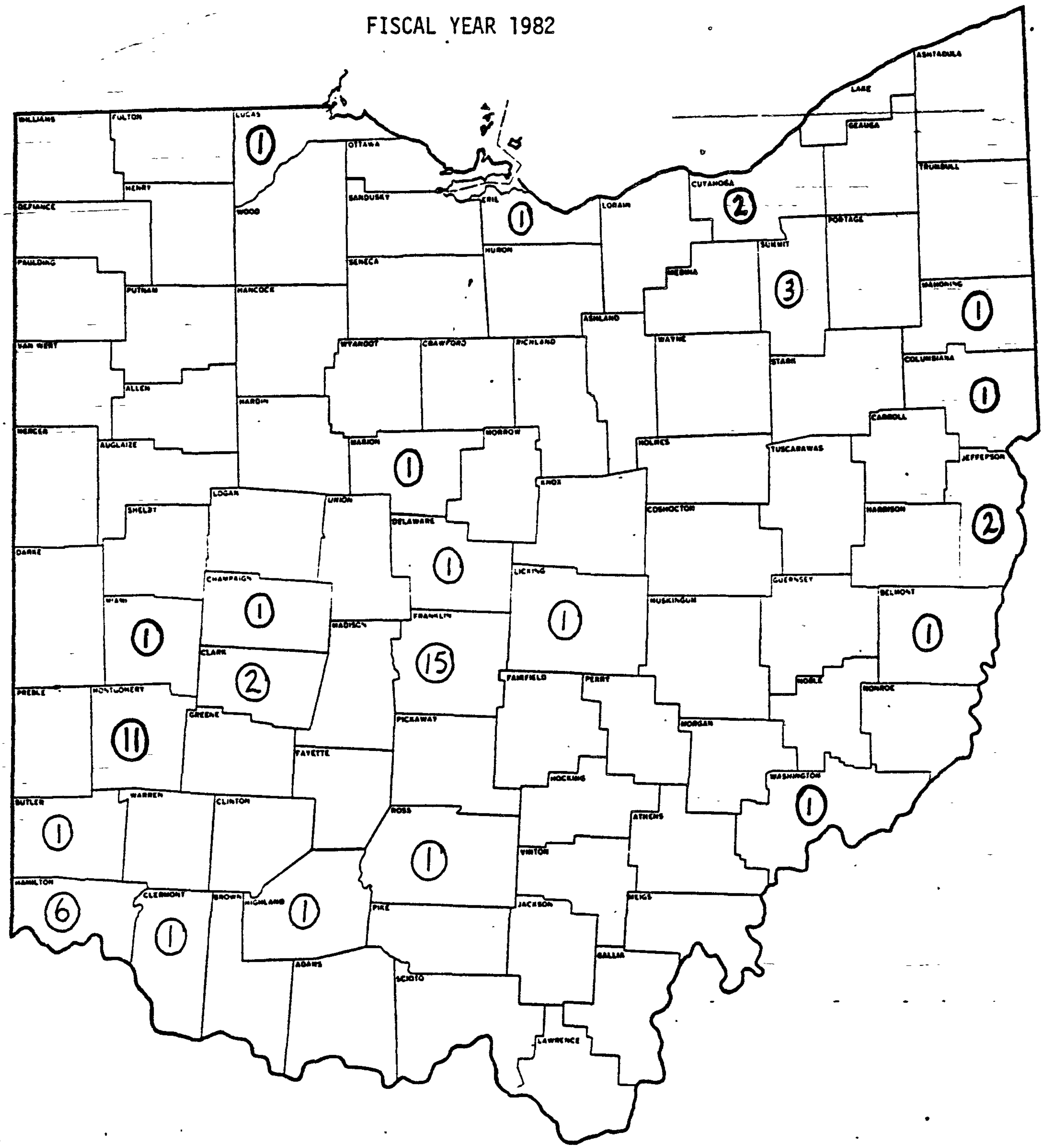


WMD/PS/ATT A-12

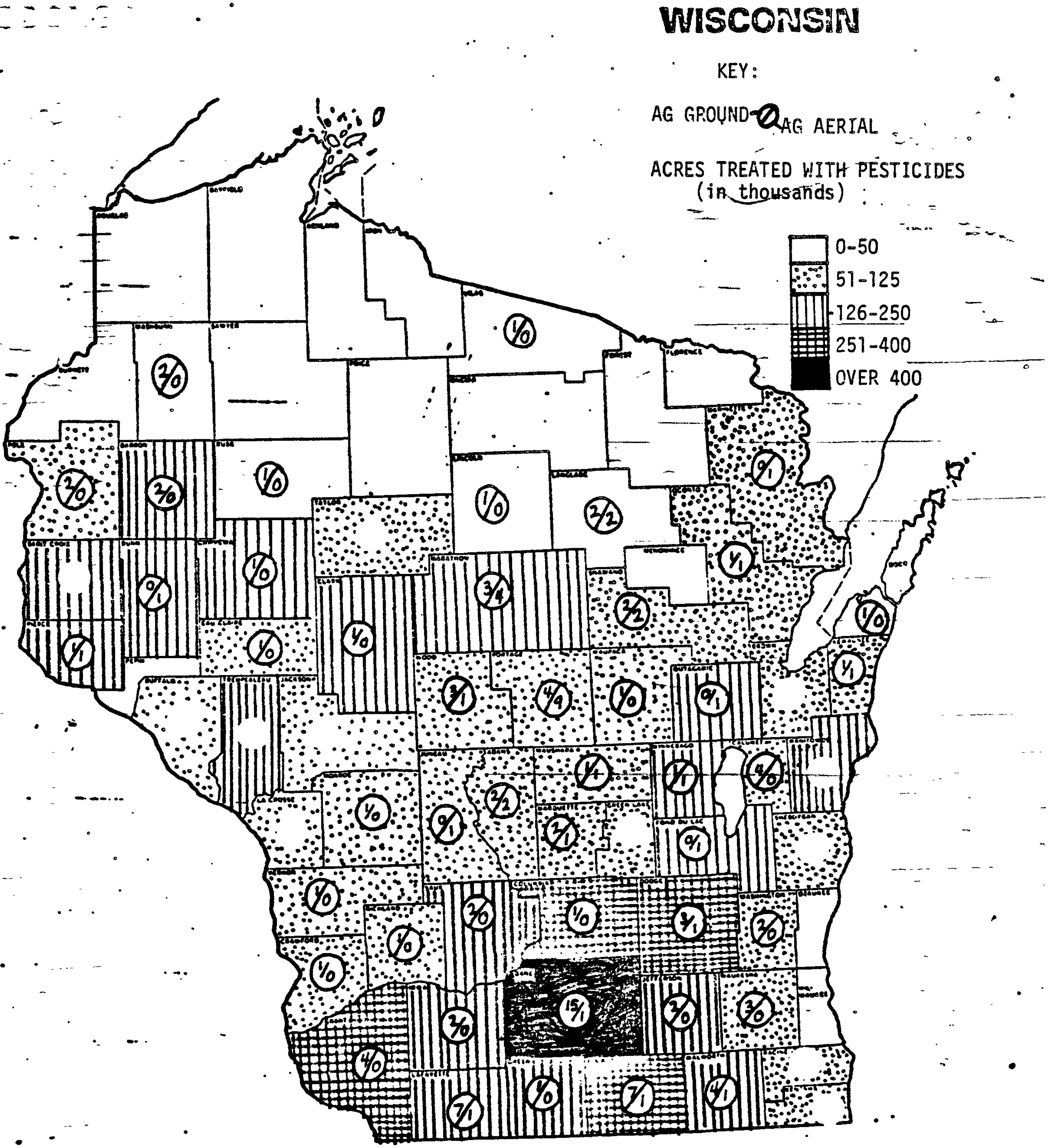
OHIO

STRUCTURAL PEST CONTROL INCIDENTS

FISCAL YEAR 1982



AGRICULTURAL INCIDENTS - FISCAL YEAR 1982



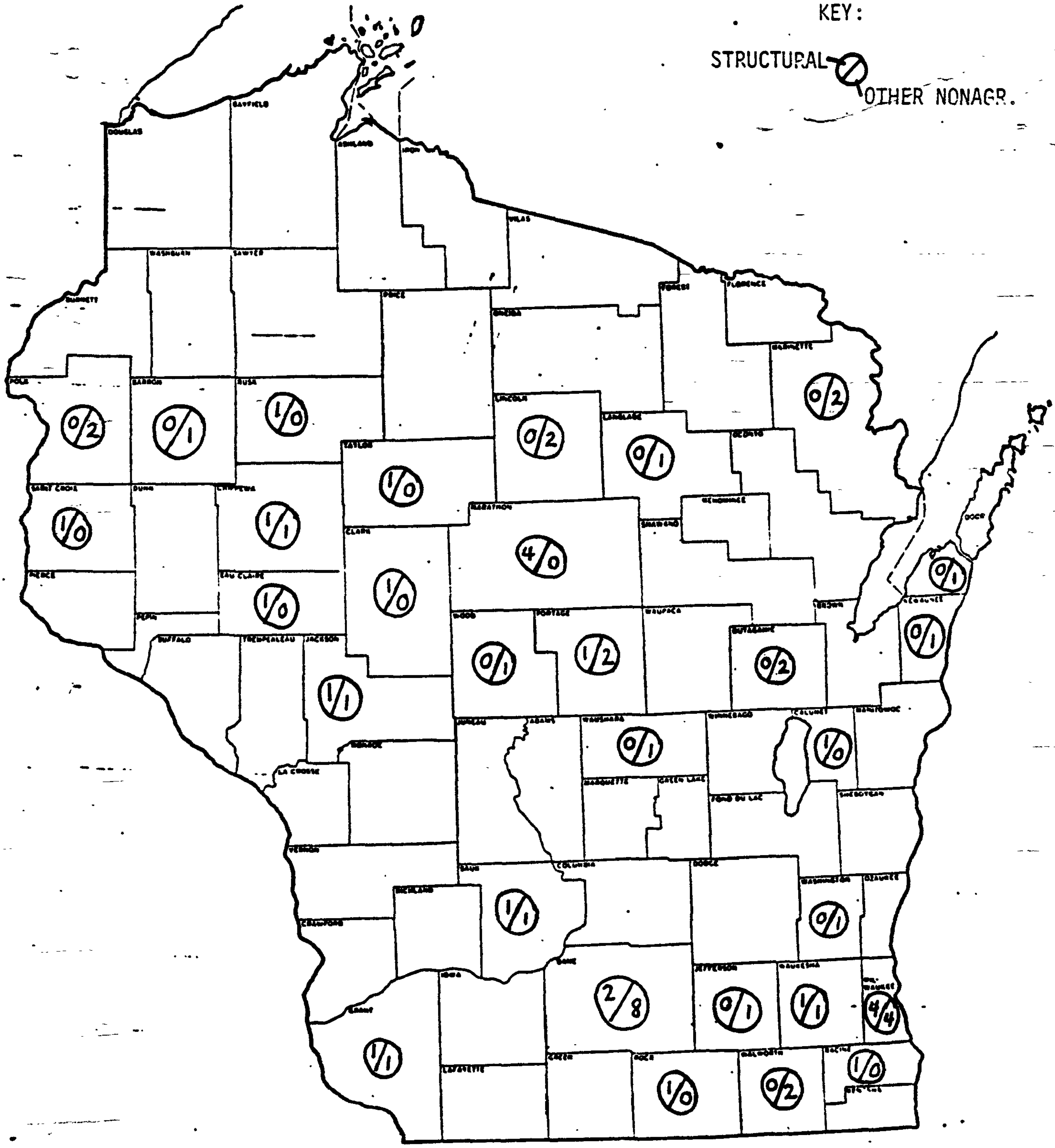
WMD/PS/ATT A-14

NONAGRICULTURAL INCIDENTS - FISCAL YEAR 1982

WISCONSIN

KEY:

STRUCTURAL / OTHER NONAGR.



REMEDIAL RESPONSE (SUPERFUND)

The NPL sites in Region V are distributed as follows:

	NPL Sites	Threatened Population
Illinois	11	203,273
Indiana	13	698,780
Michigan	46	4,912,592
Minnesota	10	868,975
Ohio	19	934,828
Wisconsin	0	0
Total	99	7,618,448

The HRS analysis looks at hazardous threats via three pathways: groundwater, surface water, and air. In Region V, the predominate abandoned hazardous waste site threats are to groundwater followed by threats to surface water and air repectively.

Groundwater

In Region V, all but two NPL sites in Illinois and two in Ohio (four total) are known to pose possible threats to groundwater. This is significant due to the fact that over half of the people living in the Region V States obtain their drinking water from groundwater sources (private and municipal wells).

Surface Water

Slightly more than half of the Region V NPL sites are known to pose a possible threat to surface waters (51 out of 99): The distribution is:

	Number of NPL Sites Posing a Possible Threat to Surface Water	% of the Total NPL Sites in the State	Population Threatened
Illinois	5	45%	112,192
Indiana	8	62%	465,886
Michigan	14	30%	2,524,334
Minnesota	8	80%	824,231
Ohio	16	84%	868,111

Clearly, potential surface water threats are the most serious in Ohio and Minnesota and to a lesser degree in Indiana. This is attributable to the large number of people who rely on these surface waters for their drinking water.

Air

Abandoned hazardous waste sites in Region V which are known to present a potential volatile release which could be a significant threat to people constitute approximately 9% of the NPL sites in each of the five "NPL" states. There are only one each of these sites in Illinois, Indiana, and Minnesota, two in Ohio and four in Michigan (nine total). One of these sites (in Illinois) scored high enough to be placed on the NPL solely because of its potential air pathway threat. Five of these sites are also known to pose significant threats to both surface water and groundwater, while the remaining three also pose potential threats to either ground water (2) or surface water (1). The total Region V population threatened by air pathway sites is 449,432.

FY '83 Superfund Program

During FY '83, Region V expects to initiate Federally financed remedial response action at 17 NPL sites (5 in Illinois, 2 in Indiana, 5 in Michigan, 2 in Minnesota, and 3 in Ohio). Sixteen of these sites are known to pose a significant groundwater threat, 12 a surface water threat, and one an air pathway threat. The projected FY '83 Federal funds obligations total $21.9 million. The total population threatened by these 17 sites is over 1.6 million people. Obviously the major thrust of Region V efforts will be to protect drinking water supplies both surface and ground water. Associated with protection of drinking water is the inherent benefit of protecting the environment in general through removal and appropriate disposal of improperly dumped hazardous materials. The goal at each individual site will be to address the threats or actual insults to public health and/or the environment by focusing on the appropriate pathways and taking necessary cost effective actions.

WMD/RRB/P2-5

Region V NPL sites prioritized by their individual hazardous ranking score:

HRS	Site Name	State
74.16	FMC	MN
66.74	Berlin & Farro	MI
63.28	Liquid Disposal Inc.	MI
62.26	Arcanum Iron & Metal	OH
60.43	Midco I	IN
59.16*	New Brighton	MN
59.16*	Oakdale	MN
59.16*	Reilly Tar	MN
58.41	Burlington Northern	MN
58.15	Seymour	IN
57.93	Northernaire Plating	MI
55.49	A&F Materials	IL
55.05	Koppers Coke	MN
53.61	Spiegelburg LF	MI
53.60	Gratiot Co. LF	MI
53.42	Wauconda Sand & Gravel	IL
53.41	Ott/Story/Cordova	MI
52.38	Velsicol MI	MI
52.28	Summit National	OH
52.15	Packaging Corp of Amer.	MI
52.05	Fisher Calo	IN
51.97	Springfield Twp Dump	MI
51.80	Bowers LF	OH
51.62	Fields Brook	OH
50.92*	Rose Twp Dump	MI
50.92*	Waste Disposal Eng	MN
50.72	South Andover Site	MN
50.30	Butterworth #2 LF	MI
49.09	G&H LF	MI
48.78	Velsicol IL	IL
48.50	Tar Lake	MI
47.78	Chem Dyne	OH
47.19	Nease Chemical	OH
47.05	Allied Chemical	OH
46.86	Verona Well Field	MI
46.44	Envirochem	IN
46.04	Wash King Laundry	MI
44.63	McGraw Edison	MI
42.93	Neal's LF	IN
42.82	OMC	IL
42.55	National Lead Taracorp.	MN
42.49*	Main St. Well Field	IN
42.49*	Lehillier	MN

*Sites with identical scores

WMD/RRB/P2-6

HRS	Site Name	State
42.33	Wayne Waste Oil	IN
42.06	LaSalle Elec. Ut.	IL
42.04	Cross Bros/Pembroke	IL
41.05	Spartan Chem. Co.	MI
40.86	Grand Traverse OSC	MI
40.37	E.H. Schilling LF	OH
40.32	Ninth Ave. Dump	IN
40.21	Gratiot Co Golf Course	MI
39.66	S.W. Ottawa LF	MI
39.42	Fultz LF	OH
39.14	Cochocton City LF	OH
38.82	Johns-Manville	IL
38.64	Forest Waste Products	MI
38.31	Lake Sandy Jo	IN
38.20	Chem Central	MI
38.16	Novaco Inds.	MI
38.02	Ionia City LF	MI
36.70	New Lyme LF	OH
36.36	SCA Indp. LF	MI
35.97	Petosky Man. Co.	MI
35.95*	Rock Creek/Jack Webb	OH
35.95*	Laskins/Poplar Oil	OH
35.43	Kentwood LF	MI
35.39	K & L Ave LF	MI
35.25*	Marion (Bragg) Dump	IN
35.25*	Pristine	OH
35.10	Buckeye Reclamation	OH
34.78*	Galesburg/Koppers	IL
34.78*	Big D Campgrounds	OH
34.66*	Duell & Gardiner LF	MI
34.66*	Cliff/Dow Dump	MI
34.18	Mason Co. LF	MI
34.16	Cemetary Dump Site	MI
33.93	Byron	IL
33.78	Ossineke	MI
33.66	U.S. Aviex	MI
32.93	Organic Chemicals	MI
32.36	Clare Water Supply	MI
32.09	Littlefield Twp Dump	MI
32.07	Auto Ion	MI
32.00	Sparta LF	MI
31.98	Morristown/Acme Solvents	IL
31.95	Charlevoix	MI
31.80	Rasmussen's Dump	MI
31.70	Hedblum Industries	MI

WMD/RRB/P2-7

HRS	Site Name	State
31.27	Wedzeb Inc	IN
31.02	Anderson Dev.	MI
31.01	Shiawassee River	MI
30.23	Skinner LF	OH
29.85	Whitehall Mun. Wells	MI
29.77	Electrovoice	MI
29.31	Lemon Lane LF	IN
28.90	Zanesville Well Field	OH
28.73	Van Dale Junkyard	OH
28.62	Belvidere	IL
28.58	Parrot Road	IN

WMD/RRB/P2-8

Region V NPL sites listed in alphabetical order:

	Site Name	HRS
IL	A & F Materials/Greenup	55.49
	Acme Solvent Reclaiming, Inc.	31.98
	Belvidere Municipal Landfill #1	28.62
	Byron Salvage Yard	33.93
	Cross Brothers Pail Recycling Site	42.04
	Galesburg/Koppers	34.78
	Johns-Manville Corporation	38.31
	LaSalle Electrical Utilities	42.06
	Outboard Marine Corporation	42.82
	Velsicol Chemical Corporation	48.78
	Wauconda Sand and Gravel	53.42
IN	Envirochem Corporation	46.44
	Fisher-Calo	52.05
	Lake Sandy Jo (M&M Landfill)	38.21
	Lemon Lane Landfill	29.31
	Main Street Well Field	42.49
	Marion (Bragg) Dump	32.25
	Midco I	60.43
	Neal's Landfill	42.93
	Ninth Avenue Dump	40.32
	Parrot Road Dump	28.58
	Seymour Recycling Corporation	58.15
	Wayne Waste Oil	42.33
	Wedzeb Enterprises, Inc.	31.27
MI	Anderson Development Company	31.02
	Auto Ion	32.07
	Berlin & Farro - Liquid Incineration	66.74
	Butterworth Number 2 Landfill	50.3
	Cemetery Dump Site	34.16
	Charlevoix Municipal Well Field	31.95
	Chem Central	38.2
	Clare Water Supply	32.36
	Cliff/Dow Dump	34.66
	Duell and Gardner Landfill	34.66
	Electrovoice	29.77
	Forest Waste Products	38.64
	G & H Land Fill	49.09
	Grand Traverse Overall Supply Co.	40.86
	Gratiot County Golf Course	40.21
	Gratiot County Landfill	53.6
	Hedblum Industries	31.70
	Ionia City Landfill	38.02
	K&L Avenue Landfill	38.10

WMD/RRB/P2-9

	Site Name	HRS
MI	Kentwood Landfill	35.39
	Liquid Disposal, Inc.	63.28
	Littlefield Township Dump	32.09
	Mason County Landfill	34.18
	McGraw-Edison	44.63
	Northernaire Plating	57.93
	Novaco Industries	38.10
	Organic Chemicals, Incorporated	32.93
	Ossineke Groundwater Contamination	33.78
	Ott/Story/Cordova Chemical Company	53.41
	Packaging Corporation of America	52.15
	Petoskey Municipal Wells	35.97
	Rasmussen's Dump	31.80
	Rose Township Dump	50.92
	SCA Independent Landfill	36.36
	Shiawassee River	31.01
	Southwest Ottawa County Landfill	39.66
	Sparta Landfill	32.00
	Spartan Chemical Company	41.05
	Spiegleburg Landfill	53.61
	Springfield Township Dump	51.97
	Tar Lake	48.5
	U.S. Aviex	33.66
	Velsicol Plant Site	52.38
	Verona Well Field	46.86
	Wash King Laundry	46.04
	Whitehall Wells	29.85
MN	Burlington Northern Site	58.41
	FMC Corporation	74.16
	Koppers Coke	55.05
	LeHillier	42.49
	National Lead-Taracorp Site	42.55
	New Brighton/Arden Hills	59.16
	Oakdale Dump Sites	59.16
	Reilly Tar and Chemical Corporation	59.16
	South Andover Site	35.41
	Waste Disposal Engineering	50.92
OH	Allied Chemical and Ironton Coke	47.05
	Arcanum Iron and Metal	62.26
	Big D Campground	34.78
	Bowers Landfill	51.80
	Buckeye Reclamation	35.10
	Chem-Dyne	47.78
	Coshocton Landfill	39.14
	E.H. Schilling Landfill	40.37

WMD/RRB/P2-10

	Site Name	HRS
OH	Fields Brook	51.62
	Fultz Landfill	39.42
	Nease Chemical	47.19
	New Lyme Landfill	36.70
	Poplar Oil Co.	35.95
	Pristine, Inc.	35.25
	Rock Creek (Jack Webb)	35.95
	Skinner Landfill	30.23
	Summit National	52.28
	Van Dale Junkyard	28.73
	Zanesville Well Field	28.90

WMD/RRB/ATT B-1

A & F MATERIALS/GREENUP
Greenup, Illinois

The A & F Materials/Greenup site is located on 3.8 acres of land on West Cumberland Street in Greenup, Illinois. The site contains four lagoons which hold a mixture of waste oils, sludges, spent caustics, spent acids, contaminated water, and other waste products containing polychlorinated biphenyls (PCBs). Similar products containing PCBs are stored in 13 steel tanks on-site, some of which have failed on several occasions, leaking their contents. The site presently contains about 1.4 million gallons of contaminated water, 16,000 gallons of contaminated oil, and 800,000 gallons of contaminated sludge and soil. The City of Newton periodically withdraws drinking water from the Embarras River downstream of the site.

Operations at the site, which began during 1977, were originally intended to reprocess waste oils and sludges from various generators. The storage lagoons became filled by March 1978 and began to overflow, contaminating the environmental pathways leading to the Embarras River 1300 feet away. The site has been inactive since June 1980.

Samples have been collected at the site on at least 10 occasions by the State of Illinois and the U.S. Environmental Protection Agency (EPA) between May 1978, and October 1981. PCBs have been found in the lagoons, tanks, ditch, Embarras River, site soils, and groundwater beneath the site. Significant concentrations of other organic compounds and metals have also been detected. In mid-1980, under section 311 of the Clean Water Act, the level of the waste in the lagoons was lowered, in addition to diking, trenching, and removal of wastes. Emergency funds from Superfund were needed in May 1982 to again lower the waste level in the lagoons and to reinforce the containment dikes.

Future activities include removal of all liquids from the tanks and lagoons, further site investigations to determine the full extent of contamination, and a feasibility study to define a cost-effective remedy for dealing with the soils, sludges, and groundwater. EPA approved funds to undertake these activities in August 1982.

This site was on the Interim Priority List of 160 sites.

A Federal civil action in U.S. District Court seeking injunctive relief has been brought by the Department of Justice on behalf of EPA against responsible parties associated with this site.

HRS: 55.49

Population threatened: 3,024

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ________

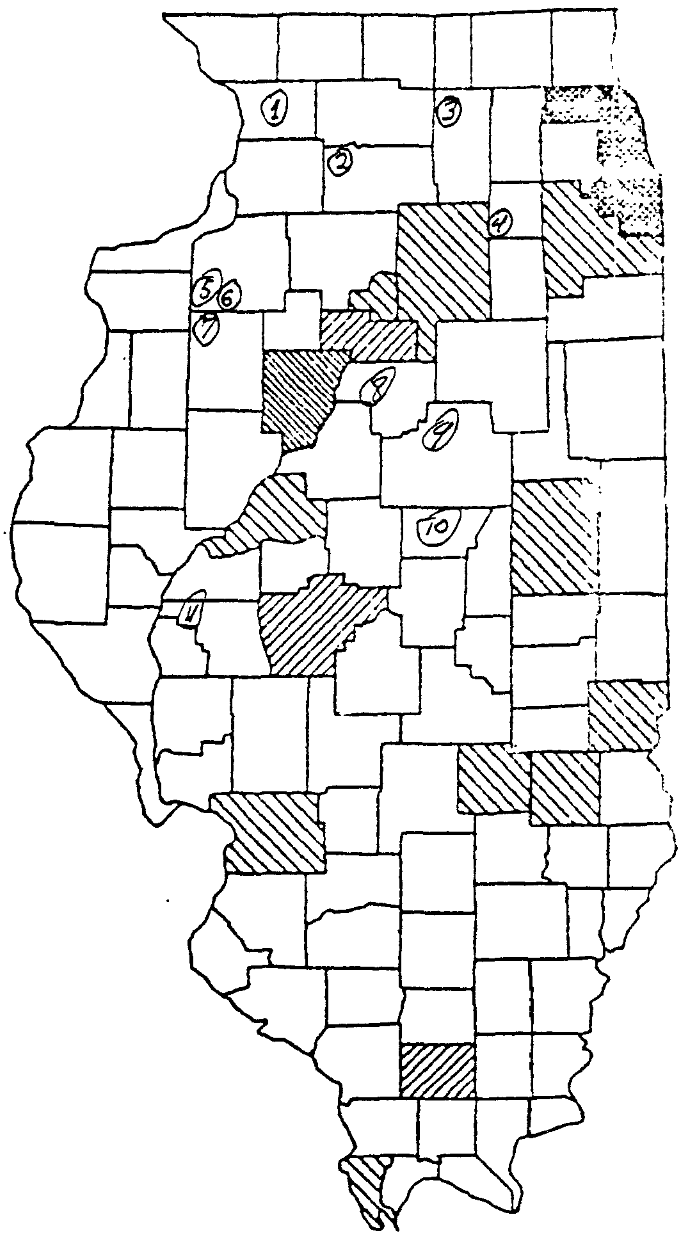
WMD/RRB/ATT A-1 through 5

75

75

ILL

(SAMPLE MOCK UP) NPL Sites



See Part 2 for index listing of sites (Crosshatching will not appear on final maps)

(There will be one map per page for 5 pages - - not Wisconsin)

WMD/RRB/ATT B-2

ACME SOLVENT RECLAIMING, INCORPORATED

Morristown, Illinois

Acme Solvents Reclaiming, Inc., is a 20 acre inactive site located on Lindenwood Road in a rural area of Winnebago County, approximately one and 1.5 miles southeast of Morristown, Illinois. The site is adjacent to sand and gravel operations and an asphalt-lined landfill. Acme Solvents reclaimed waste solvent through distillation. Still bottom material and waste drums, both full and empty, were disposed of into numerous shallow, unlined pits. The surficial geologic material at the site is a coarse textured glacial outwash deposit.

Private wells in the vicinity of Acme Solvents have been sampled by the Illinois Environmental Protection Agency and the Winnebago County Department of Public Health since April 1981. Analysis of the shallow groundwater samples indicated low levels of organic compounds, including trichloroethylene, methylene chloride, and tetrachloroethylene. Four residential wells in the area have been closed, and residents dependent on those wells are using bottled water. The shallow aquifers are hydrologically connected to the deeper, highly productive sandstone aquifers which provide the water supply for large industrial and municipal wells in the Rockford vicinity.

Acme Solvents commenced operations at the site in 1960. In late 1972, the Illinois Pollution Control Board initiated an administrative action requiring Acme Solvents to cease its disposal operations. In 1973, the waste ponds were covered over, although partially buried drums are still visible.

The U.S. Environmental Protection Agency issued notice letters under the Comprehensive Environmental Response, Compensation and Liability Act to the owners of Acme Solvents on 13 August 1982, requesting that the company undertake a hydrogeologic investigation at the site.

This site was on the Interim Priority List of 160 sites.

HRS: 31.98

Population threatened: 699

Aquifers threatened: 2

Surface waters threatened: 0

Index number on map:

WMD/RRB/ATT B-3

BELVIDERE MUNICIPAL LANDFILL #1
Belvidere, Illinois

The 11.3-acre Belvidere Municipal Landfill is located at RR#1 and Appleton Road in Belvidere, Boone County, Illinois. The site was active from 1939 until September 1973. When it closed, it was inadequately covered with sandy soil excavated from a borrow pit and soil left over from highway construction just south of the facility. The site is incompletely fenced and is mostly overgrown with natural grasses. Contamination by various organic compounds, including polychlorinated biphenyls, has been detected in downgradient monitoring wells installed by the Illinois Environmental Protection Agency. Puddles of water along the west base of the landfill were contaminated with a variety of organics, including relatively high concentrations of ethylbenzene and toluene.

HRS: 28.62

Population threatened: 14,061

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ________

BYRON SALVAGE YARD
Byron, Illinois

The Byron Salvage Yard, in the 2,200-acre drainage basin of Woodland Creek, is located south of the South Branch of Woodland Creek and Razorsville Road, just east of Byron, Illinois. It has been inactive since 1973.

The streams draining the salvage yard join Woodland Creek at about the middle of its length. Woodland Creek is an intermittent stream, except at its lower reach, about one-half mile from its confluence with Rock River. The stream flow in the lower reach is principally provided by groundwater discharge (base flow). Woodland Creek, in the middle and upper reaches, and its tributaries, flow in response to precipitation. This means that any leachate from this site will drain into Woodland Creek and contaminate the aquifer.

In 1974, the Illinois Environmental Protection Agency (EPA) filed a complaint with the Illinois Pollution Control Board against the owners of the Byron Salvage Yard, concerning the water pollution resulting from its operations. This complaint was based upon Illinois EPA's inspections, photographs, interviews, and collection and analyses of waste, surface water, and groundwater samples. Illinois EPA continued to monitor in and around the yard until the end of 1981. This investigative work revealed that cyanide-containing plating waste was sprayed onto the roads in and around the salvage yard, and that plating wastes and other wastes with or without containers were dumped and buried in the area of the salvage yard. These activities resulted in high concentrations of cyanide and toxic metals in soils, surface water, and groundwater, creating a serious threat to public health and the environment.

HRS: 33.93

Population threatened: 1,749

Aquifers threatened: 2

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-5

CROSS BROTHERS PAIL RECYCLING SITE

Pembroke, Illinois

Since 1961 there has been a drum and pail recycling operation on 20 acres in rural Pembroke Township, 15 miles southeast of Kankakee, Illinois. The main business was to reclaim 5-gallon paint cans. As part of normal operations, pails were lined up on the ground, sprinkled with waste solvents classified as hazardous, and set on fire. Over a long period of time, this "burn out" procedure contaminated the soil and groundwater. The contamination has migrated off-site. Illinois Environmental Protection Agency (EPA) monitoring of nearby drinking water wells resulted in the issuance of warning letters to four families, notifying them of the dangers of drinking their well water. Chemicals in the groundwater included alkylbenzene, toluene, xylene, methylcyclohexanone, pentachlorophenol, and others.

The sandy soils present in the area contribute to the rapid spreading of the zone of contamination. The threat to human health posed by the organic contaminants found in well water is documented by a hydrogeological study of the site conducted by the Illinois EPA in August 1981.

The operations at the site were discovered by Illinois EPA aerial surveillance and a subsequent court-authorized search of the site. Investigation revealed about 10,000 pails on-site, about 10 acres of highly contaminated soil, 10 trenches of unknown buried waste, and a plume of contaminated groundwater leaving the site.

At the request of Illinois EPA, the Attorney General's office initiated action against the site owners. Initially, the owners were ordered to stop operations. This was followed by orders to clean up the site and provide deeper wells for the affected neighbors. The owners did not have any money to start remedial actions.

HRS: 42.04

Population threatened: 402

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-6

GALESBURG/KOPPERS
Galesburg, Illinois

The Koppers Company of Galesburg, Knox County, Illinois, has been operating a railroad tie treating plant for about 75 years. The site, approximately 400 acres in area, is relatively flat, with surface drainage being provided by several drainage ditches that flow into a nearby intermittent stream. The stream flows southward into Lake Bracken. There are three lagoons on-site plus an irrigation field.

A shallow aquifer in the area and the nearby stream are contaminated with oily materials. The Illinois Environmental Protection Agency is concerned that the deeper aquifer, along with private drinking water wells serving some 300 area residents, is in danger of becoming contaminated.

HRS: 34.78

Population threatened: 33,800

Aquifers threatened: 2

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-7

JOHNS-MANVILLE CORPORATION

Waukegan, Illinois

The Johns-Manville Site is located on the shoreline of Lake Michigan, north of Waukegan, Illinois. The problem area is a 600-acre-foot (a measure of volume, usually used for water, that is one acre by one foot in depth) waste pile into which are placed asbestos wastes. Significant levels of asbestos have been found in downwind air samples. The Illinois Environmental Protection Agency has noted violations of the Illinois Environmental Protection Act regarding operation of the waste pile.

Further sampling is required to determine the full extent of air releases of asbestos.

HRS: 38.31

Population threatened: 64,400

Aquifers threatened: 0

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-8

LASALLE ELECTRICAL UTILITIES
LaSalle, Illinois

The LaSalle Electrical Utilities site is a closed factory located on St. Vincent Road, just north of LaSalle, Illinois, in LaSalle County. The facility used polychlorinated biphenyls (PCBs) to manufacture capacitors from the late 1940s until late 1978. The company reportedly used waste oils for dust control in the parking lot until 1969. Residual PCBs remain in the soil throughout the site at levels greater than 1,000 parts per million. Warning signs and a gate have been installed around the site.

The U.S. Environmental Protection Agency installed and sampled four monitoring wells at the facility during August 1982.

HRS: 42.06

Population threatened: 9,800

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-9

OUTBOARD MARINE CORPORATION
Waukegan, Illinois

In 1976, the Johnson Motors Division of Outboard Marine Corporation (OMC) in Waukegan, Illinois, was found to be discharging polychlorinated biphenyls (PCBs) into the Waukegan Harbor and the North Ditch. Both feed into Lake Michigan. This finding was of great concern as a number of Lake Michigan fish species, both then and now, contain PCBs in quantities exceeding Food and Drug Administration guidelines. Administrative orders were issued by the U.S. Environmental Protection Agency (EPA) and the Illinois EPA requiring that the company take certain steps to eliminate discharges of PCBs. Although those steps were taken, and discharges were significantly reduced, a great deal of damage had already been done.

From at least 1959 to 1971, the company purchased approximately 9 million pounds of PCBs for use in the hydraulic equipment of its aluminum die cast machines, and a substantial amount was discharged into the Harbor and Ditch. Some PCBs were carried into the Lake. The rest contaminate the sediments and biota of the Ditch and Harbor and also can be transported into Lake Michigan.

Studies were begun by U.S. EPA in 1976 to determine the nature of the PCBs problem and associated environmental impact. They show that PCBs are distributed throughout Waukegan Harbor. About 11,000 cubic yards are contaminated at a level beyond 500 parts per million (ppm), about 50,000 cubic yards beyond 50 ppm, and substantially more yardage beyond the 10 ppm level. The PCBs become suspended or dissolved and enter Lake Michigan. Additionally, fish that frequent the Harbor accumulate high levels of PCBs as a result of exposure to contamianted sediment and water.

Following a breakdown of negotiations between the State of Illinois and OMC, a Federal civil action in U.S. District Court was filed by the Department of Justice on behalf of EPA against responsible parties.

This is the top priority site in Illinois and was on the Interim Priority List of 160 sites.

HRS: 42.82

Population threatened: 64,400

Aquifers threatened: 0

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-10

VELSICOL CHEMICAL CORPORATION
Marshall, Illinois

Velsicol Chemcial Corporation's Marshall manufacturing facility is located approximately 1 mile north of the City of Marshall, Clark County, Illinois, on Highway Route #1. It was constructed in the 1930s as a specialty chemical manufacturing plant producing resins. In 1946, the plant started to manufacture chlordane. In 1950, the company shut down its two resin units. The facility continues to produce chlordane.

In the early years of operation, the process effluent was discharged from the plant untreated. In 1965, a well was installed for disposal of both process effluent and stormwater runoff. A second well was installed in 1973. These wells, under permit from the Illinois Environmental Protection Agency, continue in operation today.

Part of the disposal system consisted of surface impoundments, commonly known as ponds 5/6, on the plant site. Also of concern is an inactive landfill immediately adjacent to ponds 5/6. The surface impoundments have overflowed during periods of heavy rain, and contaminants have been detected in a drainage ditch and two observation wells.

Analyses of water samples taken from wells located adjacent to the impoundments on the plant property strongly suggest that shallow groundwater beneath the plant area is being polluted. Chlordane-related compounds have also been found in Mill Creek, its tributaries, and the Wabash River.

HRS: 48.78

Population threatened: 3,468

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ________

WMD/RRB/ATT B-11

WAUCONDA SAND AND GRAVEL

Wauconda, Illinois

Wauconda Sand and Gravel is located in Lake County, Illinois, approximately 2 miles north of the Village of Wauconda and 3 miles east of the Village of Island Lake. The 80 acre site, originally a sand and gravel pit, was operated as a landfill from 1950 to 1978 and then was closed and covered. The northern two-thirds of the site was filled prior to the State of Illinois landfill regulations and was never permitted. A 9 acre portion in the southern one-third of the site was permitted to accept general refuse.

The leachate emanating from the landfill has contaminated both the groundwater and surface water in the vicinity. Analyses of both the monitoring and residential well samples revealed low levels of contaminants, including ammonia, boron, chloride, iron, phenols, polychlorinated biphenyls (PCBs), and 2,4 dimethylphenol. Leachate contaminated by low levels of PCBs has also been detected entering Mutton Creek directly north of the landfill.

This site was on the Interim Priority List of 160 sites.

HRS: 53.42

Population threatened: 7,500

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ________

WMD/RRB/ATT B-12

ENVIROCHEM CORPORATION
Zionsville, Indiana

Envirochem Corporation owns and operates a waste storage and recycling business in Boone County, at 865 South U.S. 421, Zionsville, Indiana. This facility, in operation since August 1977, is adjacent to the Northside Landfill.

Operations at this facility involve the recovery of solvents and oils from industrial sources. On-site storage practices have resulted in an inventory beyond that needed to maintain recycling operations. On one occasion, this excessive inventory resulted in an overflow of contaminated rainwater from a holding pond into an unnamed ditch which flows to Findley Creek, causing an oil sheen on Findley and Eagle Creeks. Storing drums in the open and without an impermeable base has caused some to deteriorate. Three organic solvents (1,1-dichloroethane, trichloroethene, and 1,1,1-trichloroethane) were found in groundwater samples taken from on-site wells during July 1981.

Operations at Envirochem have ceased under a Court Order obtained by the Indiana Environmental Management Board on 5 May 1982. The facility is presently under receivership. Over 20,000 drums and 400,000 gallons of waste remain on-site as of June 1982.

Indiana and the U.S. Environmental Protection Agency-Region V will continue to monitor compliance by Envirochem with the court imposed schedule and cleanup actions for this facility.

HRS: 46.44

Population threatened: 1,875

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-13

FISHER-CALO

LaPorte, Indiana

Fisher-Calo Chemicals and Solvents Corporation (Fisher-Calo) operated a solvents reclamation facility near Laporte, Indiana, from late 1972 through mid-1978.

In July 1980, a Federal civil suit in U.S. District Court seeking injunctive relief was brought by the Department of Justice on behalf of the U.S. Environmental Protection Agency against the owner and operator for disposal of drummed waste. The drums were excavated prior to the suit, and the company has agreed to determine when contaminants, including 1,1-dichloroethene, trichloroethene, and tetrachloroethene, have dissipated.

HRS: 52.05

Population threatened: 20,300

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ________

WMD/RRB/ATT B-14

LAKE SANDY JO (M&M LANDFILL)
Gary, Indiana

Lake Sandy Jo (M&M Landfill) is located in a southwest section of Gary, Lake County, Indiana, on a 55-acre tract in the area bounded by the Tri-State Highway (I-90/80) on the south; Wright Street on the west; West 25th Avenue on the north; and Jennings Street on the east. It was a large borrow pit from which fill material had been obtained to build the Tri- State Highway. For several years it was filled with water and known as Lake Sandy Jo. According to the present owner/operator, filling has been going on for 12 years, 4 of them under his ownership. The water has been pumped out, and only a small area of the original borrow pit (less than 1 acre) remains unfilled.

The site was used for the disposal of demolition wastes, with no record of hazardous waste disposal. However, the present owner states that "midnight dumping" occurred frequently, and the site has been plagued by above- and below-ground fires. Investigators of the U.S. Environmental Protection Agency detected benzene, toluene and tetrachloroethylene in groundwater and surface water. Groundwater contamination is the primary concern since the area is surrounded on all sides by houses, a number of which use private wells to supply all water. The total population served by groundwater within 3 miles of the site exceeds 5,000, with over 1,400 wells recorded in the area.

HRS: 38.21

Population threatened: 152,900

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-15

LEMON LANE LANDFILL

Bloomington, Indiana

Lemon Lane Landfill is a 7-acre disposal site owned by the City of Bloomington, Indiana. The site, which has no liner or runoff controls, contains unstabilized wastes and piles of capacitors containing polychlorinated biphenyls (PCBs). The soils are thin and irregular. Residents in the immediate vicinity use groundwater from an underlying aquifer.

The site is located in the northeast quarter of section 31 of Bloomington Township, on the western edge of the city, off Lemon Lane Road. From 1950 to 1964, the City disposed of both municipal and industrial wastes. Allegedly, wastes were incinerated on-site. No records were kept of the types or quantities of wastes disposed.

Of primary concern are piles of exposed capacitors on the south and west sides of the landfill. Many are leaking and have contaminated underlying soils. Levels of PCBs in the soils range from 1,500 to 57,000 parts per million.

The Indiana State Board of Health and the U.S. Environmental Protection Agency (EPA) have sampled several times in the past 2 years. To date, no PCBs have been detected in nearby residential wells, nor have any surface discharges been observed. However, given the geology of the area, it is possible that groundwater contamination may occur.

No containment or cleanup actions have been taken at the site. The landfill is an open area and children play on the site. The City of Bloomington is working with EPA to erect a security fence around the site.

HRS: 29.31

Population threatened: 49,700

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ________

WMD/RRB/ATT B-16

MAIN STREET WELL FIELD
Elkhart, Indiana

The Main Street Well Field is the largest of three municipal fields which supply potable water for the City of Elkhart, Indiana. Of 21 production wells in the three, the Main Street Well Field has 15, representing approximately 70 percent of Elkhart's potable water supply.

The Main Street Well Field functions as a recharge pond system. The Christiana Creek flow is diverted to numerous ponds which recharge the shallow water table aquifer. Water table levels, varying throughout the year from 8 to 15 feet, are close to the surface. The unsaturated and saturated zones consist of coarse sand with some gravel and little clay; the top 8 to 10 feet is fill material with a thick clay layer at approximately 58 feet. All production wells are completed above this clay layer. Infiltration from the ponds is rapid, resulting in 800 gallons per minute capacity per well. Though the St. Joseph River is the main discharge point for the area, most of the groundwater in the well field discharges to Christiana Creek.

Trichloroethene (TCE) has been detected in 5 of the 15 production wells. Four show concentrations ranging from 50 to 880 micrograms per liter. The contamination was discovered in April 1981, with sample analyses ongoing through 1982.

The City of Elkhart has implemented several measures to reduce TCE levels in the immediate vicinity of the well field. Recharge ponds have been cleaned and capacity increased, and various flow control measures, including shutdown of specific production wells most adversely affected, have been taken. Two barrier wells have been installed to prevent the movement of TCE into this well field.

HRS: 42.49

Population threatened: 44,200

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

MARION (BRAGG) DUMP

WMD/RRB/ATT B-17

Marion, Indiana

The Marion (Bragg) Dump was covered and closed in 1975. The 40-acre site, located near Central Avenue on the southeast edge of Marion, Grant County, Indiana, lies in a relatively flat area, with the Mississinewa River within 200 yards.

The landfill was once an old gravel pit which was subsequently used for the disposal of various wastes. State reports indicate that the landfill received approximately 1,400 drums per month of various wastes for at least a two year period. At least 30,000 drums, containing a variety of hazardous materials such as acetone, thinners, solvents, plasticizers, lead, and cadmium, may be buried.

Some leachate areas have been observed on the south side of the fill. The primary concern is the threat of groundwater contamination. Approximately 3,000 people live within a one mile radius of the fill and draw their water from a groundwater aquifer 20 to 25 feet below the site. As yet, there are no reports of contaminated wells in the immediate area.

HRS: 32.25

Population threatened: 40,300

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-18

MIDCO I

Gary, Indiana

The Midwest Solvent Recovery Company, commonly referred to as MIDCO I, was located at 7400 West 15th Avenue, Gary, Indiana. Operations began at the site in April 1975. In addition to storing and reclaiming thousands of drums of hazardous wastes, the company apparently dumped sludges and other wastes into a pit on the site. On 21 December 1976, a fire destroyed more than 14,000 drums on the site, essentially halting the operation. Subsequently, operations were renewed at the site in late 1977.

Several thousand drums containing materials such as paint sludge, solvents, acids, caustics, and cyanides were left stored on-site, many of them leaking and deteriorated. The drums which were burned in the 1976 fire also remained on-site.

MIDCO I is located in a lowland area, with wetlands to the north and east. Studies of the area have shown contamination of the surface water, groundwater, and soils.

Using funds available under Section 311 of the Clean Water Act, the U.S. Environmental Protection Agency (EPA) erected security fencing around the site in June 1981. In February, 1982, EPA undertook a Planned Removal Action to remove the wastes and approximately one foot of soil from the site, and place a temporary clay cap on the site, therebv alleviating the threats of fire, explosion, and human contact. The removal action took over four months to complete and cost nearly $900,000. Before specific remedial actions can be determined, additional investigatory work will be required to 1) ascertain if wastes are buried on the site, and 2) determine the full extent of contamination of the soil, groundwater, and the wetlands.

A Federal civil action in U.S. District Court seeking injunctive relief has been brought by the Department of Justice on behalf of EPA against responsible parties associated with this site.

WMD/RRB/ATT B-19

NEAL'S LANDFILL
Bloomington, Indiana

Neal's Landfill is located directly north of State Highway 48, approximately 4.5 miles west of Bloomington, Indiana. The site was used as an industrial and municipal waste landfill from 1950 to 1972. It covers about 40 acres, with the main fill area approximately 300 by 150 yards.

The landfill is situated over fractured karst limestone. There are a number of springs which surface near the site and flow 0.8 miles to Richland Creek, a tributary of the White River. Recently, the landfill has been used as pasture land for beef cattle.

During parts of 1966 and 1967, capacitors and arrestors filled with polychlorinated biphenyls (PCBs), as well as PCBs-contaminated capacitor insulation material, rags, and filter clay, were disposed of at Neal's Landfill. Presently, capacitors and other contaminated materials are visible on the surface.

Available data show high concentrations of PCBs in the surface soils in the northeast portion of the landfill. PCBs has been found in water samples from the springs near the site and in sediments of Richland Creek. Analysis of a fat sample from a calf that had grazed on the site indicated 65 parts per million of PCBs.

This site was on the Interim Priority List of 160 sites.

HRS: 42.93

Population threatened: 49,700

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-20

NINTH AVENUE DUMP
Gary, Indiana

The Ninth Avenue Dump is an abandoned twenty-acre waste site located one-quarter mile east of Cline Avenue, on 9th Avenue in Gary, Indiana. The site is a relatively flat, partially filled area with marsh lands to the east and south. Operations at the dump began in 1973, and continued through September, 1980.

In 1975, the Indiana State Board of Health inspected the site and discovered 10,000 empty 55-gallon drums. As much as 500,000 gallons of industrial waste may have percolated into the groundwater. At present, 250 drums are badly deteriorated and leaking. Furthermore, there are six abandoned tank trucks on-site, as well as a suspected dump area containing liquid wastes and approximately 1,000 buried drums. The exact quantity and character of these wastes are unknown. Investigators have identified alkylated benzenes, including toluene and p-xylene, polynuclear aromatic hydrocarbons, phthalate esters, and heavy metals.

Surface runoff from the site has been contaminating marshland surrounding the site, and entering a drainage ditch on the north side of the site. The predominantly sandy soils in the area indicate a high potential for groundwater contamination.

In an effort to alleviate potentially hazardous conditions, the U.S. Environmental Protection Agency negotiated a plan in which the site operator agreed to begin removing surface containers and specific areas of contaminated soil.

A Federal civil action in U.S. District Court seeking injunctive relief has been brought by the Department of Justice on behalf of EPA against responsible parties associated with this site.

HRS: 40.32

Population threatened: 152,900

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ____

WMD/RRB/ATT B-21

PARROT ROAD DUMP
New Haven, Indiana

The 70-acre Parrot Road Dump lies in a primarily rural area, on Parrot and Hartzell Roads, New Haven, Allen County, Indiana. It was covered and closed in 1976. A ditch surrounding the site drains into the Maumee River, less than 0.5 miles from the site. A highway runs through the landfill, which is unfenced and easily accessible to the public.

The site was an open burning dump of considerable size at one time. It is believed that various wastes were buried on-site. The U.S. Environmental Protection Agency (EPA) has evidence that leachate from the site contains various organic chemicals, including tetrachloroethylene; trichloroethylene; 1,1,1-trichloroethane; benzene; fluorene; and hexachlorobenzene. Leachate has been observed flowing into the drainage ditch, and soils on-site are discolored.

The primary concern is the threat of groundwater contamination. The aquifer, located approximately 20 feet below the site, provides drinking water to nearby residents. A well 50 feet east of the site is contaminated.

Approximately 1,100 people live within 3 miles of the site and draw their drinking water from this aquifer.

HRS: 28.58

Population threatened: 5,728

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-22

SEYMOUR RECYCLING CORPORATION
Seymour, Indiana

Seymour Recycling Corporation is an approximately 14 acre site located in Freeman Field Industrial Park, about 2 miles from the center of Seymour, Indiana. The facility is an abandoned industrial waste reclamation operation. Approximately 60,000 drums and 98 bulk storage tanks containing wastes such as solvents, phenols, cyanides, acids, and C-56, were left on-site. Hundreds of small containers of hazardous materials, primarily from laboratory operations, were also found on-site. Some of them, such as ethers, are highly explosive. Studies performed off-site indicated contamination of the soil and groundwater.

Operations began at the site in 1969, when the Seymour Manufacturing Company moved its Chemical Divisions to land it leased at Freeman Field. In June, 1976, the Chemical Division was incorporated into Seymour Recycling Corporation under the ownership of the owners of Seymour Manufacturing Company. In 1978, the site was sold to Environmental Processing Corporation. Because of numerous permit violations, the site was shut down by the State in February 1980.

The U.S. Environmental Protection Agency (EPA) undertook emergency actions at the site beginning in March 1980, using section 311 of the Clean Water Act. These actions included: installation of a dike around the site; installation of a carbon filter unit to treat surface water on-site; sampling and testing of drums, tanks, soil, and water; restaging of approximately 45,000 drums to more secure areas; installation of security fencing; cleanup of a spill of 3,000 gallons of chromic acid; and removal of liquids from the bulk storage tanks. During this time, two waste generators removed wastes from the site.

A Federal civil action in U.S. District Court seeking injunctive relief has been brought by the Department of Justice on behalf of EPA against responsible parties associated with this site. In October 1982, EPA negotiated $7.7 million agreement with 24 generators to undertake a complete surface cleanup at the site.

This is the top priority site in Indiana and was on the Interim Priority List of 160 sites.

HRS: 58.15

Population threatened: 13,600

Aquifers threatened: 2

Surface waters threatened: 1

Index number on map: ______

WAYNE WASTE OIL

Columbia City, Indiana

Wayne Waste Oil, a Division of Wayne Reclamation and Recycling, Inc., owns an 11-acre site in central Whitley County, Indiana. The site is located on Daniel Drive in Columbia City, population 5,000. From 370,000 to 1.4 million gallons of wastes have been disposed of on the property by open dumping on surface soils, into unlined pits, and into a trench. The site is bordered by residences and a lumber yard on the north and west sides, and a bend of the Blue River on the east and south sides. Three municipal wells are located within one-eighth mile northeast of the site.

The primary concern is the threat of groundwater contamination, given the waste amounts, disposal practice, and the proximity of the drinking water wells. There are open, leaking drums on-site, and waste areas which have been covered with sands, as evidenced by disturbed surface soils. Laboratory analyses indicate high levels of cyanides, lead, chromium, and cadmium.

HRS: 42.33

Population threatened: 4,911

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-24

WEDZEB ENTERPRISES, INC.

Lebanon, Indiana

Wedzeb Enterprises, Inc. owns two warehouse facilities in Lebanon, Indiana, which were used to store capacitors, many containing polychlorinated biphenyls (PCBs) insulating oils, for subsequent distribution and resale.

On 2 May 1981 a fire occurred at the warehouse located at 415 West Pearl Street. The blaze destroyed the warehouse, which contained approximately 50,000 capacitors, and caused the release of PCBs and low levels of tetrachlorodibenzo-p-dioxin (TCDD) and tetrachlorodibenzofuran (TCDF) into the immediate environment. The PCB-contaminated warehouse debris was left on-site and remains on-site at the present time.

State and Federal investigators sampled the warehouse premises on several occasions, beginning on 3 May 1981. The majority of the samples obtained from the warehouse rubble contain PCBs in excess of 500 parts per million (ppm), with a level of 24,500 ppm recorded. TCDD and TCDF were detected, but in low concentrations (30 to 500 parts per trillion) that preclude adverse human health effects.

Investigators found evidence of low concentrations of PCBs in Praire Creek at U.S. 52 Lebanon and discovered that PCBs may have contaminated sludge from the Lebanon sewage treatment plant via a basement drain in the warehouse. The drain has since been sealed.

On 19 June 1981 the Indiana State Board of Health requested that the principal owner of Wedzeb Enterprises, Inc. submit a proposal for cleanup and disposal. The situation was referred to the Indiana Attorney General's office for appropriate action on 29 October 1981. To date, the site has not been cleaned up, nor have the PCBs materials been properly disposed of. The site is neither secured nor posted. There is no protection from wind and weather infiltration.

The primary concern is the threat of groundwater contamination with PCBs. The site stands on silt loam soil with a sand and gravel aquifer approximately 100 feet beneath the surface.

WMD/RRB/ATT B-25

ANDERSON DEVELOPMENT COMPANY

Adrian, Michigan

Anderson Development Company (ADC), located in Adrian, Michigan is the source of widespread environmental, residential, and occupational contamination with the carcinogenic compound 4,4'-methylene bis(2-chloro-aniline), referred to as MBOCA. This chemical curing agent was manufactured by ADC under the trade name Curene 442 from 1971 to March, 1979.

In 1973, anilines were found in the East Side Drain, where ADC discharged wastewaters to the South Branch of the Raisin River. Later that year, ADC began discharging to the Adrian municipal wastewater treatment plant and caused a decrease in the plant's efficiency. MBOCA was found to be present in sewage sludge and in sediments from a treatment lagoon. Studies conducted throughout 1979 also found MBOCA to be widely distributed in soils within a two mile radius of the plant, and in the urine of ADC workers and preschool children living near ADC.

The manufacture of MBOCA ceased in Adrian in 1979. Remedial actions at the site included increasing street sweeping activities to a weekly schedule, paving of the Sunnyside Subdivision adjacent to the ADC industrial zone, and cleaning of 253 households. The ADC plant has covered their driveway with tar and stone as part of the cleanup. Additional unpaved driveways and parking lots in the industrial area near ADC were also covered. Contaminated soils in the industrial and residential areas were removed or tilled and covered.

HRS: 31.02

Population threatened: 20,600

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ________

WMD/RRB/ATT B-26

AUTO ION

Kalamazoo, Michigan

Auto Ion Chemicals, Inc., located on Mill Street in the City of Kalamazoo, is a former plating waste treatment facility. The facility was in operation between 1963 and 1973. During this period, Michigan Department of Natural Resources staff documented numerous pollutant discharges to the grounds, sewers, and the Kalamazoo River. Hexavalent chromium and cyanide have been detected in spillage on the ground and in water samples taken from the river. Groundwater contamination is suspected, but has not yet been verified. At present, approximately 122,000 gallons of liquid plating wastes and sludges remain on-site in three basement areas and an outside concrete-lined lagoon.

The City of Kalamazoo, concerned with a public safety hazard, filed for condemnation of the facility in 1981. The facility owner filed for an injunction, but the entire case was dropped due to reversion of the property to State ownership for nonpayment of taxes.

Though fencing has been constructed around the site, vandals have repeatedly destroyed sections of the barrier. There is additional concern that two city wells, located within one and one-quarter miles of the site, may be threatened by suspected groundwater contamination. These wells are part of the Kalamazoo municipal system which services over 100,000 city residents.

HRS: 32.07

Population threatened: 76,200

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-27

BERLIN & FARRO - LIQUID INCINERATION

Swartz Creek, Michigan

Berlin & Farro, located at 8322 S. Morrish Road, Swartz Creek, Michigan, incinerated liquid industrial wastes from 1971 until 1980 with no emission controls. Open lagoons were used for storage of liquids. A landfill on the property was used for disposal of crushed and empty drums, and a large quantity of liquid waste. The landfill currently contains an estimated 20,000 barrels. Four tanks containing C-56 liquids (a pesticide by-product) and sludges have also been found buried on the site. Slocum Drain and Swartz Creek have been contaminated with C-56. Air emissions of C-56 have been and continue to present a public health threat.

Since 1974, the State has pursued administrative and legal actions to force cleanup, yielding no significant results. In May, 1980, the Governor declared a toxic substance emergency at the site and the State has since devoted $850,000 to site cleanup The funds were used for removal and disposal of 15,300 cubic yards of sludges.

The U.S. Environmental Protection Agency recently undertook an emergency removal action, using $410,000 of Superfund monies. Security fencing of the site was completed in early July. The remainder of the removal operation will involve additional cleanup near the incinerator area of the site and the removal of contaminated soil.

Prior to State-funded cleanup, the site had been in Genessee County Circuit Court since 1978, with a court-appointed receiver for the site.

This site was on the Interim Priority List of 160 sites.

HRS: 66.74

Population threatened: 4,928

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-28

BUTTERWORTH NUMBER 2 LANDFILL

Grand Rapids, Michigan

The Butterworth Number 2 Landfill, located at 1500 Butterworth Road, S.W., was owned and operated by the City of Grand Rapids until ordered closed by the State of Michigan in 1971 for improper operations. Prior to closure, the landfill accepted industrial wastes, including plating wastes, cyanides and organic solvents. The site is improperly covered and has an occasional leachate problem. The site is located adjacent to the Grand River which is threatened by leachate and runoff from the site.

HRS: 50.3

Population threatened: 180,500

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-29

CEMETERY DUMP SITE

Oakland County, Michigan

The Cemetery Dump Site is located in rural Oakland County, near Rose Center, Michigan. Barrels of industrial wastes were dumped in an old gravel pit near a cemetery in the late 1960s. It is estimated that 300 to 600 barrels were dumped, and buried. Sampling of the three domestic wells next to the site has shown no contamination to date. Excavation of a trench uncovered twenty to thirty barrels. Analysis of their contents revealed paint sludges, solvents, polychlorinated biphenyls, and oils.

HRS: 34.16

Population threatened: 1,000,500

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ____

WMD/RRB/ATT B-30

CHARLEVOIX MUNICIPAL WELL FIELD

Charlevoix, Michigan

The 5,000 residents of the City of Charlevoix, Michigan, are served by one municipal well. In September 1981, the Michigan Department of Public Health discovered the presence of trichloroethylene (TCE) at 37 parts per billion (ppb) in that well. The City of Charlevoix installed four monitoring wells around the municipal well in November 1981. Sampling of these wells also indicated the presence of TCE.

The U.S. Environmental Protection Agency conducted a study in June and July 1982, to determine the source of contamination. Although three possible sources of contamination have been identified, the actual source is yet to be defined.

HRS: 31.95

Population threatened: 3,519

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-31

CHEM CENTRAL

Kent County, Michigan

The Chem Central Site is located in Kent County, Michigan. In July 1977, a ditch located at the U.S. 131 and 28th Street intersection in Wyoming Township was found by Michigan Department of Natural Resources (MDNR) staff to contain oily, multi-colored sediments. Analysis of those sediments showed high concentrations of polychlorinated biphenyls, heavy metals, phthalates, oils, and organic compounds. The ditch has been dewatered repeatedly since November 1977, but contaminants continue to leach into the ditch. Hydrogeologic investigations conducted by MDNR have traced the contamination to Chem Central, Grand Rapids (formerly Wolverine Solvents), a chemical distribution facility. There are no domestic wells in the area, but contaminants continue to seep into the ditch, discharging to Cle Drain, a tributary of Plaster Creek. Fencing has been constructed around the ditch area and warning signs have been posted.

In April 1980, the State of Michigan filed suit in Kent County Circuit Court seeking a permanent injunction to halt Chem Central's discharges to the ground and dry wells and to correct the groundwater contamination problem.

HRS: 38.2

Population threatened: 432,700

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-32

CLARE WATER SUPPLY

Clare, Michigan

Two of the three municipal wells in the City of Clare, Clare County, Michigan, are contaminated with chlorinated hydrocarbon solvents, including dichloroethylene (DCE) and trichloroethylene (TCE). The contamination was discovered by the Michigan Department of Public Health as part of a statewide effort to sample public water supplies for contaminants. Levels of TCE contamination as high as fifty-seven parts per billion (ppb) have been found in the municipal wells. The City has taken certain steps to decrease the amount of hydrocarbons in the water distribution system. These measures include increasing the production of the city's uncontaminated well and use of an aeration system to volatilize the contaminants. The Michigan Department of Natural Resources has identified eight potential sources of groundwater contamination. The U.S. Environmental Protection Agency installed monitoring wells in the Charlevoix area this August to identify the source of groundwater contamination. Results of well sampling will help identify the contamination source.

HRS: 32.36

Population threatened: 2,639

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-33

CLIFF/DOW DUMP
Marquette, Michigan

The Cliff/Dow Dump is located on County Road 550 in Marquette, Marquette County, Michigan. Wood tars, a by-product of the manufacture of charcoal briquets, were disposed of at the site from 1954 until the late 1960s. It is estimated that approximately 20,000 cubic yards of the tar exists at the site. Groundwater has been shown to contain benzene, phenol xylene, chloroform, and other constituents.

HRS: 34.66

Population threatened: 24,300

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-34

DUELL AND GARDNER LANDFILL
Muskegon County, Michigan

Duell and Gardner Landfill, located at 1285 East Bard Road, Dalton Township, Muskegon County, Michigan, was in operation from approximately 1969 to 1975.

The site is poorly covered and there is evidence of open dumping of leaking, unsealed containers. Wastes such as polychlorinated biphenyls, ethyleniminе, and other unknown chemicals were detected in a soil analysis. General refuse and garbage have been seen scattered about the site. Groundwater contamination is suspected.

HRS: 34.66

Population threatened: 157,900

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-35

ELECTROVOICE

Buchanan, Michigan

Electro Voice, located in Buchanan, Michigan, is an existing electroplating plant that used two seepage lagoons on-site for discharge of wastes in the 1960s. The company abandoned the lagoons in the late 1960s and removed much of the material in them.

In 1979, an industrial sewer line broke, resulting in the discharge of an unknown amount of plating wastes into the abandoned treatment ponds. The company immediately had the effluent treated and removed, repaired the line, and installed a holding tank to prevent such incidents from occurring again.

The company installed four monitoring wells around the lagoons. Samples taken in January 1980, indicated toluene and xylene were present in two of the wells and trichloroethylene was present in one of the lagoons.

HRS: 29.77

Population threatened: 4,645

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

FOREST WASTE PRODUCTS

Genesee County, Michigan

Forest Waste Products is located at 8359 East Farrand Road, Otisville, Genesee County, Michigan. The site was licensed to operate a landfill and receive liquid industrial wastes from 1972 to 1978. The site is also known to have illegally received toxic materials such as PBB and C56 due to improper screening of incoming wastes. Oils, polychlorinated biphenyls (PCB), and plating wastes were buried in drums, as well as being dumped into surface impoundments. PCBs, copper, and zinc have been found in the groundwater.

HRS: 38.64

Population threatened: 442,000

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ________

WMD/RRB/ATT B-37

G & H LAND FILL

Utica, Michigan

From the late 1950s to 1966, millions of gallons of industrial waste liquids, including oils, solvents, and process sludges, were disposed of at the presently closed G & H Land Fill located at Ryan and 23 Mile Roads in Utica, Macomb County, Michigan. Liquid wastes were dumped in pits and lagoons on the 40-acre site. Pursuant to a law suit filed by the State of Michigan, a Consent Order was entered in 1967, requiring the company to cease disposal of all liquid wastes. The settlement, however, did not require the company to clean up the wastes already dumped at the site. The site was operated as a refuse landfill from 1967 until it closed in 1974. The U.S. Environmental Protection Agency (EPA) approved Superfund action on 23 July 1982 to erect a fence around a polychlorinated biphenyl-contaminated area. EPA and the State of Michigan have documented contamination of soil, surface water, and groundwater in the vicinity of the site.

This site was on the Interim Priority List of 160 sites.

HRS: 49.09

Population threatened: 3,504

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-38

GRAND TRAVERSE OVERALL SUPPLY COMPANY
Greilickville, Michigan

Grand Traverse Overall Supply Company is located in Greilickville, Leelanau County, Michigan, approximately one and one-half miles north of the city limits of Traverse City, just west of Highway M-22, and on the north side of Cherry Bend Road. The area is relatively flat, but one-half mile to the west the relief rises sharply. Perchloroethylene (PCE) and trichloroethylene (TCE) have been identified in residential wells and a school well of less than fifty feet in depth. PCE has also been found in soils of the company seepage lagoon, a water sample from one of the lagoons, drycleaning waste sludges, and soil samples from both inside and outside the company dry well. The cooling water discharge to Cedar Lake Outlet also contained TCE in 1977. All process and cooling waters are now discharged to sanitary sewers. The wet well has been excavated.

HRS: 40.86

Population threatened: 900

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ________

WMD/RRB/ATT B-39

GRATIOT COUNTY GOLF COURSE

St. Louis, Michigan

The Gratiot County Golf Course is in St. Louis, Michigan. From 1936 until August 1970, the Michigan Chemical Corporation (later purchased by Velsicol Chemical Corporation) used this 3-acre site as an industrial waste burning and disposal ground. Hazardous wastes then seeped and ran off into the Pine River.

In 1982, Velsicol completed cleanup of the site under supervision of the Michigan Department of Natural Resources.

Velsicol recently agreed to a $38.5 million combined settlement, part of which will be used to offset the cost of cleanup for this site. The rest will be used for cleanup of two other sites in Michigan — The Gratiot County Landfill and the Velsicol plant in St. Louis.

HRS: 40.21

Population threatened: 4,101

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

GRATIOT COUNTY LANDFILL
Gratiot County, Michigan

The Gratiot County Landfill covers 40 acres about 0.5 miles southeast of St. Louis, Michigan. Prior to 1977, the Michigan Chemical Corporation (later purchased by Velsicol Chemical Corporation) disposed of various plant wastes, including PBBs, at the landfill.

The State of Michigan has performed a site investigation and feasibility study and has designed remedial actions to abate threats to public health and the environment posed by this site.

Velsicol recently agreed to a $38.5 million combined settlement for cleanup of this site and two others in Michigan -- The Gratiot County Golf Course and the Velsicol plant in St. Louis, Michigan.

This is the top priority site in Michigan and was on the Interim Priority List of 160 sites.

HRS: 53.6

Population threatened: 38,200

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ____

HEDBLUM INDUSTRIES

Oscoda, Michigan

Hedblum Industries was a manufacturing plant located at 100 Au Sable Road, Oscoda, Iosco County, Michigan. It produced stamped metal parts for the automotive industry. The parts were degreased with trichloroethylene (TCE). From 1968 until 1972, Hedblum dumped an estimated 4,000 gallons of TCE directly onto the ground. Thirteen residential wells nearby have since become contaminated with TCE. A municipal water supply has been extended to the affected area.

HRS: 31.70

Population threatened: 2,170

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

IONIA CITY LANDFILL
Ionia, Michigan

The Ionia City Landfill is located three-quarters of a mile east of the City of Ionia, Ionia County, Michigan. This abandoned ten-acre landfill was used by the city as a refuse dump during the 1950s and 1960s and was closed in 1968.

A citizen's complaint in February 1981 led to the discovery of a number of drums at the site, both buried and on the surface. About 100 drums were excavated in June 1981, under the direction of the Michigan Department of Natural Resources (DNR). Many of these contained industrial liquids and some were leaking. The City of Ionia placed snow fences around the excavated drums to prevent personal contact with the wastes. Sampling results showed the drums to contain organic solvents and heavy metals. In July 1981, Michigan DNR placed monitoring wells around the site and found organic and heavy metal contamination of the groundwater.

To date, no drums have been removed from the site. A number of drums lie within the floodplain of the nearby Grand River. Deteriorating drums present an ongoing threat of personal contact, especially since a portion of the site is now a recreational area. The City of Ionia's municipal well field lies about one mile northwest of the site.

HRS: 38.02

Population threatened: 6,361

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ________

WMD/RRB/ATT B-43

K&L AVENUE LANDFILL
Kalamazoo, Michigan

The K&L Avenue Landfill, located in Oshtemo Township, Kalamazoo, Michigan, was owned and operated by Kalamazoo County beginning in 1968. The landfill accepted municipal refuse and industrial wastes. Residential wells near the landfill became contaminated with volatile hydrocarbons, including chloroform, trichloroethylene, and perchloroethylene. Leachate from the landfill has entered nearby surface waters.

A suit brought against the county in 1979 by homeowners near the site resulted in the county providing the homeowners an alternative potable water supply and the placement of a cap over the landfill. The cap is not adequate and a leachate problem still exists.

HRS: 38.10

Population threatened: 76,200

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-44

KENTWOOD LANDFILL

Kentwood, Michigan

The Kentwood Landfill, located at 4900 Walma Road, Kentwood, Kent County, Michigan, was used as an open dump up to 1972. From 1972 until 1975, the Kent County Department of Public Works operated the 55-acre site as a municipal landfill.

The landfill reportedly has received unidentified hazardous wastes. A leachate collection system was installed by the county, but maintenance problems with the system have led to leachate contamination of nearby Plaster Creek. Leachate analyses have shown the presence of cyanide and heavy metals.

HRS: 35.39

Population threatened: 28,400

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-45

LIQUID DISPOSAL, INC.

Utica, Michigan

Liquid Disposal, Inc. (LDI) is an abandoned liquid waste incineration facility located at 3901 Hamlin Road, Utica, Macomb County, Michigan. The 6-acre site contains an inoperative incinerator, various industrial liquid wastes and sludges contained in two waste lagoons, numerous above and below ground tanks, over 1,000 drums, and numerous small containers. Following an incident in which toxic hydrogen sulfide gas was produced and two workers were killed, the citizens of Shelby Township filed suit on 22 January 1982 to permanently enjoin LDI from operating. On 27 April 1982, LDI was forced into involuntary bankruptcy. The firm was permanently closed on 17 May 1982 by the Macomb County Circuit Court. U.S. Environmental Protection Agency (EPA) and State investigations have revealed contamination of air, soil, surface water, and groundwater in the vicinity of LDI. On 20 May 1982, EPA approved a Superfund action to clean up a polychlorinated biphenyl-contaminated oil spill at the site. On 23 July 1982, EPA approved additional Superfund action to remove liquid wastes from a lagoon that was in danger of overflowing and to remove contaminated water from the area surrounding the abandoned incinerator.

This site was on the Interim Priority List of 160 sites.

HRS: 63.28

Population threatened: 3,504

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-46

LITTLEFIELD TOWNSHIP DUMP
Emmet County, Michigan

The Littlefield Township Landfill Site is located near Oden, Emmet County, Michigan. The publicly owned landfill had received domestic refuse and light industrial and commercial waste for approximately ten years until November 1980. Improper operation of the disposal area, in association with natural hydrogeological conditions at the site, has resulted in groundwater degradation.

Leachate from the landfill has contaminated a private well in the area with trichloroethylene, perchloroethylene, and other chlorinated hydrocarbons. The contamination plume is moving in a southwesterly direction toward Oden and Crooked Lake. Wells have been installed at several different locations to monitor the plume and its contents. The Littlefield Township Board is pursuing funding to finance the closing and sealing of the landfill. A solid waste transfer facility is being installed in the area and will eventually eliminate landfills in the county.

HRS: 32.09

Population threatened: 21,300

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-47

MASON COUNTY LANDFILL

Pere Marquette Township, Michigan

The Mason County Landfill is in Pere Marquette Township, Mason County, Michigan, approximately 3 miles south of Ludington and one mile east of Lake Michigan.

The landfill began operation in late 1971, and was operated for the Mason County Department of Public Works by Acme Disposal Company of Ludington until the site was closed in August 1978. While in operation, the landfill received residential, commercial, and industrial refuse, liquid, and sludges. A two-foot thick clay cover was put in place in 1979.

Since closure, the landfill site and adjacent properties have been impacted by erosion. The landfill is suspected of polluting groundwater aquifers and nearby Iris Creek. Groundwater contaminants include pentachlorophenol, trichloroethylene, 1,2-trans-dichloroethylene, and 1,1-dechloroethane.

The operator, Acme Disposal, was issued an Order in late 1978, requesting the installation of additional monitoring wells, water quality analysis, and surveying at the site. A Consent Order was subsequently issued by the Resource Recovery Commission to cover the items that remained to be completed. Additional studies are needed to determine the total extent of contamination, which is complicated by the area's complex hydrogeology.

In late 1981 and early 1982, local residents filed two suits against the county and Acme Disposal Company. The Mason County Department of Public Works is postponing additional work at the site pending the results of the two suits.

HRS: 34.18

Population threatened: 1,112

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-48

MCGRAW-EDISON

Calhoun County, Michigan

The McGraw-Edison Corporation, Air Comfort Division, located at 704 North Clark Street, City of Albion, Calhoun County, Michigan, manufactured air conditioners, humidifiers, etc., until closing in 1980. From 1970 until 1980, trichloroethylene(TCE)-contaminated still bottoms (an oil waste) were spread on the site's dirt roads to control dust. As a result, TCE has been found in two on-site wells and forty-five nearby residential wells. Three Albion municipal wells have also shown TCE contamination. The company is known to have used 10,000 gallons of TCE per year from 1970 to 1980.

HRS: 44.63

Population threatened: 139,500

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ____

WMD/RRB/ATT B-49

NORTHERNAIRE PLATING
Cadillac, Michigan

Northernaire Plating is an inactive electroplating facility in Cadillac, Wexford County, Michigan. The materials on-site (2,000 gallons of plating sludge, 2,500 gallons of liquid plating solution in containers, and drums containing wastes contaminated with chrome and cyanide) have contaminated the groundwater and soil. A large volume of wastes was released through an improperly sealed sewer line. The extent of groundwater contamination is undetermined. Two private wells have been contaminated and the Cadillac Well Field is threatened by releases to the surface and the subsurface from the site.

This site was on the Interim Priority List of 160 sites.

HRS: 57.93

Population threatened: 9,990

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-50

NOVACO INDUSTRIES
Temperance, Michigan

Novaco Industries, located at 9411 Summerfield, Temperance, Michigan, is an active chrome plating facility. In June 1979, a leak was detected in an in-ground bath tank containing a hard-chrome plating solution. The company estimated that approximately 100 gallons of solution leaked out over an unknown period of time. Three area private wells plus the company well were contaminated with hexavalent chromium.

In July 1979, the company started purging operations to recover the chromium. By summer's end, 50,000 gallons of contaminated groundwater had been recovered and treated before operations were suspended due to freezing weather conditions. Cleanup operations were to resume in April 1980, but no effort by the company was made to do so.

HRS: 38.10

Population threatened: 3,000

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-51

ORGANIC CHEMICALS, INCORPORATED
Grandville, Michigan

Organic Chemicals, Incorporated, is located at 3291 Chicago Drive, S.W., Grandville, Michigan. The facility is engaged in reclamation of spent solvents and the manufacture of small quantities of various organic chemicals. From at least September 1974, to June 1980, the facility discharged process wastewater and boiler blowdown and cooling water to a seepage lagoon on the site. The facility's unpermitted groundwater discharge, accompanied by bad housekeeping practices, has resulted in groundwater contamination.

In April 1976, Organic Chemicals applied for a State Groundwater Discharge Permit. The permit, which was granted in January 1977, required monitoring for pH, phenol, oil, and grease. The discharge permit limits for these parameters were exceeded on several occasions. The permit required the diversion of process wastes to the Grandville Sanitary System. A Notice and Order to Comply was issued in 1977, when the company failed to comply with the permit time schedule.

The most concentrated area of contaminant plume has been identified. Analyses of samples from beneath the seepage lagoon identified 3,586 parts per million (ppm) total organic carbon in the groundwater. Methylene chloride, toluene, trichloroethylene, 1,1-dichclorethane, acetone, 2-propanol, ethyl benzene, and 64 other substances were also present.

In late 1981, accumulated sludges were removed from the former cooling water pond on the site. The pond was then backfilled with clean material.

HRS: 32.93

Population threatened: 10,764

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-52

OSSINEKE GROUNDWATER CONTAMINATION

Ossineke, Michigan

Several shallow private wells near Ossineke in Alpena County, Michigan, have been contaminated with benzene, xylene, trichloroethylene, and chloroform since 1977. A deeper aquifer, about seventy feet below the land surface, is currently providing an uncontaminated supply of water. Michigan Department of Natural Resources field staff identified a laundromat and a gasoline station as two suspected sources of the contamination.

HRS: 33.78

Population threatened: 1,140

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-53

OTT/STORY/CORDOVA CHEMICAL COMPANY
Dalton Township, Michigan

The Cordova Chemical Company is located in Dalton Township, Muskegon County, Michigan, north of the City of Muskegon. Various companies, including Ott Chemical and Story Chemical, have occupied the site since 1957. The facility was abandoned by Story Chemical in 1977.

From 1957 to 1977, waste handling practices at the site resulted in extensive groundwater contamination, contaminated soils, and unprotected tanks of phosgene gas. Wastewater was disposed via seepage lagoons. Approximately 1.2 billion gallons of groundwater contaminated with organic chemicals are moving into Little Bear Creek and its tributary, causing serious degradation of 1 mile of stream.

Before acquiring the facility in late 1977, Cordova Chemical Company and the State entered a Stipulation and Consent Order whereby Cordova agreed to neutralize and dispose of the phosgene gas and pay $600,000 to the State for abatement of the problem. The State agreed to use $500,000 to remove approximately 8,700 55-gallon drums and 8,000 cubic yards of sludges and contaminated soil, and to use $100,000 towards planning an alternative water supply system for affected residents. All drums have been removed from the site.

About 100 residents are now supplied with bottled water for drinking and cooking.

This site was on the Interim Priority List of 160 sites.

HRS: 53.41

Population threatened: 3,504

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-54

PACKAGING CORPORATION OF AMERICA
Filer City, Michigan

Packaging Corporation of America (PCA) operates a Kraft paper mill for production of corrugated box material in Filer City, Manistee County, Michigan. From the 1950s until 1974, PCA dumped untreated pulp mill black liquor and other process wastes in a series of unlined lagoons in Stronach Township, approximately one mile northeast of Filer City.

The Village of East Lake, to the northwest of the site, had to abandon a municipal well in 1976 because of groundwater contamination caused by the lagoons. PCA placed nine monitoring wells around the site in 1978. Sampling of the wells by the U.S. Environmental Protection Agency in August 1981 showed high levels of heavy metals and arsenic in the groundwater. Regional groundwater flow is in the direction of Manistee Lake, an important recreational resource in this area.

HRS: 52.15

Population threatened: 10,223

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-55

PETOSKEY MUNICIPAL WELLS

Petoskey, Michigan

The City of Petoskey, located in Emmit County, Michigan, uses the municipal well field as the sole source of water. The field is located at the northwest side of Petoskey, on the shore of Little Traverse Bay and the delta of the Bear River.

In September 1981, the Michigan Public Health Department notified the city that samples from the city's water supply contained 20 to 50 parts per billion of trichloroethylene. A suspected source of the pollutants is an adjacent die casting and plating firm, Petoskey Manufacturing. The company has commissioned an extensive hydrogeologic investigation to determine the extent of its responsibility, if any. Start-up of the investigation is pending Michigan Department of Natural Resources approval of the scope of work.

The City appropriated funds for new water supply wells and has installed testing wells in their selected new field.

HRS: 35.97

Population threatened: 5,400

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ________

WMD/RRB/ATT B-56

RASMUSSEN'S DUMP

Brighton, Michigan

Rasmussen's Dump is located at 9040 Spicer Road, Brighton, Livington County, Michigan. The site is a former landfill which accepted an undetermined quantity of drums of paint sludge and liquid waste. Liquid wastes were also dumped directly into the landfill. Gravel mining operations have removed the old fill material, uncovering numerous barrels. Soil samples near the drums show high concentrations of polychlorinated biphenyls, although no groundwater or surface water contamination has yet been documented. The dump was unable to meet state licensing requirements and subsequently closed in 1974.

HRS: 31.80

Population threatened: 2,457

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-57

ROSE TOWNSHIP DUMP

Oakland County, Michigan

The Rose Township Dump is one of three sites within a 5 mile area in Oakland, Michigan. About 5,000 drums of liquid industrial wastes (paint sludges, solvents, oils, polychlorinated biphenyls, and greases) were illegally disposed at these sites. Barrels were deposited on the surface, buried, and possibly drained into the ground or pits so that some barrels could be recycled. Groundwater, surface water, and soil contamination has resulted. Most drums were badly rusted or completely deteriorated, causing the contents to leak to the ground. There were also four to five pits with drums lying in stagnant water.

This site was on the Interim Priority List of 160 sites.

HRS: 50.92

Population threatened: 1,000,500

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

SCA INDEPENDENT LANDFILL

Muskegon Heights, Michigan

SCA Independent Landfill, established in 1965, is located in Muskegon Heights, Muskegon County, Michigan. The site is situated on sandy soils, and depth to the groundwater table is between five and seven feet. Residences are located within one-quarter mile of the site and gas generation has been detected on-site. Monitoring wells are located on-site. A portion of this site was treated with bentonite. However, problems have been detected with the bentonite liner.

Groundwater and surface water contamination is confirmed. Xylene, benzidine, dichlorobenzidine, 1,1-dichloroethane, and toluene have been detected in monitoring wells downstream from the site.

HRS: 36.36

Population threatened: 14,800

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-59

SHIAWASSEE RIVER

Howell, Michigan

Since 1969, the Cast Forge Company has operated a plant for the manufacture of aluminum cast products at 2440 West Highland Avenue, Howell, Livington County, Michigan. Until 1973, wastewater contaminated by hydraulic fluids containing polychlorinated biphenyls (PCB) was discharged to the South Branch of the Shiawassee River. From 1973 to 1977, process wastewater was discharged into a 400,000-gallon lagoon on the plant property. Illegal discharges from this lagoon, as well as periodic overflows of the lagoon, led to the contamination of nearby wetlands and subsequently the Shiawassee River.

Results of sampling performed by the Michigan Department of Natural Resources (DNR) in late 1978 showed high levels of PCB in soils around the site. PCB was also found in monitoring wells on the site in June 1979. High levels of PCB have been found in Shiawassee River sediment below the plant property. PCB concentrations above 1 part per million (ppm) have been found in sediments for 14 miles downstream of the plant. PCB has also been found in fish as far as 52 miles downstream of the plant.

The State of Michigan filed suit against Cast Forge on 8 November 1977 for PCB-contamination of the environment. The case was settled through a Consent Judgment on 19 June 1981. Pursuant to that settlement, the company removed its wastewater lagoon, cleaned up PCB- contaminated soils and sediments from its property, and provided $750,000 for the restoration of the Shiawassee River. In an ongoing project, Michigan DNR began dredging contaminated sediments from the South Branch of the Shiawassee River in June 1982.

HRS: 31.01

Population threatened: 5,224

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

SOUTHWEST OTTAWA COUNTY LANDFILL

Park Township, Michigan

The Southwest Ottawa County Landfill is located in Park Township, northwest of the City of Holland, Ottawa County, Michigan. The forty-acre landfill was constructed and licensed in 1968, and received municipal refuse, industrial sludges, and wastewater treatment plant sludges. Groundwater studies performed by the Michigan Department of Natural Resources have indicated the presence of aromatic hydrocarbons and heavy metals in monitoring wells around the site. Several private wells were also found to be contaminated. Operation of the landfill ceased in 1981 as a result of administrative enforcement action initiated by the State of Michigan. Pursuant to that action, Ottawa County closed and covered the landfill, provided hookups to the municipal water system for residents with potentially affected wells, and committed the County to a five-year post-closure care program. Ottawa County is in the process of conducting a study to assess the feasibility of installing a groundwater treatment system.

HRS: 39.66

Population threatened: 13,004

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ____

SPARTA LANDFILL
Sparta Township, Michigan

Sparta Landfill is a closed refuse dump located east of Alpine Avenue in Sparta Township, approximately one mile southeast of the Village of Sparta, Kent County, Michigan. Prior to 1965, the landfill was operated by Sparta Township and a private operator. The site was purchased in 1970 by the Kent County Department of Public Works. Until 1977, the landfill accepted municipal refuse, foundry sand, and industrial wastes.

In 1979, toluene and several other organic solvents were found in samples taken from on-site monitoring wells and off-site domestic wells. Pursuant to a request by the Michigan Department of Natural Resources, Kent County installed deep wells for two nearby affected residences and provided bottled water for other affected homes.

HRS: 32.00

Population threatened: 8,618

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ________

WMD/RRB/ATT B-62

188

SPARTAN CHEMICAL COMPANY

Wyoming, Michigan

The Spartan Chemical Company is located at 2539-28th Street, S.W., Wyoming, Michigan. The company began its operations at the site in 1952. The company blends and packages chemicals and distributes such liquid industrial chemicals as solvents and thinners. At present, the company does not manufacture or process any chemicals on-site.

Residential wells near the company have become contaminated with trichloroethylene, perchloroethylene, chloroform, and other organic compounds. These wells have been abandoned and residences have been connected to a municipal water supply.

HRS: 41.05

Population threatened: 58,600

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

SPIEGLEBURG LANDFILL

Brighton, Michigan

The Spiegleburg Landfill Site is located on Spicer Road in Brighton, Livington County, Michigan. Prior to 1966, this site was used as an open dump. Unknown quantities of paint sludges and liquid waste were dumped into a pit on the site around 1977. The pit was located in a sand and gravel excavation area. The pit recently has been covered with gravel, and paint sludges are no longer disposed of on-site. A sand and gravel operation is now located on another portion of the property. A limited hydrogeological study by the Michigan Department of Natural Resources to detect groundwater contamination is nearing completion.

HRS: 53.61

Population threatened: 2,457

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

SPRINGFIELD TOWNSHIP DUMP

Oakland County, Michigan

The Springfield Township Dump site, located near Davisburg in rural Oakland County, Michigan, was an illegal disposal site for liquid industrial wastes. Barrels of waste were dumped on the ground, buried in pits, and drained into the ground to reclaim the barrels. Dumping is known to have occurred between 1966 and 1968, and possibly longer. Drum contents were identified as paint sludges, solvents, polychlorinated biphenyls (PCB), oils, and greases. Soils are contaminated with PCB, metals, and some organic chemicals. Groundwater is also contaminated with organic chemicals directly below the dumping area. However, sampling of domestic wells for several months showed no contamination to water supplies. Migration of contaminants could cause more serious impacts.

HRS: 51.97

Population threatened: 1,000,500

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-65

TAR LAKE

Mancelona Township, Michigan

Tar Lake is located south of Elder Road in Mancelona Township, Antrim County, Michigan. This site is a shallow, four-acre pond that served as a disposal lagoon for the Antrim Iron Company, which operated in Mancelona from the 1880s until 1944. The company's complex includes a saw mill, a chemical plant, an iron extraction and smelting plant, and a steel mill.

As long ago as 1949, groundwater contamination was documented by the State as far as three miles from the site. Sludge deposits in Tar Lake have been found to contain high concentrations of heavy metals and phenol. Sampling of area residential wells in 1980 revealed the presence of lead and phenol contamination.

HRS: 48.5

Population threatened: 3,011

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-66

U.S. AVIEX

Cass County, Michigan

U.S. Aviex Company, located in Howard Township, Cass County, Michigan, specializes in production of auto solvents, including windshield washing solution, auto starting fluid, and fuel line antifreeze. In 1972, several domestic wells southwest of the U.S. Aviex facility were contaminated with ether at levels up to 190 parts per million. A leaking ether transmission line on-site proved to be the source, and repairs were made. Three of the affected wells subsequently were replaced at company expense.

In November 1978, fire destroyed most of the facility and resulted in the release of a number of organic compounds into the soil and groundwater. Dichloromethane, benzene, toluene, and other chemicals have been detected in nearby residential wells.

The State of Michigan filed suit against the company in early 1982. Under Court Order, U.S. Aviex is currently conducting a pump test in preparation for possible groundwater purging and treatment.

HRS: 33.66

Population threatened: 46,400

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-67

VELSICOL PLANT SITE

St. Louis, Michigan

The Velsicol Chemical Company, operated a plant formerly belonging to the Michigan Chemical Company, at 500 Bankson Street, St. Louis, Michigan. The plant manufactured a variety of chemicals, including polybrominated biphenyls and TRIS. Plant effluent and poor housekeeping practices resulted in contamination of the Pine River and soils and groundwater at the site. The plant closed in 1978, and all buildings have now been removed.

Velsicol Company recently agreed to a $38.5 million combined settlement for cleanup of this site and two others in Michigan—the Gratiot County Landfill and the Gratiot County Golf Course.

HRS: 52.38

Population threatened: 4,101

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-68

VERONA WELL FIELD
Battle Creek, Michigan

The Verona Well Field is the sole source of water for 35,000 residents of Battle Creek, Michigan. The Well Field also supplies water to several major food-producing industries, including Kellogg, General Food, and Ralston Purina. As a result of groundwater contamination, 16 of the 31 wells in the Field are no longer in production. An imminent hazard is the contamination of other municipal wells because of the horizontal spread of groundwater contaminants.

In September 1981, hydrocarbon contamination was discovered in tap water serving residents of Battle Creek. Sampling in the Well Field indicated contamination in one-third of the wells. Sampling near the Well Field also indicated high levels of contamination in private wells.

This site was on the Interim Priority List of 160 sites.

HRS: 46.86

Population threatened: 37,600

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WASH KING LAUNDRY

Pleasant Plains Township, Michigan

Wash King Laundry, located in Pleasant Plains Township, Lake County, Michigan, is a small privately owned laundromat which has been in operation since 1962. During the early 1970s, dry cleaning solvents were discharged with laundry wastes to the facility's wastewater lagoons. As a result, approximately thirty domestic water supplies north of the laundromat have been contaminated with perchloroethylene (PCE). PCE-contamination was initially detected in August 1977 in a well sample from a local commercial establishment. In February 1978, the laundry waste dump, a suspected source of PCE, was cleaned out by the Michigan Department of Public Health. Use of PCE was discontinued in 1978, in response to enforcement actions initiated by the State of Michigan. However, no relief was provided to residents with affected wells who had been using bottled water. A preliminary hydrogeologic study conducted in 1979 by the Michigan Department of Natural Resources established Wash King as responsible for the PCE contamination. The lateral and vertical extent of groundwater contamination has not yet been determined, although the contaminant plume is known to be migrating in a northeasterly direction toward the Middle Branch of the Pere Marquette River.

HRS: 46.04

Population threatened: 3,962

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ________

WHITEHALL WELLS
Whitehall, Michigan

The Whitehall Wells are located in Whitehall, Michigan. Perchloroethylene (PCE) contamination was detected in production well number 3 in January 1981, during sampling conducted by the Michigan Department of Public Health. At that time, Whilehall city officials were attempting to locate an acceptable site for installation of a new municipal well to replace an existing well on the city's south side. In February 1981, two observation wells in close proximity to production well number 3 were found to be contaminated with high levels of trichloroethylene and cis-1,2-dichloroethylene, in addition to low levels of PCE and 1,1-dichloroethane.

Upon discovery of PCE contamination, the City of Whitehall took production well number 3 off-line and increased pumping rates at the other four municipal wells. Well number 3 is currently used only on an emergency basis.

Limited sampling of additional wells in the area has shown the same chemicals in residential wells northeast of production well number 3. There are several suspected sources of contamination, spread over a relatively wide area, due to uncertainty regarding the direction of groundwater flow. The United State Environmental Protection Agency has installed five monitor wells in the area, but groundwater sample results are not yet available.

HRS: 29.85

Population threatened: 3,017

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-71

BURLINGTON NORTHERN SITE
Brainerd/Baxter, Minnesota

Burlington Northern (BN) has initiated an on-site groundwater investigation at the Brainerd tie preservation plant. Groundwater has been found to be moving to the east from the site, in the Brainerd/Baxter area of Minnesota, with probable discharge to the Mississippi River. On-site groundwater has been found to be contaminated by a number of carcinogenic polynuclear aromatic hydrocarbons. At the request of the Minnesota Pollution Control Agency (MPCA) staff, BN has agreed to expand the groundwater study to include off-site areas between the plant site and the Mississippi River. BN is also investigating methods by which to remove and dispose of or treat sludges and contaminated soils.

The MPCA has sampled a number of area wells. Most currently used wells are north or west of the plant site, while groundwater flows to the southeast from the plant. No drinking water wells appear to be affected by contamination at this time. Low levels of contaminants may be entering the Mississippi River through discharge of contaminated groundwater to the river.

Wastewater and sludges from creosote preservation of railroad ties have been discharged to on-site ponds since the plant's construction in 1907. The original pond was abandoned in the 1930s and covered. The existing pond has been used since that time. Both ponds were probably low spots lacking any sort of natural or constructed seal. The existing pond is approximately 2 acres in area. There is approximately 3 feet of sludge within the pond, and an unknown quantity of contaminated soil beneath the sludge. Several exploratory borings have confirmed the existence of sludge and/or contaminated soil in the area of the original pond.

This site was on the Interim Priority List of 160 sites.

WMD/RRB/ATT B-72

FMC CORPORATION

Fridley, Minnesota

The FMC Corporation, formerly the Northern Pump Company, disposed of hazardous waste on the company property in Fridley, Minnesota, from the early 1950s to the early 1970s. The property is located adjacent to the Mississippi River. Wastes were disposed of at two locations, one consisting of an 11- acre unlined landfill. Wastes consisted of solvents, paint sludges, and plating wastes. Records indicate that solvents and sludge were dumped directly into unlined pits and burned or buried.

Three groundwater wells used by FMC for drinking and processing were found to be contaminated. The cities of Fridley and Brooklyn Center withdraw drinking water from the contaminated aquifer. Groundwater also discharges into the Mississippi River, which serves as the water supply for the city of Minneapolis, 800 feet downstream of FMC property. The surface drinking water supply is contaminated.

Contaminants found in the groundwater include: trichloroethylene; dichloroethylene; tetrachloroethylene; methylene chloride; 1,1 and 1,2 dichloroethane; trichloroethane; acetone benzene; 1,2 trans-dichloroethylene; and bis-(2-ethyhexyl) phthalate. Trichloroethylene has been found in the City of Minneapolis surface drinking water supply.

This site was on the Interim Priority List of 160 sites.

HRS: 74.16

Population threatened: 37,800

Aquifers threatened: 3

Surface waters threatened: 1

Index number on map: ________

WMD/RRB/ATT B-73

KOPPERS COKE

St. Paul, Minnesota

The Koppers Company operated a coking plant at the Midway Industrial Park in St. Paul, Minnesota, from 1911 to 1979. The facility converted coal to coke and produced such byproducts as coal tars and coal tar distillates. Koppers Company has dismantled and removed all equipment from the site. Additionally, the company has completed an intensive on-site soil and groundwater investigation. The investigation revealed that wastes discharged to the ground in unlined earthen pits and disposed of on the land surface have contaminated the soil and groundwater. The contaminants present include polynuclear aromatic hydrocarbons (PAH), thiocyanate, ammonia, sulfates, phenols, oil, and grease. The contamination does not threaten St. Paul's municipal water supply, which is obtained from the Mississippi River just north of Minneapolis.

The U.S. Environmental Protection Agency, in cooperation with the Minnesota Pollution Control Agency (MPCA), will be investigating the migration of contaminants from the Koppers property.

In cooperation with MPCA, the Koppers Company has been working to remove coal tar wastes and contaminated soil from the property. Thus far, Koppers has excavated and shipped 17,500 cubic yards of material to secured disposal in Illinois. When the surficial cleanup is completed, Koppers expects to sell the property to the St. Paul Port Authority, which intends to make the property available to developers of the St. Paul Energy Park.

This site was on the Interim Priority List of 160 sites.

HRS: 55.05

Population threatened: 263,400

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-74

LE HILLIER

Le Hillier, Minnesota

In October 1981, the Minnesota Pollution Control Agency (MPCA) discovered groundwater contaminated with organic chlorinated solvents in the community of Le Hillier, located just west of Mankato, Minnesota. Since trichloroethylene (TCE), which is a main contaminant, may act as a carcinogen, a health advisory was issued by the Minnesota Department of Health to approximately 200 affected residents, suggesting that they utilize an alternative drinking/cooking water supply. This community also has high levels of nitrates in its groundwater. The TCE may be from degreasers used in cleansing of the septic tanks used in the community.

Le Hillier is located in a floodplain of the Blue Earth and Minnesota Rivers, and until 1976, when the U.S. Corps of Engineers constructed a dike around this area, was subject to seasonal flooding. The area of solvent contamination in Le Hillier/Mankato is characterized by permeable soils (unconsolidated sands and gravels) that allowed rapid infiltration of liquids into the surficial groundwater aquifer. This aquifer is thought to be approximately 20 to 25 feet below the surface, with bedrock (sandstone) being found at approximately the 60-foot depth.

The U.S. Environmental Protection Agency, in coordination with MPCA, is conducting a hydrogeological study of this area to determine the source(s) of contamination and the extent of the contamination plume.

This site was on the Interim Priority List of 160 sites.

HRS: 42.49

Population threatened: 200

Aquifers threatened: 2

Surface waters threatened: 2

Index number on map: ______

WMD/RRB/ATT B-75

NATIONAL LEAD-TARACORP SITE

St. Louis Park, Minnesota

National Lead (NL) Industries, Incorporated (formerly National Lead Industries, Hightstown, New Jersey), operated a secondary lead smelter in St. Louis Park, Minnesota, from approximately the 1930s to 22 August 1979. NL Industries sold a portion of its St. Louis Park property to Golden Auto Parts, Incorporated in the early 1960s. The remainder of the property was sold to Taracorp, Incorporated (Atlanta, Georgia) on 22 August 1979. Taracorp notified the Minnesota Pollution Control Agency (MPCA) on 19 May 1982 that it was permanently closing the St. Louis Park smelting plant.

Apparently, the smelting operation had air quality problems throughout most of its lifetime. MPCA air quality monitoring conducted from June 1979, to June 1982, indicated frequent violation of lead standards when the plant was in operation. Air quality violations were not noted when the plant was closed.

Lead also was disposed during the plant's earlier years of operation. A large lead slag disposal site was located in the northern portion of the former NL property. Golden Auto Parts is now located over much of the disposal site.

At present, NL Industires, Taracorp, and Golden Auto Parts are conducting investigations at the site in order to assess the impact of slag burial and lead emissions on area soils, surface water, and groundwater.

This site was on the Interim Priority List of 160 sites.

HRS: 42.55

Population threatened: 46,100

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-76

NEW BRIGHTON/ARDEN HILLS
Ramsey, County, Minnesota

In June 1981, the Minnesota Pollution Control Agency (MPCA) and the Minnesota Department of Health (MDH) discovered organic solvent contamination of the Prairie du Chien-Jordan aquifer in Ramsey County. This aquifer is used to supply drinking water to several communities in this area. MPCA, in coordination with the U.S. Environmental Protection Agency (EPA), is actively pursuing an initial hydrogeological study of the area to determine the extent and level of contamination and the source(s) of the contaminants.

The contamination plume is now believed to be 6 miles long, 3 miles wide, and affect approximately 38,000 residents. Several suspected sources of the contamination are now being monitored to determine what had been disposed of at these sites in the past, when record-keeping was not strictly regulated. The MPCA and MDH continue to monitor the wells in the area for worsening or stabilizing of the contamination levels. The Department of the Army was awarded a contract in February 1982, to perform an extensive hydrogeological study on Twin Cities Army Ammunition Plant, located in New Brighton, Minnesota. Both the State of Minnesota and EPA have met with Army officials to coordinate all phases of the study.

This site was on the Interim Priority List of 160 sites.

HRS: 59.16

Population threatened: 448,100

Aquifers threatened: 3

Surface waters threatened: 5

Index number on map: ______

WMD/RRB/ATT B-77

OAKDALE DUMP SITES
Oakdale, Minnesota

The Oakdale Disposal Sites in Washington County, Minnesota, are a group of three adjoining properties that were used for the disposal of industrial wastes during the 1950s. It is estimated that more than 100,000 drums of waste products have been buried there, in addition to large quantities of other solid industrial wastes. Groundwater and surface water contamination has been documented in the area. The sites are located just west of Interstate 694, at the junction of State Route 212. The sites are named for the property owners at the time when disposal took place.

The Albresch Site, the largest, is actually dissected by State Route 212. This was a wetland that was filled with waste. A number of large trenches were excavated for waste burial.

The Brockman Site, located to the immediate southwest of the Albresch Site, was used for disposal when the Albresch Site experienced high water.

The Eberel Site, located to the north of the Albresch Site, was used for open burning of combustible materials. Solvents were opened, spilled on the ground, and ignited. Seepage caused groundwater contamination.

A large amount of work leading toward site cleanup has been done at the site by the Minnesota Pollution Control Agency and 3M Corporation, possibly one of the waste contributors. 3M then sponsored a cleanup of surface material that could have been dangerous to people walking the site. Several children's play areas were identified and cleaned up to increase site safety. 3M then sponsored a test excavation to learn the condition of the buried waste. The test revealed that the buried drums were still in relatively good condition.

Current work on the site includes the accurate identification of burial sites. When this study is completed, a cleanup plan will be prepared.

This site was on the Interim Priority List of 160 sites.

WMD/RRB/ATT B-78

REILLY TAR AND CHEMICAL CORPORATION
St. Louis Park, Minnesota

Between 1917 and 1972, Reilly Tar and Chemical Corporation operated a coal tar distillation and wood preserving plant in St. Louis Park, Minnesota. The operation was located on an 80-acre tract near Highway 7 and Louisiana Avenue. Wastes from the operation were disposed of on the site and in a network of ditches that discharged to an adjacent wetland. The primary area of soil and heavy groundwater contamination is below the wetland and the southern portion of the former site itself. The wastes consisted of a mixture of many compounds, including polynuclear aromatic hydrocarbons (PAH), some of which are carcinogenic.

In May 1978, the Minnesota Department of Health was able to commence very sensitive analysis of water using High Performance Liquid Chromatography. An investigation in St. Louis Park identified PAH in wells 7, 9, 10, and 15. Three other municipal wells have subsequently been closed, including St. Louis Park wells 4 and 5 and Hopkins well 3. All of these wells are located in the Prairie du Chien-Jordan aquifer, 250 to 500 feet below ground surface.

In 1979, some 28 multi-aquifer wells were abandoned or reconstructed to prevent the spread of contamination. A plan for a gradient control well system was drawn up in 1981. Also in 1981, the Minnesota Pollution Control Agency (MPCA) was awarded a $400,000 grant by the U.S. Environmental Protection Agency to clean out two deep wells on the former Reilly site, conduct a complete well survey, and conduct a water treatability study on the closed municipal wells. In 1982, the MPCA entered into a Cooperative Agreement with EPA for approximately $2 million to abandon additional multi-aquifer wells, conduct a study on treating source materials, and model any field test portions of a gradient control system.

The site is Minnesota's top priority site and was on the Interim Priority List of 160 sites.

A Federal civil action in U.S. District Court seeking injunctive relief has been brought by the Department of Justice on behalf of EPA against responsible parties associated with this site.

WMD/RRB/ATT B-79

SOUTH ANDOVER SITE
Andover, Minnesota

There are five adjacent hazardous waste disposal sites in the City of Andover, Minnesota, on the south side of Bunker Lake Boulevard, N.W., and west of Jay Street. Solvents, paints, glues, and greases have been disposed of or accumulated at these sites between the years 1969 and 1976. The 372 drums of waste remaining there pose a hazard because of their high flammability and the deterioriation of the containers. The wastes that have been disposed of at these sites have contaminated both shallow groundwater and, more important, a deeper aquifer.

The shallow groundwater is contaminated with a number of solvents, including methylene chloride, 1,1,1-trichloroethane, trichloroethylene, toluene, and xylene, as well as arsenic, cadmium, lead, selenium, cyanide, and phenols. It has been recommended that three shallow residential wells on the south side of these sites not be used for drinking water and cooking purposes.

The problem arose when five or more waste generators provided their wastes to four or more transporters, who in turn delivered the waste to the five properties, where the waste was prepared for use as a fuel, burned on-site, or spilled. These properties have been owned by eight different individuals and corporations.

The Minnesota Pollution Control Agency became aware of this problem in 1973 as a result of Anoka County's inspection of the sites.

This site was on the Interim Priority List of 160 sites.

HRS: 35.41

Population threatened: 3,940

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-80

WASTE DISPOSAL ENGINEERING
Andover, Minnesota

The Waste Disposal Engineering Site is located in Andover City, Anoka County, Minnesota. A hazardous waste pit, constructed in 1972, holds approximately 6,600 barrels. The operation of the pit was stopped in 1974. Since that time, contamination of the groundwater beneath the landfill was detected in high concentrations. The rest of the landfill handled sanitary wastes since approximately 1962, and is still operating to a small degree. The Minnesota Pollution Control Agency has met with the current owner and is monitoring the groundwater. Due to the organic pollution of the groundwater and the potential for contamination of near-by drinking supplies, it appears that, as a minimum, the drums should be removed.

This site was on the Interim Priority List of 160 sites.

HRS: 50.92

Population threatened: 3,940

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-81

ALLIED CHEMICAL AND IRONTON COKE

Lawrence County, Ohio

The Allied Chemical and Ironton Coke facility, located on Third Street in Ironton, Ohio, involves two adjacent industrial facilities. Both have disposal lagoons containing hazardous wastes on their property. Hazardous wastes such as lime sludge from an ammonia distillation unit and tar sludge located between the two facilities are also suspected of contaminating groundwater. Studies have detected ammonia, chloride, cyanides, phenols, and thiocyanates in groundwater. The contaminated groundwater has the potential for affecting local wells. There is also potential for contamination of the Ohio River and Ice Creek, which are used for municipal drinking water supplies.

The present owners of Ironton Coke have stated their intention to not use the lagoons for any purpose.

HRS: 47.05

Population threatened: 15,000

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map:

ARCANUM IRON AND METAL

Darke County, Ohio

Arcanum Iron and Metal is a lead battery recycling facility located on Pop Rite Lane in Arcanum, Darke County, Ohio, approximately twenty-five miles northwest of Dayton. The facility is known to have been in the scrap metal/recycling business since the early 1960s. Currently, large piles of battery casings, lead, and lead oxides exist on the property, as well as standing pools of acid wastes. Acid overflow from this operation has killed both fish and vegetation in Painter Creek, downstream of the site. Concern exists for Arcanum's water supply, which is furnished by wells within one mile of the site, and for local individual wells.

The Ohio Environmental Protection Agency (EPA) and the Ohio Attorney General's Office have been involved with efforts to clean up this site. In October 1979, both agencies entered into a Consent Decree with the owner to clean the site. However, cleanup efforts have not been satisfactory to either agency. The defendant has subsequently been found in contempt of the Darke County Court of Common Pleas; however, the site has not been cleaned up.

HRS: 62.26

Population threatened: 3,500

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ________

WMD/RRB/ATT B-83

BIG D CAMPGROUND

North Kingsville, Ohio

Big D Campground, a 10-acre site in Kingsville, Ohio, was originally a sand and gravel pit. The pit was used as a dump for waste products from 1964 to 1976. Hazardous waste is known to be on the site. One of the companies responsible for sending wastes to the facility is currently conducting a soil erosion control program.

There is evidence that leachate from the facility is contaminating Conneaut Creek. There is potential for contamination of local groundwater supplies.

HRS: 34.78

Population threatened: 2,458

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ________

WMD/RRB/ATT B-84

BOWERS LANDFILL

Pickaway County, Ohio

Bowers Landfill, also known as Island Road Landfill, is located west of Island Road, approximately 1 mile north of Circleville, Ohio, within the western side of the Scioto River floodplain. The site is situated over a very productive aquifer (capable of yields of 1,000 gallons per minute) that is utilized for both industrial and domestic water supplies.

In 1958, a gravel pit operation was started adjacent to the future landfill site. Shortly thereafter, a landfilling operation was started in which soil from the gravel operation was used to cover refuse dumped on top of the existing surface. Little is known of the initial years of the landfill operation; however, the site is known to have accepted organic and inorganic chemicals and general domestic and industrial refuse from 1963 to 1968. In response to a House Subcommittee inquiry, two chemical manufacturers in the area stated that in excess of 7,500 tons of chemical wastes (physical state and concentration unknown) had been disposed of at this site. In July 1980, the U.S. Environmental Protection Agency identified toluene and ethylbenzene in water samples from the landfill. The Ohio Environmental Protection Agency has been successfully working with the current owner who has hired a local engineering firm to evaluate the site. The report has been reviewed by Ohio, and additional information is being requested prior to selection of a remedial option.

HRS: 51.80

Population threatened: 45,000

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

BUCKEYE RECLAMATION

Belmont County, Ohio

The Buckeye Reclamation landfill, located near St. Clairsville in Belmont County, Ohio, was licensed as a sanitary landfill. It also accepted industrial waste, including sludges and liquids, without Ohio Environmental Protection Agency approval. The site has been strip mined and undermined, and industrial waste was subsequently landfilled in a permeable gob (composed of mining refuse), producing erosion and leachate. Substantial leachate discharges from the rear of the site have entered a stream adjacent to a private home. The slopes of the filled area are steep, and the gob used for cover is eroding. The facility creates a surface water pollution problem at McHahon Creek, which may be used for recreational purposes. There is potential for contamination of local groundwater wells.

HRS: 35.10

Population threatened: 82,300

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

CHEM-DYNE
Hamilton, Ohio

Chem-Dyne Corporation in Hamilton, Ohio, began business in 1974, and was used as a chemical waste transfer and storage facility. While in operation, Chem-Dyne handled a wide variety of wastes, including pesticides, chlorinated compounds, polychlorinated biphenyls, polybrominated biphenyls, TRIS, lab packs, acids, resins, solvents, heavy metals, and cyanide wastes. In 1980, Chem-Dyne failed to meet a court-ordered waste reduction schedule. The company was then closed and placed in the control of a court-appointed receiver in an effort to utilize the corporate assets of Chem-Dyne to clean up the site. These efforts, in addition to voluntary removals by generators of some of the wastes at the site, have reduced the waste inventory significantly.

A Federal civil suit in U.S. District Court seeking injunctive relief has been brought by the Department of Justice on behalf of the U.S. Environmental Protection Agency (EPA) against the owners and operators in December 1979. The case was dismissed when it became clear that they were bankrupt and had no ability to clean up the site.

In August 1982, a settlement was reached with a number of waste generators who agreed to contribute $2.4 million toward the $3.4 million allocated by the EPA and Ohio for surface cleanup of the approximately 9,000 drums and 200,000 gallons of bulk waste remaining at the site. Additionally, a subsurface investigation will be performed to determine the extent of soil and groundwater contamination at the site.

After completion of the groundwater study, a cleanup option, if one is necessary, will be selected, and the responsible parties will again be given the opportunity to act in lieu of Fund-financed remedial work.

This is the top priority site in Ohio and was on the Interim Priority List of 160 sites.

WMD/RRB/ATT B-87

COSHOCTON LANDFILL

Coshocton County, Ohio

The Coshocton Landfill is located on State Route 83 in Franklin Township, Coshocton County, Ohio, approximately 3 miles south of the City of Coshocton. The site consists of fifty acres of strip mined land which was a licensed sanitary landfill from 1969 to 1979. During its operation, the site accepted industrial wastes.

Surface coal mining resumed after landfill operations were discontinued at the site and areas containing solid waste were exposed during mining. Paints, sewage or septage, oily wastes, halogenated solvents, caustics, phenols, polychlorinated biphenyls (PCBs), metals, melamine, methanol, acetone, and epoxy resin reportedly were disposed of at the landfill. Even though there is little known chance that groundwater is polluted at the site, there are known surface water pollution problems such as a leachate discharge to a tributary of the Muskingum River.

HRS: 39.14

Population threatened: 34,200

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ________

E.H. SCHILLING LANDFILL

Lawrence County, Ohio

E.H. Schilling Landfill is situated in Hamilton Township, 4.5 miles down-river from Ironton, Ohio. The site was a licensed industrial waste landfill and began receiving waste for disposal in April 1972. The landfill was closed in July 1980, because it accepted liquid wastes and failed to cover wastes properly with soil. The operation of the landfill has permitted surface water infiltration. After the Solid Waste Disposal License for the landfill was revoked, the site was covered and closed. Leachate is still migrating from the landfill, although the owner attempted to contain the flow.

HRS: 40.37

Population threatened: 59,200

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-89

FIELDS BROOK
Ashtabula, Ohio

Fields Brook, located in Astabula in the northeastern corner of Ohio, is a tributary of the Ashtabula River, which flows into Lake Erie. Fields Brook meanders for approximately four miles, first through a diversified chemical industrial complex and then through a residential area in Ashtabula, before emptying into the Ashtabula River. Both point and non-point sources adjacent to Fields Brook have contaminated its sediments with a variety of toxic organic chemicals (hexachlorobenzene, polychlorinated biphenyls, hexachlorobutadiene, trichloroethylene, methylene chloride) and heavy metals (mercury, chromium, arsenic).

The contaminated sediments can potentially reach drinking water intakes of Lake Erie. Analyses of fish flesh indicate the bioaccumulation of chlorinated organics. This situation poses a secondary threat to people who consume contaminated fish.

This site was on the Interim Priority List of 160 sites.

HRS: 51.62

Population threatened: 23,700

Aquifers threatened: 0

Surface waters threatened: 3

Index number on map: ________

WMD/RRB/ATT B-90

FULTZ LANDFILL

Guernsey County, Ohio

The Fultz Landfill, Guernsey County, Ohio, is a currently operating sanitary landfill, located in Jackson Township near Byesville. A variety of industrial and commercial wastes were disposed of at the facility. Contaminants (including ethylene glycol and methylene chloride) have been found in nearby Wills Creek. A trace of methylene chloride has also been found in a sample from the Byesville water supply.

HRS: 39.42

Population threatened: 39,400

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-91

NEASE CHEMICAL

Mahoning County, Ohio

Nease Chemical in Mahoning County, Ohio, started operation in 1961 and was closed in 1973 by the Ohio Environmental Protection Agency because of wastewater discharge violations. This facility, located on Ohio Route 14-A, manufactured chemicals such as pesticides and fire retardants. Wastes from these processes were put into 55-gallon drums, which were then buried on-site. Also, wastes were placed in unlined lagoons as part of wastewater treatment. Field inspection determined that the drums are leaking and the lagoons are leaching. Samples from an on-site groundwater well and leachate from a lagoon contain organic and chlorinated organic substances. Negotiations between Ohio and the owners of the facility indicate a willingness on the part of the owners to conduct the necessary remedial activities.

HRS: 47.19

Population threatened: 15,000

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-92

NEW LYME LANDFILL

Ashtabula County, Ohio

New Lyme Landfill is located near Route 11 on Dodgeville Road in Ashtabula County, Ohio, approximately 20 miles south of the city of Ashtabula. The site was operated as a sanitary landfill, for which detailed plans were approved in May 1971. The site was closed in 1978 by the Ashtabula County Board of Health. While in operation, the landfill accepted some industrial wastes, including cyanide sludge in drums. Presently, serious leachate outbreaks on the north and especially the south sides of the fill area threaten the surface waters downstream. Concern also exists that groundwater in the area might be degraded by leachate from the landfill.

The U.S. Environmental Protection Agency is currently sampling groundwater at this site.

HRS: 36.70

Population threatened: 10,000

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-93

POPLAR OIL CO.
Jefferson, Ohio

Poplar Oil Co. (included in the Interim Priority List as Laskin/Poplar) is an abandoned greenhouse and waste oil recovery operation at 717 Poplar Street, Jefferson Township, Ashtabula County, Ohio.

Liquids stored in ponds and tanks contain high levels of polychlorinated biphenyls (PCBs) and lesser amounts of phenols and other organic solvents. The tanks and ponds have the potential to overflow, leak, or collapse because of poor construction and maintenance. Any contaminants released would enter Cemetary Creek, which runs adjacent to the site. The creek is a tributary of the Grand River and the source of drinking water for 24,000 Ashtabula County residents.

Emergency response funds under section 311 of the Clean Water Act were used for cleanup and containment activities at the site in late 1980, following a discharge of contaminants into Cemetary Creek. In early 1981, emergency funds were obtained to prevent further oil spillage into the creek. In addition to the $479,000 spent in these activities, $1.2 million was allocated for a Superfund planned removal action to eliminate the threat posed by two open storage tanks and the two large lagoons containing contaminated oil.

The Ohio Environmental Protection Agency (OEPA) has been involved with the site since 1976, investigating citizen complaints and conducting sampling activities.

A Federal civil action in U.S. District Court seeking injunctive relief has been brought by the Department of Justice on behalf of EPA against responsible parties associated with this site. This resulted in a suit under the Resource Conservation and Recovery Act in 1979. A Consent Decree in 1980 committed the company to clean up the site. It did not, and a planned removal action was begun on July 7, 1982.

PRISTINE, INC.

Reading, Ohio

Pristine, Inc., is located in the city of Reading, Ohio, at the intersection of Big Four and Smalley Roads. The site is flanked on two sides by a drum reclaimer and a chemical company. On one of the remaining sides is a railroad track with an adjacent trailer park, while the other side is adjacent to the Reading water supply well field. Operation of the liquid waste incineration facility began in November 1974. In April 1979, an inspection revealed the presence of 8,000 to 10,000 drums and thirteen bulk storage tanks containing a wide variety of hazardous substances, with the potential for groundwater and surface water contamination, fire, and explosion. Also, soil was contaminated.

In June 1980, the facility ceased operations and since that time the wastes have been reduced, through State enforcement actions, to fifteen drums and some bulk wastes. Threats posed by the wastes at the facility have been greatly reduced.

HRS: 35.25

Population threatened: 14,617

Aquifers threatened: 2

Surface waters threatened: 1

Index number on map: ______

ROCK CREEK (JACK WEBB)

Rock Creek, Ohio

The Rock Creek (Jack Webb) site is located on Hill Street in Rock Creek, Ashtabula County, Ohio. About four years ago, the site owner was involved with a local brine and oil hauling business in an old grain elevator complex consisting of three or four buildings and several silos, he processed peat moss with a polymer and other materials. About 1,400 drums of flammable waste materials accumulated at the site. The owner then filed for bankruptcy.

There is serious concern of possible fire or explosion at the site. Most of the drums on the site contain resins, solvents, oils, and aqueous/acid materials. Polychlorinated biphenyls have been detected. In addition, the site is close to a school and several houses.

Some cleanup activities are currently being funded by a generator and a $50,000 Superfund Emergency Removal grant.

HRS: 35.95

Population threatened: 731

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

SKINNER LANDFILL
West Chester, Ohio

Skinner Landfill, West Chester, Ohio, was never licensed. It is located at 8750 Cincinnati-Dayton Road on a ridge, approximately thirty feet above the East Fork of Mill Creek. The facility contains approximately 100 drums of a variety of organic, chlorinated organic, and heavy metal substances. There is also a lagoon once used to dispose of similar bulk wastes. The owner of the facility has indicated that old demolition bombs were disposed of on-site as well. The facility was closed in the early 1970s.

Although there have been no observed releases, the potential for contamination of private drinking water wells and surface water exists.

HRS: 30.23

Population threatened: 400

Aquifers threatened: 1

Surface waters threatened: 0

Index number on map: ______

WMD/RRB/ATT B-97

SUMMIT NATIONAL

Deerfield, Ohio

Summit National, located near Deerfield in Portage County, Ohio, is an 11-acre facility that operated as a liquid waste incinerator from late 1972 to March 1978. During this period, approximately 60 companies sent a wide variety of hazardous wastes to the facility. At the time the facility was closed, an estimated 16,000 drums and 300,000 gallons of bulk wastes remained on site.

Surface runoff from the facility threatens to contaminate the Berlin Reservior, a backup water supply for the city of Youngstown. Groundwater and soils had also been contaminated.

The U.S. Environmental Protection Agency spent $180,000 in October 1980, under section 311 of the Clean Water Act, to remove C-56-contaminated material which threatened the Berlin Reservior. Between February 1980 and January 1981, the State of Ohio spent $788,000 to control on-site pollution and to minimize public health hazards. In November 1981, a settlement was reached between the State and a number of potentially responsible parties to finance a $2.4 million cleanup of the materials stored on the surface.

This site was on the Interim Priority List of 160 sites.

HRS: 52.28

Population threatened: 350

Aquifers threatened: 1

Surface waters threatened: 2

Index number on map: ______

VAN DALE JUNKYARD
Marietta, Ohio

The Van Dale Junkyard is located 1.5 miles northeast of the city of Marietta, Ohio, on Route 5, just off County Road 83. The licensed junkyard, covering about 10 acres, is on a ridge near Duck Creek, a tributary to the Ohio River. In addition to nonhazardous solid wastes, hundreds of drums containing waste dyes and organic chemicals were disposed of there. As a result of the facility's geology and poor management practices, the stream, sediments, and an adjacent marshy area are contaminated. Additionally, the potential exists for contamination of local private groundwater wells.

HRS: 28.73

Population threatened: 15,300

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

WMD/RRB/ATT B-99

ZANESVILLE WELL FIELD

Zanesville, Ohio

The Zanesville Well Field, located northeast of Zanesville, Ohio, on the eastside of the Muskingum River, is the water source for the City. In late 1981, the Ohio Environmental Protection Agency (EPA) found that three of the thirteen production wells had elevated levels of chemical contaminants. A groundwater study conducted by the U.S. Environmental Protection Agency during the summer of 1981 confirmed the the presence of trichloroethylene (TCE) as a primary contaminant and lesser concentrations of dichloroethylene and chloroform. The three contaminated wells, located at the southern end of the well field, have been taken out of service.

After organics were identified in Zanesville's water supply, the City began flushing the system to remove contaminants remaining in the water lines. By August 1982, the three wells which contained high levels of TCE were still not in use, but were being continually pumped in an effort to reduce the contamination and prevent further migration into the well field. A nearby production well was also not in use because of the danger of contamination. At that time, the City had eight wells in service to supply 5.3 million gallons. All of the wells were used each day on an alternating basis.

To remedy the situation, the city initiated a regular monitoring program at the site. A neighboring industry hired a consultant to pinpoint any unknown sources of contamination and evaluate remedial alternatives.

HRS: 28.90

Population threatened: 36,400

Aquifers threatened: 1

Surface waters threatened: 1

Index number on map: ______

Attachment A: Toxic Substances Overview

Region V's activities under TSCA fall within two main areas--inspecting facilities for compliance with regulations developed under the TSCA and identifying emerging problems which may be multi-media in nature and/or for which there may be no regulatory authority. Specifically, inspections are being conducted for the polychlorinated biphenyl (PCB) compliance program, chlorofluorocarbon (CFC) compliance program, dioxin compliance program, asbestos in schools program, and premanufacture notification (PMN) and test marketing exemption (TME) activities. Since Region V is a heavily industrialized area, numerous facilities which use equipment containing PCBs, which manufacture chemicals and pesticides, or which use CFCs are present. In addition, about one fifth of the total population of the United States reside in Region V. This means that not only are there many potential sources of toxic substances in the Region, but there are also many human receptors whose health could be adversely effected from exposure to toxic substances.

1. PCB Compliance Program

The following table includes the breakdown by State of the number of inspections conducted since 1978, when the PCB complaince program was initiated. This number includes inspections completed by EPA contractors and State inspectors. The number of facilities found to be in compliance and in noncompliance is also indicated. The table also illustrates the types of enforcement actions taken for those facilities found to be in violation of the PCB regulation, as well as the number of compliance letters issued to those facilities found to be in compliance:

TABLE

PCB COMPLIANCE PROGRAM*

Inspection Information	IL	IN	MI	MN	OH	WI	TOTAL
Number of inspections	163	71	139	36	243	104	757
Number in compliance	95	24	52	12	85	52	320
Number in noncompliance	59	44	74	18	97	51	343
Closeout Actions							
Compliance letters issued	75	18	41	8	59	48	249
Notices of noncompliance issued	22	7	11	3	13	12	68
Voluntary compliance letters issued	8	9	17	2	15	5	56
Civil administrative actions (Complaints) issued	21	11	9	6	25	17	89
Consent agreements issued	13	5	3	2	20	9	52

*Numbers in columns may not add up due to status unknown for cases under development (NNCs and CAAs under development) or inspections conducted but report not complete.

In addition, Pilot PCB Enforcement Cooperative Agreements have been awarded to the States of Michigan and Ohio. Under these agreements, State inspectors are conducting inspections to determine compliance with the Federal PCB regulations. These programs have resulted in an increase in the number of facilities inspected, as well as an increase in follow-up actions. No States in Region V, other than Michigan and Ohio, have enforcement programs aimed at PCBs.

The number of facilities that still need to be inspected is estimated to be 8,000. This estimate was made from a computer printout listing facilities by SIC codes, which are associated with possible PCB usage.

In selecting sites for PCB inspections, the following references are used:

Monsanto PCB purchaser list
Manufacturers/Industrial Directory Guide
List of Utilities
Referrals from States, other Federal agencies, etc.
Complaints and spill reports

2. Dioxin Compliance Program

In 1980, regulations were promulgated regarding disposal and storage of wastes contaminated with tetrachlorinated dibenzo-p-dioxin (TCDD), which is highly toxic. Under these regulations wastes from manufacturing or processing trichlorophenol or its derivatives are presumed to be contaminated with TCDD unless chemical analysis indicates that TCDD is not present. Twenty dioxin compliance inspections were conducted in Region V in FY '82. This was the first year during which dioxin inspections were conducted. These inspections, which covered about half of the manufacturers subject to the regulation, were conducted to document the manufacturers' storage and disposal practices.

The final list for those facilities which may be subject to the Dioxin Waste and Disposal Regulations under TSCA has not yet been made available to the Region. The preliminary list that was prepared for the first group to be inspected was compiled from printout information relating to manufacturers and processors of 2,4,5-trichlorophenol or its pesticide derivatives. Inspections have been conducted at all 20 manufacturers or processors that were identified on the Region V preliminary list.

3. Asbestos in Schools Program

The asbestos in schools program requires that schools be inspected and if asbestos is found, school staff and parents of students must be so notified. This regulation does not require that corrective action be taken. Of the 23,757 schools in the Region, 20,900 were inspected for friable asbestos-containing materials as of November 1982. These records also show that of those schools inspected, 2,377 schools required corrective action. Of that number, 901 schools have taken steps to eliminate or control exposure to asbetos. EPA estimates that 389,567 children attending those schools are no longer exposed to hazardous asbestos materials. With the enactment of the Final Asbestos Inspection Rule on May 27, 1982, all six States within Region V have actively participated with the Regional Office to achieve a 100% inspection rate by June 28, 1983.

At one time, Congress passed a law to provide partial funding grants and/or low-interest loans for inspection and corrective actions. However, this was never funded. Because of the lack of funding, many schools have not yet taken corrective action. As indicated, Region V estimates that more than 954,000 children attended schools in Region V in which friable asbestos has been identified. Although approximately 390,000 school children have had their level of exposure to asbestos reduced due to corrective actions by the school, this is only 40% of the students in the Region.

The following table summarizes the status of the Asbestos in Schools Program for each of the six States in Region V, as of November 1, 1982:

TABLE

ASBESTOS IN SCHOOLS PROGRAM

A. Public Schools

	IL	IN	MI	MN	OH	WI	(12/1/82) TOTALS
Total number of public schools	4214	2096	3935	1807	4157	2221	18,430
Public schools inspected to date	4199	2096	3796	1672	3990	1534	17,287
Public schools which need corrective action	462	159	161	260	400	250	1,692
Corrective action taken to date	216	10	97	55	361	15	754
Number of children exposed to asbestos	218387	75159	76105	22902	189080	118175	799,808
Number of children not exposed to asbestos due to corrective action	102103	4730	45852	25996	170645	7091	356,417

B. Non-Public Schools

	IL	IN	MI	MN	OH	WI	TOTALS
Total number of non-public schools	1361	496	1022	552	936	960	5,327
Non-public schools inspected to date	1068	496	775	301	481	492	3,613
Schools which need corrective action	300	20	60	70	75	160	685
Corrective action taken to date	75	5	20	12	20	15	147
Number of children exposed to asbestos	67650	4510	13560	15785	16913	36080	154,468
Number of children not exposed to asbestos due to corrective action	16913	1128	4510	2706	4510	3383	33,150

The list of private and public schools was obtained from individual State Board of Education directories; reference for State school enrollment was the National Center for Education Statistics, Statistics of Public Elementary and Secondary Day Schools, 1977-1978 school year and Survey of Nonpublic Elementary and Secondary Schools, 1976-1977.

4. CFC Compliance Program

In 1979, the National Academy of Science estimated that CFCs could cause a 15%-18% reduction of the stratospheric ozone layer by late in the next century. More recently, based on stratospheric ozone models, that figure has been reduced to 5%-9% (Chemical Week, Nov. 1982). It is predicted that a reduction in the stratospheric ozone layer will allow higher levels of biologically damaging ultra violet radiation to reach the Earth's surface, resulting in increased rates of cancer, especially skin cancer, change the climate, and produce other adverse effects. Chlorofluorocarbon release may also affect the climate by increasing infrared absorption in the atmosphere.

CFCs are used in air-conditioners, refrigerators, freezers, industrial solvents, the manufacturing of plastic foam products, and as propellants in aerosol spray products. Approximately 750 million pounds of CFCs were produced in the United States in 1979. Worldwide production of the two major types of CFCs, in 1978, was 2 billion pounds. Effective December 15, 1978, the EPA, under TSCA, banned manufacturing CFCs for use as aerosol propellants, except for specific essential uses. Since that time the use of CFCs as an aerosol propellant has dropped considerably. However, Region V has an active CFC inspection program to monitor aerosol propellant uses of CFCs by known processors. Forty-five facilities have been inspected for compliance with the CFC exempted use requirements.

REGION V ENVIRONMENTAL MANAGEMENT REPORT

ATTACHMENT A

Water

Materials used to develop the Water medium portion of this report are attached. Documents used, which are in Regional and/or Headquarter's files, are referenced in the following list.

Environmental Assessment and Strategy, Region V (March, 1981)

305(b) Reports (from each State)

State Water Quality Management Reports

Lake Classification Studies (Michigan, Minnesota, Wisconsin)

STORET Data (1980 & 1981)

GICS - Region V

The Nation's Water Resources, 1975 - 2000 (Volume 3, Appendix V)

Ohio River Basin Study (1969)

Upper Mississippi River Comprehensive Basin Study

WATER QUALITY INDEX

The Water Quality Index (WQI) is an aggregation of a standardized set of 80 parameters and associated criteria which provides a means for measuring and comparing water quality status to Federal water quality goals (fishable/swimmable). The WQI compares measured water quality with recommended fishable/swimmable Federal water quality goals.

The data used to make the comparisons comes from various Federal, State and Local agencies and are stored in the STORET data base. An overall WQI number is calculated for every selected water quality sampling station with sufficient data. The WQI number for a station (calculated monthly) is an aggregation of subindices for ten pollution categories which are weighted by the relative severity of criteria exceedances for each group.

The WQI number for a station spans a scale that may run from "0" (no measured evidence of pollution) to a maximum of "100" (severe pollution in most criteria/parameter groups at all times). Based on professional judgement as to the significance of the WQI values and known water quality status, the entire scale of 0 to 100 is divided into three ranges.

0 to 20 — Indicates streams or pollution categories which have no pollution or are minimally polluted and are considered to meet the fishable/swimmable goals.

20 to 60 — Indicates streams or pollution categories which are intermittantly and/or moderately polluted and are considered marginal with respect to the fishable/swimmable goals.

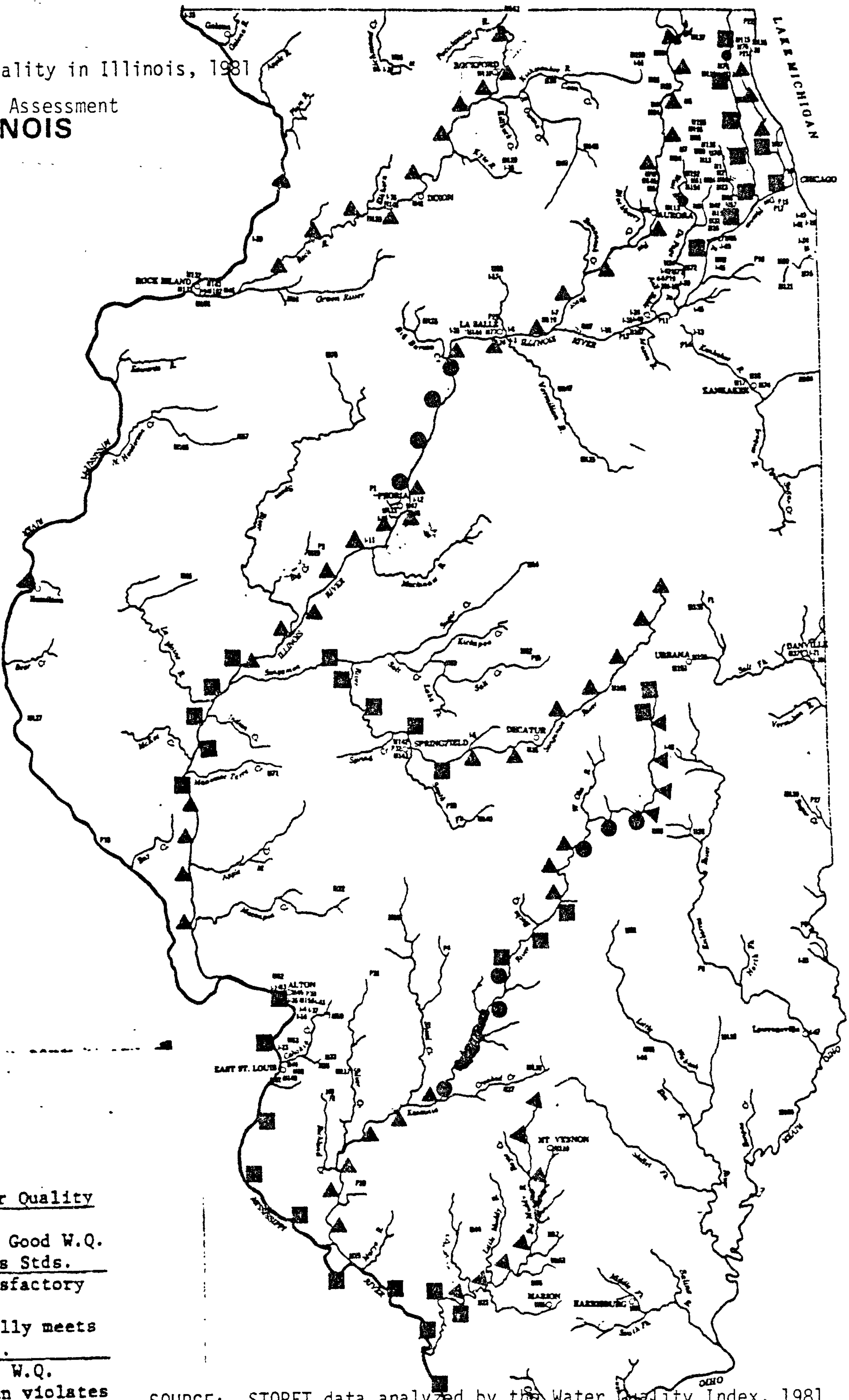
60 to 100 — Indicates streams or pollution categories which are severely polluted and are considered unacceptable with respect to the fisable/swimmable goals.

The ten categories and their associated parameters are summarized in the following table.

WQI POLLUTION CATEGORY	WQI COMPONENT PARAMETER GROUP
1. TEMPERATURE	STREAM TEMPERATURE
2. OXYGEN	DISSOLVED OXYGEN DISSOLVED OXYGEN % SATURATION
3. PH	PH
4. BACTERIA	FECAL COLIFORM TOTAL COLIFORM
5. TROPHIC	CHLOROPHYLL - A NITROGEN & TOTAL PHOSPHOROUS NITROGEN & ORTH PHOSPHOROUS NITROGEN & DISSOLVED ORTHO PHOS
6. AESTHETIC	TURBIDITY OIL AND GREASE PHENOL TAINTING
7. SOLIDS	DISSOLVED SOLIDS CONDUCTIVITY SUSPENDED SOLIDS
8. RADIATION	ALPHA RADIOACTIVITY BETA RADIOACTIVITY
9. ORGANIC TOXICITY	PESTICIDES HERBICIDES PCB'S
10. INORGANIC TOXICITY	HEAVY METALS CYANIDE AMMONIA TOTAL DISSOLVED GAS % SATURATION

Figure
Water Quality in Illinois, 1981

Chemical Assessment



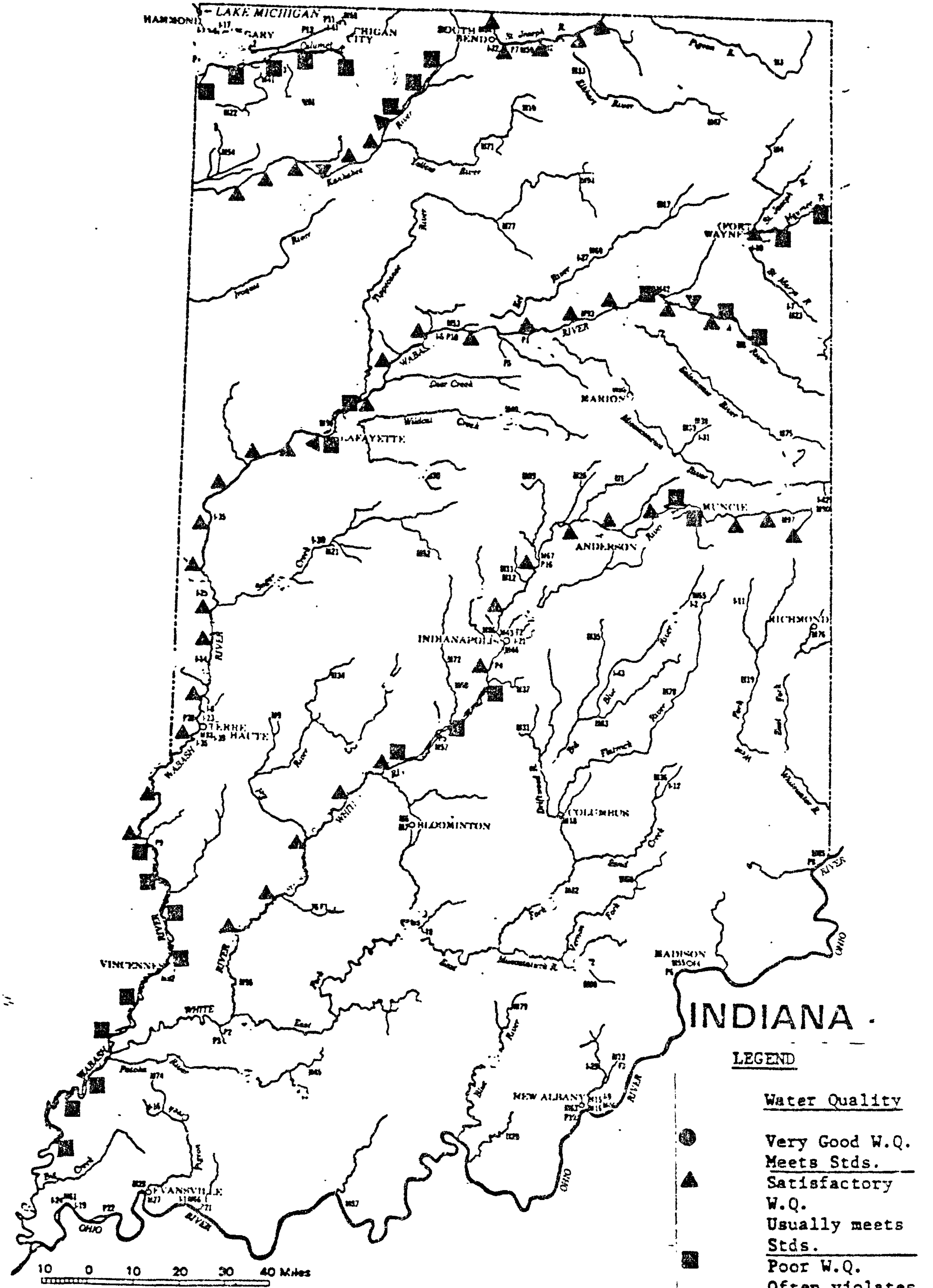
LEGEND

Water Quality

- ● Very Good W.Q. Meets Stds.
- ▲ Satisfactory W.Q. Usually meets Stds.
- ■ Poor W.Q. Often violates Stds.

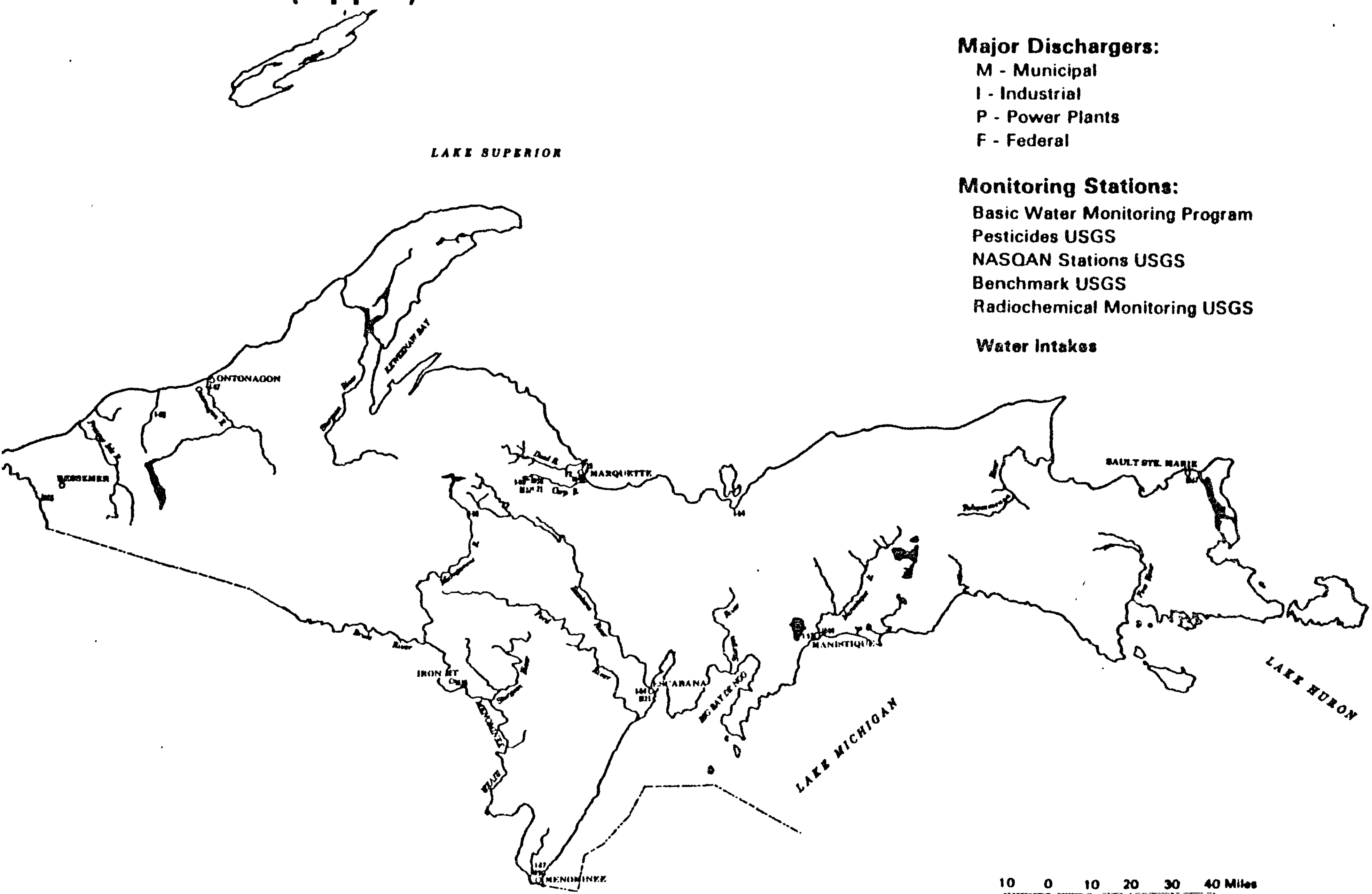
SOURCE: STORET data analyzed by the Water Quality Index, 1981

Figure Water Quality in Indiana, 1981 Chemical Assessment



SOURCE: STORET data analyzed by the Water Quality Index, 1981

MICHIGAN (Upper)



Major Dischargers:
- M - Municipal
- I - Industrial
- P - Power Plants
- F - Federal

Monitoring Stations:
- Basic Water Monitoring Program
- Pesticides USGS
- NASQAN Stations USGS
- Benchmark USGS
- Radiochemical Monitoring USGS

Water Intakes

NO AMBIENT MONITORING STATIONS ARE LOCATED IN THE UPPER PENINSULA OF MICHIGAN

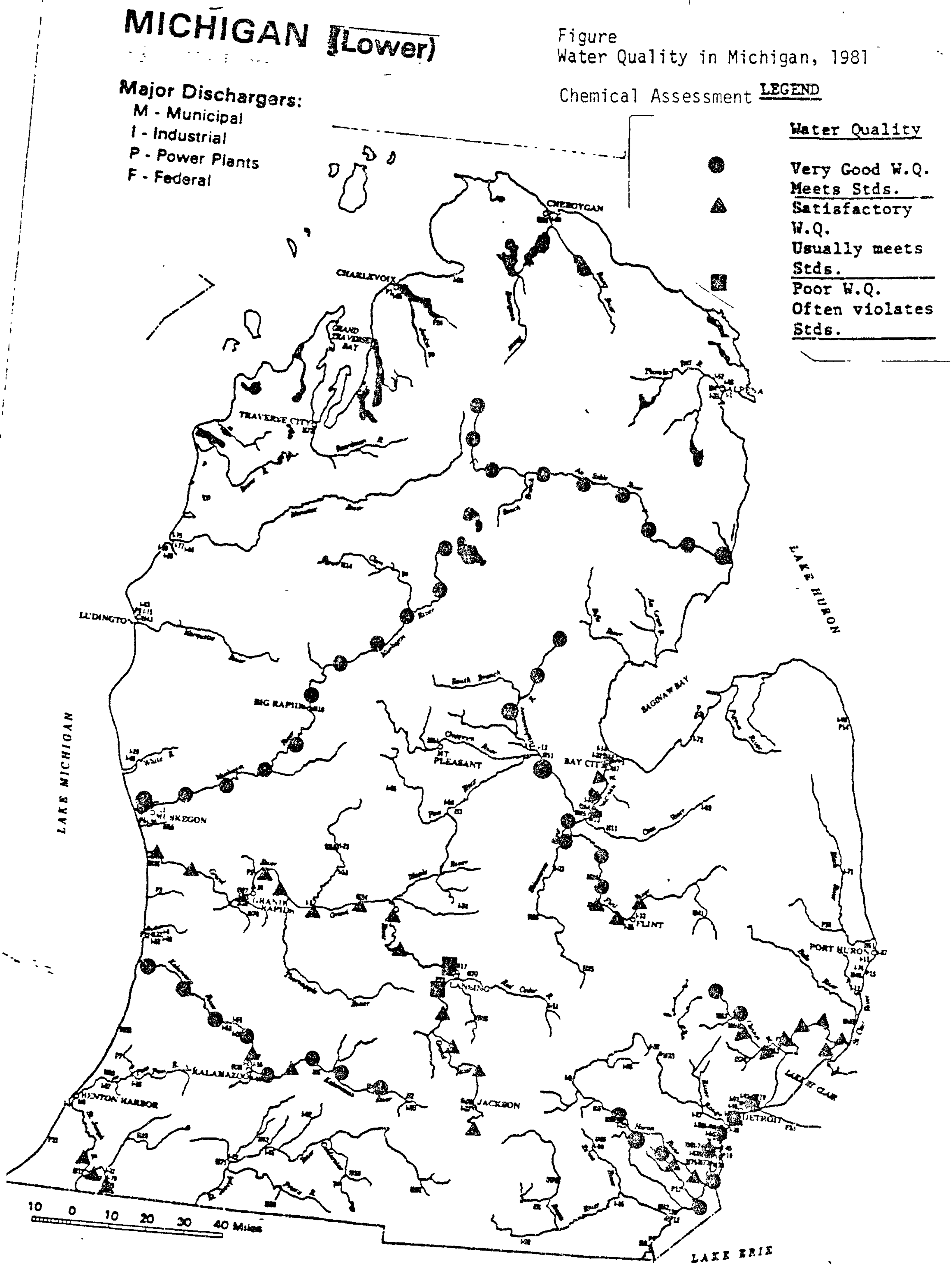


Figure
Water Quality in Michigan, 1981

Chemical Assessment LEGEND

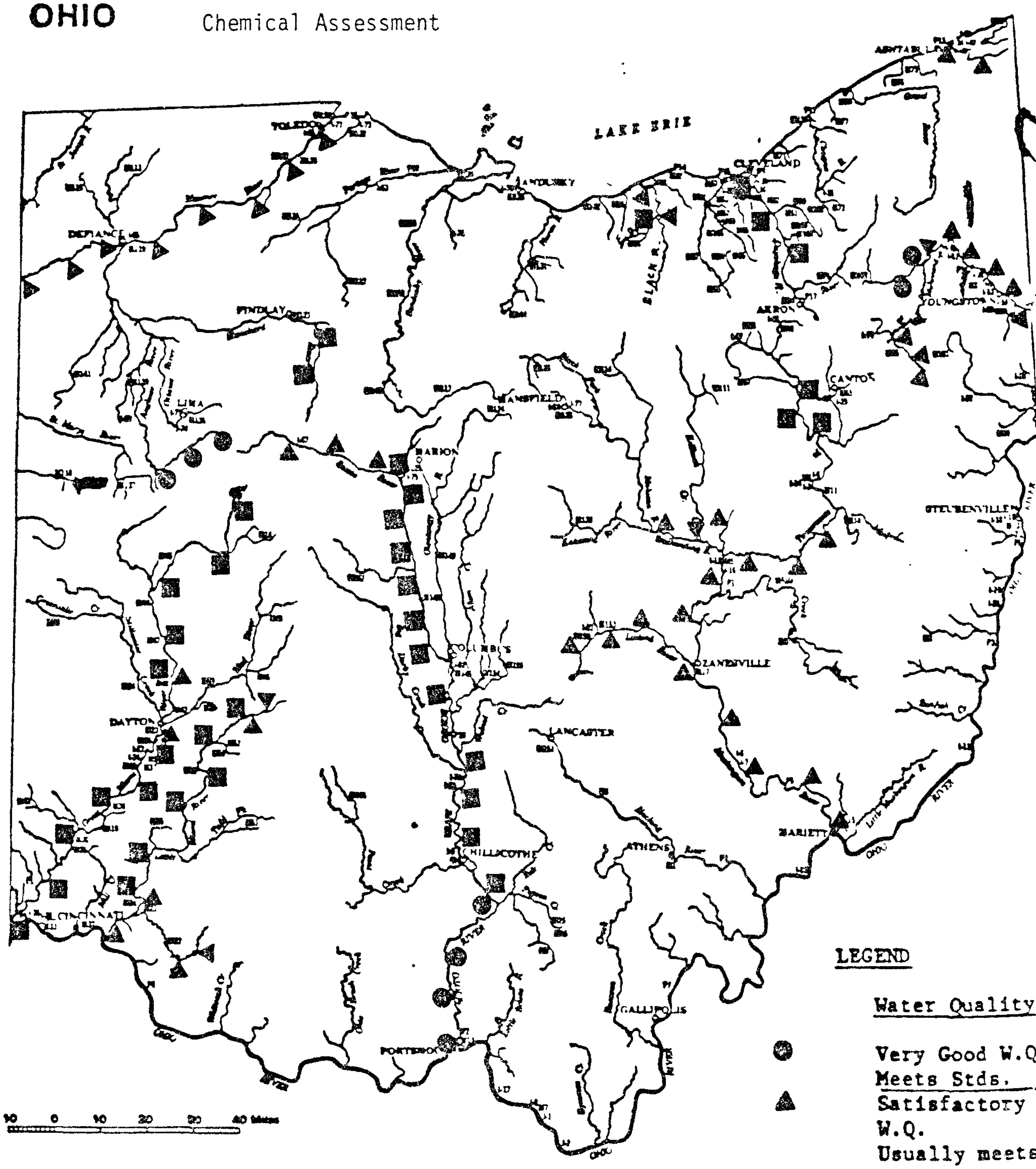
Water Quality

- ● Very Good W.Q. Meets Stds.
- ▲ Satisfactory W.Q. Usually meets Stds.
- ■ Poor W.Q. Often violates Stds.

Figure
Water Quality in Ohio, 1981

OHIO

Chemical Assessment



LEGEND

Water Quality

● Very Good W.Q. Meets Stds.

▲ Satisfactory W.Q. Usually meets Stds.

■ Poor W.Q. Often violates Stds.

SOURCE: STORET data analyzed by the Water Quality Index, 1981

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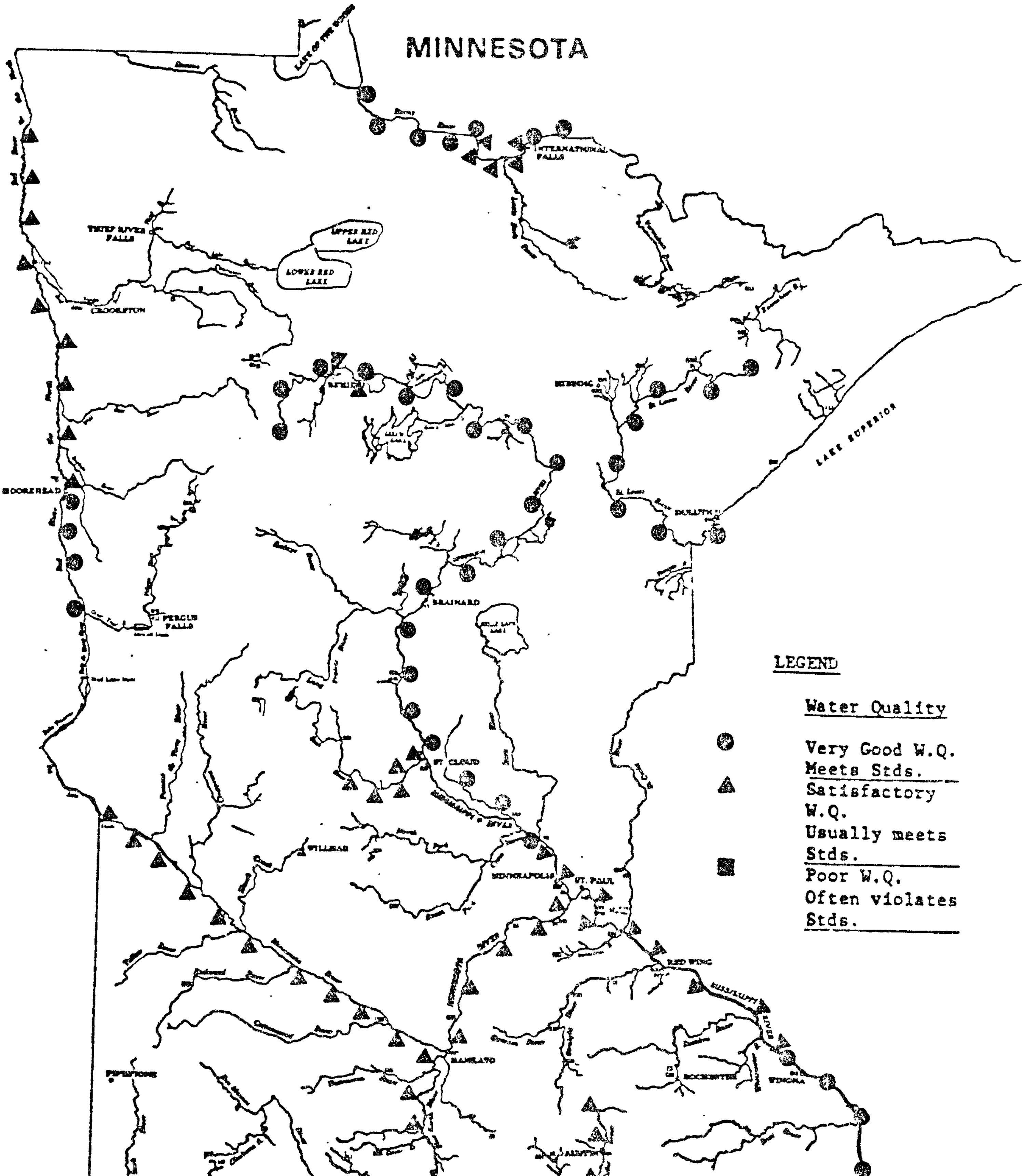
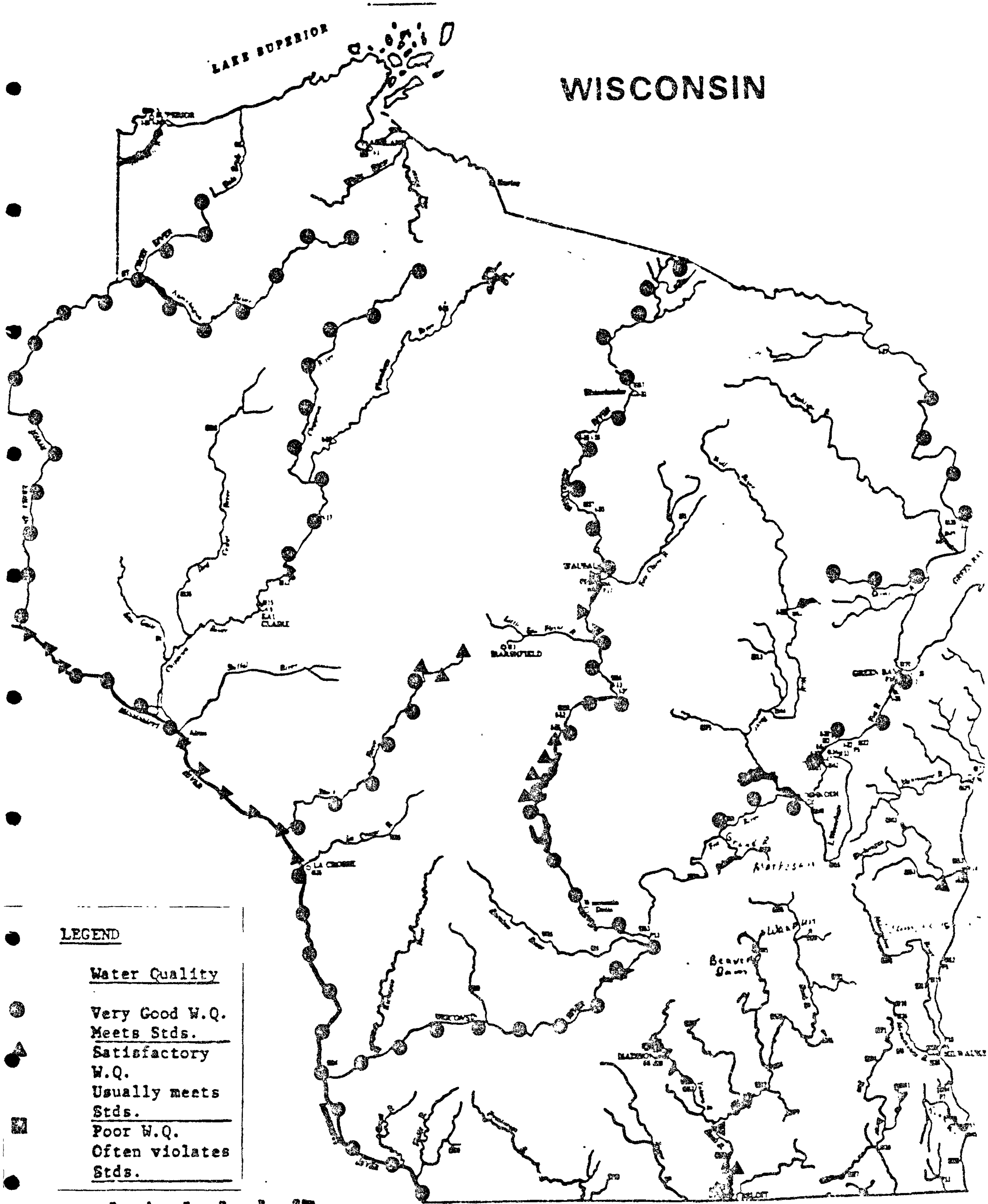
Figure
Water Quality in Minnesota, 1981

Chemical Assessment



SOURCE: STORET data analyzed by the Water Quality Index, 1981

Figure 187
Water Quality in Wisconsin, 1981 Chemical Assessment



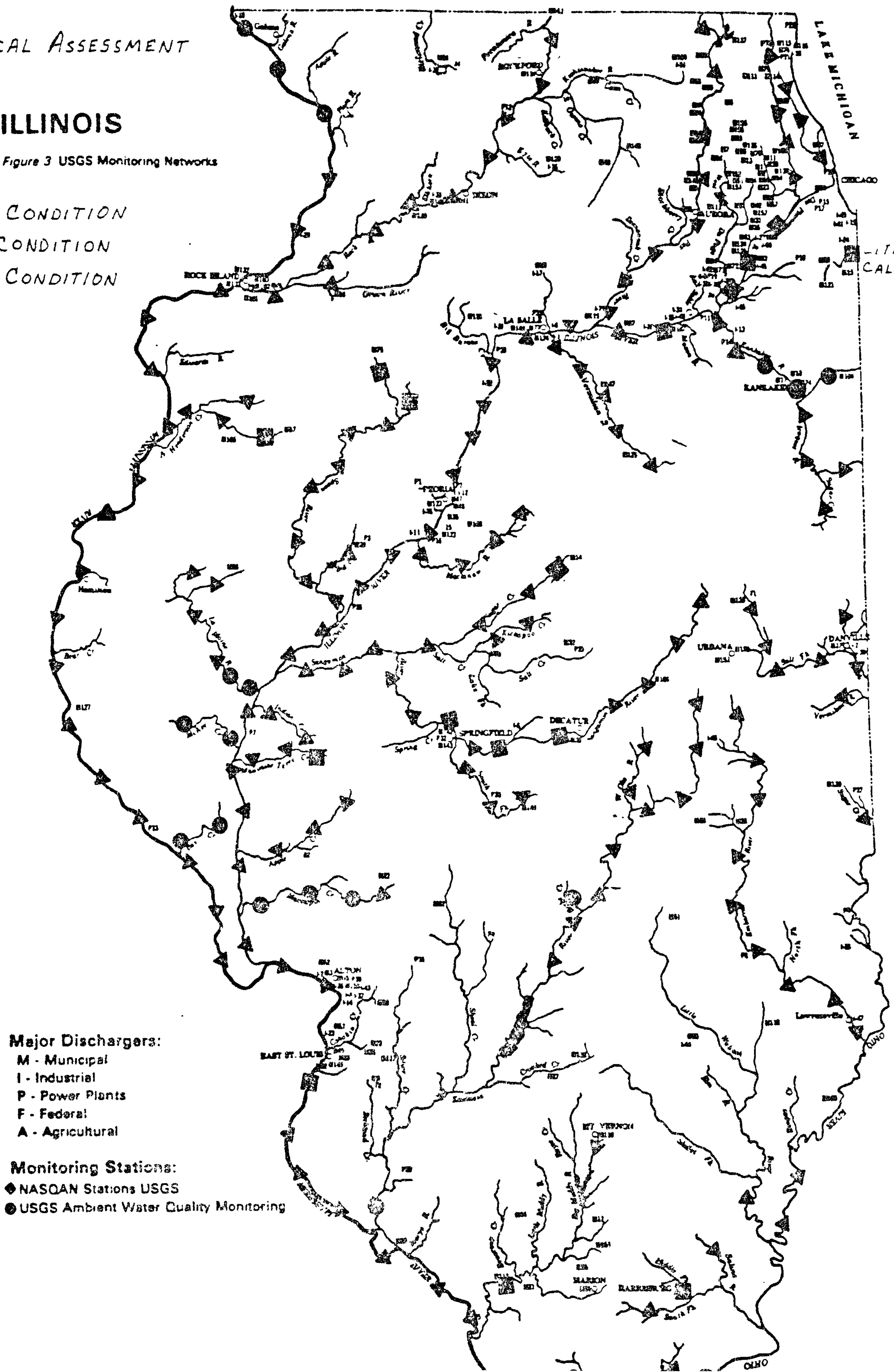
SOURCE: STORET data analyzed by the Water Quality Index, 1981

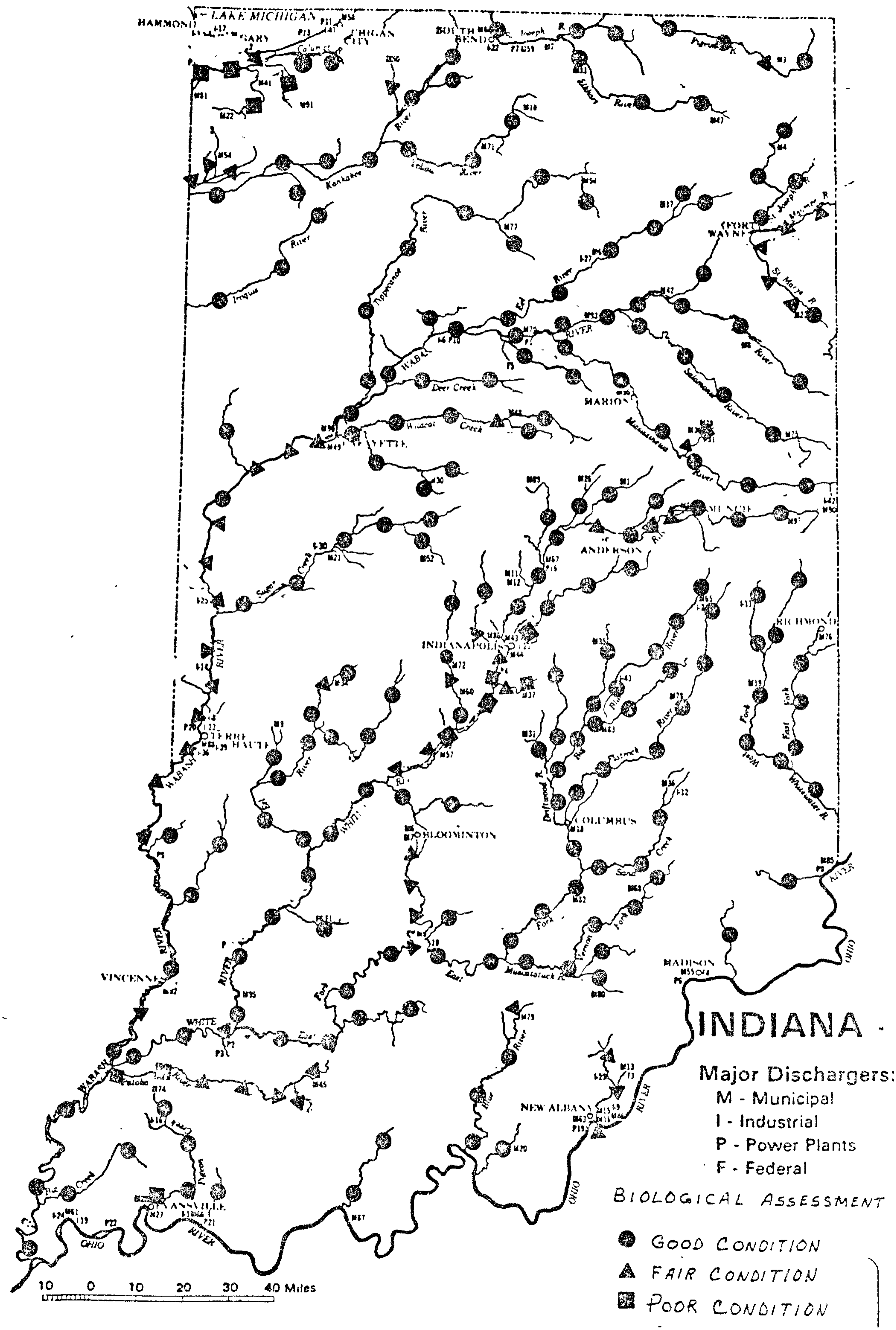
BIOLOGICAL ASSESSMENT

ILLINOIS

Figure 3 USGS Monitoring Networks

- ● GOOD CONDITION
- ▲ FAIR CONDITION
- ■ POOR CONDITION




LAKE MICHIGAN
HAMMOND
GARY
SOUTH BEND
FORT WAYNE
MARION
LAFAYETTE
MUNCIE
ANDERSON
INDIANAPOLIS
RICHMOND
TERRE HAUTE
BLOOMINGTON
COLUMBUS
VINCENNES
MADISON
NEW ALBANY
EVANSVILLE
Kankakee
Iroquois River
Tippecanoe River
WABASH RIVER
Eel River
Deer Creek
Wildcat Creek
Sugar Creek
Mississinewa River
Salamonie River
WHITE RIVER
Driftwood R.
Flatrock
Sand Creek
Muscatatuck R.
Whitewater R.
Elkhart River
St. Joseph R.
St. Marys R.
Patoka River
Blue River
OHIO RIVER
INDIANA
Major Dischargers:
M - Municipal
I - Industrial
P - Power Plants
F - Federal
BIOLOGICAL ASSESSMENT
GOOD CONDITION
FAIR CONDITION
POOR CONDITION
10 0 10 20 30 40 Miles

190 1

SPINE

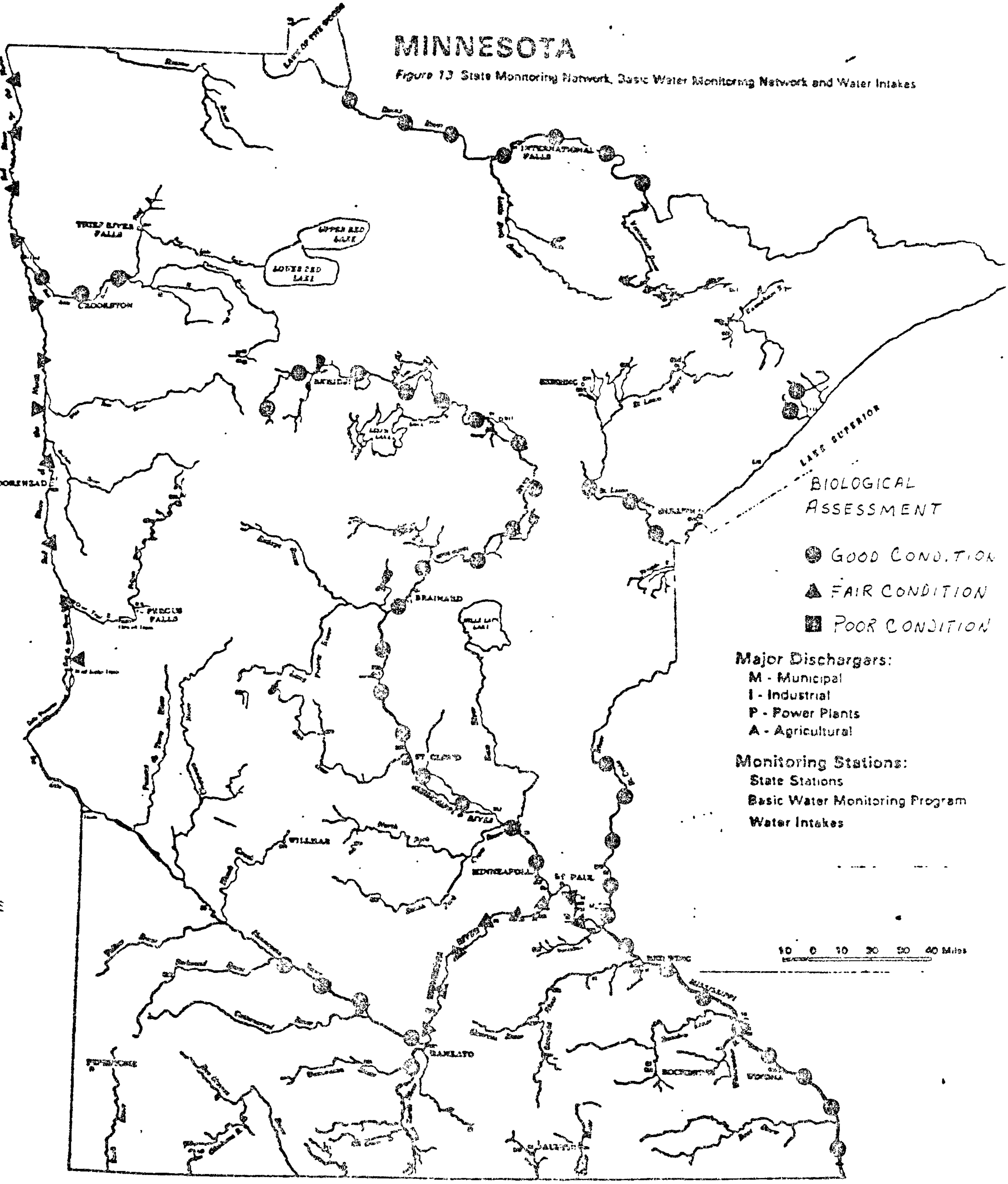


Figure 13 State Monitoring Network, Basic Water Monitoring Network and Water Intakes

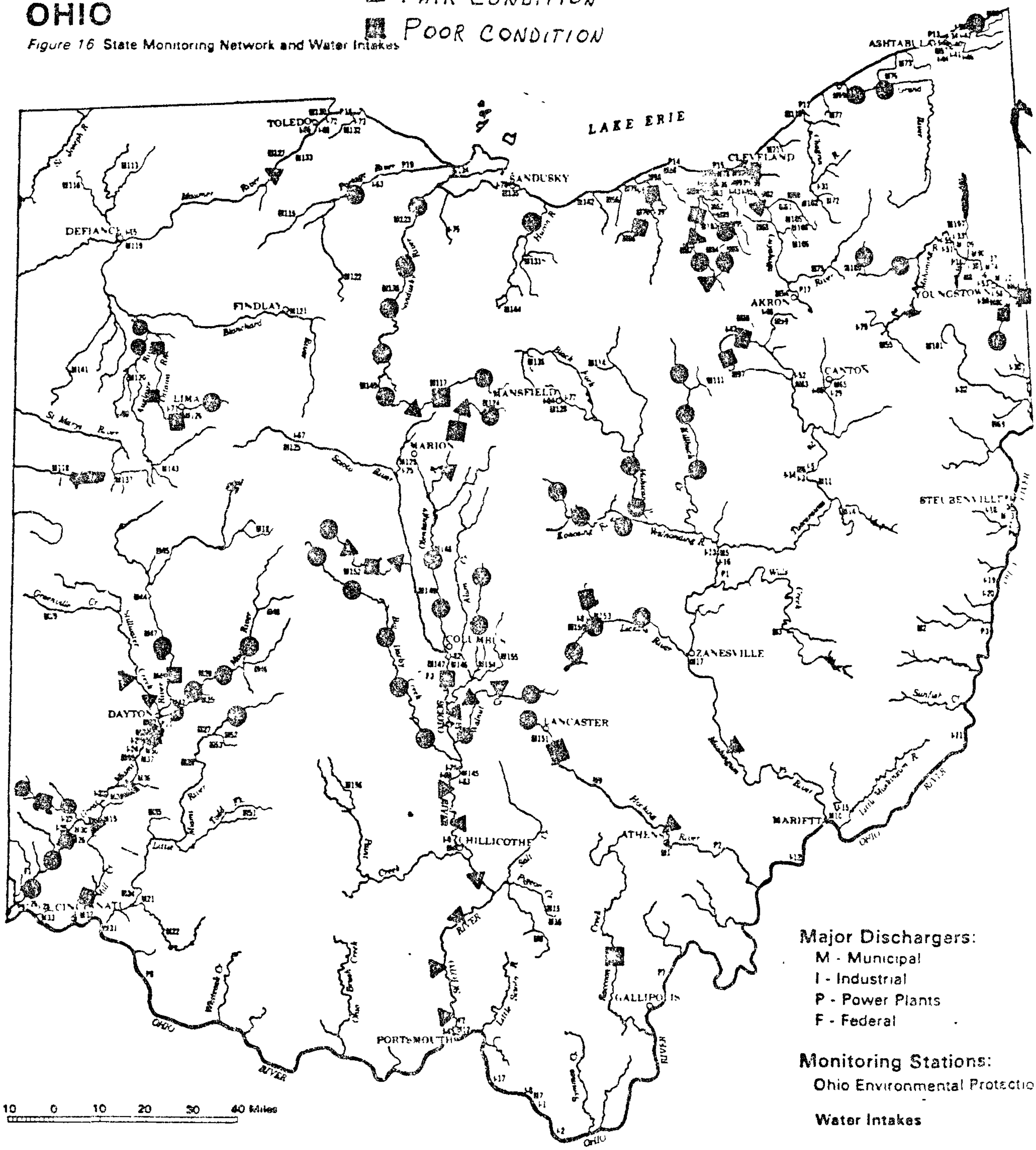
FOLD

BIOLOGICAL ASSESSMENT

GOOD CONDITION
FAIR CONDITION
POOR CONDITION

OHIO

Figure 16 State Monitoring Network and Water Intakes



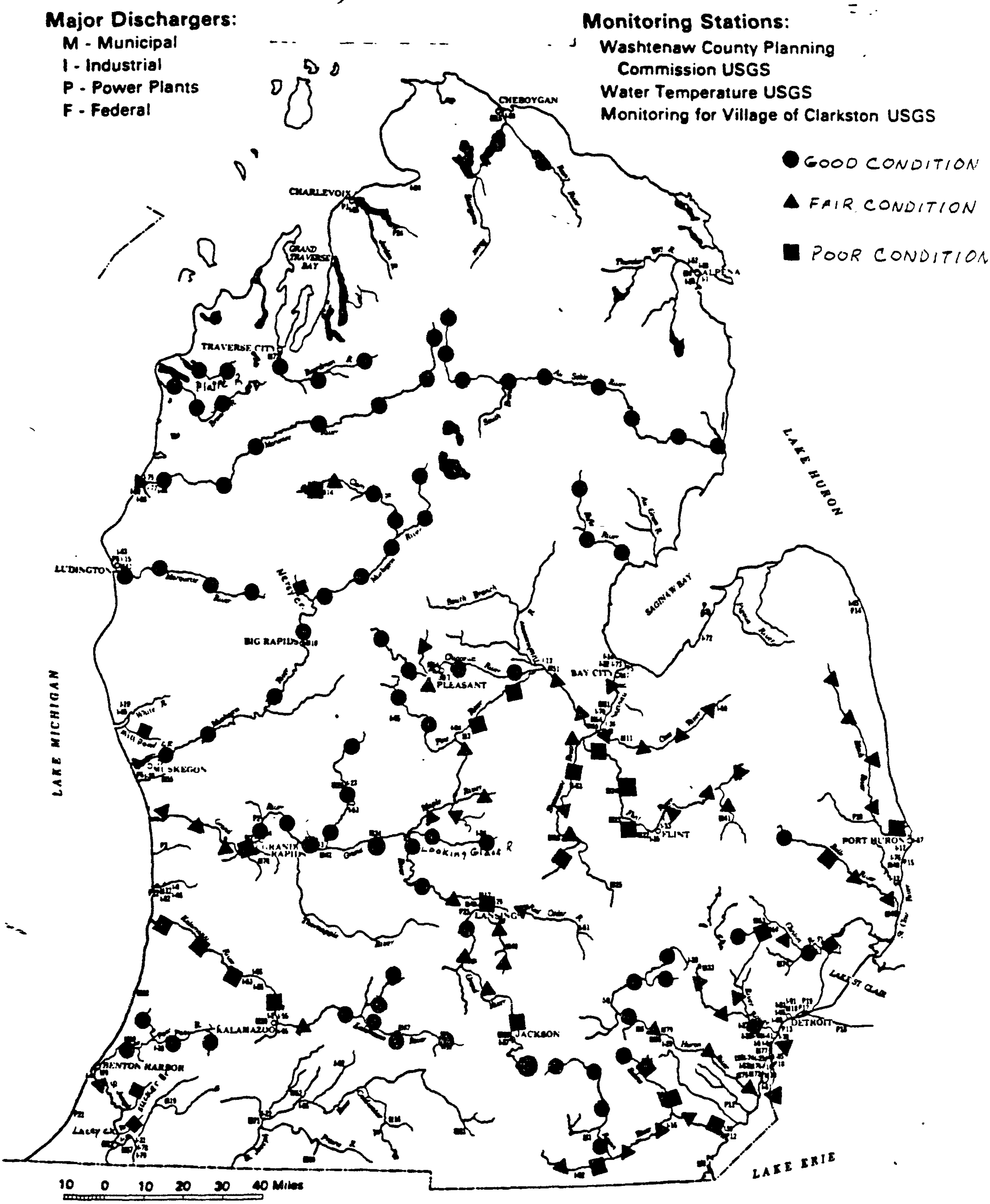
SPINE

SAME SIZE - 11 INCHES

MICHIGAN (Lower)

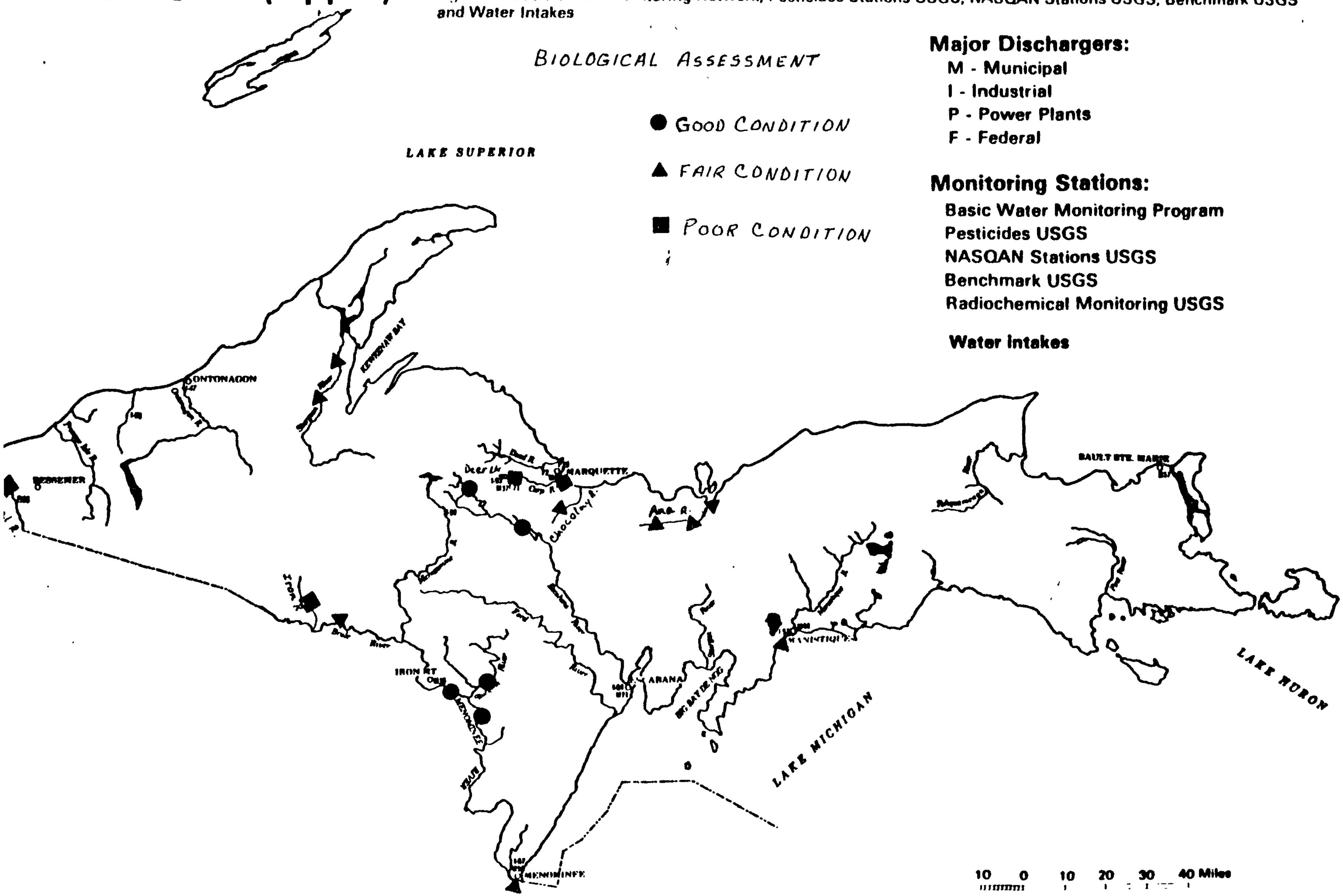
Figure 11: USGS Monitoring Networks

BIOLOGICAL ASSESSMENT



MICHIGAN (Upper)

Figure 8 Basic Water Monitoring Network, Pesticides Stations USGS, NASQAN Stations USGS, Benchmark USGS and Water Intakes



Water Toxics

The need for evaluation and control of toxicants has received attention in recent years impart because of the organic chemical contamination of fish and other aquatic life and resulting mammal contamination. Sport and commerical fishing bans or advisories resulted from DDT and PCB in Lake Michigan from mercury in Lake St. Clair and other lakes in Illinois, Minnesota and Wisconsin, from PCB in the Fox, Wabash, Sheboygan, Mississippi and other rivers, etc. Mink were made sterile from eating large diets of Lake Michigan fish, significant levels of dioxins, PCB, dibenzofurans, etc., has been identified in fish eating birds in Green Bay and Saginaw Bay areas. Only recently have the States or EPA significantly started to analyze fish for organic contaminants other than a few pesticides. As an example, a recent analyses of 25 carp from the Ashtabula River found 3.4 ug/g octachlorostyrene and 2.6 ug/g tetrachloroethane.

Until relatively recently little attention was paid to industrial discharges to municipal treatment plants. Upon preliminary investigation Region V States found many POTWs where heavy metals or organic toxicants passed-through the treatment plant to cause water quality problems or significantly contaminated the sludge. Over 100 POTWs have been identified by the States as having known significant sludge contamination. Sludge contamination is particularly a problem where open distribution to the public or to food crop farms occurred. Examples of recent or continuing problems follow:

Facility	Cadmium (ppm)	Lead (ppm)	PCB (ppm)
Aurora, IL	122		
Elgin, IL	26-14, 473		
Goshen, IN	805	676	
Auburn, IN	75	478	49
Vincennes, IN	20	28,200	
Baraboo, WI	131-304	486-548	
Gillett, WI	356	3,138	
Gallion, OH	390-2, 500	120-402	
Columbus (JP), OH	65-162	656-1,000	
Bryan, OH	110-310	580-1,900	

In the last several years the States and EPA have been more active in identifying, evaluting and, where needed, controlling the discharge of industrial toxicants to municipal treatment systems that may interfere with operation of plant, contaminate sludge or cause water quality violations. The States and EPA have conducted detailed evaluations to determine which POTW's should develop pretreatment programs. The evaluations utilized information on known water quality problems, sludge contamination, interference with treatment plant operation and type of industry discharging to the POTW. Presently 508 POTWs (IL-92, IN-83, MI-122, MN-63, OH-132 and WI-24) are developing evaluation and/or control programs.

The control of toxicants, particularly those that are persistent, is becoming the central focus of the Region and States. While our understanding, and in large part control, of conventional and a few toxicants has reached a desirable level, our understanding of and addressing of the broad range of toxicants is just beginning. EPA and the States are just now focusing on the control of toxicants from continuing and previous discharges. As we improve our analytical capability and our ability to look more intelligently at those factors which damage human health and the environment we recognize the need to focus on toxicant pollutants. Our water media efforts must change to more adequately address toxicants discharged to municipal treatment systems, toxicants discharged directly by industry and those toxicants in municipal sludge or in sediment from previous industrial discharges.

Michigan and Indiana have recently worked to redevelop a fishery in the St. Joseph River (Lower Michigan) now that major water quality discharge problems from municipalities and industries have been resolved. Their work has included construction of fish ladders and planting of game fish to augment the tourist industry of the area. However, when an old mill race near South Bend was cleaned, toxicant contaminated sediments and old toxic waste drums were uncovered. This discovery has temporarily thwarted efforts to return the St. Joe as a viable asset to the local economy. High levels of PCBs and other organic and inorganic chemicals have recently been found in the Kalamazoo and other Rivers. In addition, toxicants such as polynuclear aromatic hydrocarbons (PAH) and other carcinogens in the Black River (Ohio), Indiana Harbor Canal and other waterways have accumulated in the sediments as a result of previous coke plant discharges. Similarly, the fish and wildlife service has found dioxin in birds from the Fox River (Green Bay). The dioxin may be from previous discharges of pentachlorophenol. It is becoming apparent that toxicant contamination of sediments is a pervasive problem. Sampling indicates that toxic contaminants are present in trace quantities in sediments of nearly every major river, lake and stream in the Region. In many areas, these contaminants are found at elevated levels.

The list of waterways known to have sediments containing levels of toxic contaminants is growing. Most of the existing data is on PCB and pesticide contamination. However, recent data includes some of the lesser known toxic contaminants. Continuing efforts will be needed to find, evaluate and control toxicants in sediments. The question is how extensive are these contaminated sediments and what efforts should we take to control or remove them. In some areas they may be below the present zone of biological activity and, therefore, not be a problem. However, they may in the future be reintroduced through scour when the stream changes its channel or when the stream is dredged.

While sediments constitute a continuing potential source of toxicants, perhaps the largest source of toxicants to the Region's waters (other than the Great Lake) is from municipal treatment plants. As stated separately, over 100 POTWs have been identified by the States as having significantly contaminated sludge and/or effluent toxicants. Between 450-500 POTWs are believed by the States to have toxicant problems or to have a high potential for toxicant problems. Prior to the pretreatment program most cities had conducted little if any work to evaluate what toxicants, particularly organic toxicants, are being discharged to their system or the fate of the toxicants.

Recent studies on the Ottawa River at Lima, Ohio, demonstrated that despite good operation of an advance waste treatment plant, the effluent was still toxic. Examination of this "high quality" system found that butylated hydroxy toluene (BHT) from a local industry was passing through the plant and causing toxicity in the receiving water. This is a typical example of what new work is revealing, though often the concern is with persistent long-term bioaccumulation or direct human health effect rather than immediate lethality. While the pretreatment program will address a number of the more obvious toxicant problems, particularly heavy metals, it is unrealistic to anticipate that most organic toxicants will be addressed. The lack of adequate evaluation is due to the reluctance of many States to look for problems. They seem to be either technically of politically unable or unwilling to deal with the issues. Fortunately, there is increasing recognition by the States of the need to realistically address these issues. However, for many States it will be in the "second round" of the pretreatment program, 2-5 years from now when increased public pressure forces the issue.

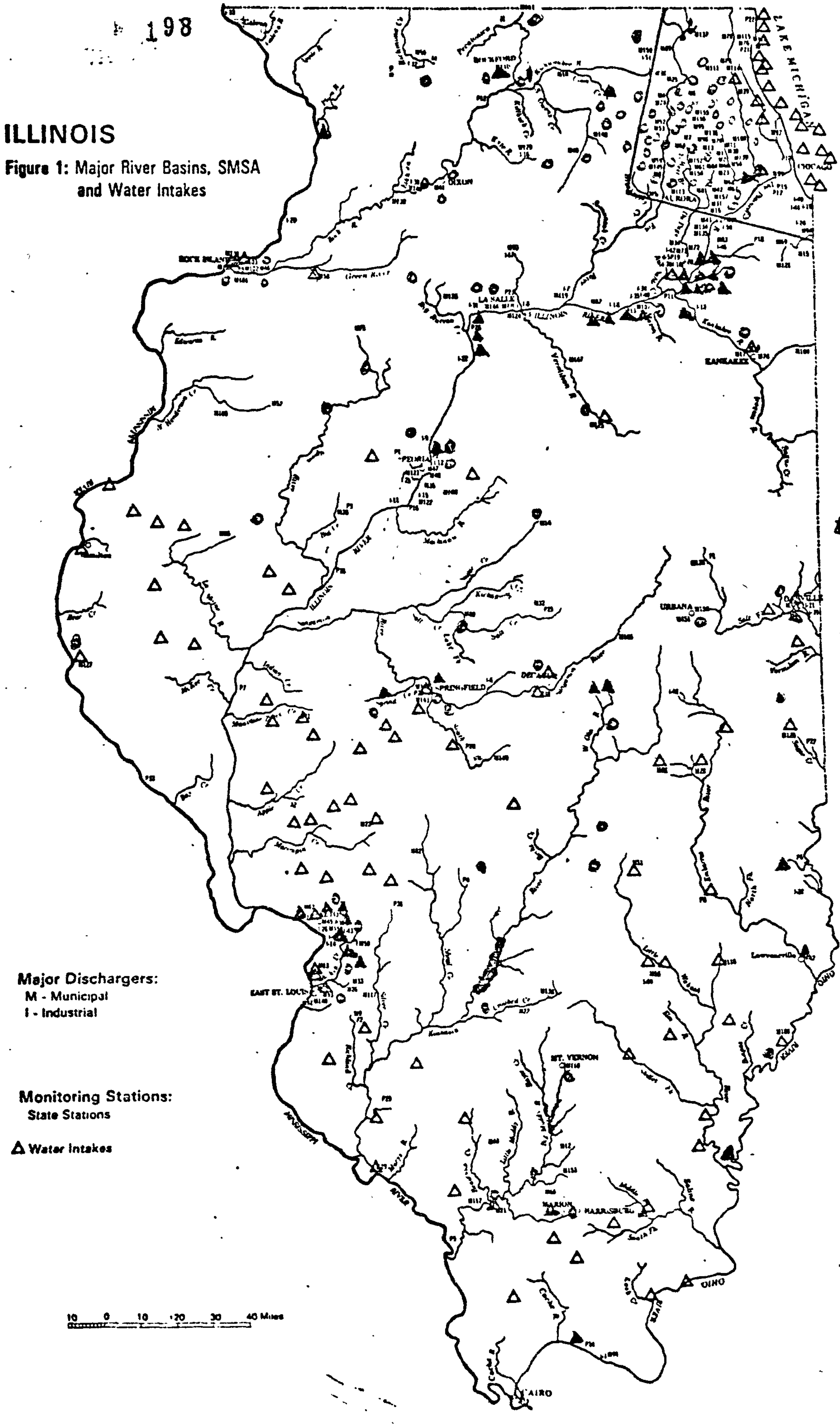
Just as there is increasing awareness of long-term toxicant problems from municipal/industrial discharges to the Region's waters, there is beginning to be an understanding of the problems with toxicants in municipal sludge. As mentioned previously, over 100 POTWs have been identified by the States as having significant sludge contamination. This contamination is from PCB, HCB, curine, and cadmium and other heavy metals. However, most POTWs have not conducted anen adequate evaluation of toxicants. In most cases neither EPA nor the States have adequate staff or skills to assist the POTWs. Similarly, most consultants assisting the POTWs are from civil engineering firms that lack expertise in chemical engineering and toxicology to address these issues. Also, many POTWs cannot address these issues because of pressure from local industries.

Sludge from many POTWs has been distributed to home gardners and to commercial agricultural operations with little if any control. This use of sludge is worthwhile and energy efficient but regulatory agencies must work with POTWs and industry to assure that adequate protection of public health is provided. In several areas, studies are needed to see if remedial measures are needed to control problems from indiscriminate distribution and use of sludge that was significantly contaminated (eg: there were POTWs that "reclaimed" inner city land with 100% sludge that later was found to contain over ten times the acceptable level of contaminants, but no evaluation has been conducted as to the need for remedial action). While the 100 known POTW sludge contamination situations are starting to be addressed, little work has been done by POTWs, States or EPA to evaluate what additional toxicants, particularly persistent organic toxicants, may be contaminating sludge. There is a major need through the pretreatment program for POTWs to develop industrial inventories and evaluate the discharge of organic and other toxicants into their systems. Technical assistance and overview from EPA and the States is needed, but it is not likely to occur soon.

Just as EPA and the States have not significantly addressed toxicants in municipal effluents and in sludge that is used on land, little research or regulatory action has gone to sludge incineration. Often the only concern has been to find the least costly disposal method. Incineration of municipal sludge is a common disposal method. While this has been successful in many instances, there are several cases where this has later resulted in environmental/human health problems. These problems have occurred where sludges contain toxic organic contaminates that are not broken down during low temperatures incineration, where high levels of heavy metals occur or where high levels of phosphate or other nutrients exist. Incineration of these materials results in volitilization rather than destruction. This volitilization adds to the air toxicant burden and also the toxic pollutants or nutrients are often precipitated into the Great Lakes or other water bodies. Little work has been done to identify POTWs that may cause significant human health/environmental damage from this source. There is a clear need to establish a specific Regional/Agency program to fully evaluate potential human health/environmental damage from incineration of municipal sludge and to propose controls of these toxicants or nutrients where needed.

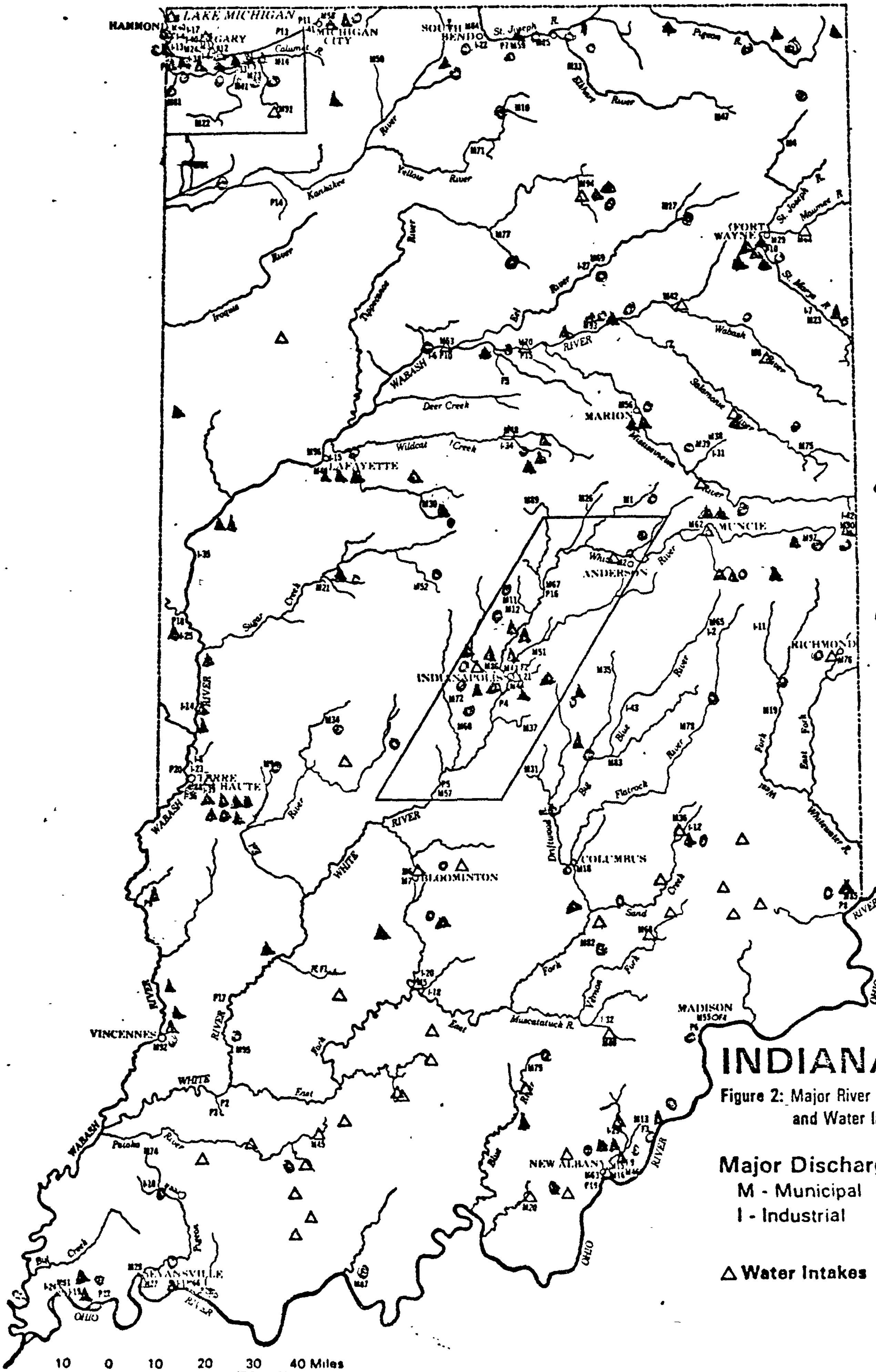
ILLINOIS

Figure 1: Major River Basins, SMSA and Water Intakes



Significant Industrial Facilities

o POTWS developing pretreatment



INDIANA

Figure 2: Major River Basins, SMSA, and Water Intakes

Major Dischargers:

M - Municipal

I - Industrial

△ Water Intakes

▲ Significant Industrial Facilities.

● POTWs develop pretreatment

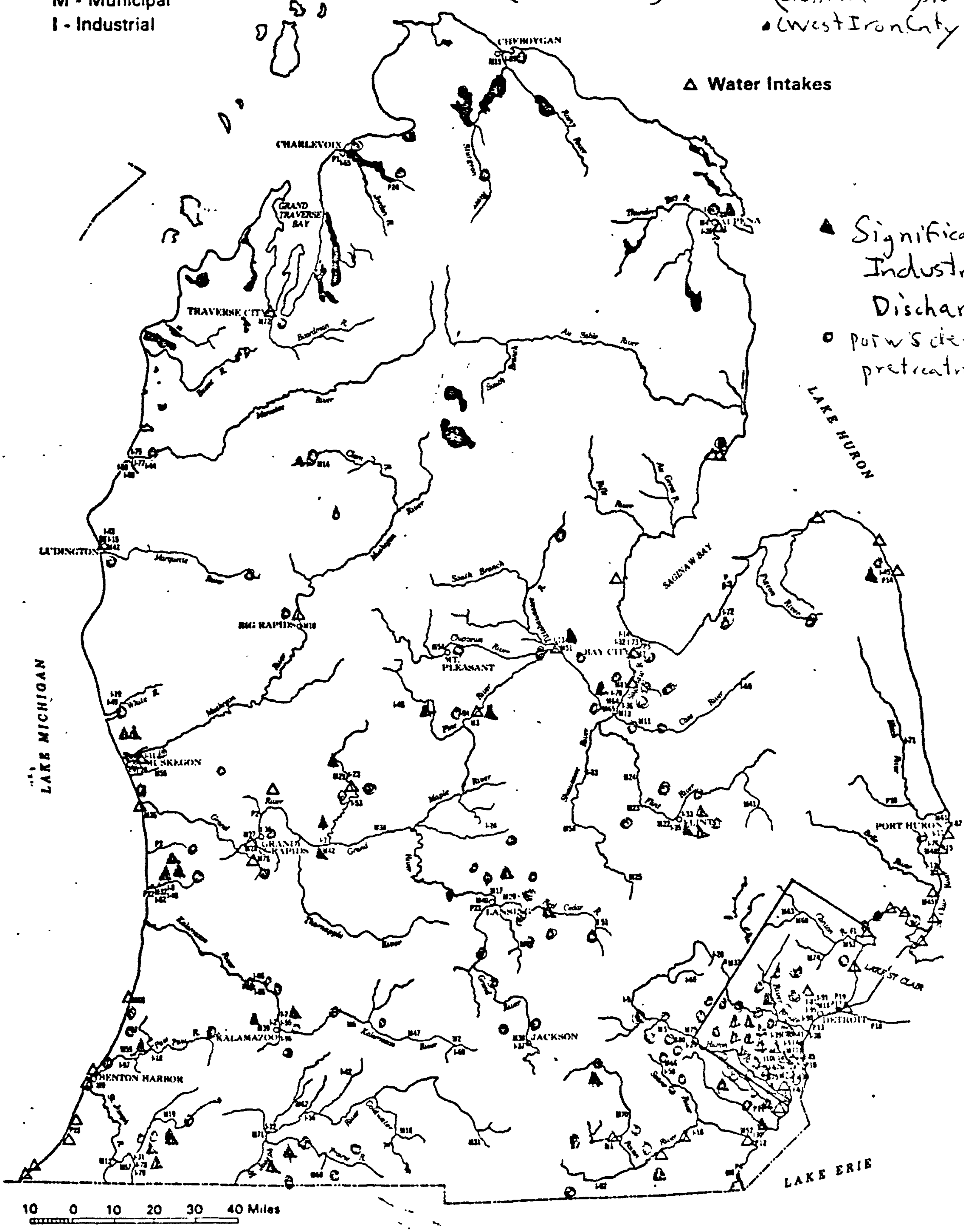
MICHIGAN (Lower)

Figure 3: Major River Basins, SMSA, and Water Intakes 200

Upper Peninsula
▲ (Escanaba)
● (Marquette)
● (Sault St Marie)

● (Escanaba)
● (Menominee)
● (Norway)
● (Iron Mtn-Kingsford)
● (West Iron City)

Major Dischargers:
M - Municipal
I - Industrial

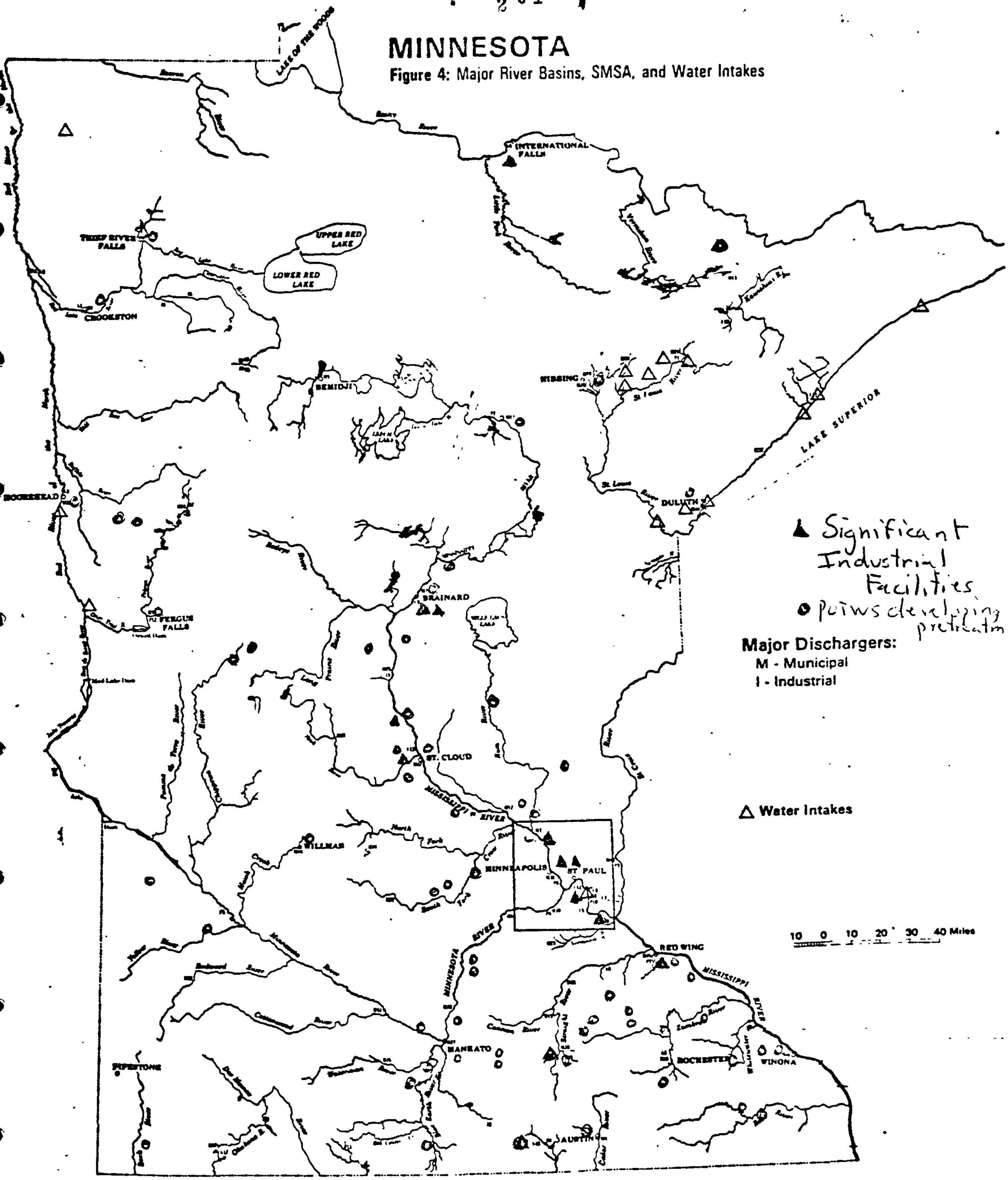


▲ Significant Industrial Dischargers.
● potw's developing pretreatment

201

MINNESOTA

Figure 4: Major River Basins, SMSA, and Water Intakes



▲ Significant Industrial Facilities

● POTWs developing pretreatment

Major Dischargers:
M - Municipal
I - Industrial

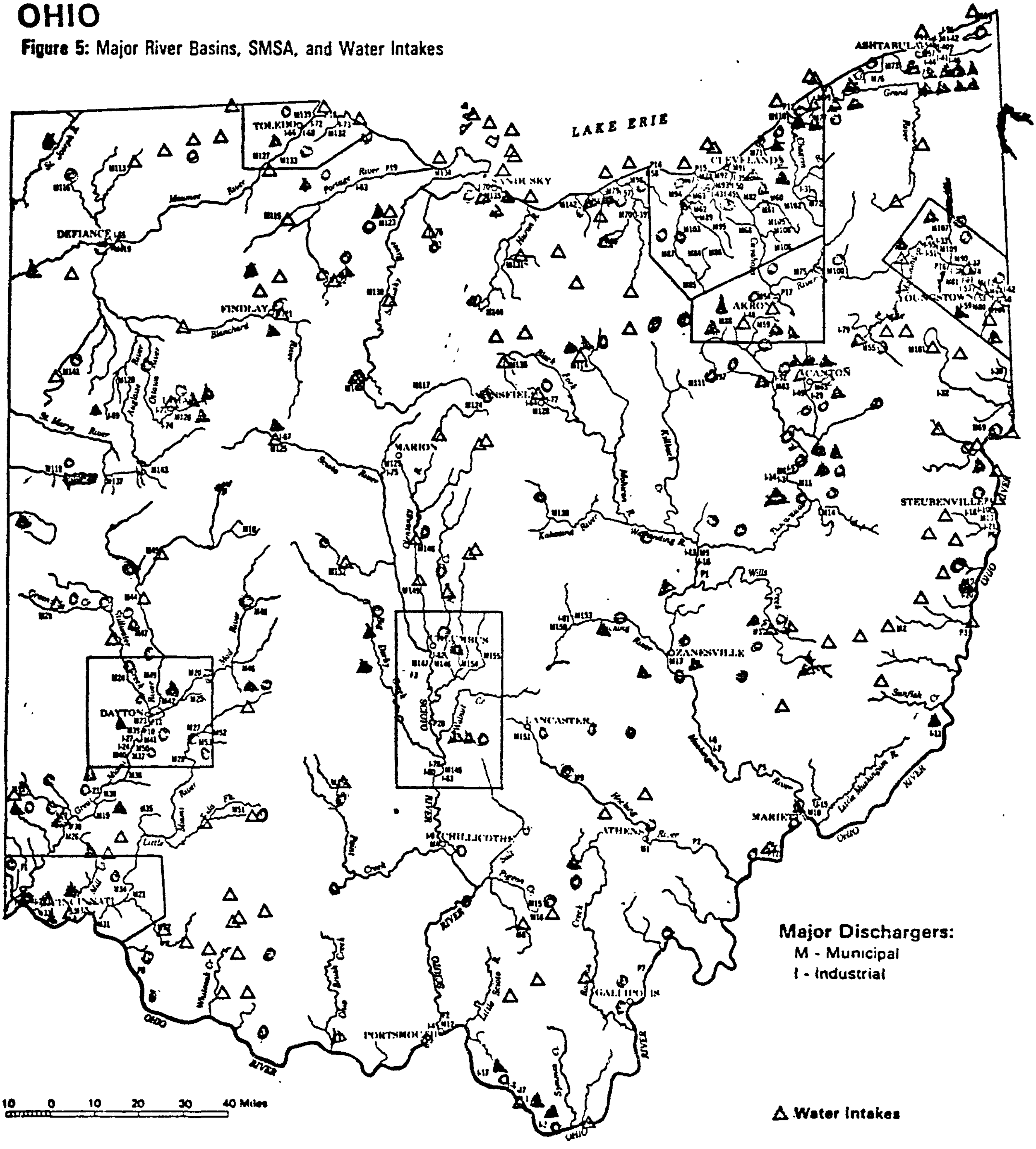
△ Water Intakes

202

▲ significant industrial facilit
● POTW's developing pretreatment

OHIO

Figure 5: Major River Basins, SMSA, and Water Intakes



Major Dischargers:
M - Municipal
I - Industrial

△ Water Intakes

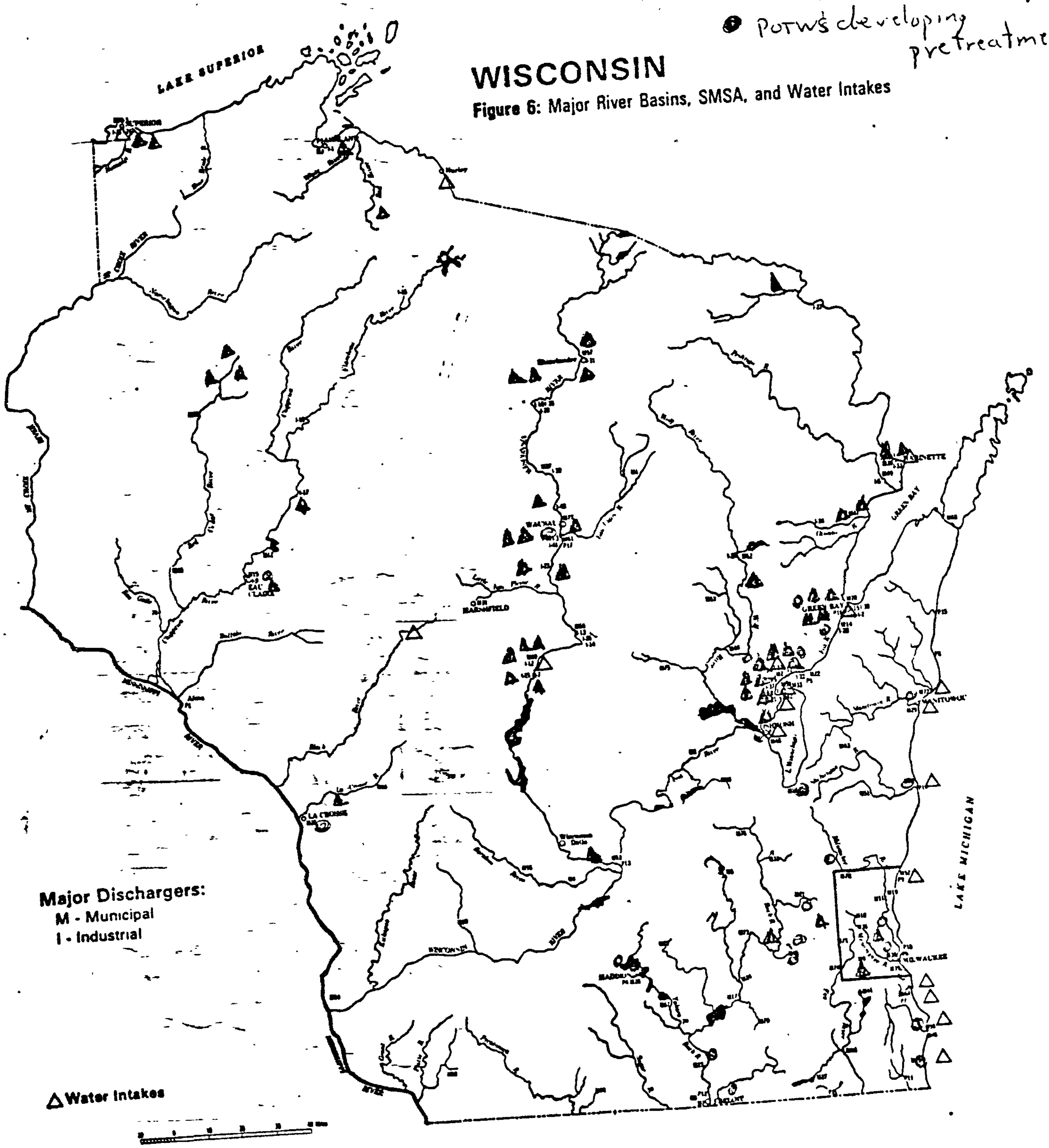
203

Significant Industrial Facilities

POTW's developing pretreatment

WISCONSIN

Figure 6: Major River Basins, SMSA, and Water Intakes



1. Description/Definition of Problem/Causes

Environmental inter-media issues indicate that solutions for one media may contribute to a problem in another media. This is evident in the POTW sludge management and pretreatment areas. Previously, many industries connected their discharges to municipal POTWs with little advance analyses by the POTW on the fate of the waste in or on the POTW. Often the resultant combined treatment was environmentally sound and resulted in cost savings for both the POTW and industry. However, some industrial waste discharged to POTWs caused significant contamination of the POTWs sludge. PCB and cadmium are two of the more pervasive such toxicants. Other toxicants such a curine, kepone, mercury, etc., have caused significant localized contamination. Also, now additional industries are connecting to POTWs or illegally utilizing POTW sewers to avoid the controls of RCRA, thus, introducing additional toxicants to POTWs.

Similarly, when POTWs institute programs to control the discharge of toxicants to their systems, often concentrated toxicant industrial residuals are produced which can cause environmental damage if not properly recycled or disposed of.

Over 100 POTWs have presently been identified by Region V States as having significant sludge contamination. This contamination is from PCB, HCB, curine, and cadmium and other heavy metals. However, most POTWs have not conducted an adequate evaluation of toxicants.

Sludge from many POTWs has been distributed to home gardners and to commerical agricultural operations with little if any control. This use of sludge is worthwhile and energy efficient but regulatory agencies must work with POTWs and industry to assure that adequate protection of public health is provided. However, some POTWs have indiscriminately distributed their sludge only to later find that significant contamination existed. Some POTWs "reclaimed" inner city land with 100% sludge that later was found to contain over ten times the acceptable level of contaminants, but no evaluation has been conducted as to the need for remedial action. While the 100 known POTW sludge contamination situations are starting to be addressed, little work has been done by POTWs, States or EPA to evaluate what additional toxicants, particularly persistent organic toxicants, may be contaminating sludge. There is a major need through the pretreatment program for POTWs to develop industrial inventories and evaluate the discharge of organic and other toxicants into their systems. Technical assistance and overview from EPA and the States is needed, but it is not likely to occur soon.

Limited regulatory action has focused on sludge incineration. Often the only concern has been to find the least costly disposal method. Incineration of municipal sludge is a common disposal method. While this has been successful in many instances, there are several cases where this has later resulted in environmental/human health problems. These problems have occurred where sludges contain toxic organic contaminates that are not broken down during low temperatures incineration, where high levels of heavy metals occur or where high levels of phosphate or other nutrients exist. Incineration of these materials results in volitilzation rather than destruction. This volitilization adds to the air toxicant burden and also the toxic pollutants or nutrients are often precipitated into the Great Lakes or other water bodies. Little work has been done to identify POTWs that may cause significnat human health/environmental damage from this source.

INLAND LAKES

ATTACHMENT A

In general the States have not been monitoring beach closings caused by water quality problems. Some data exist for Michigan, which in 1979 reported beach closings for inland lakes as indicated in Table ___. In 1980 no beach closings were reported for these particular lakes, but a beach closing of 7 to 10 days each was reported for two other lakes, Addison Oaks Lake in Oakland County and Dukes Lake in Chippewa County.

As these data are not based on consistent State-wide monitoring no trends can be drawn from them.

There were 17 bathing beaches closed for a period of time during Water Year 1979. Five of these bathing beaches were closed for the entire season. Table 4 presents specific information on location, length of closing, and cause of each official bathing beach closing during Water Year 1979.

TABLE 4. NON-SWIMMABLE WATERS DURING WATER YEAR 1979. Location, length of closing, and cause of official bathing beach closings by either County, District, or City Health Departments in Michigan during Water Year 1979.

* Inland lake with beach closed because of water quality problem

	PUBLIC BATHING BEACH	BODY OF WATER	COUNTY	LENGTH OF CLOSING (During WY 1979)	CAUSE
	Shiras Beach	Lake Superior	Marquette	entire season	sewage contamination
	City of Munising Municipal Beach	Lake Superior	Alger	entire season	sewage contamination
*	Cass Lake Community Association Beach	Cass Lake	Oakland	entire season	sewage contamination
*	Meadowbrook Lake Association Beach	Meadowbrook Lake	Oakland	entire season	sewage contamination, high turbidity, and soft bottom
	Avalon Beach	Square Lake	Oakland	entire season	soft mucky bottom
	Stoney Creek Metropolitan Park Beaches	Stoney Creek	Macomb	July 17 - August 9	suspected virus of unknown origin
*	Burlington Lake Park I and Huntoon Village Beaches	Huntoon Lake	Oakland	August 1 - Labor Day	sewage contamination
*	Silver Spring Lake Beach	Silver Spring Lake	Wayne	July 20 - Labor Day	probable sewage contamination
*	Bruin Lake Beach	Bruin Lake	Washtenaw	July 15-21	sewage contamination
	Village of Lexington Beach	Lake Huron	Sanilac	July 20-22	sewage contamination
	Sandy Beach	Baw Beese Lake	Hillsdale	one day in Mid-June one day in Mid-July	swimmer's itch control treatment
	Bay View Beach	Lake Michigan	Emmett	two days at the end of July	sewage contamination
	Big Blue Lake Beach	Big Blue Lake	Muskegon	June 18	swimmer's itch control treatment
*	Pioneer Highlands Beach	Sylvan Lake	Oakland	24 hours following each rainfall	stormwater contamination
*	Jordan Lake Beach	Jordan Lake	Ionia	July 24	sewage contamination
*	Sleepy Hollow State Park Beach	Lake Ovid	Clinton	June 11 June 20 July 20	aquatic weed control treatment algae control treatment swimmer's itch control treatment

Due to the variety of potential lake conditions, the average TSI value is presented as an estimate of the average summer water quality.

Additional Lake Classifications

Approximately 1200 lakes have monitoring data that has been entered in the STORET computer system by the MPCA. Of this number, about 400 lakes were classified in addition to the Phase I study lakes (154) for this final report. These classifications are included in Appendix D for all interested parties and in an effort to further define Minnesota lake water quality patterns. The TSI classifications for these lakes were generated from data supplied by many sources. (In some cases, it should be cautioned, classifications may differ from previously presented TSI values due to the merging of all available data.)

Current Minnesota Lake Water Quality Conditions

Data from over 500 lakes were summarized and indicated the following:

1. Over 38% of the study lakes had average secchi disc transparency less than 4 feet in depth, which may present direct contact recreation safety concerns (diving, skiing, swimming).
2. Over 48% of the study lakes had average summer chlorophyll a concentrations in excess of 20 ug/l. A level of 20 ug/l has been observed to indicate lake conditions that may be suitable for warm water fisheries and rough fisheries. Hypolimnetic oxygen depletions may begin in the early summer, and there is a danger of winterkills of fish for these lakes, particularly if they are smaller in area or have lower mean depths.

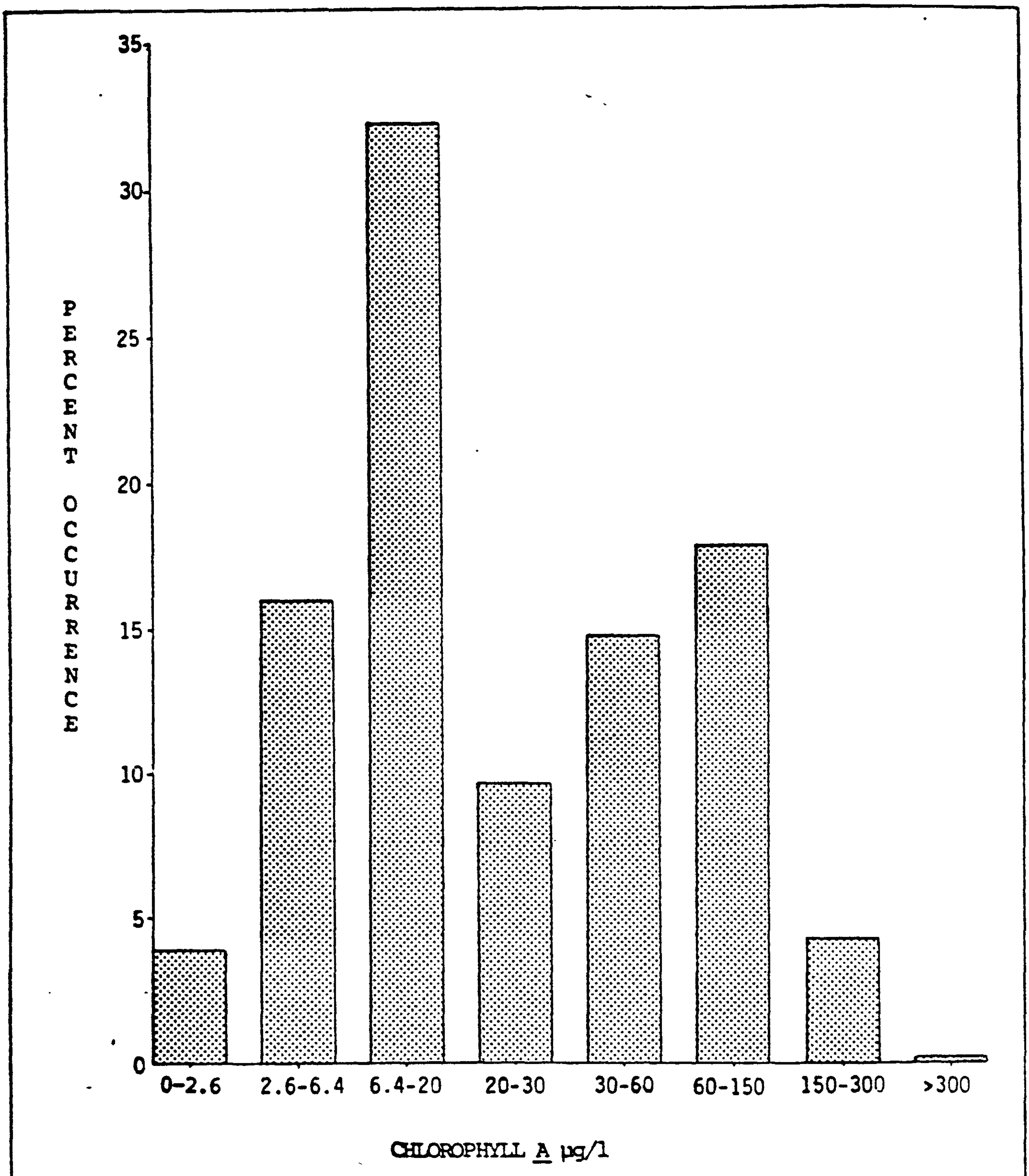
3. Approximately 44% of the study lakes also have mean surface total phosphorus concentrations in excess of 50 ug TP/l, which is suggested as defining lakes where algal productivity may be pronounced. Summer occurrences of algal blooms may be expected along with possible depletions of oxygen from the bottom waters. Winterkills of fish may occur especially in lakes with small surface areas or lower average depths.
4. Water coloration in excess of 50 PT-CO units, which is suggestive of significantly colored water, was encountered in about 7% of the study lakes.
5. Total phosphorus concentrations tended to explain about 55% of the algal production variance as estimated by statistical analyses.
6. From preliminary calculations, about 13% of the study lakes could be nitrogen limited at times instead of phosphorus limited. Nitrogen limitation may cause the occurrence of noxious blue-green algae which tend to dominate algal specication in late summer. The occurrence of toxic algal blooms in Minnesota was not tabulated in this report.
7. The Carlson Trophic State Index (TSI) was used to classify lake water quality. The distrubution of mean TSI

occurrence for 543 lakes was:

TSI Range	% Occurrence
0-10	
11-20	
21-30	4.4
31-40	
41-50	26.4
51-60	
61-70	
71-80	69.2
81-80	
81-90	
91-100	

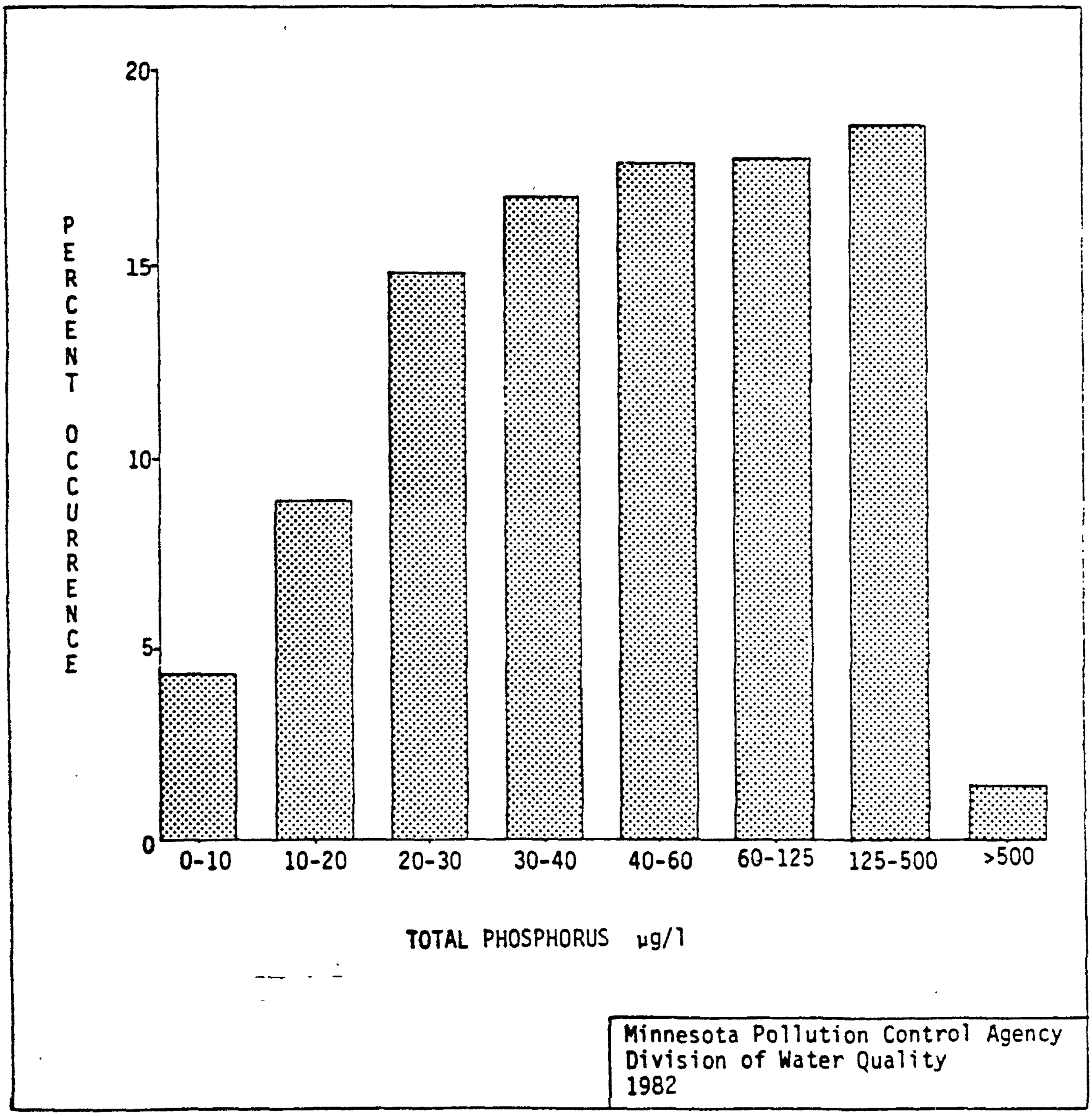
In general terms, oligotrophic lakes with cold water fisheries could be associated with at least 4.4% of the lakes. Approximately 70% of the lakes have mean TSI values greater than 50 TSI units, and these lakes may exhibit characteristics symptomatic of over-fertility or eutrophication. Continued degradation of these lakes may be expected to result in periodic algal blooms and, in some instances, dense algal blooms of blue-green algae. These occurrences will likely have significant, adverse consequences for recreational and other water uses. Reduction of sediment and nutrient loading will produce immediate, beneficial results in the majority of instances. Secondarily, reducing the phosphorus supply rate may increase the in-lake ratio of total nitrogen to total phosphorus, which will tend to discourage noxious blue-green algae from dominating in the late summer.

FIGURE 3. CHLOROPHYLL A DISTRIBUTIONS. Mean summer epilimnetic concentrations for 412 Minnesota lakes.



Minnesota Pollution Control Agency
Division of Water Quality

FIGURE 6. TOTAL PHOSPHORUS DISTRIBUTIONS. Mean summer epilimnetic concentrations for 514 Minnesota lakes.



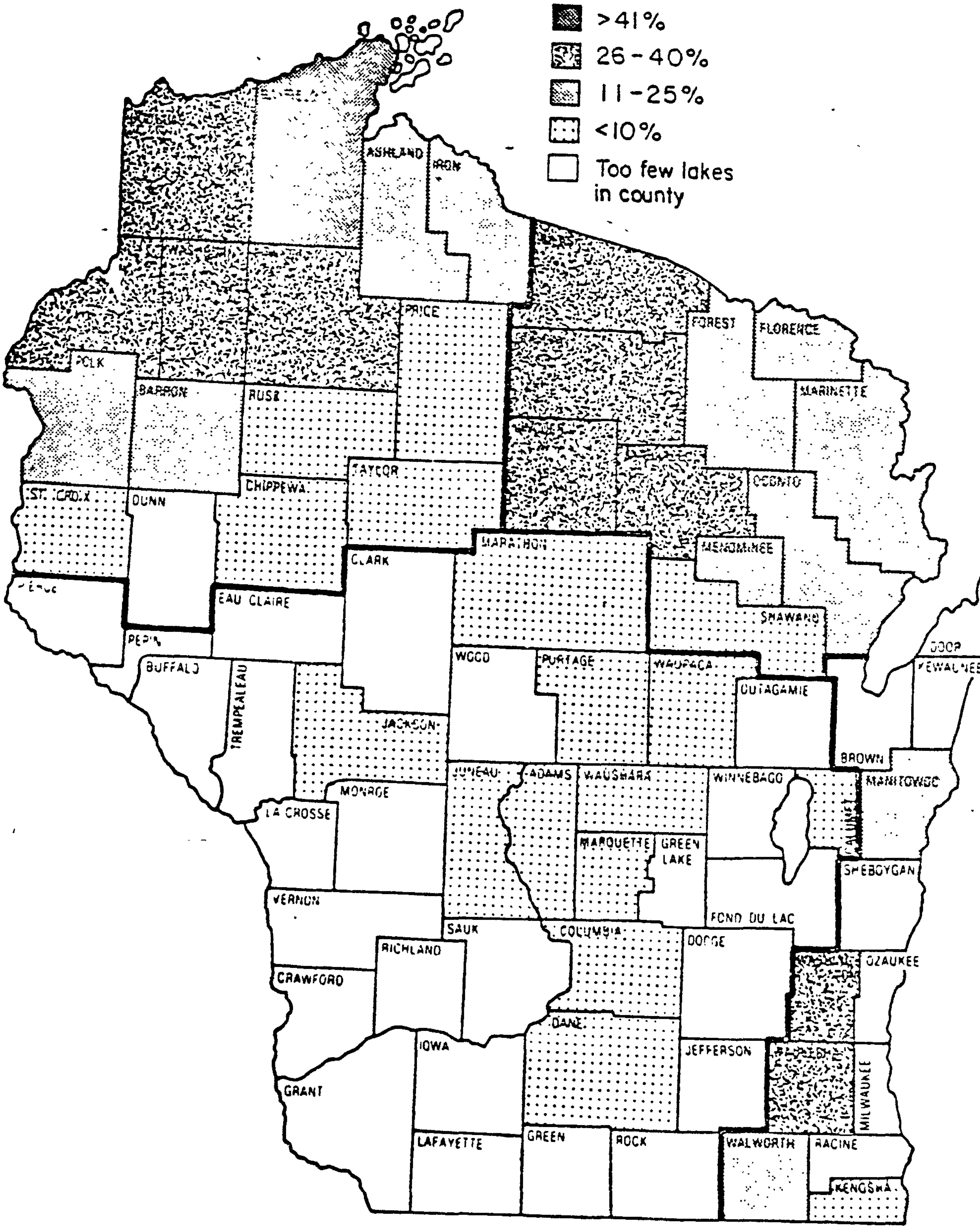


Figure 34. The percentage of oligotrophic lakes in each county predicted by the TSI-SD model.

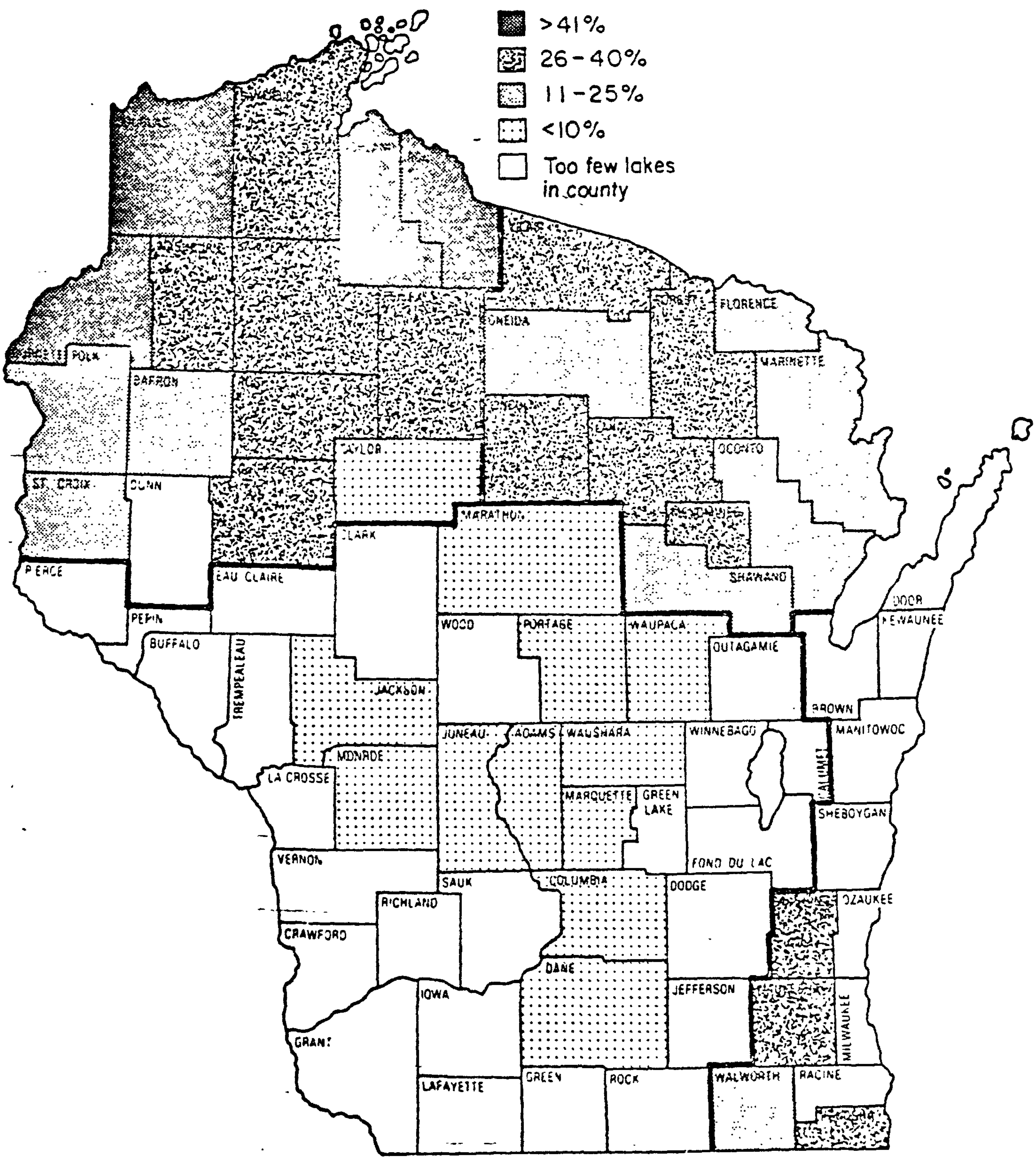


Figure 35. The percentage of oligo-mesotrophic lakes in each county predicted by the TSI-SD

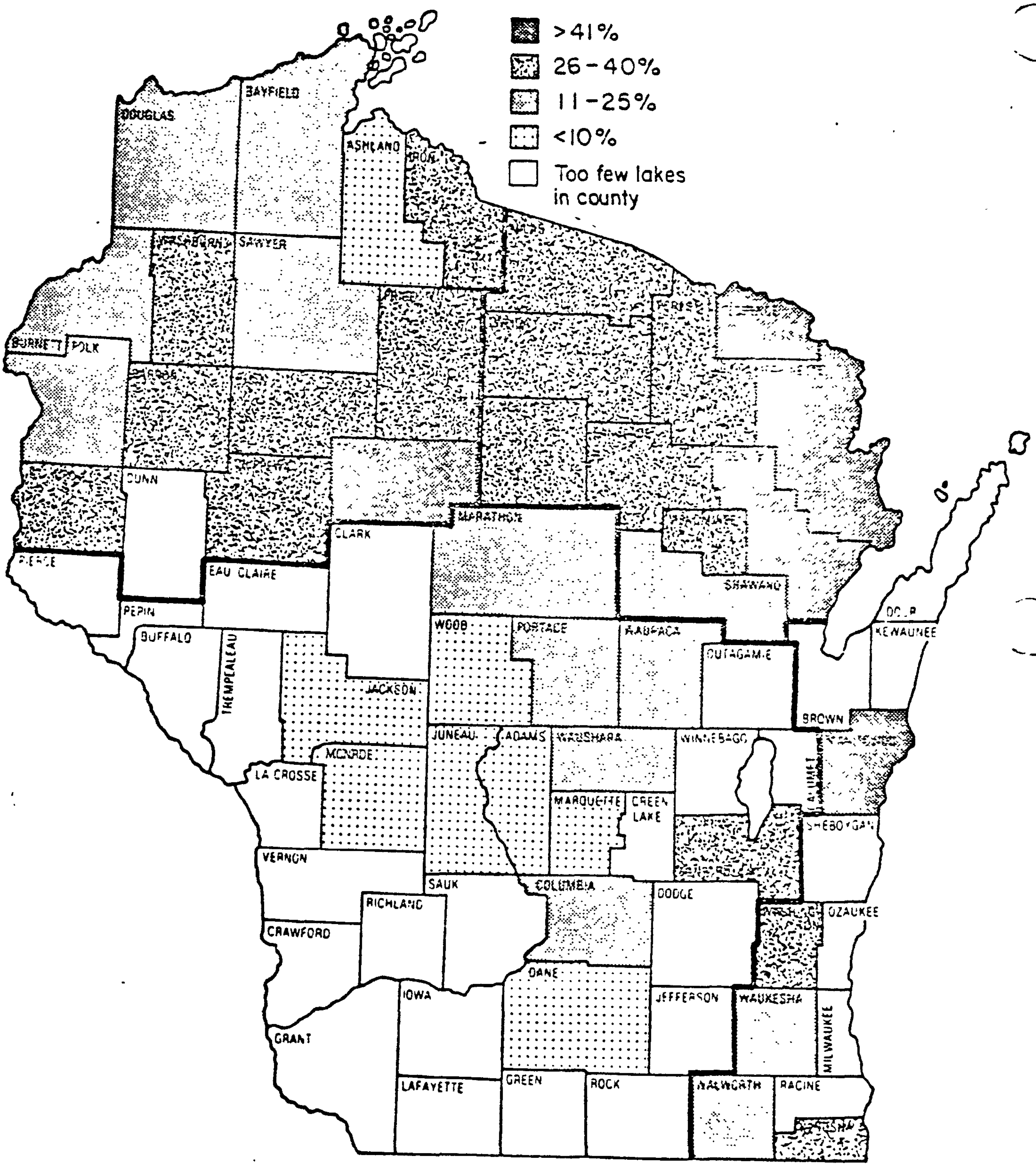


Figure 36. The percentage of mesotrophic lakes in each county predicted by the TSI-SD model

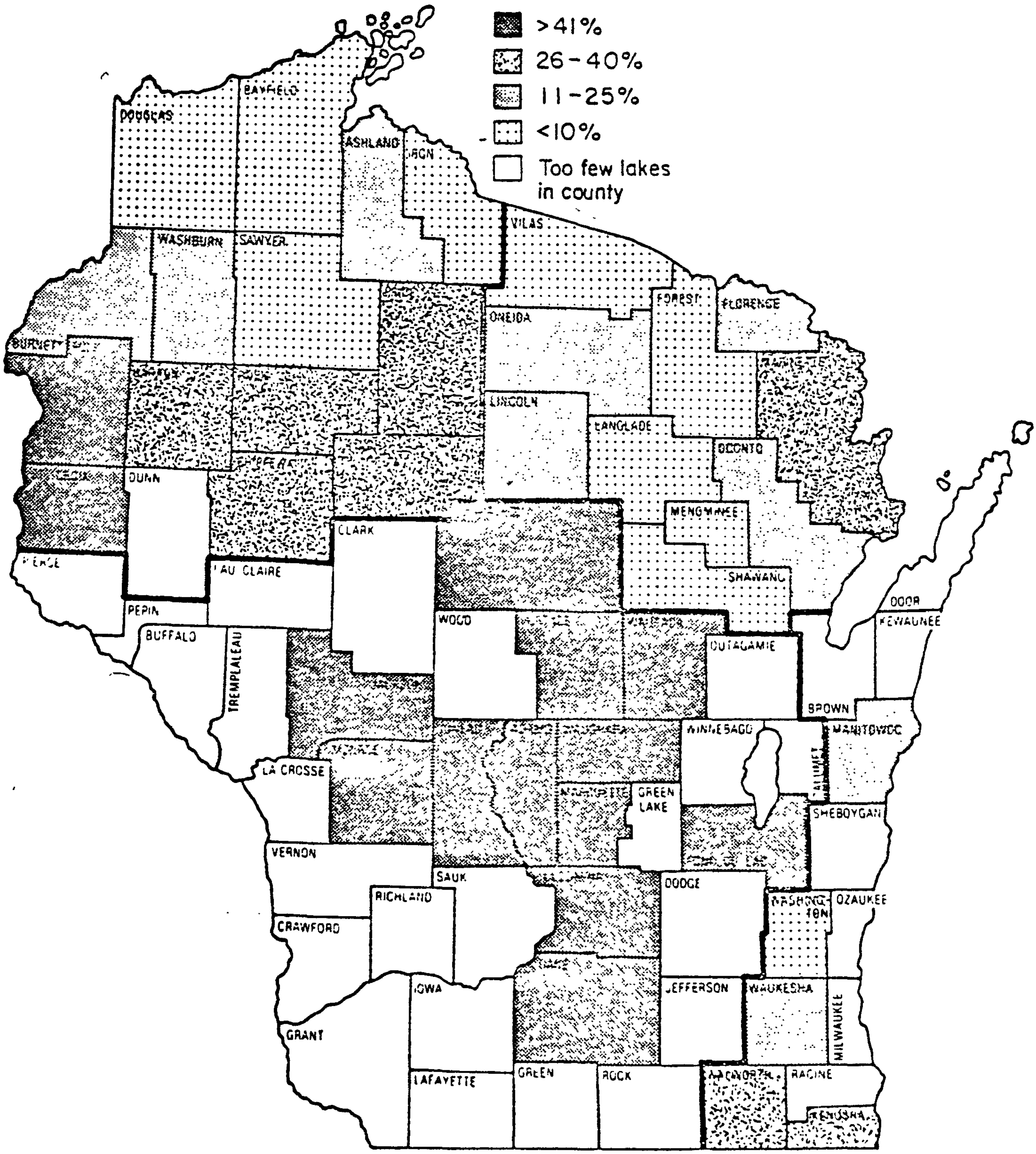


Figure 37. The percentage of eutrophic lakes in each county predicted by the TSI

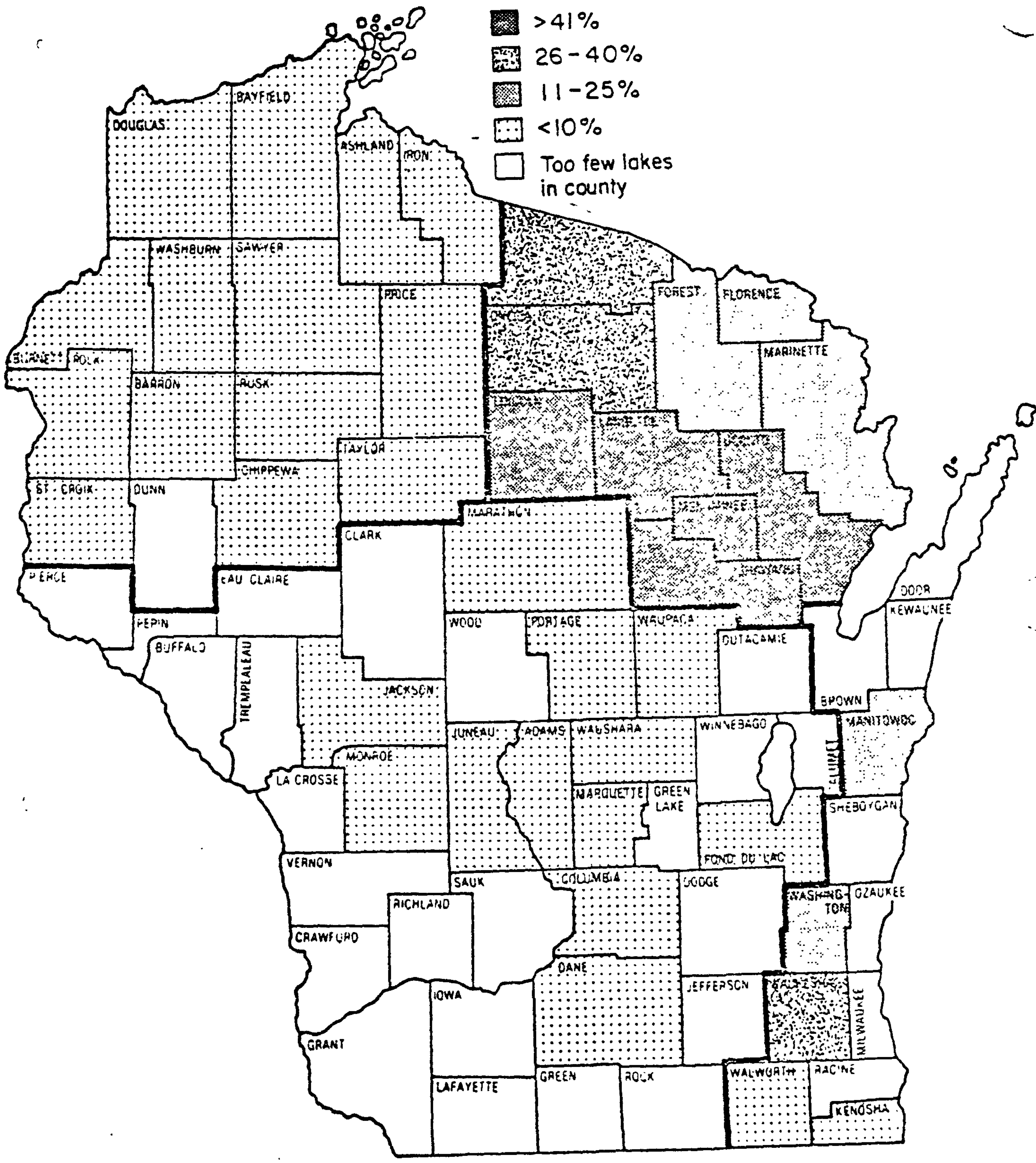


Figure 38. The percentage of oligotrophic lakes in each county predicted by the TSI-CHL model.

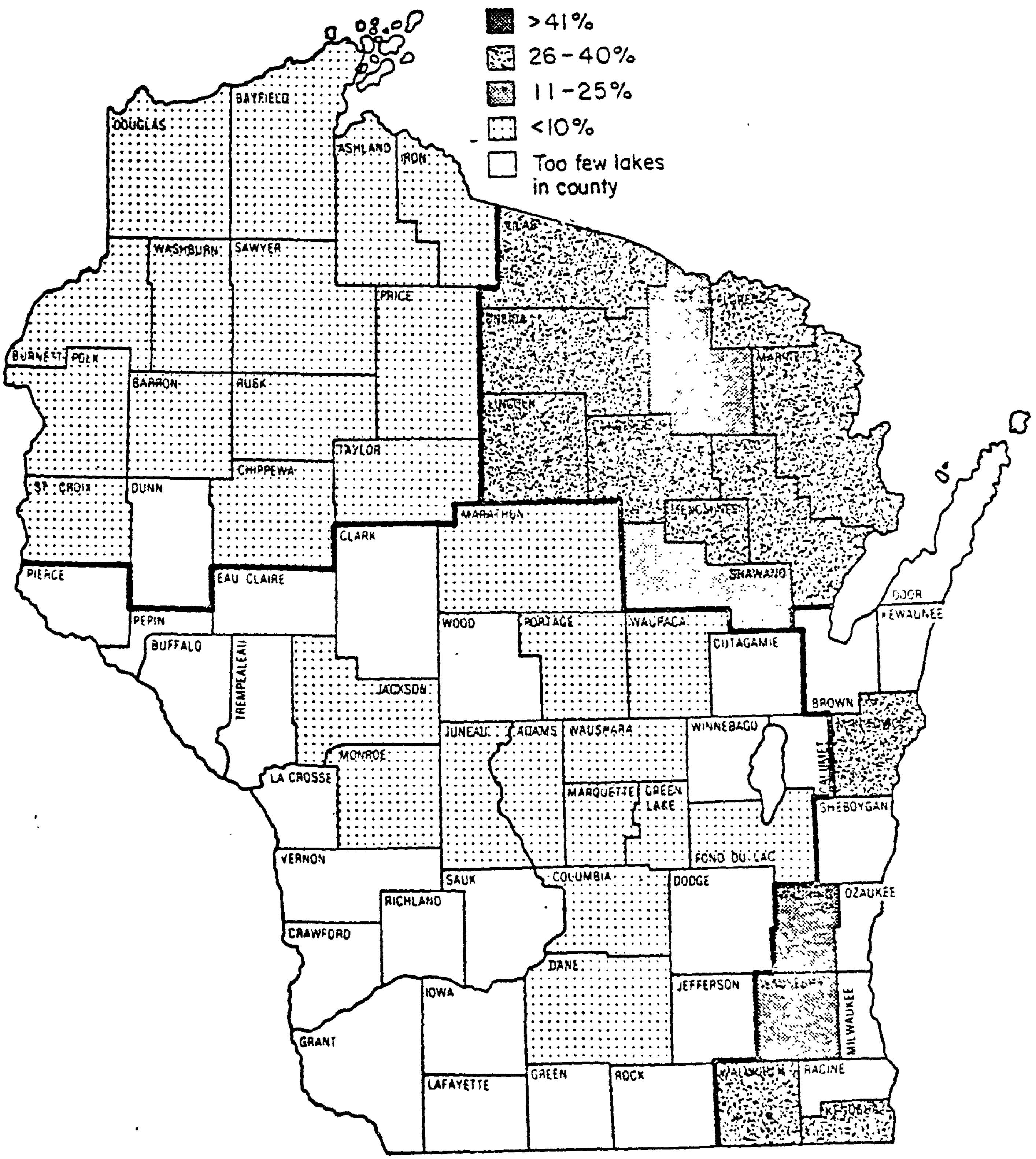


Figure 39. The percentage of oligo-mesotrophic lakes in each county predicted by the TSI-CHL model.

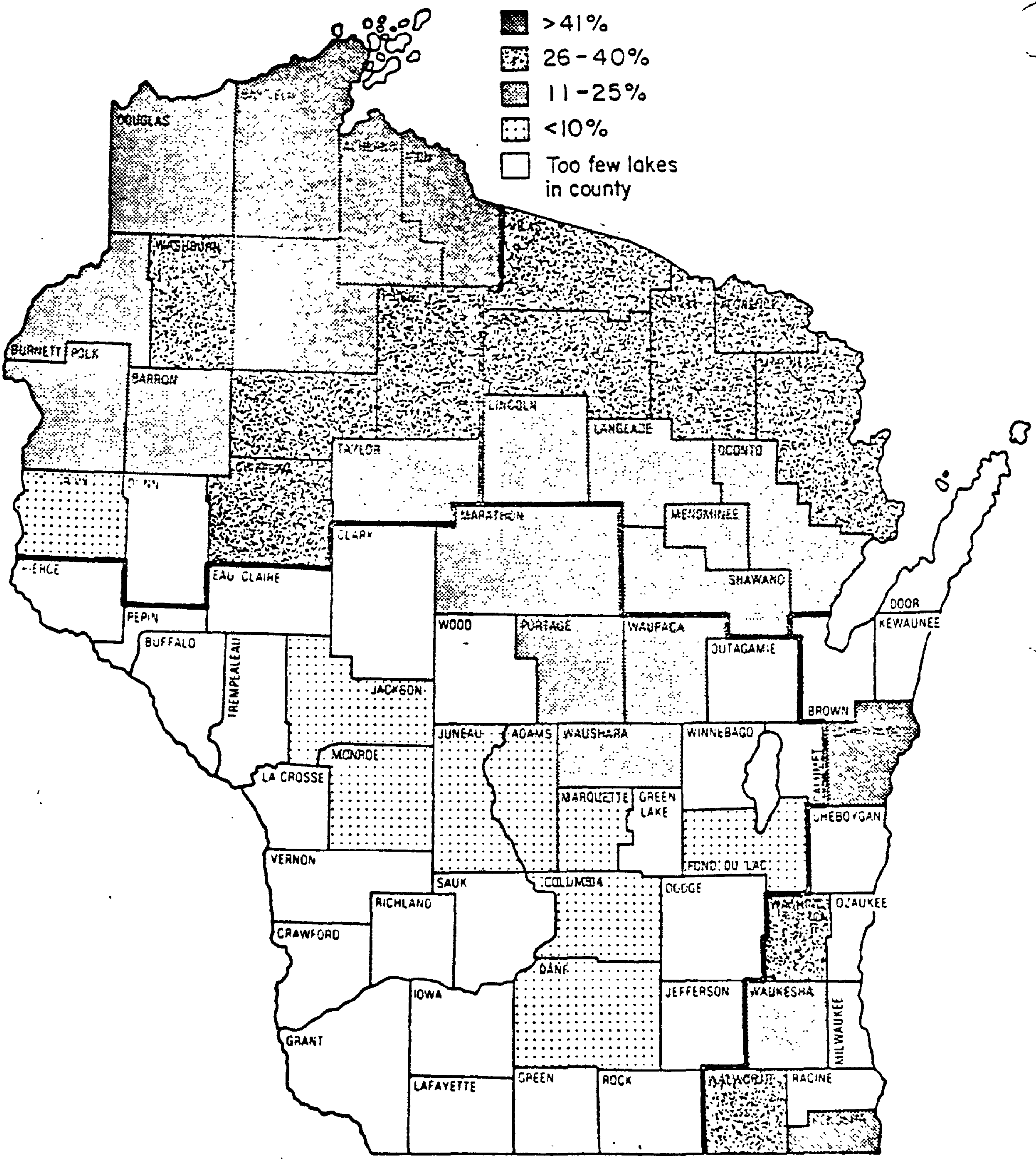


Figure 4c. The percentage of mesotrophic lakes in each county predicted by the TSI-CHL model.

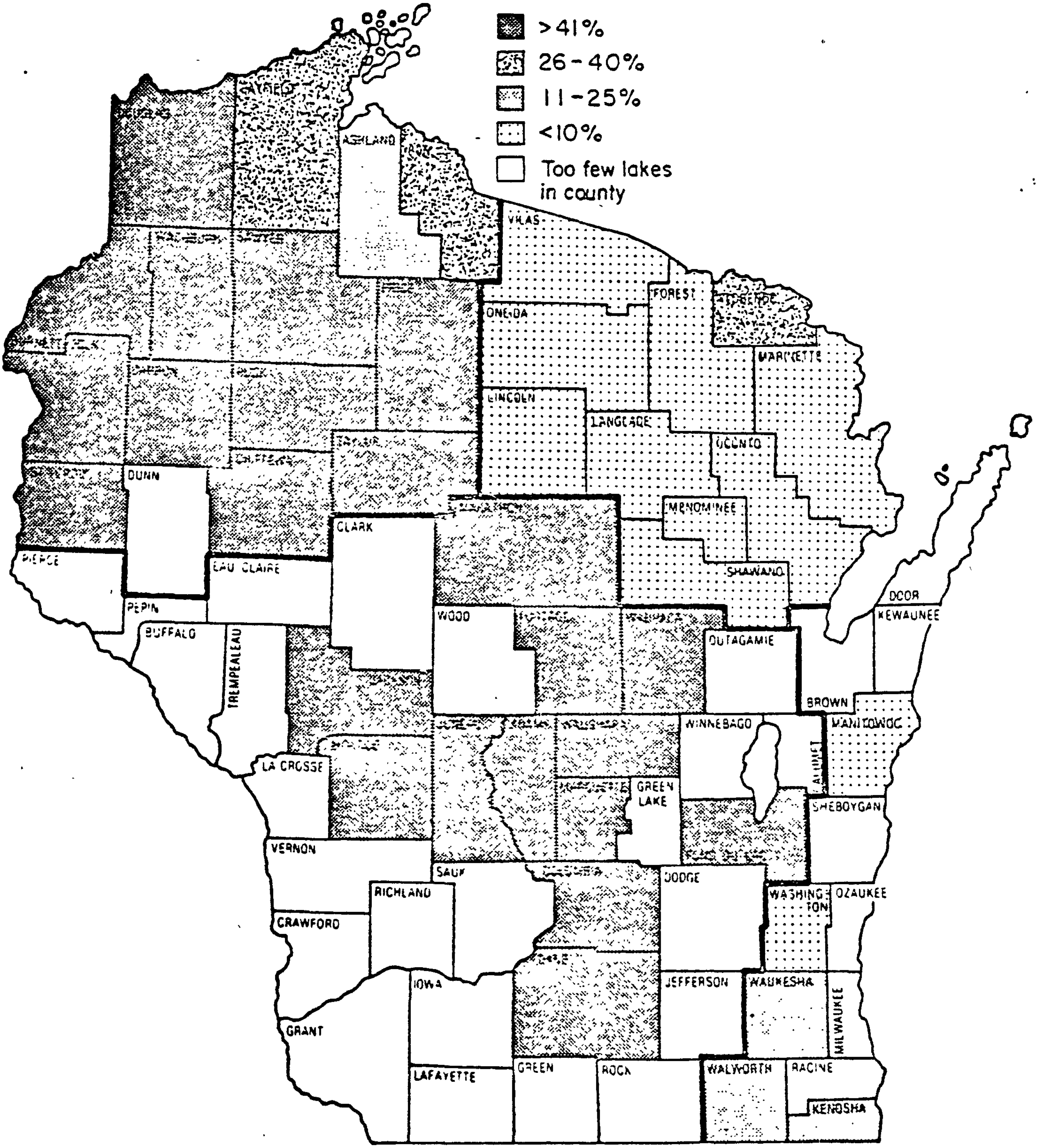


Figure 41. The percentage of eutrophic lakes in each county predicted by the TSI-CHL model.

SUMMARY

1. The Land Resource Programs Division, Michigan Department of Natural Resources, collected chemical and physical information for 656 Michigan inland lakes greater than or equal to 50 surface acres in size with boat launch facilities. Additionally, watershed information, such as size, local relief, land use, and soil types were determined and compiled.

2. Lakes and impoundments included in this study ranged in size from 50 to 20,044 acres (20.2 - 8115 hectares) and in depth from 3 to 285 feet (0.9 - 87 meters). Lake types varied from completely "closed systems" with no inlets or outlets to "open systems" with numerous inlets and outlets.

3. Sixty-three (63) or approximately 10% of the lakes contained "soft" water having alkalinities less than 20 mg/l. "Soft" water lakes have the potential of being impacted by acid precipitation because of their low buffering capabilities or inability to neutralize the acid waters. The most apparent effect of acid precipitation is the reduction or elimination of fish populations. The majority (80%) of the "soft" water lakes were located in the western portion of the Upper Peninsula; an area of igneous bedrock outcroppings and carbonate-poor soils.

4. Trophic classification of lakes was determined with three in-lake measurements (total phosphorus, chlorophyll a, transparency) and the relative density of macrophytes. Survey results indicate that 12% of the lakes are oligotrophic, 62% are mesotrophic, and 26% are eutrophic. The greatest percentage of eutrophic lakes are in the southern half of the Lower Peninsula where Michigan's most fertile soils and large population centers are located. The greatest percentage of oligotrophic lakes are located in the northern half of the Lower Peninsula.

5. Forty-six (46) lakes or 7% of the total lakes surveyed receive phosphorus inputs from one or more municipal and/or industrial discharges. Twenty-eight (28) of these lakes are classified eutrophic which constitutes only 16% of all lakes classified eutrophic in the study. Therefore, future protection/rehabilitation projects must look more closely at other causes, such as "naturally" occurring eutrophic lakes and non-point nutrient sources.

Table 4.2-3. Summary of known wetland discharge sites in USEPA Region V by type of facility. Data are current as of November 1980.

	Illinois	Indiana	Michigan	Minnesota	Ohio	Wisconsin	Region V	Percent of Tota
Municipal[a]	4	4	7	27	2	28	72	75
Industrial[b]	1	2	-	5	1	7	16	17
Commercial	-	-	-	2	-	-	2	2
Other[c]	1	3	-	1	-	1	6	6
Total	6	9	7	35	3	36	96	100
Approximate Percent of Region	6	9	7	37	3	38	100	

[a]Municipal facilities include water treatment plants.

[b]Industrial facilities include creameries.

[c]Other facilities include parks, mobile home communities, shopping centers, and semi-public facilities such as truck stops.

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Commercial	-	-	-	2	-	-	2	2
Other[c]	1	3	-	1	-	1	6	6
Total	6	9	7	35	3	36	96	100
Approximate Percent of Region	6	9	7	37	3	38	100	

[a]Municipal facilities include water treatment plants.

[b]Industrial facilities include creameries.

[c]Other facilities include parks, mobile home communities, shopping centers, and semi-public facilities such as truck stops.

COMBINED SEWER OVERFLOWS

The direct water quality impacts of combined sewer overflows (CSO) in the Region have not been quantified to a great extent. One indirect or surrogate measure of environmental impacts of CSO's that has been used in the past is the amount of dollar expenditures for projects to correct or abate CSO discharges. One such measure is the Agency's bi-annual Needs Survey. The 1982 survey indicates a potential estimated need of $11.8 billion for construction of CSO abatement needs in the Region. This represents 33 percent of the total national CSO needs estimated in the report. A breakdown of these needs, by State and by levels of control associated with meeting designated stream use classifications, is shown in Table 1.

The CSO needs reported in the 1978 and 1980 Needs Survey (Category V costs) were $12.76 and $10.38 billion respectively in 1980 dollars for Region V states. Updating these estimates to 1982 dollars the CSO needs are $15.5 and $12.6 billion.

These previous Needs Surveys however, were based on an assumed recreation use of each combined sewer overflow area. The 1982 survey approach matches the degree of needed wastewater treatment with the actual stream use designated by the State. As such, the 1982 survey represents the best data available on potential CSO needs in the Region. The 1982 Survey indicates that there are 513 combined sewer systems in Region V. A breakdown by State is shown in Table 2.

The Needs Survey also contains information, on an economic basis, of CSO needs that have already been met. The 1982 Survey shows for Region V states that $1.96 billion of CSO needs have been met. A State breakdown is shown in Table 3. (The figures discussed earlier are net needs remaining.) These needs would have been met by EPA grant funds, State grants, non-EPA grants, e.g. HUD, and local funds.

According to the information on the Regional Construction Grants Management System (RCGMS), the Region has currently provided 1.065 billion in grant funds for over 50 CSO Step 3 and 4 projects to date. In terms of pending CSO projects, RCGMS shows that there are 104 projects for $2.04 billion of Category V costs on the current state project priority lists. These projects are on both the fundable portion and extended portion of the priority lists.

In the past, the Region has tracked and reported on various "major" CSO projects for various purposes. Principally, these include major dischargers to the Great Lakes basin, for the Great Lakes National Program Office, and CSO projects over $50 million to EPA Headquarters. The Region has consolidated these various lists of major dischargers into a single list of 35 major projects. The overall status, and proposed solutions are shown for each of these projects in the attachment in Table 4.

Based upon the preceding project-specific analysis, state wide CSO project management trends have developed to reveal the following results. In Ohio, CSO projects have generally been assigned low-priority status and therefore, do not get funded. Most Indiana projects are still in the Step 1 planning stage with CSO solutions still to be recommended. Wisconsin projects are currently under construction. Michigan and Minnesota (Minneapolis/St. Paul) CSO projects have experienced difficulty in being justifiable based upon water quality related impacts. Finally, two out of the three Illinois projects had been completed in earlier fiscal years when such projects were generally assigned higher priority values and grant funding was more easily obtained. Overall, the general trend across the Region has shown a decreased emphasis on CSO projects. As a result, the 104 projects discussed earlier on the state project priority lists may not actually receive construction grant funding as might be expected in the coming years.

In further addressing the CSO problem in Region V, the discussion in Part I brings to the forefront that:

1. CSO issues are very project (or site) specific,

2. CSO problems are being treated differently by each of the six states in the Region.

Region V's experience with past CSO project reviews indicates that there are various barriers to overcome in dealing with CSO projects. These are discussed briefly below:

1 - There currently exists no definition of flow regime under which water quality standards are applicable to wet weather flows. Low flow relief is defined for flows less than the 7 Day/10 year flows. While this recognizes that WQS cannot be expected to operate under unusually low flow conditions, it is equally logical to establish high flow conditions that are unusual. (e.g. during a 100 year storm storm where major river suspended solids include houses, cars, trees etc. a typical suspended solids standard is obviously inappropriate).

2 - Due, in part, to the above permits there has been no comprehensive policy for issuance of NPDES dealing with CSO discharges. Those permits that have been issued are generally done on a case-by-case basis frequently emenating from controversial situations. However, most CSO discharges are not permitted with limits. Therefore, enforcement against the local community is often lacking. Motovation for CSO projects are frequently emenating from pressures other than pollution abatement (e.g. basement flooding).

3 - PG-61 the only guidance document by EPA which is utilized as the basis for funding CSO projects, was not established on WQS or law but primarily on an economic basis. The knee-of-the-curve maximizes removal of BOD and similar pollutant indicators per dollar spent without making a direct analysis on whether that level of treatment is more or less than necessary for attainment of WQ or benefits.

4 - Definition of "significant water quality" problems tend to be indirect with regard to many major CSO events, causing benthic loadings and downstream impacts to impoundments which may be difficult to asses. Additionally, CSO impacts are often masked by non-point source impacts.

5 - Since the basis of many CSO activities include other objectives, they result frequently in multi-purpose projects. The complexity of the multi-purpose funding policy used by EPA opens many pitfalls for implementation, particularly since eligibility cannot be determined until the end of the planning process.

6 - Finally, since established EPA guidance in this area is minimal, many decisions concerning CSO projects are made on a case-by-case basis, and in five States in this region these decisions are made at the State level through delegation. Therefore, it is anticipated that the project solutions, impacts, and cost will tend to vary considerably from state to state.

The implications for agency management are that until sufficient Water Quality work is completed to support, i.e. justify, the major expenditures that CSO projects generally seem to call for, few CSO projects may actually receive sufficient priority to receive grant funding and proceed to construction.

Table 1

1982 NEEDS SURVEY
CATEGORY V (CSO) NEEDS - REGION V
Thousdands of 1982 Dollars

STATE	FISH & WILDLIFE	RECREATION	SEWER SEPARATION	FACILITIES PLAN	TOTAL
IL	2,168	1,013,077	126,729	954,048	2,096,022
IN	2,468,900	446,361	51,978	0	2,967,239
MI	2,061,005	1,944	86,190	8,318	2,157,457
MN	40	293,286	26,269	1,126	320,721
OH	339,695	2,921,034	618,002	0	3,878,731
WI	0	369,650	0	0	369,650
TOTAL	4,871,808	5,045,352	909,168	963,492	11,789,820

National Total: 35,739,535
Region V Percent of National Total: 32.98%

Note: The costs for aesthetics and public health designated stream uses are zero for each state in Region V.

Source: 1982 Needs Survey, Cost Estimates for Construction of Publicly-Owned Wastewater Treatment Facilities, December 31, 1982.

Table 2

1982 NEEDS SURVEY
NUMBER OF COMBINED SEWER
SYSTEMS BY STATE

State	
IL	124
IN	137
MI	95
MN	19
OH	124
WI	14
TOTAL	513

SOURCE: 1982 Needs Survey, cost estimates for construction of publicly-owned wastewater treatment facilities, December 31, 1982.

Table 3

1982 NEEDS SURVEY
COMBINED SEWER OVERFLOW
TOTAL AND NET NEEDS
Thousands of 1982 Dollars

STATE	TOTAL NEEDS	NEEDS MET	NET NEEDS REPORTED TO CONGRESS
IL	3,895,893	1,799,871	2,096,022
IN	3,020,250	53,011	2,967,239
MI	2,199,052	41,595	2,157,457
MN	325,862	5,141	320,721
OH	3,898,022	19,291	3,878,731
WI	412,448	42,798	369,650
TOTALS	13,751,527	1,961,707	11,789,820

SOURCE: 1982 Needs Survey, Cost Estimates for Construction of Publicly-Owned Wastewater Treatment Facilities, December 31, 1982.

Table 4

REGION V
MAJOR CSO PROJECT STATUS
January 1983

Urban Area	State	Overall CSO Status	Multipurpose Solutions	Proposed Solutions
Springfield	IL	Construction Completed	-	Relief Sewers Addition Plant Capacity
Peoria	IL	201 Study Completed WQ jusitification insufficient. Grantee rejected Step 3 award.	-	In-line storage off-line sedimentation treatment.
Chicago	IL	201 Study Completed Under Construction	Flood control Basement flooding	In-line storage and treatment (Tunnel and Reservoir Plan -TARP)
Anderson	IN	Ongoing 201 Study	-	Probably clarifiers
Evansville	IN	Phase I Construction Completed. Phase II & III 201 Study under review.	-	Phase I: Sewer Rehabilitation and Pump Station Rehabilitation.
Fort Wayne	IN	Ongoing 201 Study	-	Probably relief sewers, storage & treatment.
Indianapolis	IN	Ongoing 201 Study	-	-
Lafayette	IN	Ongoing 201 Study	-	-
Muncie	IN	Ongoing 201 Study	-	-
South Bend	IN	No action taken low priority/lack of funding	-	-
Hammond	IN	Ongoing 201 Study	-	Probable storage and sewer separation

Table 5

REGION V
MAJOR CSO PROJECT STATUS
January 1983

Urban Area	State	Overall CSO Status	Multipurpose Solutions	Proposed Solutions
Grand Rapids	MI	201 Study Completed Insufficent WQ justification	-	No action
Detroit	MI	201 Study suspended by court order	-	No action
Bay City	MI	Sewers completely separated. No longer combined.	-	Sewer separation
Monroe	MI	201 Study Completed Sewer rehabilitation design under review at EPA	-	Sewer rehabilitation Bypass elimination
Flint	MI	201 Study Completed Under construction	-	Relief Interceptor and retention basin.
Midland	MI	201 Study Completed Lack of funding (low priority)	-	Retention Basin
Lansing	MI	201 Study Completed Insufficient WQ justification	Basement flooding	Sewer Separation Retention Basin
Saginaw	MI	201 Study Completed Phase I: One Retention Basin Built. Phase II: Insufficient WQ justification	-	Phase II: Swirl Swirl Concentrators.

Table 6

REGION V
MAJOR CSO PROJECT STATUS
January 1983

Urban Area	State	Overall CSO Status	Multipurpose Solutions	Proposed Solutions
Muskegon	MI	201 Study Completed. Design Completed. Awaiting Step 3 fudning.	-	Sewer Rehabilitation
Kalamazoo	MI	201 Study Completed Under Construction	-	Sewer Rahabilitation
Minneapolis	MN	Initial 201 Study submitted and under review; EIS ongoing Reduced CSO alternatives being developed.	-	Sewer Separation. Relief sewers.
Akron	OH	201 Study Completed (9/82). One Detention Tank Constructed. Low Priority/Lack of Funding	-	Separation Swirl Concentrator Detention Tanks
Cincinnati	OH	201 Study Completed. Some design completed. Low Priority/Lack of Funding	-	-
Cleveland	OH	201 Study completed. Low Priority/Lack of Funding	-	Study not reviewed. Study recommends numerous solutions.
Columbus	OH	Ongoing 201 Study Target Completion 1/84	-	-
Elyria	OH	201 Study Completed Study under Review	-	Basin Storage Sewer Separation Relief Sewers

Table 7

REGION V
MAJOR CSO PROJECT STATUS
January 1983

Urban Area	State	Overall CSO Status	Multipurpose Solutions	Proposed Solutions
Lima	OH	201 Study Completed Low Priority/Lack of Funding	-	Study not reviewed
Oregon	OH	Sewers completely separated. No longer combined	-	Sewer Separation
Springfield	OH	201 Study Completed Low Priority/Lack of Funding	-	Study not reviewed
Toledo	OH	3 part CSO program: Part I-construction completed. Part II-under design.	basement flooding	In-system storage
Youngstown	OH	201 Study Nearly Completed (Expected 2/83)	-	-
Kenosha	WI	Under Construction	-	Sewer Separation
Milwaukee	WI	Under Design	-	In-line Storage
Racine	WI	Under Construction	-	Sewer Separation

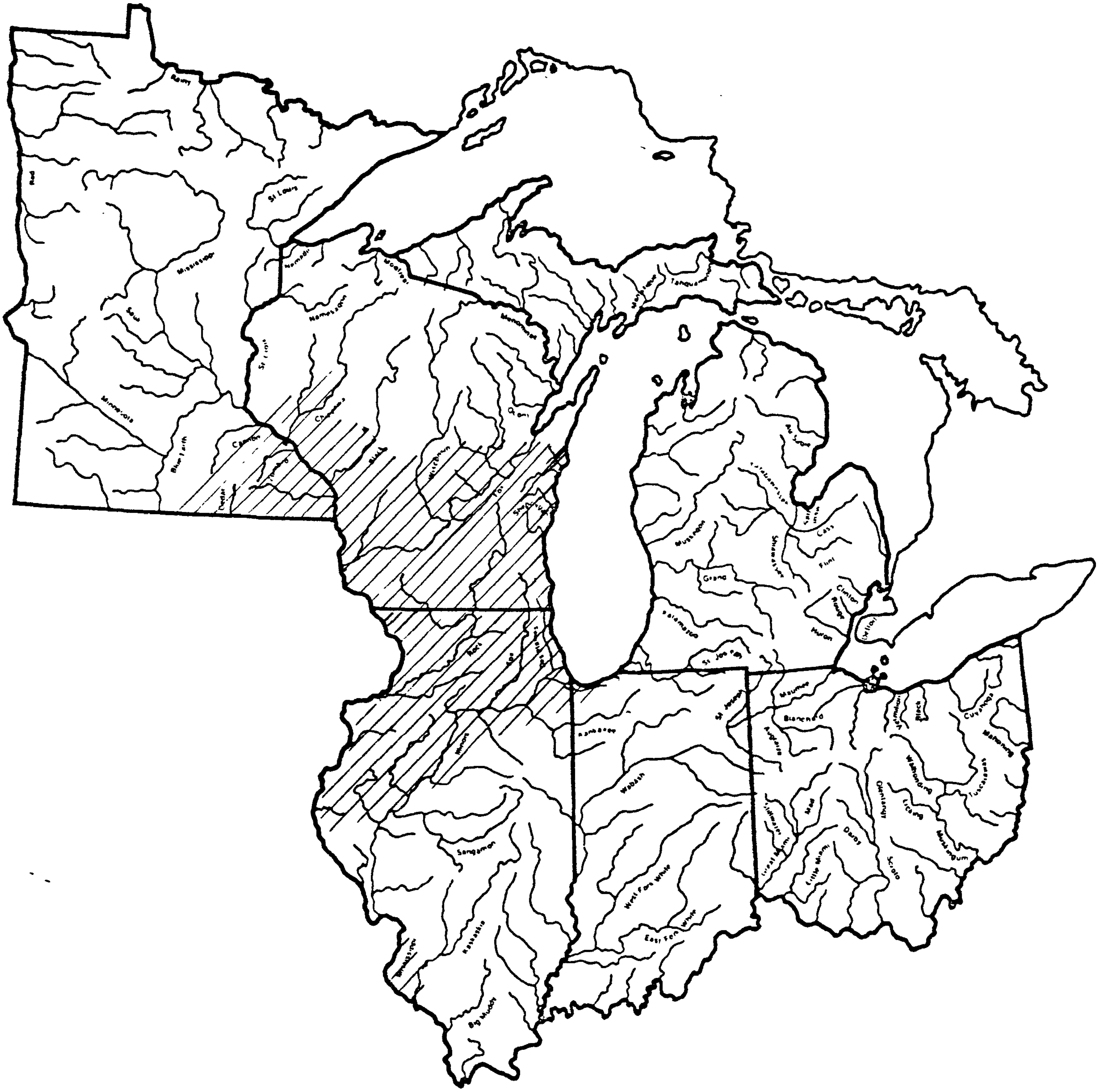
Reference Materials and Data Used by the Region V Drinking Water Program in Preparing Parts 1 and 2.

a. Region V Public Water System Statistics and Compliance Trends

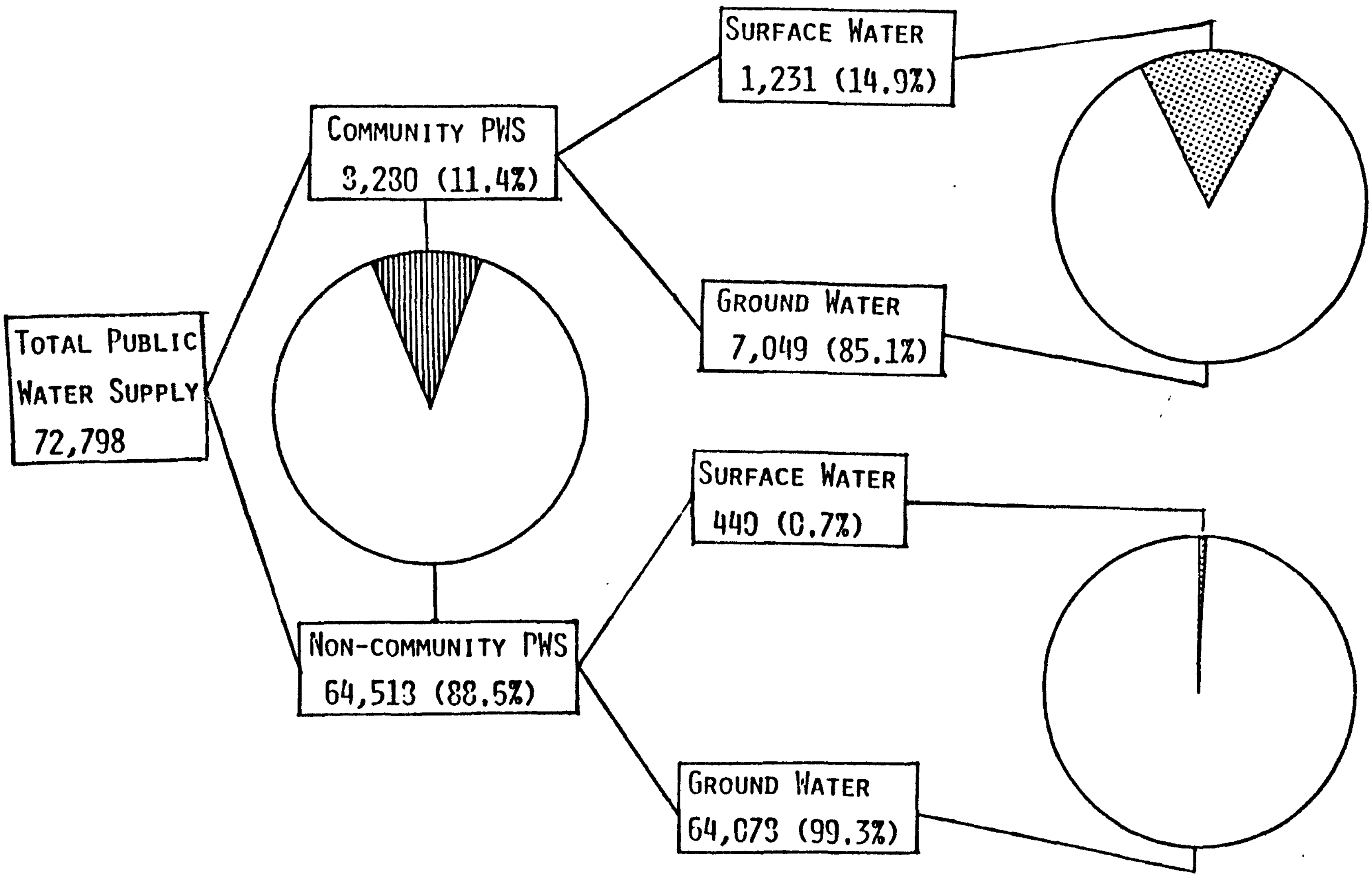
The regional map shows the areas where barium, fluoride, and alpha radiation contamination are found. They are associated with the cambro-ordivician sandstone formation that rises from greater than 2,000 feet deep in Indiana; to almost the surface in Wisconsin. It then begins to descend again into Iowa and Minnesota. The cross-hatched area is where the sandstone is shallow enough to contain fresh water, but deep enough to be high in dissolved solids which include the barium, fluoride, and radium drinking water contaminants. The area essentially stops at the Illinois-Wisconsin border due to drift aquifers being available and almost universally used on the Wisconsin side.

The charts that follow the map are self explanatory breakdowns of public water system statistics and compliance data for Region V. This information was developed from the Federal Reporting Data System for the national public water system supervision program.

Location of Public Water Systems Using the Cambro-Ordovician Sandstone Aquifer



PUBLIC WATER SUPPLIES IN REGION V



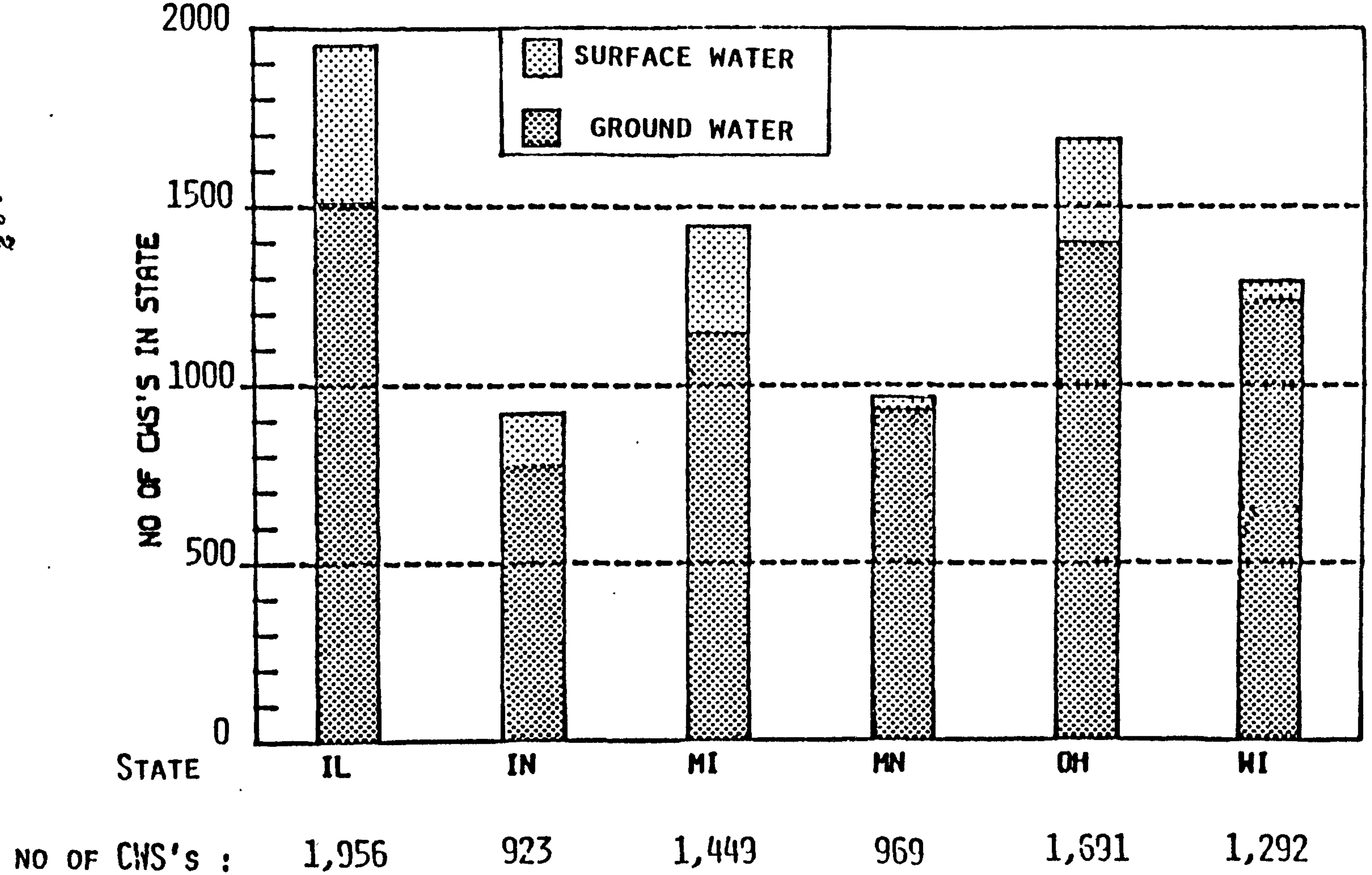
FY81

COMMUNITY WATER SUPPLIES IN STATES

	SIZE CATEGORY						SOURCE TYPE	
STATE	V-S	S	M	L	V-L	TOTAL	SURFACE	GROUND
IL	865	688	208	189	6	1956	444	1512
IN	430	353	89	45	6	923	135	788
MI	827	395	119	101	7	1449	284	1165
MN	535	311	65	55	3	969	35	934
OH	943	464	157	118	9	1691	289	1402
WI	842	324	76	47	3	1292	44	1248
REG V	4442	2535	714	555	34	8280	1231	7049
% IN REG	53.65	30.62	8.62	6.70	0.41	100.00	14.87	85.13

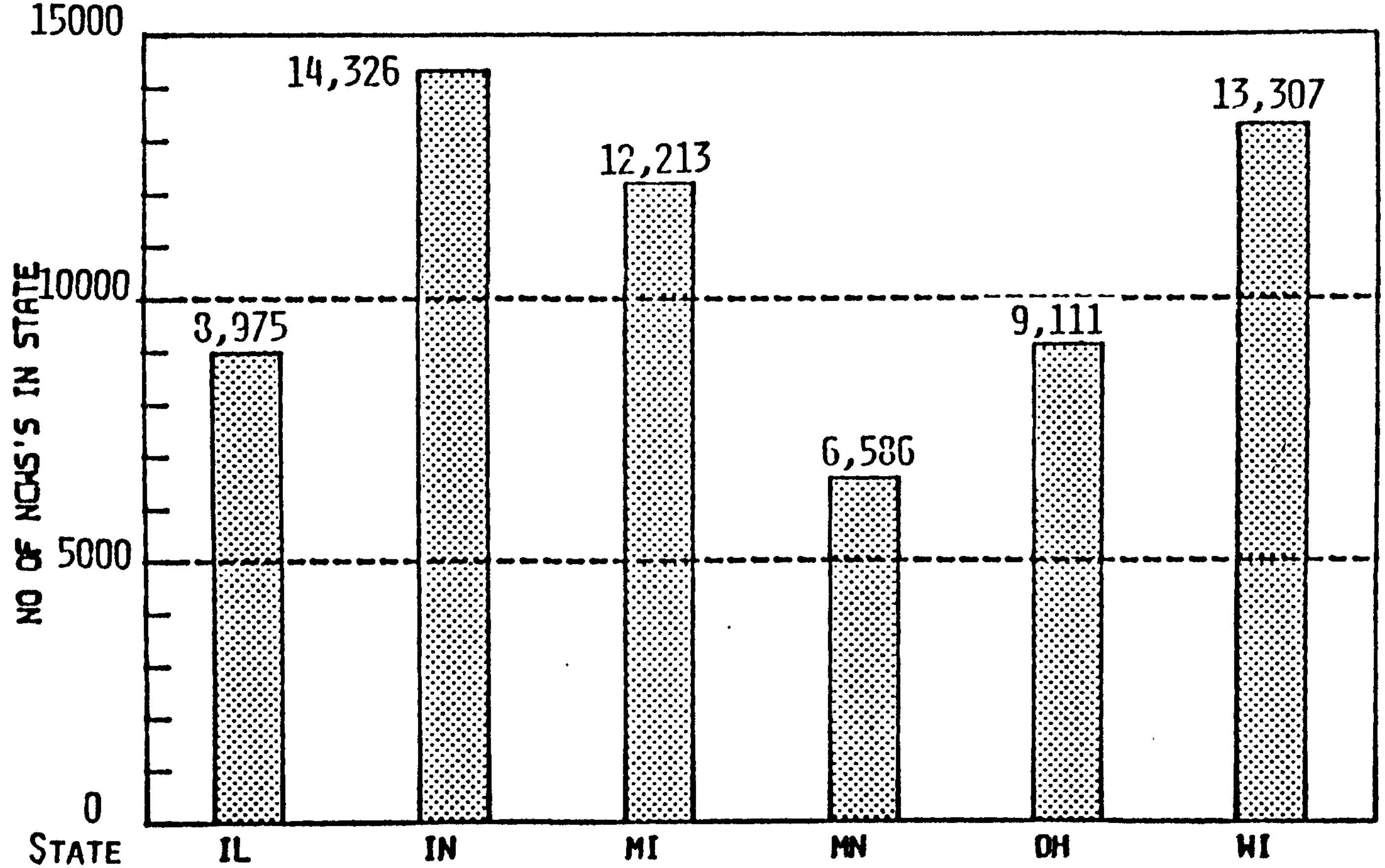
STATE DISTRIBUTION OF CWS'S IN REGION

REGIONAL TOTAL = 8,280

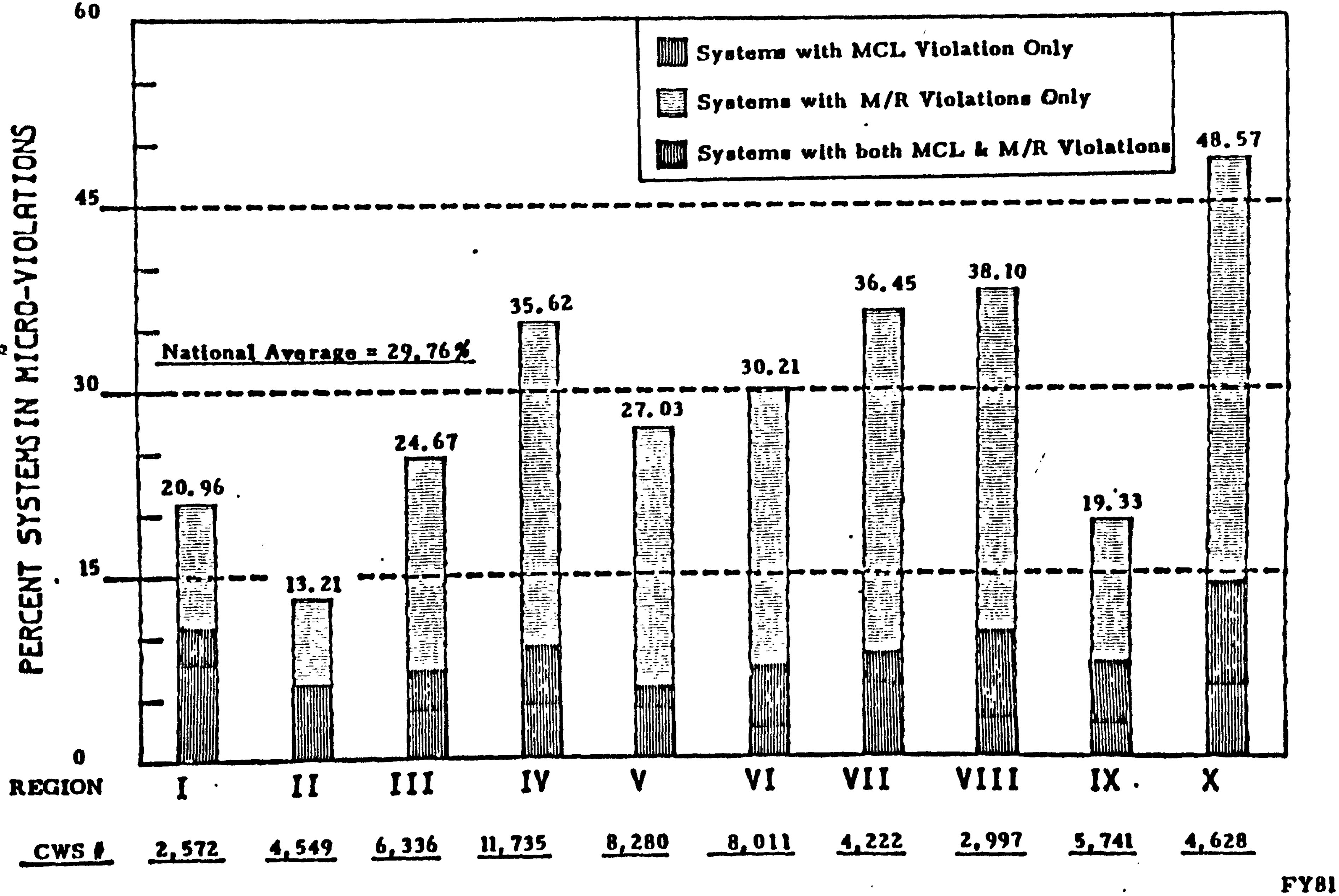


STATE DISTRIBUTION OF NCWS'S

REGIONAL TOTAL = 64,518



REGIONAL MICROBIOLOGICAL STATUS



FY81

REGIONAL MICROBIOLOGICAL COMPLIANCE

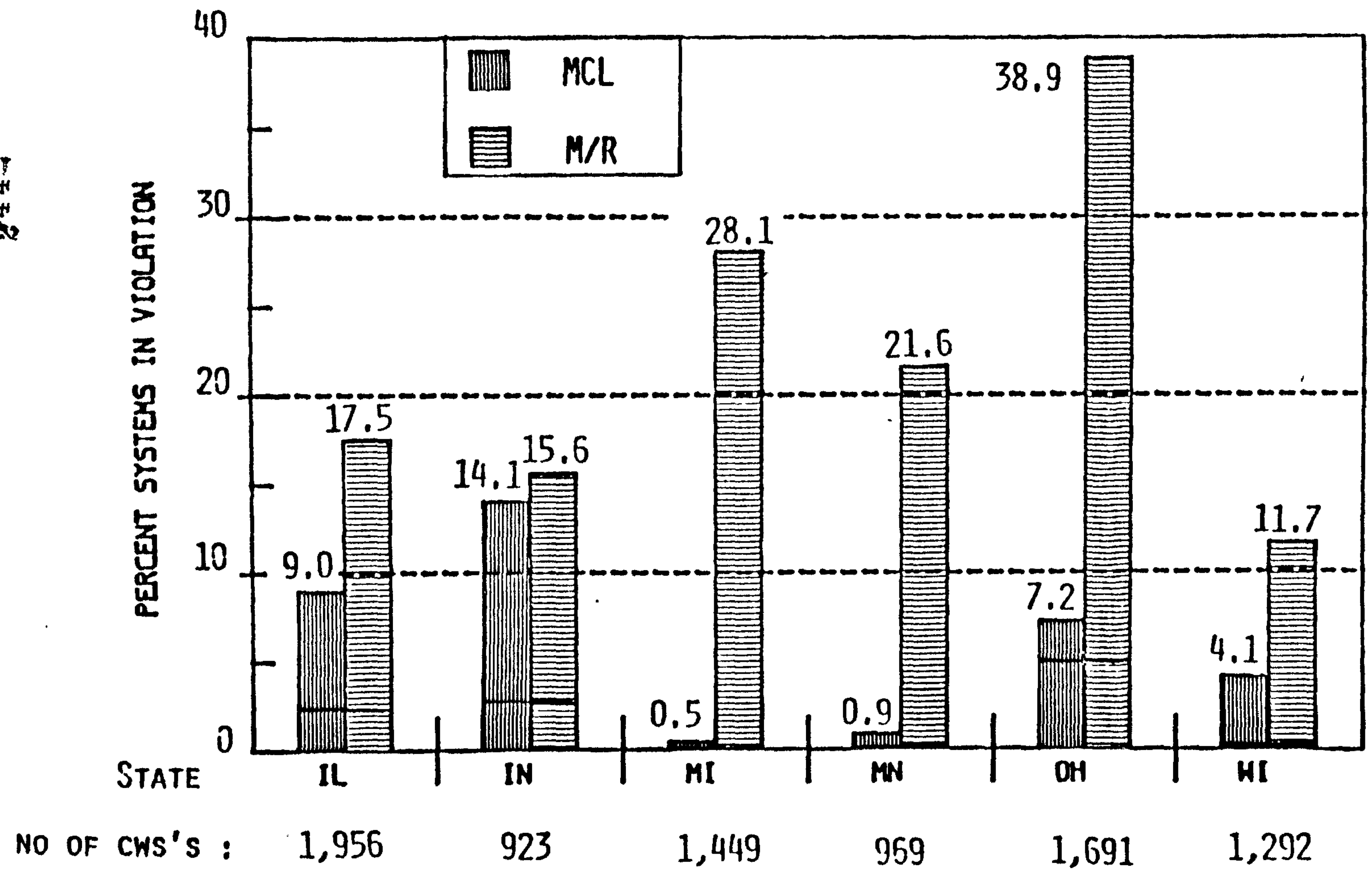
REGION	CWS	%MCL	% M/R	% TOTAL	% BOTH
I	2572	10.81	13.22	20.96	3.07
II	4549	6.07	7.32	13.21	0.18
III	6336	7.43	20.83	24.67	3.60
IV	11735	9.31	31.78	35.62	5.47
V	8280	5.99	23.08	27.03	2.04
VI	8011	7.39	27.61	30.21	4.79
VII	4222	8.76	30.81	36.45	3.13
VIII	2997	10.34	35.10	38.10	7.34
IX	5741	7.80	16.63	19.33	5.10
X	4628	14.43	43.02	48.57	8.88
NATIONAL TOTAL	59071	8.47	25.64	29.76	4.34

DISTRIBUTION OF THE MICROBIOLOGICAL VIOLATIONS IN STATES

STATE	TOTAL # OF CWS'S	MCL		M/R		TOTAL	
		SYSTEMS	%	SYSTEMS	%	SYSTEMS	%
IL	1956	176	9.0	343	17.5	472	24.1
IN	923	130	14.1	144	15.6	249	27.0
MI	1449	7	.5	407	28.1	411	28.4
MN	969	9	.9	209	21.6	216	22.3
OH	1691	121	7.2	657	38.9	692	40.9
WI	1292	53	4.1	151	11.7	198	15.3
REGIONAL TOTAL	8280	496	6.0	1911	23.1	2238	27.0

NATIONAL AVERAGE: 8.47% (MCL)
25.64% (M/R)
29.76% (TOTAL)

MICROBIOLOGICAL VIOLATIONS IN FY81

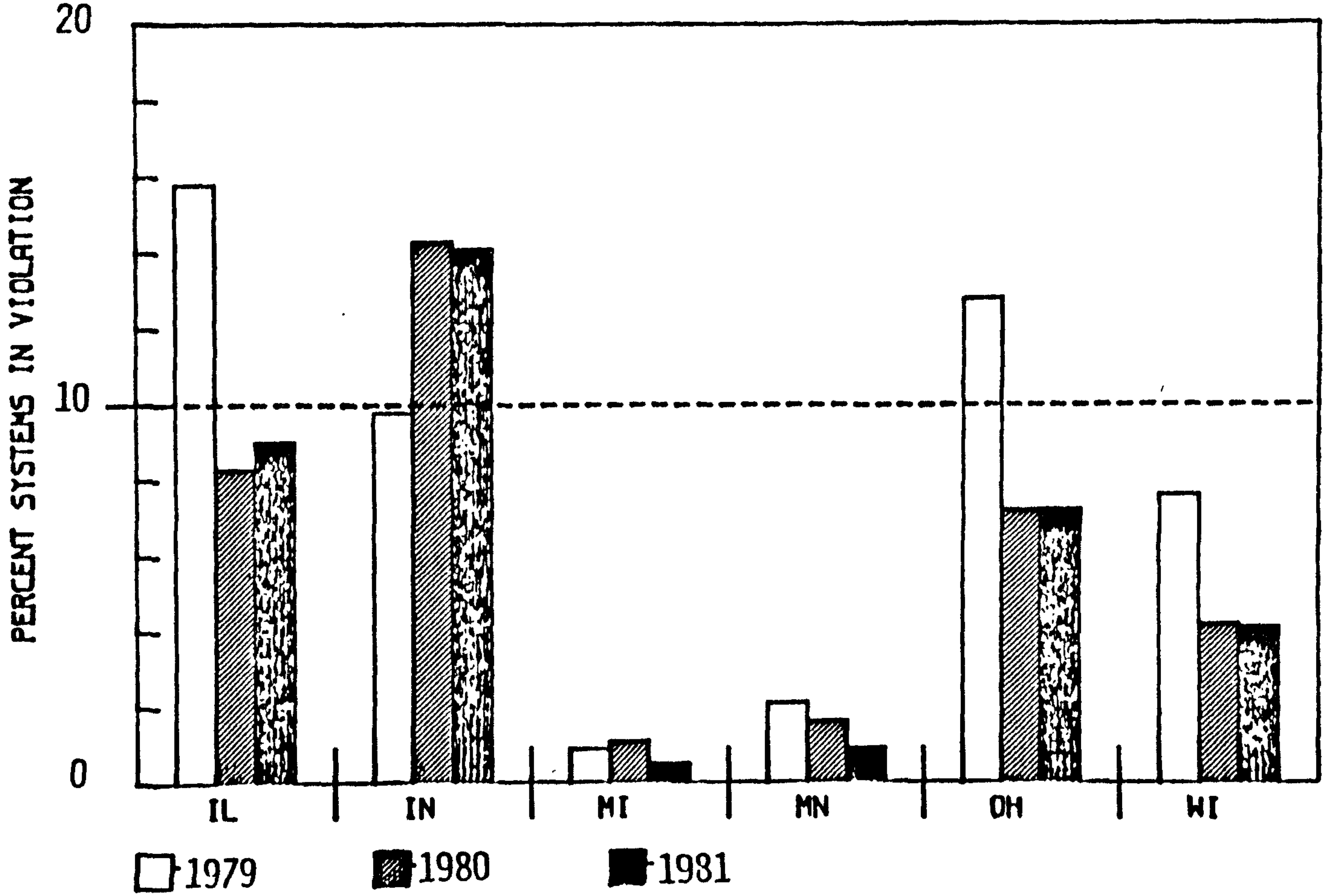


Compliance Comparison for Microbiological Violations

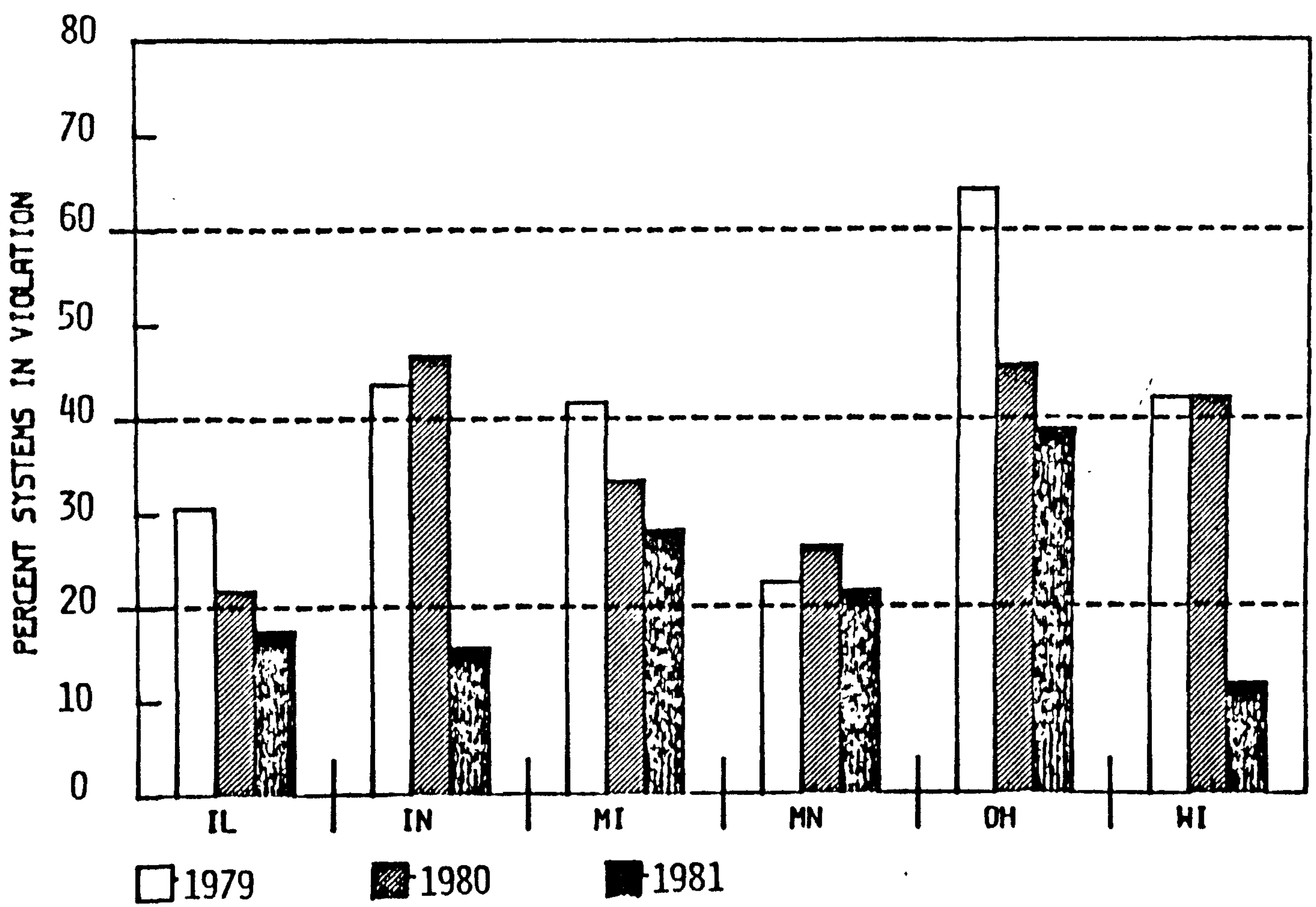
(by % systems in violation)

	MCL				M/R			
State	FY 79	FY 80	FY 81	FY 82	FY 79	FY 80	FY 81	FY 82
IL	15.8	8.3	9.0	TO BE COMPLETED	30.6	21.8	17.5	TO BE COMPLETED
IN	9.8	14.3	14.1		43.7	46.7	15.6	
MI	0.9	1.1	0.5		41.7	33.4	28.1	
MN	2.1	1.6	0.9		22.6	26.4	21.6	
OH	12.8	7.2	7.2		64.3	45.7	38.9	
WI	7.6	4.2	4.1		42.2	42.2	11.7	
Regional Average	8.9	6.0	6.0		42.1	35.3	23.1	

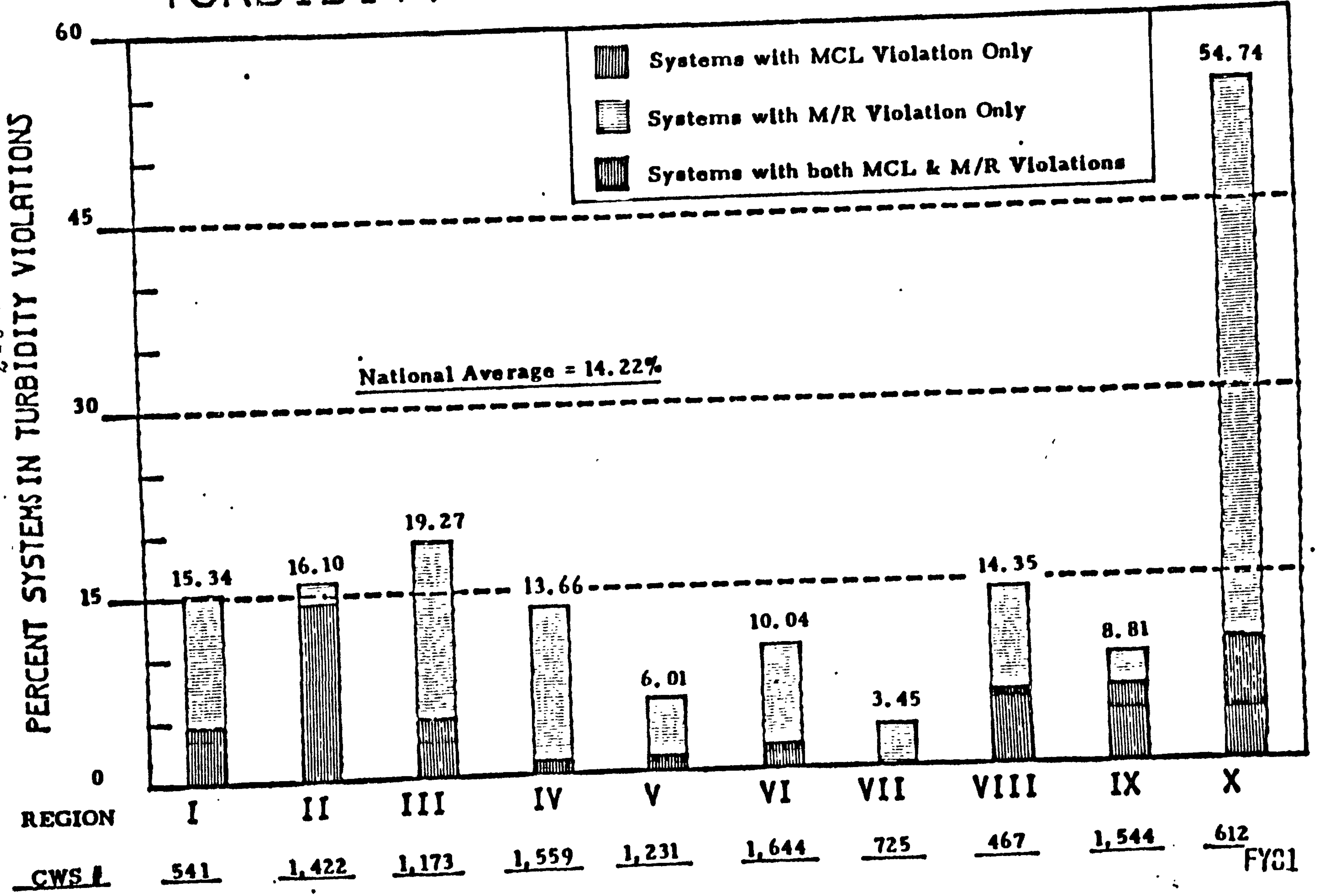
COMPARISON OF MICRO-MCL VIOLATIONS



COMPARISON OF MICRO-M/R VIOLATIONS



TURBIDITY VIOLATIONS IN TEN REGIONS



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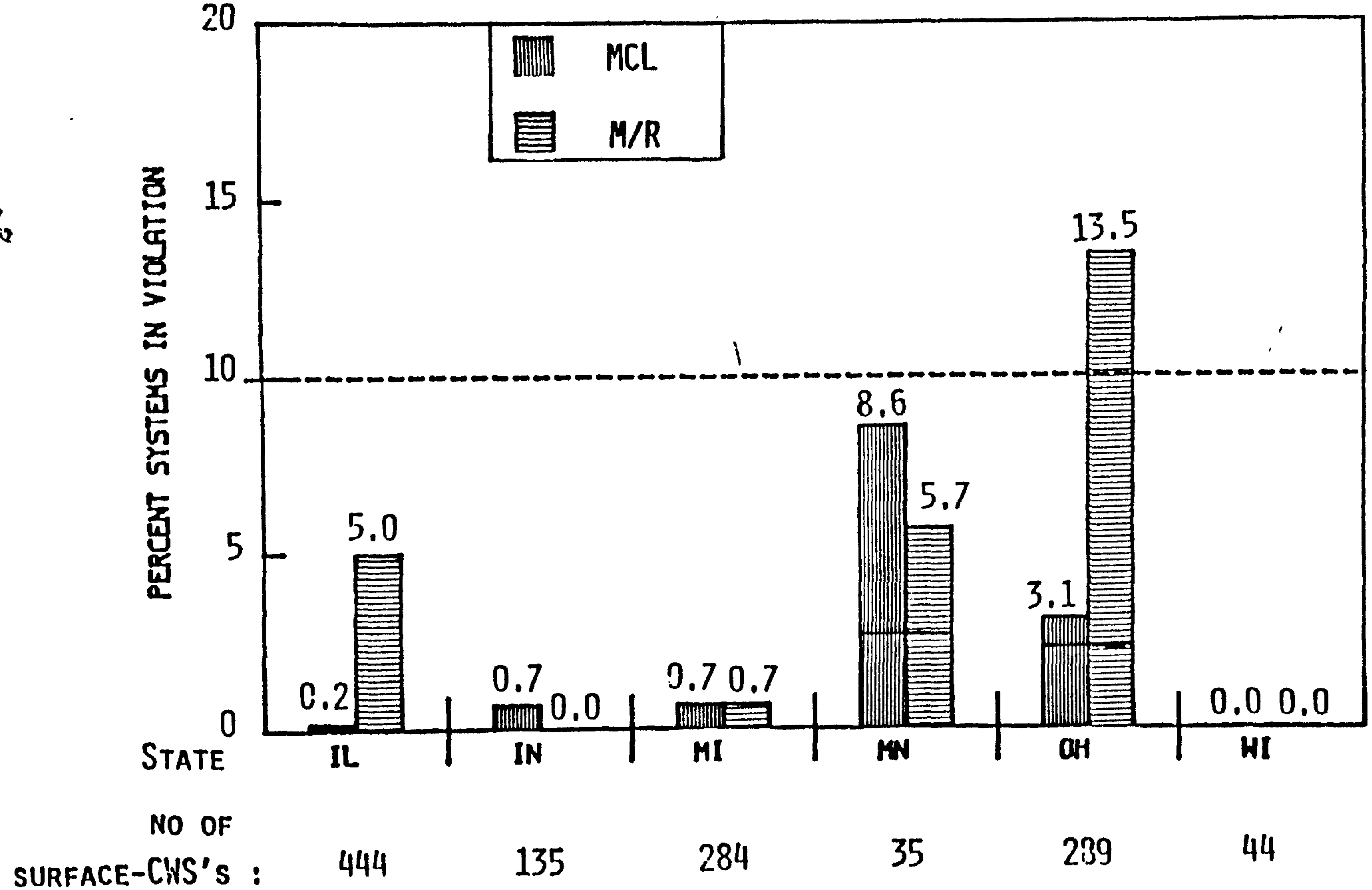
REGIONAL TURBIDITY VIOLATIONS

REGION	SUR-CWS	MCL	%MCL	M/R	% M/R	TOTAL	% TOTAL	T-BOTH	% T-BOTH
I	541	25	4.62	65	12.01	83	15.34	7	1.29
II	1422	205	14.42	26	1.83	229	16.10	2	0.14
III	1173	56	4.77	192	16.37	226	19.27	22	1.88
IV	1559	17	1.09	209	13.41	213	13.66	13	0.83
V	1231	16	1.30	65	5.28	74	6.01	7	0.57
VI	1644	32	1.95	145	8.82	165	10.04	12	0.73
VII	725	0	0.00	25	3.45	25	3.45	0	0.00
VIII	467	28	6.00	43	9.21	67	14.35	4	0.86
IX	1544	96	6.22	75	4.86	136	8.81	35	2.27
X	612	60	9.80	311	50.82	335	54.74	36	5.88
NATIONAL TOTAL	10918	535	4.90	1156	10.59	1553	14.22	138	1.26

FY31

TURBIDITY VIOLATIONS IN FY81



DISTRIBUTION OF THE TURBIDITY VIOLATIONS IN STATES

STATE	TOTAL # OF CWS'S	MCL		M/R		TOTAL	
		SYSTEMS	%	SYSTEMS	%	SYSTEMS	#
IL	444	1	.2	22	5.0	23	5.2
IN	135	1	.7	0	0	1	.7
MI	284	2	.7	2	.7	4	1.4
MN	35	3	8.6	2	5.7	4	11.4
OH	289	9	3.1	39	13.5	42	14.5
WI	44	0	0	0	0	0	0
REGIONAL TOTAL	1231	16	1.3	65	5.3	74	6.0

NATIONAL AVERAGE: 4.9% (MCL)

10.59% (M/R)

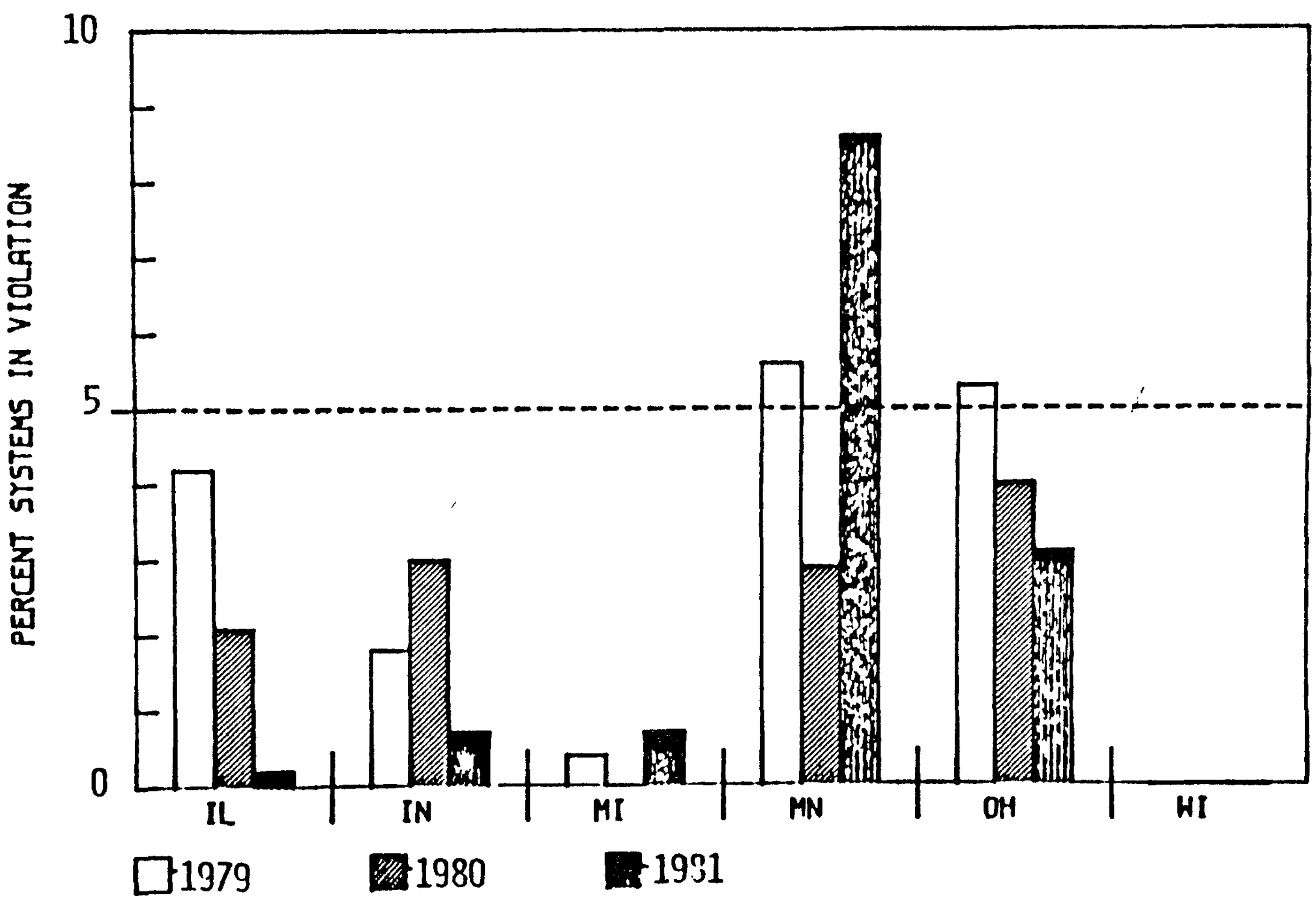
14.22% (TOTAL)

Compliance Comparison for Turbidity Violations

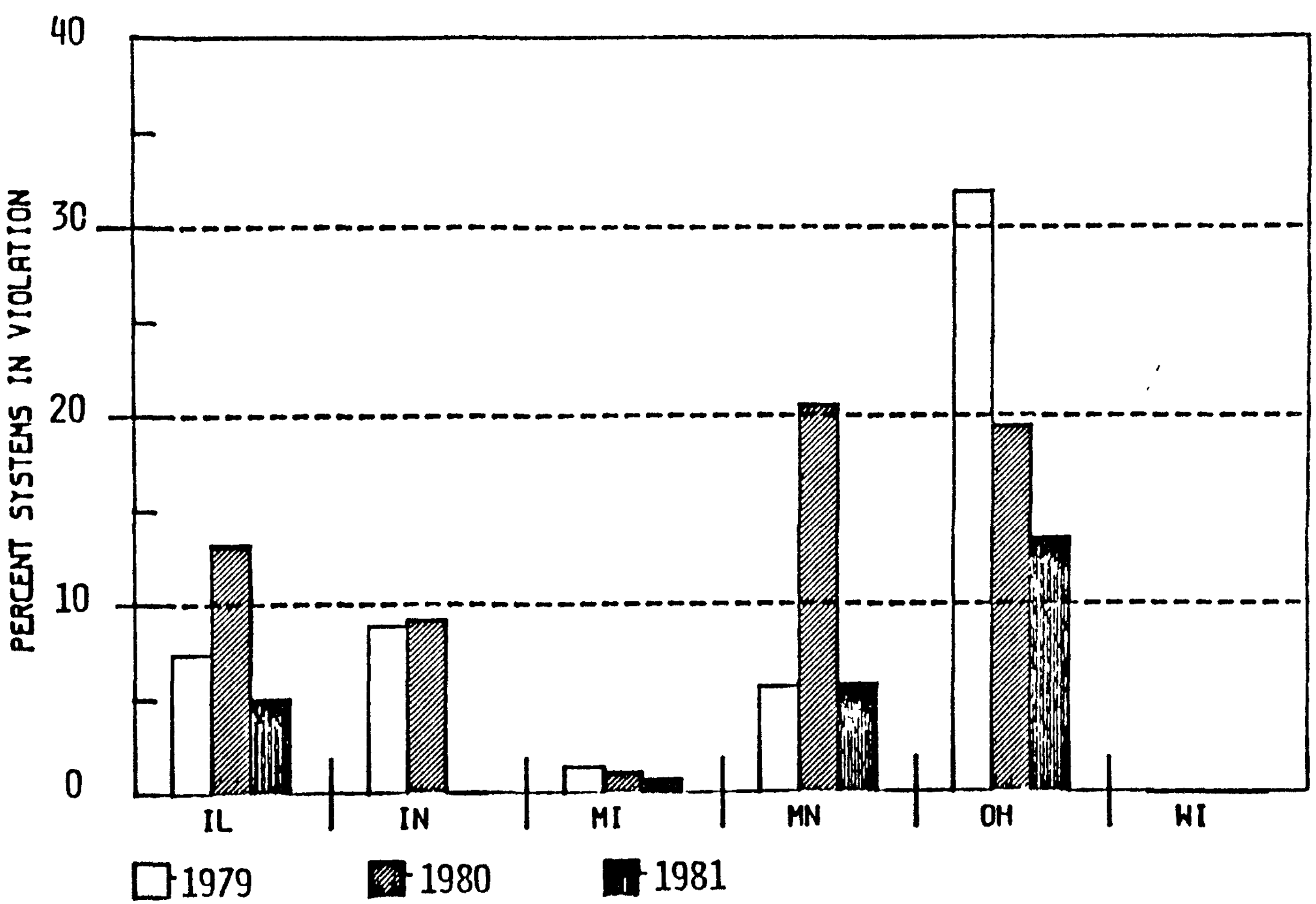
(by % systems in violation)

	MCL				M/R			
State	FY 79	FY 80	FY 81	FY 82	FY 79	FY 80	FY 81	FY 82
IL	4.2	2.1	0.2	To be completed	7.4	13.2	5.0	To be completed
IN	1.8	3.0	0.7		8.9	9.2	0.0	
MI	0.4	0.0	0.7		1.4	1.1	0.7	
MN	5.6	2.9	8.6		5.6	20.6	5.7	
OH	5.3	4.0	3.1		31.9	19.5	13.5	
WI	0.0	0.0	0.0		0.0	0.0	0.0	
Regional Average	3.2	2.1	1.3		11.4	11.4	5.3	

COMPARISON OF TURB-MCL VIOLATIONS



COMPARISON OF TURB-M/R VIOLATIONS



PUBLIC NOTICES ISSUED TO VIOLATION

STATE	MICRO- MCL	MICRO- M/R	TURB- MCL	TURB- M/R	CHEM- MCL	CHEM- M/R
IL	310	468	2	10	22	69
IN	120	145	2	0	0	320
MI	9	0	5	0	3	0
MN	4	0	18	0	3	0
OH	68	309	4	21	0	0
WI	56	0	0	0	13	0
REG V	567	922	31	31	41	389

ALL INFORMATION ARE OBTAINED FROM FRDS 30.06.

b. Volatile Synthetic Organic Chemicals in Region V Drinking Water

During 1981, U.S. EPA conducted a sampling of 945 public water supplies which use ground water as a source, specifically looking for the presence of volatile synthetic organic chemicals (VOCs). Samples were collected from water systems in all States, and the laboratory analyses specifically looked for the presence of 34 chemicals which are considered to be a health hazard at low concentrations.

Laboratory equipment capable of reliably detecting VOCs at low concentrations has only recently become available, so it has taken State laboratories some time to up-grade their equipment and staff with qualified personnel in order to process VOC samples. A few States had early indications of wide-spread contamination so had begun some sampling, but in general, most States had little idea of how wide-spread the problem could be. Nationally, there was contamination above the laboratory detection limit found during the survey in about 25% of the randomly selected systems. About this same percentage is now being found in Region V States.

During the past year, U.S. EPA and the Region V States have begun additional sampling for VOCs, within current resource and laboratory capability constraints. Following is a summary of data available to this point on sampling completed and prevalence of VOCs in Region V drinking water.

Occurrence Data for the Detection of Organic Chemicals in Drinking Water in Illinois

Parameters	No. of Wells Analyzed	No of Drinking Water Wells With Results Above Detection Limit	Estimated 1 X 10^{-6} Risk Level	% Results $\geq$ 1 X 10^{-6} Risk	% Results $\geq$ 1 X 10^{-4} Risk	Range of all Results
one or more VOC's	TO BE COMPLETED		-	-	-	0.26 - 550
trichloroethylene	" "	"	4.6(1)	TO BE COMPLETED		0.29 - 550
tetrachloroethylene	" "	"	2.2(2)	" "	"	0.26 - 390
1,1,1-trichloroethane	" "	"	unknown	" "	"	1.1 - 240
cis &/or trans-dichloroethylene	" "	"	unknown	" "	"	2.0 - 31.0
1,1-dichloroethylene	" "	"	0.034**	" "	"	0.32
1,1-dichloroethane	" "	"	30.6**	" "	"	4.2 - 29.0
1,2-dichloroethane	" "	"	.7(1)	" "	"	1.1
benzene	" "	"	.67(3)	" "	"	0.58 - 2.7
methylene chlorides	" "	"	unknown	" "	"	1.0 - 19.0
vinyl chloride	" "	"	1.0(1)	" "	"	5.9
chlorobenzenes	" "	"	unknown	" "	"	2.7
O-dichlorobenzene	" "	"	unknown	" "	"	2.2
M-xylene	" "	"	unknown	" "	"	0.30
O+P-xylene	" "	"	unknown	" "	"	0.27
carbon tetra chloride	" "	"	4.5(1)	" "	"	0.22
dibromochloromethane (THM)	" "	"	unknown	" "	"	2.1
bromoform (THM)	" "	"	unknown	" "	"	110

** Estimated
(1) NAS Drinking Water & Health
(2) National Cancer Institute
(3) EPA Drinking Water Advisory
All concentrations reported in micrograms per liter (parts per billion)

REV. 2/84

Occurrence Data for the Detection of Organic Chemicals in Drinking Water in Indiana

Parameters	No. of Wells Analyzed	No of Drinking Water Wells With Results Above Detection Limit	Estimated 1 X 10^{-6} Risk Level	% Results $\geq$ 1 X 10^{-6} Risk	% Results $\geq$ 1 X 10^{-4} Risk	Range of all Results
one or more VOC's	67	31*	-	-	-	0.25 - 880
trichloroethylene	67	22	4.6(1)	36%	5%	0.5 - 880
tetrachloroethylene	67	8	2.2(2)	62%	none	0.21 - 53
1,1,1-trichloroethane	67	11	unknown	27%	none	0.6 - 65
1,2-dichloroethylene	67	6	unknown	unknown	unknown	0.33 - 5.0
1,1-dichloroethylene	67	2	0.034**	100%	none	1.0 - 1.7
1,1-dichloroethane	67	6	30.6**	none	none	.85 - 9.0
1,2-dichloroethane	67	9	0.70(1)	67%	11%	0.25 - 77
para-dichlorobenzene	67	1	unknown	unknown	unknown	0.66
xylenes	67	1	62.0**	none	none	3.7
benzene	67	2	.67(3)	100%	none	1.0 - 3.5

* Confirmed
** Estimated
(1) NAS Drinking Water and Health
(2) National Cancer Institute
(3) EPA Drinking Water Advisory
all concentrations reported in micrograms per liter (parts per billion)

REV. 2/24

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Occurrence Data for the Detection of Organic Chemicals in Drinking Water in Michigan

Parameters	No. of Wells Analyzed	No of Drinking Water Wells With Results Above Detection Limit	Estimated 1×10^{-6} Risk Level	% Results $\geq 1 \times 10^{-6}$ Risk	% Results $\geq 1 \times 10^{-4}$ Risk	Range of all Results
one or more VOC's	398	35*	-	-	-	1.0 - 103.0
trichloroethylene	398	23	4.6(1)	52.0	none	1.0 - 103.0
tetrachloroethylene	398	18	2.2(2)	66.0	none	1.0 - 44.0
1,1,1-trichloroethane	398	19	unknown	21.0	none	1.0 - 91.0
cis-1,2-dichloroethylene	398	25	unknown	unknown	unknown	1.0 - 67.0
1,1-dichloroethane	398	13	30.6**	none	none	1.0 - 12.0
1,2-dichloroethane	398	4	.7(1)	100.0	none	1.0 - 12.0
carbon tetrachloride	398	1	4.5(1)	100.0	none	20

* Confirmed
** Estimated
(1) NAS Drinking Water & Health
(2) National Cancer Institute
(3) EPA Drinking Water Advisory
All concentrations reported in micrograms per liter (parts per billion)

REV. 2-4

Occurrence Data for the Detection of Organic Chemicals in Drinking Water in Minnesota

Parameters	No. of Wells Analyzed	No of Drinking Water Wells With Results Above Detection Limit	Estimated 1×10^{-6} Risk Level	% Results $\geq 1 \times 10^{-6}$ Risk	% Results $\geq 1 \times 10^{-4}$ Risk	Range of all Results
one or more VOC's	156	*	-	TO BE COMPLETED		* - 4100.0
1,1,1-trichloroethane	156	18	unknown	" "	"	* - 1400.0
trans-1,2-dichloroethylene	156	13	unknown	" "	"	* - 42.0
1,1-dichloroethylene	156	18	0.034**	" "	"	* - 210.0
1,1-dichloroethane	156	19	30.6**	" "	"	* - 330.0
1,2-dichloroethane	156	3	.7(1)	" "	"	* - 1.1
carbon tetrachloride	156	1	4.5(1)	" "	"	* - 2.6
1,1,2-trichloroethylene	156	28	5.0(1)	" "	"	* - 4100.0
cis-1,2-dichloroethylene	156	6	unknown	" "	"	6.7

* To be completed
** Estimated
(1) NAS Drinking Water & Health
(2) National Cancer Institute
(3) EPA Drinking Water Advisory
All concentrations reported in micrograms per liter (parts per billion)

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rev. 2-1-4

Occurrence Data for the Detection of Organic Chemicals in Drinking Water in Ohio

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Parameters	No. of Wells Analyzed	No of Drinking Water Wells With Results Above Detection Limit	Estimated 1 X 10^{-6} Risk Level	% Results $\geq$ 1 X 10^{-6} Risk	% Results $\geq$ 1 X 10^{-4} Risk	Range of all Results
one or more VOC's	TO BE COMPLETED		-	-	-	.52 - 14.0
trichloroethylene	" "	"	4.6(1)	TO BE COMPLETED		.56 - 9.9
tetrachloroethylene	" "	"	2.2(2)	" "	"	.52 - 3.6
1,1,1-trichloroethane	" "	"	unknown	" "	"	.61 - 8.9
cis-1,2-dichloroethylene	" "	"	unknown	" "	"	1.3 - 7.3
1,1-dichloroethane	" "	"	30.6**	" "	"	.60 - .80
1,2 - dichloroethane	" "	"	.7(1)	" "	"	.6
methylene chloride	" "	"	unknown	" "	"	1.5 - 14.0
carbon tetrachloride	" "	"	4.5(1)	" "	"	.70 - 1.0

** Estimated
(1) NAS Drinking Water & Health
(2) National Cancer Institute
(3) EPA Drinking Water Advisory
All concentrations reported in micrograms per liter (parts per billion)

REV. 2/-2

Occurrence Data for the Detection of Organic Chemicals in Drinking Water in Wisconsin

262

Parameters	No. of Wells Analyzed	No of Drinking Water Wells With Results Above Detection Limit	Estimated 1×10^{-6} Risk Level	% Results $\geq 1 \times 10^{-6}$ Risk	% Results $\geq 1 \times 10^{-4}$ Risk	Range of all Results
one or more VOCs	208	51	-	-	-	0.1 - 93.0
trichloroethylene	208	21	4.6(1)	33.0	none	0.1 - 93.0
tetrachloroethylene	208	22	2.2(2)	35.0	none	0.1 - 37.0
1,1,1-trichloroethane	208	15	unknown	unknown	none	0.1 - 44.0
1,2-dichloroethylene	208	5	unknown	unknown	unknown	1.0 - 11.0
1,1-dichloroethylene	208	2	0.034**	100.0	none	1.1 - 1.5
1,1-dichloroethane	208	1	30.6**	- 0 -	none	2.7
1,2-dichloroethane	208	1	.7(1)	100.0	none	2.5
para-dichlorobenzene	208	4	unknown	unknown	unknown	(to be comp.)
xylenes	208	2	62.0	- 0 -	none	0.6 - 0.9
benzene	208	2	.67(3)	100.0	none	2.0

** Estimated
(1) NAS Drinking Water & Health
(2) National Cancer Instutute
(3) EPA Drinking Water Advisory
All concentrations reported in micrograms per liter (parts per billion)

REV. 2/84

WD/DWGWPB/ATT A

c. Herbicides in Region V Drinking Water

During 1981 and 1982, the Water Quality Laboratory at Heidelberg College in Tiffin, Ohio studied the occurrence and transport of currently-used pesticides in tributary streams draining agricultural water sheds. The pesticide measurements were from 12 stream gaging stations and occasionally from tap water at a 23,000 population public water system that uses one of the streams as their source of drinking water supply. This research concentrated on detailed studies during storm events following periods of major pesticide application, and concluded that relatively high concentrations of many currently-used pesticides are present in rivers draining large agricultural watersheds. They occur primarily during the run-off events of May and June. Where municipalities withdraw public water supplies directly from rivers, finished tap water may contain pesticide concentrations similar to those in the raw water, unless special efforts are made to remove soluble organic compounds. For many currently-used pesticides insufficient data are available to assess human health hazards. Given the levels of human exposure to these compounds through drinking water, they should be given priority for further investigation of potential health effects. The following table shows the concentrations of herbicides found in the City's tap water. The State laboratory also confirmed high herbicide concentrations in this system's finished drinking water.

Comparison of herbicide concentrations in city tap water with nearby river samples (all concentrations in ug/l)

Source	Date	Atrazine	Simazine	Alachlor	Metolachlor
City Tap Water	810617	15.87	0.85	14.36	16.23
	810702	6.30	0.38	1.97	4.37
	810713	9.13	0.88	3.30	6.45
	810807	1.48	0.30	0.75	1.8
	820528	11.0	0.7	11.4	24.2
Downstream River Location	810615	12.95	0.559	11.89	12.42
	810622	5.05	1.581	3.52	4.29
	810629	7.93	0.479	1.91	4.00
	8205 -	18.8	2.52	18.19	40.6
Upstream River Location	810617	19.73	0.91	10.68	13.36
	810702	5.85	0.25	1.64	3.25
	810712	1.48	0.12	0.27	0.87
	8205 -	48.4	3.6	69.6	90.8

d. Concerns Expressed by Region V State Water Supply Programs

1) Laboratory support

Laboratory equipment and staff is generally not adequate for the sampling that presently should be done for synthetic organic chemicals in drinking water. As additional water systems are identified with contamination, the follow-up sampling that will be required creates a considerable additional load. Present resource restrictions cause a restricted sampling program which results in only a small percentage of the population being protected. Delays in processing and analyzing samples due to laboratory back-up has an adverse effect on adequately following up on identified problems, and creates some loss of creditability with the public.

There is often lack of consistency of data between laboratories, causing confusion and lack of public confidence.

Although newer laboratory equipment with increased sensitivity will surely be introduced as laboratories are up-graded, it should be kept in mind that the net result will probably be the discovery of additional new contaminants and lower concentrations. This will accordingly create even greater demands on laboratory services because of increased confirmation and follow-up requirements.

2) Water system surveillance and technical assistance

Surveillance and technical assistance relative to organic chemical contamination is generating increased program demands on State staff at a time when both State and Federal resources are being generally reduced. The net result is program personnel becoming overwhelmed by a large number of projects with inadequate time to provide an acceptable level of service to any of them. The only apparent solution is to try to reorganize priorities at State and Federal levels.

Good progress has been made in the noncommunity public water supply program. Many potential serious construction deficiencies and microbiological contamination problems are being found and corrected, with great benefit to the public at nominal cost. There is fear that dwindling resources and new priority responsibilities could adversely affect this program.

Suggested methods of re-adjusting priorities to allow more staff time for newly identified problems are to 1) carefully examine all repetitive monitoring requirements to allow States maximum flexibility in modifying monitoring where appropriate, 2) re-examine the maximum contaminant levels to make sure they are established at meaningful public health related levels, and 3) review specified analytical techniques to eliminate or adjust any which are too rigid.

3) Maximum contaminant levels

It is perceived by many State program staff, water supply operators, as well as the public that there is not sufficient evidence of the health dangers of some of the present MCLs to support the rather substantial expenditures required of some systems. It is difficult to obtain compliance if there appears to be any chance that the MCL may be relaxed in the future. The standards particularly considered in this category are those for barium, fluoride, radionuclides, arsenic, chromium and selenium.

There is also concern over the difficulty in enforcing the nitrate MCL. There is tremendous resistance to expending local resources for the rather expensive removal of a contaminant that benefits only a very small portion of the population served. The cost/benefit ratio appears far too great to water system operators and the public.

4) Treatment of contaminated water

Concern is expressed that there is general reluctance by water systems to consider treatment for contaminant removal if other alternatives are available. Research and development funding should be enhanced to show that treatment is safe, and how and when it is viable.

5) Public information

There is a feeling that the public is ~~not~~ being adequately informed or educated on the public health significance ~~dangers~~ concerning drinking water. Many decisions concerning public water supply changes and improvements are being made because of emotional and political pressures rather than on sound technical judgement.

6) Water treatment devices

The market is being plagued with innacurate claims on point-of-use water treatment devices, with the result of a false sense of security by an uninformed public. There is even danger of some devices causing adverse health effects. It appears that control over these devices may be necessary.

WD/DWGWPB/ATT A

Part 1 - Documentation Related to Aldicarb Contamination of Ground Water in Wisconsin which supports Sections IE4b, IIA3f, IIA5e(2), and IIB5d(2)(d)

Information Presented:

1) History of Aldicarb Contamination (excerpted from the Draft Environmental Impact Statement prepared by the State of Wisconsin Department of Agriculture, Trade and Consumer Protection on "Proposed Rules Relating to Special Resitrctions on the Use of Pesticides Containing Aldicarb")

2) Map of the 10 central counties of Wisconsin and the approximate boundaries of the sand plain (excerpted from a draft report prepared by the Wisconsin Department of Natural Resources and attributed to its source).

WD/DWGWPB/ATT A

History of Aldicarb Contamination of Groundwater

In mid-1976, soon after aldicarb was registered for use on potatoes, Cornell University researchers indicated a concern for potential leaching ability to the compound in the sand regions and Long LIsland (5, 43). In 1979, samples were analyzed by Union Carbide and In August 1979, the corporation informed the U.S. EPA that aldicarb had been identified in a few shallow wells located with potato fields (5,48). Additional sampling confirmed that contamination of the ground water existed in many wells located around the potato fields in eastern Long Island (5).

A level of 7 ppb was set as an advisory guideline level for aldicarb contamination by the New York State Department of Health. In addition, an agreement to further test the water was put into place. Between August 1979 and mid-March 1980, approximately 270 New York wells were sampled. Included in the sampling were 11 irrigation wells, 45 public wells and 214 private wells. Of these samples, 61 wells were over the guideline level and an additional 35 wells had amounts detected below the guideline (5). Union Carbide's laboratory has a method sensitivity for the analysis procedure of 1 ppb in ground water (2).

Union Carbide continued to analyze for aldicarb contamination in Logan Island wells. In 1980, Union Carbide analyzed 7,650 samples which resulted in confirmation of contamination of two public water supplies and the following results of analysis of private wells (46):

73% of samples analyzed	No residue detected
13.4% of samples analyzed	1-7 ppb residue detected
7.4% of samples analyzed	8-30 ppb residue detected
4.3% of samples analyzed	31-75 ppb residue detected
2.1% of samples analyzed	>75 ppb residue detected

As a result of the contaminant problems, Union Carbide, in February 1980, voluntarily amended its aldicarb label to exclude uses of the chemical on Long Island (2, 37). In addition, the State of New York took action against the registration of the aldicarb product and has continued the ban of the sale of aldicarb for use of Long Island (37).

Union Carbide was granted an Experimental Use Permit in 1980 to study timing, dosage rates and alternate placement of aldicarb in an attempt to assure minimization of ground water contamination. That study was not continued in 1981 (5). INTERA Environmental Consultants, Inc. was contracted to do modeling work for EPA and determined that breakdown of Temik™ could take years (5). Union Carbide contracted with INTERA to do some additonal simultations of varying degradation and source rates of aldicarb using the modeling developed in the EPA contract work along with new information developed by Union Carbde that indicates a half life of aldicarb in ground water to be 3 years (23, 29).

ASSESSMENT OF GROUNDWATER CONTAMINATION

INVENTORY OF SITES

Task 3(a2) & 3(b) of Groundwater Management Strategy for Michigan
Major Funding From Environmental Protection Agency Grant No. P00558801

July 1982

SUMMARY OF SOURCES

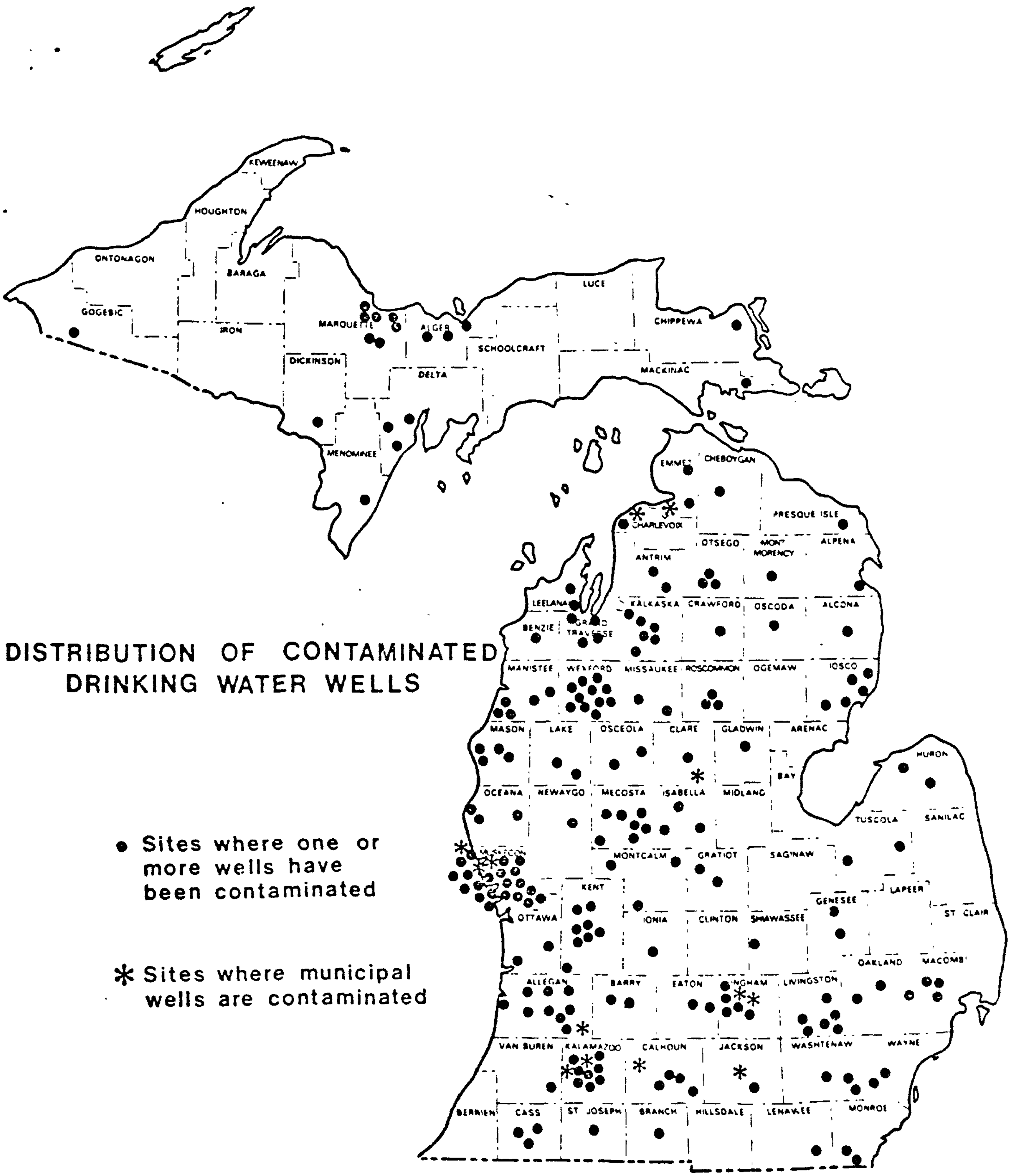
NATURE OF SOURCE	KNOWN NUMBER OF INCIDENTS	KNOWN % OF TOTAL	SUSPECTED NUMBER OF INCIDENTS	SUSPECTED % OF TOTAL
Storage and handling of petroleum products: Total	112	25.5	27	6
--Gasoline stations	--47	--10.5	--5	--1
--Crude bulk storage, refining, pipelines	--30	--7	--3	--1
--Other storage/use (RR yards, co-ops, industries)	--29	--6.5	--12	--2.5
--Transportation spills	--2	--0.5	--5	--1
--Residential gasoline/fuel oil storage	--4	--1	--2	--0.5
Heavy industry (mining, casting, chemical manufacturing, large volumes)	96	22	64	14
Unknown source (most appear to be gasoline contaminations)	59	13.5	2	0.5
Surface and subsurface solid waste (sanitary landfills, illegal dumps, on-site industrial dumps)	57	13	215	47
Salt storage/road salting	33	7.5	86	19
Light industry (small metal plating, printing, manufacturing, woodworking, etc.)	24	5.5	19	4
Oil and gas exploration/production brines	19	4	8	2
Agriculture (animal/vegetable processors, fertilizer/herbicide applicators or distributors)	8	2	8	2
Municipal Wastewater	7	1.5	2	0.5
Transportation spills (fertilizer, chemicals, etc.)	5	1	1	0.5
Laundromats	5	1	19	4
All others, e.g. spill during fire	16	3.5	5	1
TOTALS	441	100%	456	100%

(1979 TOTALS 268 KNOWN 381 SUSPECTED)

CONTAMINATION OF DRINKING WATER SUPPLIES

Approximately 50% of the population of Michigan depends upon groundwater for its drinking water. Consequently, groundwater contamination problems frequently impact drinking water supply wells. There are over several thousand sites that pose a significant potential for contaminating the groundwater (see page 203). Since there are so many such sites, most of which have never been investigated and are not subject to current regulatory programs, many of these problems only surface as a result of complaints from well owners and health departments about unusual tastes and odors in the drinking water. A major portion of the new known contamination sites listed in this inventory involve the contamination of water supply wells. In addition, within the past year, several municipal groundwater supplies have been found to be contaminated. The distribution of sites where drinking water wells have been contaminated are shown on the map on the following page. These sites are also identified in the inventory.

DISTRIBUTION OF CONTAMINATED DRINKING WATER WELLS



• Sites where one or more wells have been contaminated

* Sites where municipal wells are contaminated

1982

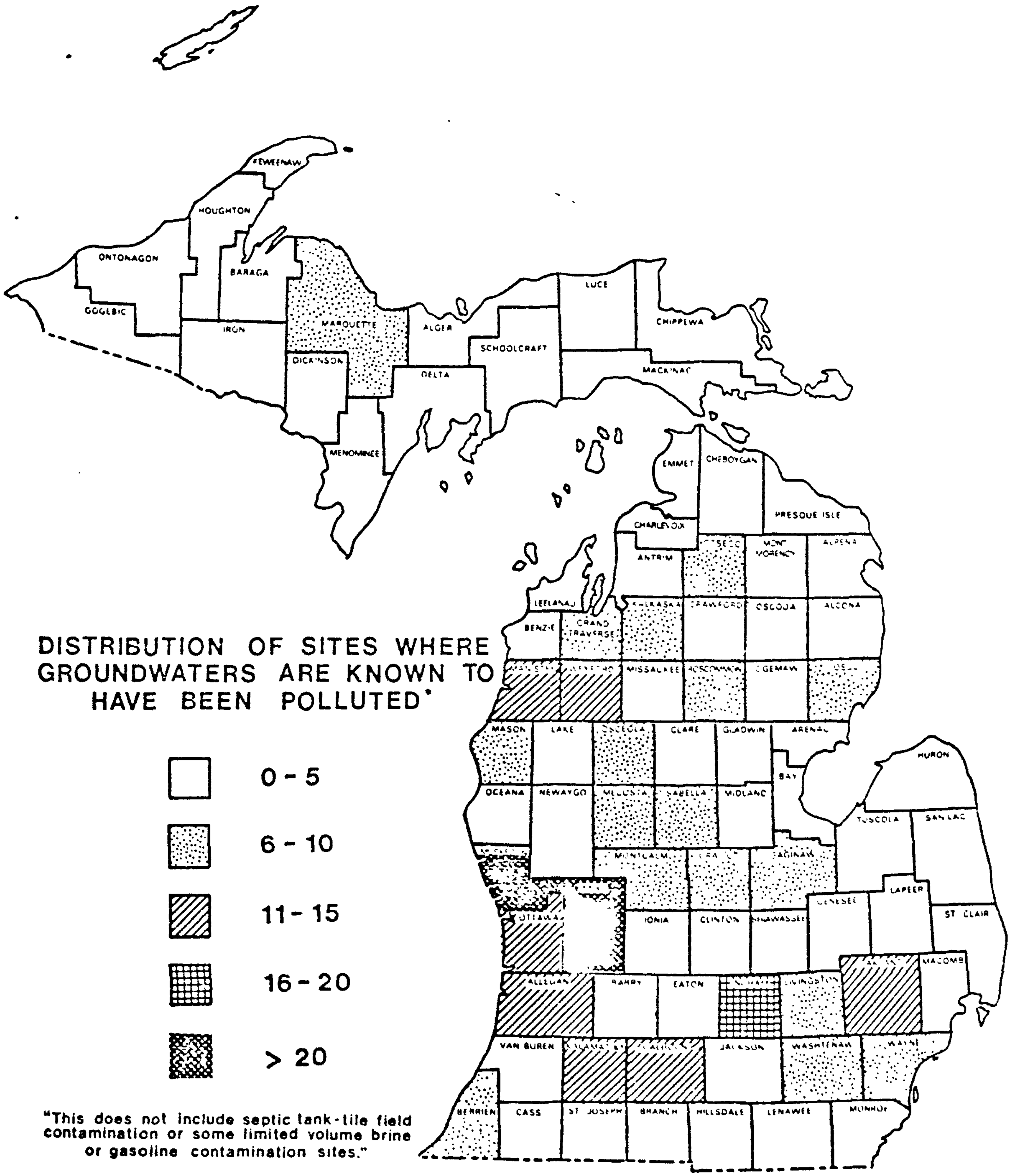
LOCATIONS WHERE GROUNDWATERS ARE KNOWN TO HAVE BEEN POLLUTED

The following is an inventory of locations for which the Department presently has information on hand to indicate that groundwaters at a particular site are or have been polluted.

Many more sites have experienced some form of groundwater contamination than has been possible to include in this inventory. Our intent is to focus attention on sites which seem to have the greatest environmental consequences. Sites which have experienced contamination from domestic septic tank tile field systems are not included. In addition, documentation in this inventory of contamination at several hundred sites due to the spill or loss of limited volumes of gasoline or brine was beyond the scope of this project.

Site investigations, well samplings, as well as literature and file reviews are examples of on-going activities of the Department which provide evidence of the presence or absence of groundwater contamination. Contamination site information is also provided by state and local health departments as it becomes available. Consequently, an inventory of this nature is never "complete" as new information necessitates the continual updating of the list.

Given the above mentioned limitations, this inventory documents 441 locations where groundwaters are known to have been polluted (as of May,1982.)



DISTRIBUTION OF SITES WHERE GROUNDWATERS ARE KNOWN TO HAVE BEEN POLLUTED*

"This does not include septic tank-tile field contamination or some limited volume brine or gasoline contamination sites."

SOURCE : Known Site Inventory as of May 19

LOCATIONS WHERE GROUNDWATERS ARE SUSPECTED TO HAVE BEEN POLLUTED

The following is an inventory of locations at which the Department has reason to believe groundwaters may have been polluted but lacks sufficient data to reach a definite conclusion. This inventory lists sites where past or current activities or incidents are suspected of having caused (or continue to cause) contaminants to enter the groundwaters. The sites on this inventory need additional data before they can be adequately evaluated as to whether or not the groundwater has been contaminated, and whether there is an environmental problem of concern. (Domestic septic tank-tile field incidents are not included.)

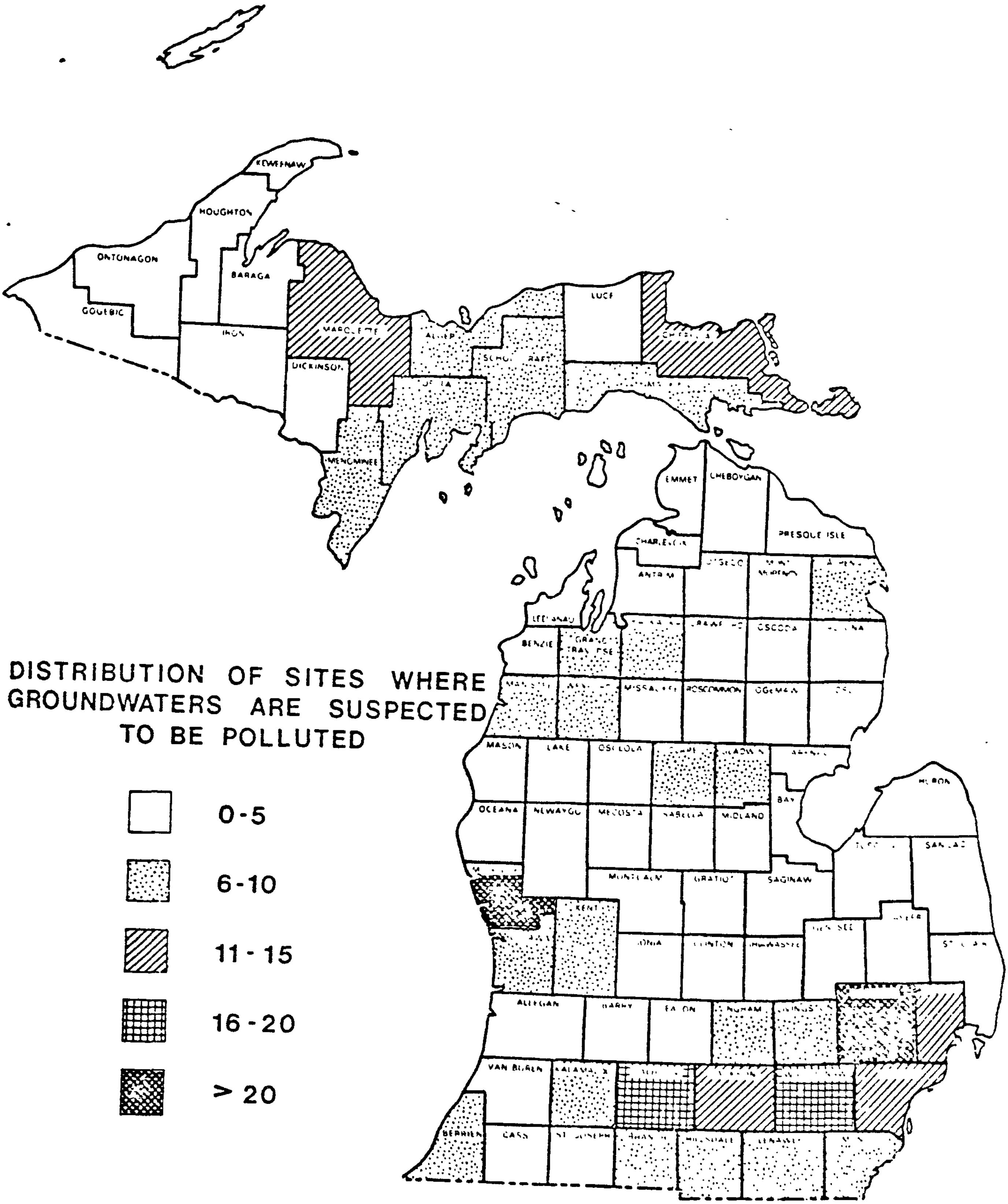
Inclusion of a site in this inventory was based on the following criteria:

1. A release of pollutants is believed to have occurred at the site. This could be such as a release from the confines of a disposal area, or a loss or spill where an uncontrolled release of pollutants has occurred to the soils or the subsurface; and

2. At least two of the following are believed to be true:

   a) groundwater in the area is highly vulnerable to pollution based upon permeability of the soils and depth to the groundwater.
   b) the pollutants involved are hazardous to human health and the environment.
   c) the quantities of pollutants released could be sufficient to limit the use of the groundwater in the affected area.

About 456 sites have been listed as of May, 1982) as being suspected groundwater problem sites meeting the above criteria. This inventory is continually updated as further information about the sites becomes available to the Department.



DISTRIBUTION OF SITES WHERE GROUNDWATERS ARE SUSPECTED TO BE POLLUTED

SOURCE: Suspected Site Inventory as of May 1982

LOCATIONS AT WHICH THERE EXISTS A POTENTIAL FOR GROUNDWATER TO BECOME CONTAMINATED

Numerous activities exist that by their very nature could cause groundwater to become contaminated. These activities were described with listings by category of sites where the activities were occurring in Part II Assessment of Groundwater Contamination in Michigan, December 1979 (currently out of print). It was beyond the scope of this project to update the potential listings. However, category descriptions and summary information have been repeated here in predominantly the same form as in 1979, with some updating and rewording for clarity.

For the majority of potential sites within each category described, insufficient information exists to assess whether they have caused a groundwater problem. It is expected that as such reviews are conducted, many of the sites will be found to be additional groundwater problems which will need to be addressed.

Explanation of Chart Showing the Number of Potential Groundwater Contamination Sites in Michigan

The chart on the following pages illustrates the number of sites with the potential for contaminating groundwater in the state. Each category within a bar on the chart is given a relative rating of concern for potential groundwater contamination. Generally, those categories of greater concern are shown on the far left of the chart (see legend on graph).

Most of the categories that are described in the following text are shown on the chart. The bar labeled "Miscellaneous" on the chart does not correspond with a miscellaneous category in the text. The categories included in the bar under "Miscellaneous" are discussed separately in the text under their respective headings. The combining of these categories was done for ease of illustration, and does not indicate that they are of lesser significance or concern than those categories shown as single bars.

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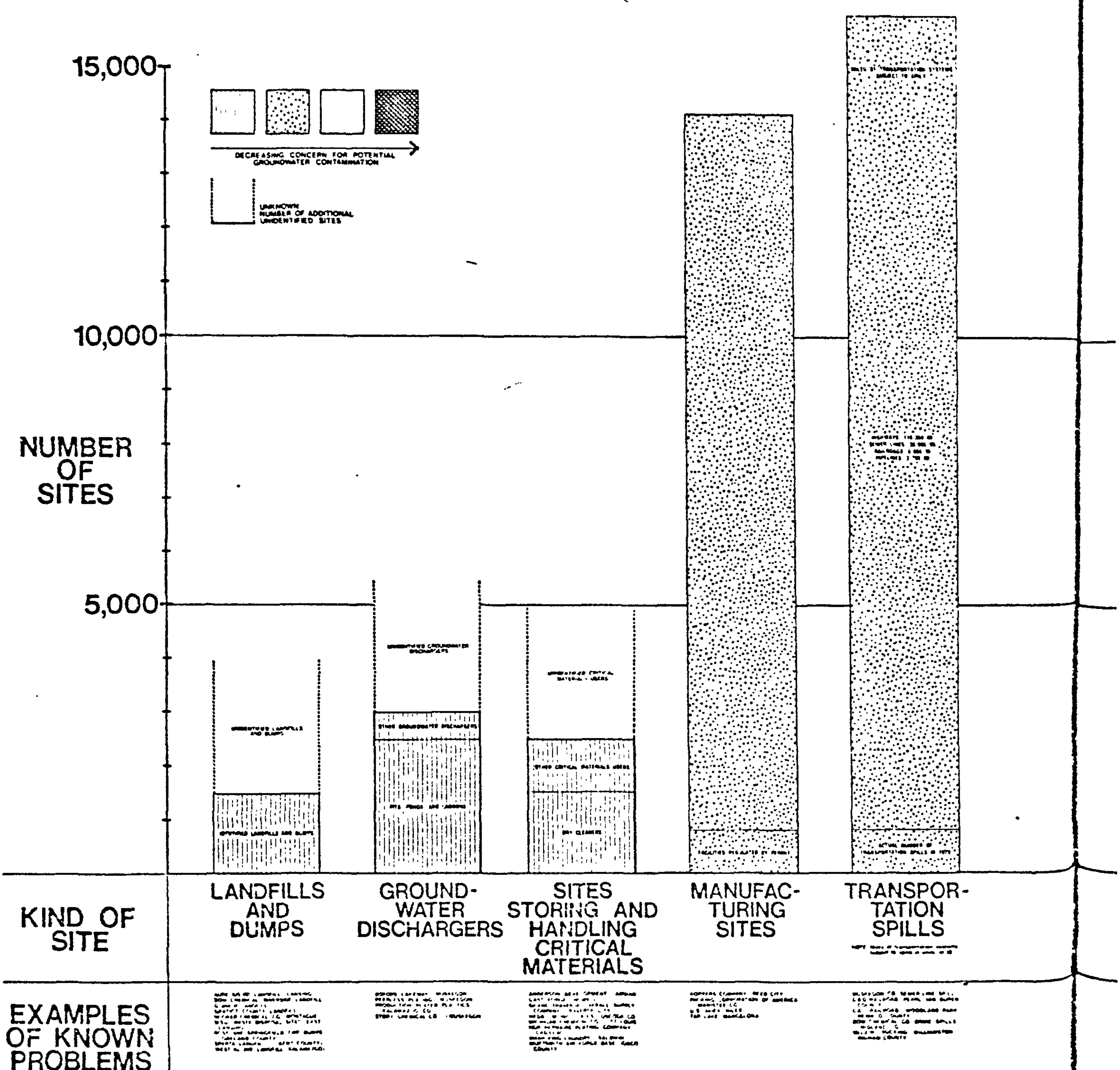
POTENTIAL

GROUNDWATER CONTAMINATION SITES



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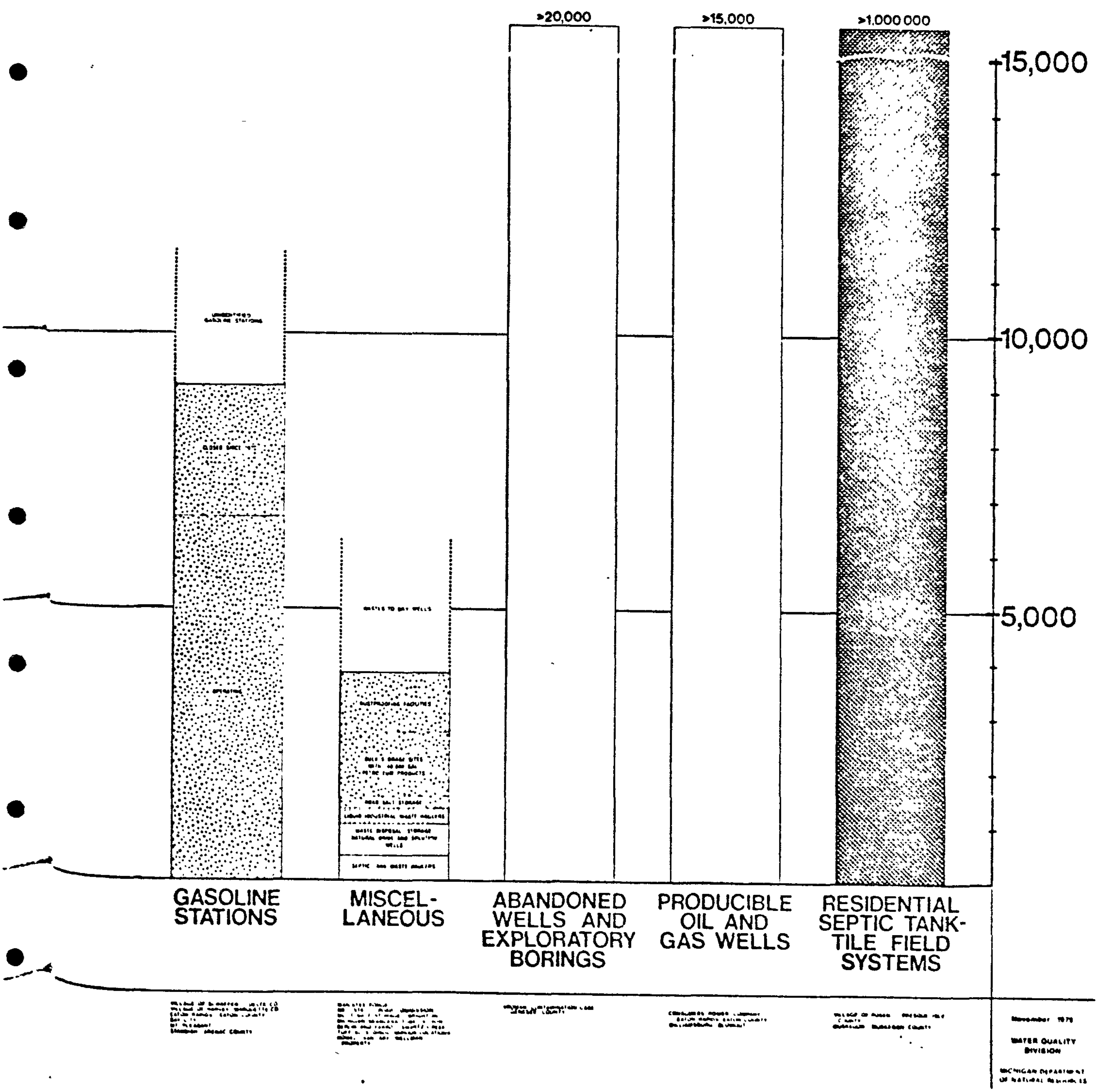

>20,000
>15,000
>1,000,000
15,000
10,000
5,000
GASOLINE STATIONS
MISCEL-LANEOUS
ABANDONED WELLS AND EXPLORATORY BORINGS
PRODUCIBLE OIL AND GAS WELLS
RESIDENTIAL SEPTIC TANK-TILE FIELD SYSTEMS

Gasoline Stations

There were an estimated 5,657 gasoline stations operating in 1981 in the state[1]. Approximately 2,675 gasoline stations closed between 1972 and 1981[2]. A number of additional, unidentified closed gasoline stations most likely exist. The number of gasoline stations per county in 1972 for those counties with greater than 500 retail establishments[2] is given in the table of "County Totals for Selected Site Categories". The degree of potential hazard that gasoline stations pose to the groundwater is determined by the methods of transport, handling and storage of gasoline by the volume of material on site and by the hydrogeology of the area.

Gasoline stations are regulated by the Michigan Flammable Liquid Regulations of 1973, under authority of Act 207, P.A. of 1941, as amended by Act 3, P.A. of 1978 (the Michigan Fire Protection Act). This act regulates the transport, handling and storage of flammable liquid and the abandonment of gasoline stations. The Fire Marshall's Office of the Michigan Department of State Police administers and enforces this act.

[1] The number of gasoline stations in operation is based on information from the Energy Administration, Michigan Department of Commerce and the Michigan Treasury Department.

[2] The number of gasoline stations that were operating in 1972 was obtained from the 1972 Consensus of Retail Trade and Area Statistics of Michigan, U.S. Department of Commerce.

icide Applicators and Dealers

1120 business pesticide applicators and 345
state as of November, 1981. The number of
ing to renew their licenses for restricted
s slightly under 3,500, down from 12,000 in
cause groundwater contamination when transported
e groundwater. The degree of potential hazard
ds on the amount and kind of pesticide used
the area in which the pesticide is used.

(Act 171, P.A. 1976) regulates the registration,
on of pesticide users. Regulation 636 (amendment
requires the certification of aerial applicators.

plicators and dealers in the state were provided
ion, Michigan Department of Agriculture.

REGION V ENVIRONMENTAL MANAGEMENT REPORT

ATTACHMENT A

GREAT LAKES

TOXIC CONTAMINATION

A unique characteristic of the Great Lakes Basin ecosystem is the long retention time of the lakewaters. The Great Lakes constitute an essentially closed system, entirely unlike riverine systems which discharge their water and pollutant to oceans in a relatively short time. Due to their closed-system nature, the lakes accumulate persistent toxic substances. For this reason, the lakes serve as a laboratory where new pollutants often first show their effects and where they can be studied and controlled from a system perspective.

While data was not available to determine the presence of persistent toxic substances in the Great Lakes in the early 1970's, major monitoring efforts launched through the Great Lakes International Surveillance Plan, the Pollution from Land Use Activities Reference Group (PLUARG), and the Upper Lakes Reference Group developed an information base which permitted a basinwide inventory of contaminants in sediment, water, air, sludges, plankton, fish or wildlife, as reported in Appendix E to the 1976 and 1978 U.S. Canada Water Quality Board Reports. It was apparent from these inventories that the contaminant issue was a basin problem and was not isolated to discrete "hot spots", all ecosystem compartments demonstrating ubiquitous contamination.

With a history of commercial fishery bans (e.g. banning fishing in Lake St. Clair because of mercury), fish consumption advisories in effect on all the lakes, and the continued identfication of new compounds in the Great Lakes, there is widespread concern for the contamination of the Great Lakes by persistent toxic substances and the serious environmental problems which can result from this contamination. Until recently there was no direct evidence of human health impacts due to toxicants in the Great Lakes. However, a direct linear correlation between PCB contamination in Lake Michigan fish and levels of PCBs in the blood of sport fishing families in 18 Michigan counties bordering Lake Michigan has been reported. (Humphrey 1980).

While toxic substances found in Great Lakes fish pose a clear threat to human health, their affects elsewhere within the ecosystem are less well established. It appears that Lake trout reproduction in Lake Michigan is being prevented by unknown toxics and it has been shown that PCB's can interfere with growth.

Under the provision of the 1978 Great Lakes Water Quality Agreement, the Governments of Canada and the United States are required to control and prevent the input of toxic substances into the Great Lakes, and to rehabilitate portions of the Great Lakes already degraded by toxic contamination. (Toxic substances as used herein refers to persistent toxic substances, as defined in the 1978 Water Quality Agreement, as well as other toxic chemicals of potential concern in the Great Lakes Basin.) These goals are to be accomplished through the development of programs and activities designed to virtually eliminate the entry of toxic substances into the Great Lakes ecosystem.

The requirements of Annex 12 of the Agreement call for programs which include: inventories of toxic substances ranging from production and use to release or disposal; close coordination between air, water, and solid waste control programs; and joint programs to manage hazardous materials. In addition the Agreement requires monitoring and research programs to address the increasing threat of toxic substances, and activities in support of an early warning system to anticipate toxic substances problems.

Restrictions or bans on the use or manufacture of chemicals deemed to represent environmental hazards are the major remedial efforts in Canada and the United States. Both countries are developing legislative controls. As many of the toxics problems encountered to date are the result of unregulated discharges from the past, which were not discovered until dangerous levels of the compounds were present in the fish and throughout the ecosystem, control of human exposure to these materials resulted in many restrictions on sport fisheries and bans on commercial fisheries.

Most organic contaminants, because of their diffuse atmospheric input and because of their persistence, have become basinwide problems. Because of the widespread usage of pesticides, such as DDT and herbicides, and organochlorines such as PCBs, there is a strong tendency for these contaminants to cause system-wide problems. For example, in 1978 the Water Quality Board notified the International Joint Commission of the presence of dioxin in fish in Saginaw Bay. Follow-up studies examining dioxin levels in the eggs of herring gulls found dioxin levels between 9-14 nonograms/kg. in Lake Superior, Huron, Erie and Michigan. Elevated levels were found in eggs from gull colonies in Saginaw Bay and from colonies throughout Lake Ontario. These elevated levels are considered to be the result of historic releases in that dioxin levels in Lake Ontario herring gulls have decreased from more than 700 nonograms/kg. in 1971 to 68 nonograms/kg. in 1980.

General indications of declines of PCB, DDT and DDE have been found in fish and gull populations throughout the basin, indicative of decreased exposure of the biological community.

There have also been substantial decreases in the concentration of organochlorine residues in a variety of species of small fish of Lakes Ontario and Erie. Declines in PCB concentrations have ranged between 22% and 89% in Lake Ontario fish samples and between 60% and 89% in Lake Erie fish samples. The general nature of this decrease in a variety of fish species implies a decrease in input of organochlorides to the system.

Similarly PCB, DDT and mirex residues declined in herring gull eggs from both Lower Lakes during 1979. Declines are also reported for Lake Huron and Lake Michigan, although declines in Lake Superior were not as significant as in the other lakes. These declines also represent decreased inputs of contaminants to the Great Lakes.

Sediments are a natural historic data bank representing past and present conditions in the Great Lakes. Surficial organic contaminent concentrations, particularly PCBs and DDTs tended to increase up to 1974-76, and they generally decreased since that time with imposition of manufacturing bans.

While the decreases in some ambient toxicant levels are encouraging, new compounds continue to be discovered and the rate of decline in PCB's appears to have reached a plateau in at least some areas and to be increasing in Lake Superior waters.

In response to.the presence of numerous persistent organic contaminants in the Great Lakes ecosystem studies have been undertaken to assess the associated hazard and risk to human health and the environment. A result is the development of action levels by the U.S. Food and Drug Administration regarding the commercial sale of fish containing such contaminants as DDT, PCB, mirex, toxaphene, and 2,3,7,8-TCDD. Several states have issued fish consumption advisories, in addition, for the protection of human health. Further, the 1978 Great Lakes Water Quality Agreement contains specific objectives regarding the maximum contaminant level in fish.

Toxaphene and toxaphene-like substances have been detected in fish caught in Lake Superior and Lake Michigan between 1977 and 1980 in concentrations which ranged from 0.4 to 10.9 mg/kg. In response to concern in the U.S. about the presence and persistence of toxaphene in the Great Lakes, the U.S. EPA banned most uses of toxaphene in September 1982, to begin reducing the levels of toxaphene in the environment. Toxaphene, a common pesticide which was employed in pest control on cotton, wheat, beef cattle, soybeans and peanuts, is suspected of causing cancer in humans and is found to be extremely toxic to fish and other wildlife.

Metals of concern in the Great Lakes are primarily those which can bioaccumulate and therefore potentially represent a threat to human health and the general ecological community. Mercury, tin, cadmium, copper, zinc and lead are the primary concerns for whole lake problems because of elevated levels and/or the ability to bioaccumulate. Lead levels in the sediments of the Great Lakes have increased in all lake basins since the 1930s. Levels of lead in the Great Lakes are not thought to be a problem at present levels, but if loadings continue, a problem could develop particularly with the potential for lead methylation.

Lake Superior: A contaminant problem unique to Lake Superior is that of asbestos-like fibers in the vicinity of Silver Bay.

Amphibole fiber concentrations in raw Lake Superior water samples collected from northeastern Minnesota municipal water intakes have decreased progressively since April 1980, the date when the taconite tailings discharge at Silver Bay, Minnesota, ended. The magnitude of fiber reduction at western Lake Superior sampling sites decreases in the order of Beaver Bay-Silver Bay-Two Harbors-Duluth, (where the concentration has decreased more than 90%). This distribution appears to be related to water depth in the area of each intake. Beaver Bay and Silver Bay, although very close to the past taconite tailings discharge site, are adjacent to deep water, whereas the Duluth area is relatively shallow and subject to the resuspension of settled sediments. Since tailings cover more than 1000 square miles of lake bottom, resuspension may produce measurable levels of amphibole fibers in the Duluth area for some time.

Trends and residue levels of PCB and dieldrin in gull eggs collected from two monitored colonies in Lake Superior have indicated little change since 1974.

But levels of persistent organochlorines such as DDE are declining at rates similar to those observed in Lake Ontario colonies. Reproductive success of gulls at one of the monitored colonies was normal while the other was below normal. The contrast in the apparent ecosystem behavior of the chemically similar residues DDE and PCB, might reflect the continuing input of PCB into Lake Superior from the atmosphere. Levels of DDT, PCBs and Mercury in lake trout collected near Thunder Bay have decreased, but high levels of toxaphene found in lake trout taken from Lake Siskiwit (Isle Royale) appear to indicate that contaminant problems in Lake Superior remain a serious environmental problem. This concern is also reflected in the contaminant levels in herring gull eggs where levels of PCB and dieldrin have shown little change between 1974 and 1980 as compared with the Lower Lakes.

Lake Huron: Declining trends have been demonstrated in all major organochlorines detected in eggs from the two gull colonies monitored in Lake Huron. Rapid rates of decline are evident for DDE, DDT, HCB and mirex. PCBs and dieldrin are declining more slowly. Reproductive success of both colonies in Lake Huron was normal in 1979. Levels of PCB, DDT, and dieldrin are below Agreement objectives in lake trout, smelt and walleye. Since there are few trend data for Lake Huron and Lake Superior, investigators are prevented from doing a thorough analysis as to the status of these systems with regard to toxic materials.

Analysis of Saginaw Bay gull eggs show elevated levels of TCDD, approximately six times higher than the "baseline" levels in other colonies in Lake Michigan, Lake Superior and other parts of Lake Huron. Preliminary results from a study by the U.S. Fish and Wildlife Service on levels of TCDDs in the Great Lakes support the findings of the herring gull study, in that residues of TCDD were highest in fish from the Tittabawassee River and Saginaw Bay. Fish from both of these water bodies contained TCDD in excess of 20 ng/kg, while a composite lake trout sample from Lake Michigan, contained 5 ng/kg. Fish from Lake Superior and Lake Siskiwit did not contain TCDD or other PCDDs at measurable concentrations. Fish and Herring gull samples from Saginaw Bay and Fish samples from Lake Huron were found to have more complex mixtures of PCDD congeners than the usual 2,3,7,8-TCDD.

The fishery of the Saginaw River System and Saginaw Bay is impacted by PCB, PBB, and dioxin contamination. Fish consumption bans are in effect for portions of the area rivers, and a fish comsumption advisory is in effect for Saginaw Bay. Sediments in the Pine River are contaminated with PBB, and sediments in the Saginaw River are contaminated with PCB.

Lake Michigan: Persistent organic contaminants remain a major environmental concern in the Lake Michigan Basin, in spite of substantial progress to reduce inputs to the lake.

Levels of DDT in bloater chubs, coho salmon, lake trout and in herring gull eggs have declined by as much as 90% between the late 1960's and 1980. These declines demonstrate the rapid response throughout the biological system to the ban on the use of DDT, which went into effect during 1970.

In response to controls on the manufacture, use, and disposal of PCBs, levels in fish are declining, but weaknesses in quality assurance place in doubt the confirmation of any downward trend. An estimated 80 to 90% of the PCBs reaching Lake Michigan come by way of the atmosphere. PCBs enter the atmosphere when materials containing this substance are incinerated or when they escape from landfills via volatization. In addition, the very high concentration of PCBs in the sediment of Waukegan Harbor is a source of contamination to the lake.

Lake Michigan gull colonies continue to exhibit high levels of PCBs and DDE. At the same time levels at Sister Island in Green Bay indicate a decline in residues in 1979. Levels of dieldrin continued to be the highest of all Great Lakes colonies, but reproductive success at both gull colonies was normal. Levels of heptachlor epoxide, oxychlordane and p,p'-DDD have also remained constant, while p,p'-DDT, DDE, mirex and PCB have declined.

In spite of the ban on the use of dieldrin, levels in fish populations (coho salmon and lake trout) and herring gull eggs have not decreased, and concentrations have increased in bloater chubs. These concentrations are still twice as high as Agreement Objectives. The reasons for this delayed response to controls suggest the need for further research as to the role of dieldrin in the Great Lakes ecosystem.

A major concern of the fisheries in Lake Michigan is that very few naturally produced lake trout have been found for over a decade. It has been suggested that toxic substances such as DDT and PCB adversely affect the lake trout reproduction. Recent studies found that cumulative mortality of lake trout fry exposed to simulated Lake Michigan levels of PCB and DDT for six months was twice that of unexposed fry. Although several factors probably contributed to the lack of natural reproduction, levels of PCB and DDT in the mid-1970s were sufficient to reduce survival of any fry produced in the lake. The added exposure of the fry to other toxic substances known to be present in the lake could have further reduced survival, illustrating the interactive nature of water quality and resource management throughout the ecosystem.

Lake Erie: Lake Erie and St. Clair, combined with the St. Clair and Detroit Rivers, represent one of the most developed urban areas on the Great Lakes. Because of the high potential of man's impact on water quality in this area, annual surveillance programs are maintained to closely monitor and detect environmental problems resultant of man's activities.

On the Canadian side declines in PCBs in spottail shiners have been observed at the Thames River, Pike Creek, Point Pelee, and Thunder Bay. Similarly, declines of all DDTs have continued at the Detroit River, Point Pelee, and Thunder Bay, Lake Erie. These trends in small planktivorous nearshore fish are also reflected in main lake populations of coho salmon, smelt, and walleye, although a longer term data base is required to substantiate these trends. Year-to-year increases or decreases can occur because of sampling problems, thus changes in contaminant levels need to be considered over the long term.

Levels of PCB and DDT residues in herring gull eggs collected from within the Lake Erie basin have illustrated only slight declines between 1974 and 1980. Contaminant levels at the Port Colborne and Middle Island gull colonies were already low in 1974 (as compared with levels in Lake Ontario gull colonies) and this explains why the declines in residue levels are small.

Declining logarithmic trends are evident for all other major organochlorine residues in gull eggs except dieldrin, which showed an extremely long half-life or no significant trends. Half-lives of most measured residues are comparatively high for Lake Erie. This might indicate a continuous input of residues to the foodchain.

Mercury in fish of Lake St. Clair and the western basin of Lake Erie was a major contaminant problem in the early 1970's. Levels of total mercury in walleye collected from Lake St. Clair have declined from over 2 ug/g in 1970 to 0.5 ug/g in 1980. This represents a major example of the effect of point source controls on contaminant levels in the ecosystem. The rapid response in fish after the stopping of mercury discharge at the chlor-alkali plant of Dow Chemical is probably a function of the high suspended sediment load and sediment translocation through the Huron-Erie corridor.

Organic contaminant analysis of sediments from the western basin of Lake Erie during 1979 indicated that the Detroit River was a major source of PCB contaminated sediments. Mirex was not detected in May 1979 but was detected in August of that year, suggesting a source of contamination during the intervening period. The difference in spatial distribution and variation between the two 1979 surveys for organic materials such as PCBs, DDT and mirex and industrial metals such as chromium, zinc and lead suggests that significant active sediment transportation occurs in very short periods of time.

Lake Ontario:

Lake Ontario has a long history of contaminant problems. Unique concerns about the lake have developed because of local industrial inputs of mirex, endosulfan, and dioxin. In all three circumstances, inputs into the Niagara River have resulted in lakewide problems because of the geophysical processes which influence the eventual fate of these compounds.

Levels of total DDT residues in lake trout, coho salmon, and smelt have declined in Lake Ontario, whereas levels of dieldrin remained static between 1977 and 1980. The level of dioxin (2,3,7,8-TCDD) found in herring gull eggs collected from four colonies in Lake Ontario in 1980 was approximately 60 ng/kg. A minimal increase in PCB levels in these top predators was observed in 1980, but this increase cannot be confirmed until 1981 samples are evaluated.

In, 1979 mean values of PCBs in top predator species still exceeded the Agreement objective of 1.0 ug/g.

A Canadian study of the Kingston Basin in Lake Ontario found that both plankton and benthos are contaminated with an assortment of toxic substances. The biota showed the highest levels of contamination in the Spring. Analysis of top and bottom levels of contamination suggest that land runoff in the form of sediment and snowmelt water seemed to be responsible for the peaks in contaminant levels.

In the nearshore zone, declines of PCB, total DDT, and mirex have generally been observed in spottail shiner populations of Twelve Mile Creek, Credit River, and Humber River. Increases in contaminant levels between 1979 and 1980 in spottail shiners at Niagara-on-the-Lake probably represent year-to-year variations in sampling and do not reflect new inputs of PCB, total DDT, or mirex. It should be noted that 1980 levels of these contaminants are still well below earlier values recorded in 1975, that 1979 DDT concentrations met Agreement Objectives at all sampling sites, and PCB concentrations met Agreement Objectives at all locations except at Point Pelee.

The observed declines in nearshore fish contaminant residues are likely the result of reduced contaminant concentrations observed in adult sport and commercial fish. The level of dioxin (2,3,7,8-TCDD) found in herring gull eggs collected from four colonies in Lake Ontario in 1980 was approximately 60 mg/kg.

This is about five times higher than the "baseline" levels in eggs from colonies in Lakes Michigan, Superior, Huron (except Saginaw Bay), and Erie. The even distribution of residue levels among the four colonies suggests that lakewide contamination has occurred in the fish species (mainly alewives and smelt) which comprise the main aquatic portion of the herring gull's diet in the Great Lakes. The United States Fish and Wildlife Service has reported that 2,3,7,8-TCDD is present in brown trout collected near Roosevelt Beach, New York.

Restrictions on the usage and disposal of organochlorine compounds were put into place in the Great Lakes Basin in the late 1960's and early 1970's. Levels of 2,3,7,8-TCDD were determined in herring gull egg samples taken from Scotch Bonnet Island, Lake Ontario and archived since 1971. Analyses show that, in 1971, 2,3,7,8-TCDD levels were greater than 700 ng/kg. Comparison of this value with the 1980 levels reported above indicates a greater than tenfold decrease in 2,3,7,8-TCDD levels during the last decade. This trend parallel's those for the majority of organochorine residues in Lake Ontario. If the decline of 2,3,7,8-TCDD in Lake Ontario herring gull eggs continues at its present rate, "baseline" levels of about 10 ng/kg will be reached in 5-7 years. Possible mechanisms for the clearance of 2,3,7,8-TCDD and other persistent organochlorine compounds from the Lake Ontario ecosystem include physical transport through the St. Lawrence River, sedimentation, and loss to the atmosphere.

In response to the presence of 2,3,7,8-TCDD in fish, New York has developed a sport fish consumption guideline of 10 ng/kg, based on consumption of six ounces of fish per week. Ontario has developed a guideline of 20 ng/kg, based on consumption of four ounces of fish per week. With regard to the sale of commercially caught fish, the United States Food and Drug Administration has developed a guideline of 50 ng/kg, and the Canada Department of National Health and Welfare has developed a health protection guideline of 20 ng/kg.

NUTRIENT ENRICHMENT

Accelerated cultural eutrophication of the Great Lakes caused by increased nutrient loadings to the system has had detrimental effects on water uses such as recreation, water supply, freshwater biota and wildlife. Recreational uses impaired by eutrophication are bathing, sport fishing and boating. Water supply, whether for municipal, industrial, private or agricultural uses, is also very dependent on the eutrophic status of the main lake or embayments because of potentially impaired utility (due to clogging of intakes and other equipment), and nuisance problems (due to disagreeable taste and odor). An increase in the supply of nutrients can change the population structure of the aquatic biota, the functioning of an aquatic food chain that supports lake fisheries, or cause extensive algal growth with the consequent deep water depletion of oxygen which supports game fish production. The character of populations of shore birds and animals in turn is greatly dependent upon the population characteristics of the lake fisheries.

While it is sometimes impossible for scientists to identify one to one relationships between causes and effects in the complex Great Lakes ecosystem, we will summarize briefly in the following the progress in control of nutrient inputs to the Great Lakes in recent years along with the associated responses of the Lake to these control measures. Then we outline the dimensions of the historic damage to the lakes and the problems which remain throughout the basin that scientists believe can be conquered by further nutrient control measures.

Since 1975 there has been a consistant decrease in the annual phosphorus load to each of the Lower Lakes, as a result of specific, massive programs to reduce municipal and industrial point source inputs. To date municipal loads to Lake Ontario have decreased by 36% (780 MT), and those to Lake Erie have been reduced by a huge 60% (4640 MT). Loads to Lake Michigan have also been reduced enormously - 59% (1373 MT) (See Figures 1 and 2). Water quality at the mouth of the Detroit River has generally improved since the 1960's with the data showing reductions in suspended solids, chlorides, phenols, iron and ammonia nitrogen. Total phosphorus concentrations in 1980 were only 11% of the concentrations measured in 1967. Phosphorus loadings to Saginaw Bay have decreased by 60% (from 1044 tons/annum in 1974 to 472 t/a in 1980).

The environmental response of the lake to these massive efforts have in many instances been gratifying and most apparent in the nearshore areas. Water quality problems at drinking water intakes have noticeably decreased in Saginaw Bay (Lake Huron), at the Union Water Filtration Plant on western Lake Erie, and at the South Chicago Water Intake on Lake Michigan. Recreational uses (swimming, boating, fishing) have been restored at Thunder Bay and Saginaw Bay (Lake Huron), Marquette, Michigan (Lake Michigan), Monroe County and the City of Rochester (Lake Ontario), Sterling State Park (Lake Erie) and Chicago's North Shore beaches on Lake Michigan.

Open lake responses have also been documented: a decrease in phosphorus concentrations and increased silica concentrations (associated with an increased population of diatoms) in the waters along the shore at the southern tip of Lake Michigan; dramatic trends to reduction of the area without oxygen in the central basin of Lake Erie (from a high measurement of 65 percent in 1966 to a low of 6 percent in 1975), which trend was also associated with a progressive decline in open lake phosphorus concentrations, a reduction in biomass and shift to oligotrophic algal species in both the western and central basins of the lake.

The concentration of total phosphorus in the open water of Lake Ontario has declined, and a reduction in biomass in the western portion of this lake has been maintained since 1975.

In a major milestone for phosphorus control the U.S.-Canada Water Quality Board reported in 1981 that municipal treatment facilities in the Lower Lakes Basin have virtually achieved the objective of limiting effluents from major municipal dischargers to a concentration of 1 mg./l. by December 31, 1982, as called for in the Great Lakes Water Quality Agreement. The flow weighted averages of such U.S. effluents are now at a level below 1 mg/l. This was made possible by accelerating compliance schedules at key plants, most notably, Detroit. Numerous smaller majors remain out of compliance, but the net gain to be achieved through their compliance is less than the amount of "extra" treatment being provided by plants discharging at less than 1 mg/l.

Lake Superior:

There is little evidence of long term changes in general water indices relative to eutrophication in Lake Superior. Major ion chemistry has not changed much since 1890. The Lake is classified as oligotrophic, associated with its very large volume, very low temperature and the low nutrient loadings from the adjacent land mass. The next major open water intensive survey for Lake Superior is scheduled for 1983.

Lake Huron:

Eutrophication is not considered to be a severe environmental problem in Lake Huron except in localized nearshore areas and in Saginaw Bay, which now is classified as moderately eutrophic.

With an overall load reduction of 60% (572 MT) between 1974 and 1980, point source inputs to Saginaw Bay appear to have stabilized. However, runoff from agricultural lands in the basin contribute suspended solids, nutrients, organic matter and pathogenic organisms to the Bay. Siltation and associated turbidity degrades fish habitat, fills surface drainage ways and fills the main navigation channel from the bay into the Saginaw River.

Nutrient and organic matter contributed by agricultural activities adversely affects the dissolved oxygen level in the Saginaw River. Loadings from agricultural sources vary from year to year, depending on the timing and amount of rainfall. Runoff in recent years has been below normal, accounting for some of the improvements in the bay. To maintain recent gains and make further improvements in the bay nonpoint source of phosphorus must be reduced.

To abate taste and odor problems in public water supplies and restore recreational facilities, point and nonpoint phosphorus inputs must be controlled in a cost-effective balance to where the bay exhibits mesotrophic water quality.

Lake Michigan:

The open waters of Lake Michigan have suffered considerable degradation in trophic condition but are still of high quality with some evidence of improvement in the last 10 years. Acute problems are localized in nearshore areas of the lake. Chloride levels in the lake are increasing much more rapidly than in the past, probably as a result of the application of road salt in winter. Some investigators have expressed concern that increased levels of these substances may alter the biological community structure and consequently adversely affect the fisheries in the lake.

Phosphorus concentrations (the principal nutrient controlling eutrophication in Lake Michigan) were dramatically reduced over the hard winter of 1976-77, apparently due in large extent to enhanced setting of particulate matter under unusually extensive ice cover. Along with decreases in turbidity, transparency, nitrite/nitrate concentrations and silica concentrations increased. While these positive changes were not entirely maintained in subsequent warmer winters (when ice cover was at a minimum), the more degraded pre-1976 trophic conditions have not since been documented. Increases in chlorides, sulfates, blue-green algae and phytoflagellates in the southern basin of Lake Michigan indicate that the system there suffers from cultural nutrient enrichment.

Lake Erie:

Accelerated eutrophication of Lake Erie has been a critical water quality concern since the early 1960's. An analysis of Lake Erie water quality for the past decade indicates a general improvement, which in part is due to high water levels, since 1970, that have provided some dilution of contaminants. There have also been major reductions in phosphorus loads to the lake - from 23,000 metric tons in 1970 (all sources) to 13, 000 tones in 1979.

Concentrations of total phosphorus in the western, central and eastern basins have shown significant declines since 1970. However, the decline in the basins does not entirely reflect the reductions in phosphorus loading from point sources. This can partially be explained by phosphorus release from the sediment through wave resuspension and anoxic regeneration. (It has been demonstrated that approximately 80% of the phosphorus loading to Lake Erie becomes incorporated in the bottom sediments.) While there are no significant reductions in chlorophyll concentrations in either the western or central basins, a reduction in open lake phytoplankton biomass has been documented, as well as algal species shifts to more oligotrophic species. Conductivity, sulfate and chloride concentrations also reflected a gradual but steady decline in the central and western basins. The eastern basin showed few changes in nutrient concentrations over the past decade, except for total phosphorus, as noted above.

While dramatic reductions in the area without oxygen depletion in the central basin has been reported in the last decade, such reports may have been more directly connected to climatic or meteorological changes than to improvements in Lake Erie's hypolimnion. Comparison of 1970 and 1979 surveys of the central basin hypolimnion showed no difference between primary production rates in the basin, despite the difference in nutrient loadings and 2-3 fold changes in epilimnion chlorophyll a and epilimnion primary production rates.

Lake Ontario:

Eutrophication of Lake Ontario was a major concern identified in the 1980's by the United States and Canada. As a result of phosphorus control programs some localized areas, such as the Bay of Quinte and the Toronto waterfront, have responded immediately with improved water quality. The open waters of the lake have responded with small reductions in the total phosphorus concentration and a reduction in total biomass in the western portion of the lake which has been maintained since 1975. Phosphorus levels in the nearshore zones of Lake Ontario appear to have stabilized, having declined from elevated levels observed in 1967. Further reductions in phosphorus loading are necessary to reach the level of algal biomass agreed to by the U.S. and Canada.

Lower Lakes Perspective:

Lake Erie and Lake Ontario suffer many of the same problems as the other lakes, only in greater intensity. Problems are observed on a lakewide basis rather than being restricted to localized nearshore areas, although many nearshore problems do exist. The magnitude of the eutrophication problem in the Lower Lakes is largely a result of the fact that the Lower Lakes are much smaller in size, do not have the long water residence times of the upper lakes, and are much more heavily populated and industrialized than the Upper Lakes. Both lakes are showing some signs of improvement in response to joint U.S.-Canada pollution abatement efforts. These efforts under the 1972 and 1978 Great Lakes Water Quality Agreements represent the greatest effort made by man, anywhere, to reverse a serious case of environmental degradation. Since the signing of the 1972 Agreement more than $5.7 billion have been committed to new and improved municipal wastewater treatment programs, including funds to reduce phosphorus inputs to the lakes.

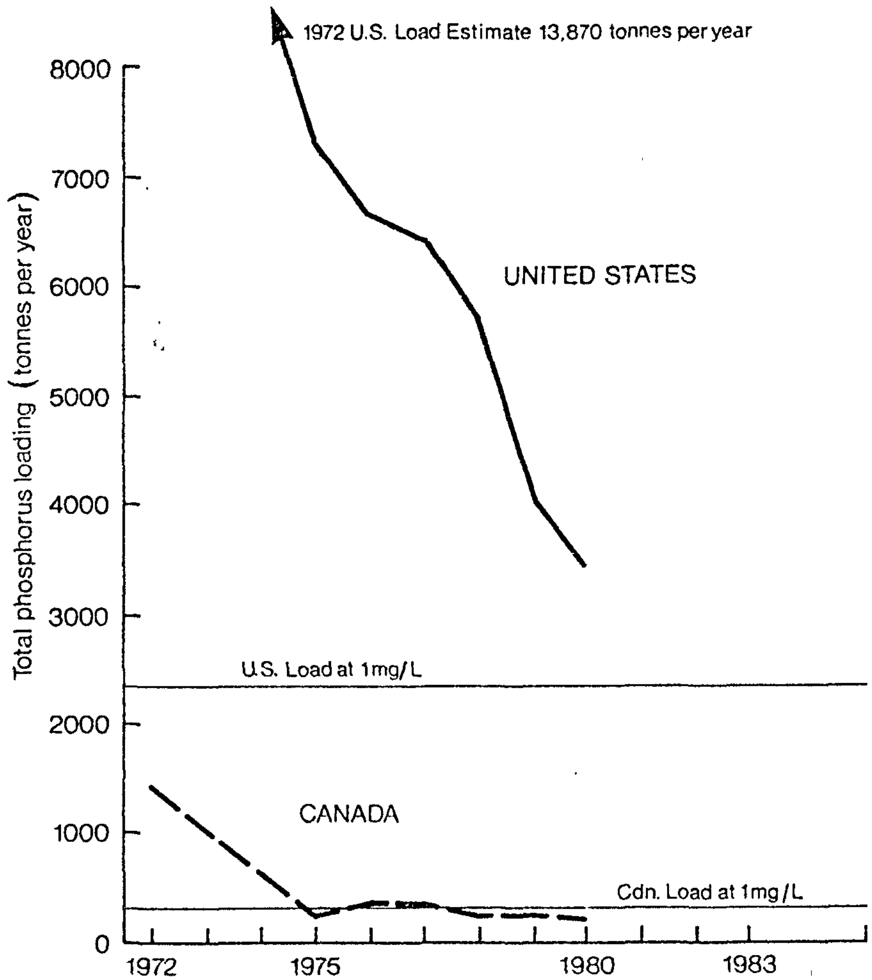

Figure 1. Lake Erie municipal phosphorus loads.

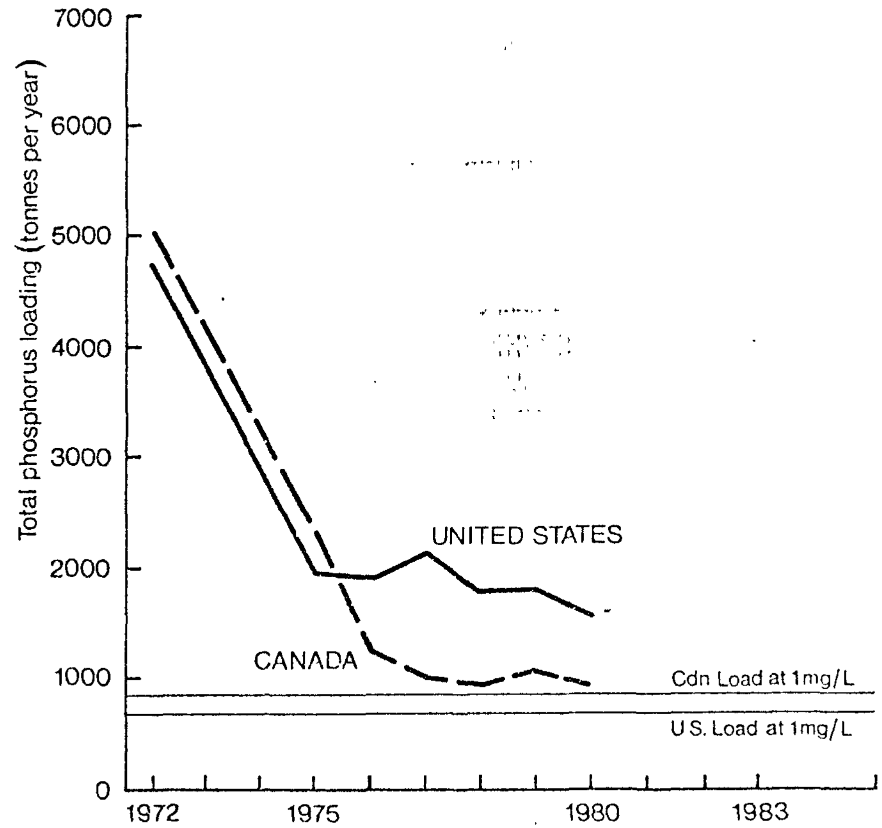

Figure 2. Lake Ontario municipal phosphorus loads.

ATMOSPHERIC DEPOSITION

The atmosphere acts as a mechanism to transport pollutants from a large number of different sources to and within the Great Lakes Basin. These pollutants are deposited directly into the lakes, or onto the land within the Basin after which they are carried by storm runoff and snowmelt into the lakes and tributaries. During the transport process, the atmosphere carries large quantities of pollutants over great distances. Some of these pollutants can be transformed into more toxic forms. The International Joint Commission's Pollution from Land Use Activities Reference Group (PLUARG) - in a preliminary effort to model the transport and deposition of airborne materials-found that the amounts of material deposited from the atmosphere into the individual Great Lakes were generally proportional to the lake surface area.

PLUARG found that atmospheric inputs were surprisingly high in some instances. For example, the Reference Group calculated that the atmosphere contributed about 1600 metric tons of phosphorus in 1976 to both Lakes Superior and Michigan. The 1976 phosphorus input to Lake Huron was about 1100 metric tons. Even the relatively small surface areas of Lakes Erie and Ontario received about 800 and 500 metric tons of phosphorus, respectively, during this period. (Thus, phosphorus loadings are heavier on a per unit area basis for the Lower Lakes.) Modeled estimates for more recent years are summarized in Tables 1, 2 and 3.

Inspection of this calculated data makes it clear that the nutrient budgets of the Upper Lakes must consider the atmospheric loading term. While the percentage contribution to the Lower Lakes is smaller, the influence on biological production may be greater. The availability of the nutrients from lake surface precipitation to the photic zone of the lake is immediate and, for the Upper Lakes, at a concentration higher than that of the epilimnion waters. Thus, the atmospheric deposition may support the open lake production in a higher proportion than an equivalent point source shoreline loading.

Studies undertaken by the Upper Lakes Reference Group as well as PLUARG indicate that a variety of other contaminants are also contributed in part by atmospheric sources, including nitrogen, lead, copper, sulfates, PCBs and other synthetic contaminants. The deposition of metals, most significantly lead, contributes a large portion of the loading to all of the lakes. PLUARG (1978) reported that the nonpoint sources of lead dominate the loading, the atmosphere being the chief pathway (Table 4). Mercury, tin, cadmium, copper, zinc and lead are the primary heavy metal concerns for whole lake problems because of elevated levels and/or the ability to bioaccumulate. Allen and Halley (1980) found that 11% to 60% of these metal contaminants were input to the Great Lakes from atmospheric deposition (Table 5). Inputs of asbestos from vehicular brake linings also occur in the Great Lakes Basin due to their atmospheric transport and deposition.

Sievering (1979) compared minimum dry deposition loadings to estimates of precipitative loading and surface run-off inputs in the southern Lake Michigan basin. Results of this work show that atmospheric inputs by dry loading are at least 60% of the total Pb inputs, 30% of the total Zn input, 20% of the total Fe input, and probably well over half the total sulfate and nitrate input.

The deposition of synthetic contaminants such as PCBs has been shown to be sufficient to account for the levels contained in the lakes (Strachan et at, 1978; Hollod, 1979). While urban areas are major sources of PCBs, the widespread dispersal of this contaminant throughout the sediments of the Great Lakes, including areas remote from industrial centers, indicates the importance of atmospheric transport of PCBs throughout the entire Basin (Table 6).

Soil particles reach the Great Lakes via atmospheric deposition from construction sites, plowed agricultural lands or other cleared land surfaces. Klappenbach and Goranson found that soil erosion caused by strong winds can produce heavy particulate concentrations in the Great Lakes area. These soil particles serve as input to any water area through atmospheric deposition. At this time no baseline data exists documenting this potential source of pollution to the lakes.

Acid rain is a dramatic and serious example of industrial emissions being transported over long distances through the atmosphere, undergoing chemical transformation in the process, to produce a severe environmental problem. The Great Lakes region receives precipitation that is from five to 40 times more acidic than pure pH 5.6 rain. According to a July 1979 report to the United States-Canada Water Quality Board, the large volume and high buffering capacity of the lakes themselves protects them from becoming acidified.

Acid rain can lead to the release of heavy metals from soil and sediment; these metals can then be transported to the Great Lakes. Acid rain may also result in loss of Great Lakes fish habitat (Beamish and Harvey, 1972), since some of the soft-water tributary lakes and streams of the Canadian basin of Lakes Superior and Huron are very poorly buffered and many have already become acidic. A direct effect on Great Lakes fisheries may be expected as the acidification affects the tributary and embayment spawning habitats. For example, episodes of high acidity have been documented (Kramer, 1977) during the spring snowmelt period, which may be critical to fish survival.

Thus, the effects of acid rain on the land and tributaries may ultimately be shown to have a measurable effect on the Great Lakes ecosystem. These concerns will become more severe in the future as energy demands lead to an increase in the burning of coal as an alternate energy source both within and outside the Great Lakes Basin.

Atmospheric pollutants are transported as gases, aerosols and particulates. To some degree, all three phases are scavanged by the precipitation processes and deposited as contaminated precipation. The gaseous material is diffused to the surface and absorbed at rates dependent upon the surface characteristics. The particulate material is deposited under gravitational influences between precipitation events. Thus, an accurate measure of atmospheric deposition must include all three components.

Because of methodology problems, there have been no coordinated long term studies monitoring contaminants in the air of the Great Lakes Basin. The atmospheric portion of the Great Lakes International Surveillance Plan considers the aspect of contaminant loading rather than ambient conditions. Despite the obvious correlation of ambient levels and loadings as noted in Annex 12 - 3(b) of the 1978 Water Quality Agreement, it is not possible to predict one from the other, each requiring different monitoring strategies. The following section assesses baseline knowledge of ambient levels and loadings, present monitoring networks, and future needs of atmospheric surveillance.

Atmospheric fluxes of contaminants to the Great Lakes are a combination of dry and wet removal processes. When inputs into the air are limited, for example, the bans on DDT and PCB, atmospheric concentrations are expected to decline. Bidleman et al. (1977) reported decreases of DDT concentrations in the air over the North Atlantic, but there is no specific data base representative of the Great Lakes. Sufficient information exists to estimate PCB concentration in the air of the Great Lakes area (Eisenreich et at., 1980) to be 1 ng/m^3, which is double those of marine areas (0.5 ng/ m^3). Andren and Doskey (1979) reported that atmosphric PCB's averaged 7.7 ng/m^3 over Madison, Wisconsin, and 3 ng/m^3 over Milwaukee. These examples illustrate that ambient concentrations of contaminants in air may be unique to specific locales, and there is a need to quantify such in the Great Lakes Basin.

By examining precipitation data it is possible to infer relative levels and changes in concentration of specific contaminants in air and calculated respective wet and total loadings, as summarized in Table 6. It should be noted that Eisenreich's calculations assume homogenous ambient conditions throughout the basin. This assumption is supported by the work of Sanderson and LaValle (1979) who found no significant differences in the spatial or seasonal loadings of PCB and heavy metals. Confirmation is required, however, before these values could be accepted as a baseline data set, especially considering the range of ambient concentration of total PCBs (total = particulate + vapor) reported for the Lake Superisor areas (1.3 7.1 ng/m^3; Hollod, 1979; Eisenreich and Hollod, 1980) and the Michigan portion of the basin (1.0 - 7.7 ng/m^3; Murphy and Rzeszutko, 1977; Doskey, 1979). Measurement of atmospheric input of PCBs to Lake Michigan have ranged from 2500 kg/yr. (Murphy et al, 1980) to 6900 kg/yr. (Eisenreich et al, April 1980). More work is required to quantify loadings and seasonal and spatial ambient concentrations.

Similarly, few data bases exist on the ambient heavy metal concentrations in the air. Loading estimates were made from a literature review by Allen and Halley (1980) as summarized in Table 7. Again the work of Sanderson and LaValle supports such estimates (Table 8). It is particularly noteworthy that surface loadings of pollutants were correlated with the amount of precipitation; and as there were few differences among sites where measurement were made, it was not spatially justifiable to draw isoline maps of surface loadings in the Great Lakes Basin for these modeled estimates.

Studies measuring the wet and dry deposition as separate components have shown that the chemical parameters of interest are contained in various proportions in dry and wet deposition with phosphorus being about 80 percent contained in the wet component while lead and zinc loadings are predominantly contained in the dry component (Delumyea and Petal, 1977; Sievering, 1978).

Atmospheric Monitoring Networks: The Great Lakes Atmospheric Deposition program was initiated in 1976 with the objective of measuring "total" deposition. Since there was evidence that the bulk samplers of this program were contaminated by local sources, the Canadian network (CANSAP) was converted in 1978 to automatic wet-dry samplers, a system which is in conformity with the National Atmospheric Deposition Program (NADP) in the U.S. The objective of this conversion was to achieve a valid measure of precipitation deposition and an unevaluated measure of deposition of dry material. In 1981 the Great Lakes National Program Office added a network of 35 wet samplers to the 41 bulk collectors maintained by that Office to improve data quality from the Great Lakes Atmospheric Deposition Network (GLAD). The parameters include nutrients, trace metals and other major contaminants.

The samplers for the Great Lakes network are located along the shorelines, on islands or on nearshore structures. The validity of the samples collected is limited by the fact that the nearshore wind regime is quite different from that of the open waters of the lakes (collections from land bases reflecting deposition rates which may or may not reflect actual open lake deposition rates), contamination of samples by local sources, and inefficient collection of small particles in the bulk collectors. In fact there are no samplers that can measure accurately the total atmospheric deposition available today. The plan for the present, then, is to measure the wet deposition by a network of automatic samplers and to estimate the dry deposition through application of deposition models. The latter requires additional measurements of atmospheric particulate concentrations and further research related to deposition models. In order to provide for a transition from the "bulk" data on which past deposition estimates have been based, several "bulk" samplers will be continued for a number of years in conjunction with the automatic wet samplers. This overlap of records may produce a statistical evaluation of the "bulk" records from past years, or a random variance may be observed.

A Canadian effort will be made to assess the confidence in the present estimates of atmospheric deposition contained in Table 4 through an analysis of the two years of data presently available from the wet-dry sampler network for Canadian stations. While this data may be biased by lack of appropriate U.S. data, the Canadians plan to complete their summary and initiate an effort to model the dry deposition.

Conclusion

It is clear from all of the above that atmospheric inputs of materials to the Great Lakes deserves much more consideration. Virtually any material discharged into the atmosphere, such as stack emissions and automobile exhausts, will eventually be returned to the land or water or water surface in dry fallout or precipitation. Materials may be deposited in the Great Lakes Basin from sources both within and outside the Basin. Such long range transport of pollutants is already a problem of global nature, as exemplified in acid rain problems occurring in numerous regions in Europe and North America and as highlighted in recent reports of the International Joint Commission's Great Lakes Science Advisory Board and Water Quality Board. These concerns will become more severe in the future as energy demands lead to an increase in the burning of coal as an alternate energy source both within and outside the Great Lakes Basin.

TABLE 1

(1978 TABLE 1.0.1)

SUMMARY OF 1978 ESTIMATED ATMOSPHERIC, INDUSTRIAL, MUNICIPAL AND TRIBUTARY PHOSPHORUS LOADING DATA TO THE GREAT LAKES
(all values are in metric tonnes/year)

	SUPERIOR	MICHIGAN	HURON	ERIE	ONTARIO	ST. LAWRENCE RIVER	TOTAL
Atmospheric (standard error)	3,521 (1,612)	1,690[1] -	2,120 (476)	879 (164)	764 (120)	- -	8,974
Direct Industrial Discharge	73	46	1	191	117	26	454
Direct Municipal Discharge	123	494	169	4,440	1,913	146	7,285
Tributary: Monitored (standard error)	1,480 (148)	3,540 (154)	1,700 (162)	10,037 (899)	2,297 (202)	26 (2)	19,080 (960)
Adjustment for Unmonitored Area (standard error)[2]	793 (102)	475 (30)	608 (113)	2,804 (396)	674 (91)	185 (10)	5,539 (435)
TOTALS	5,990	6,245	4,598	18,351	5,765	383	41,332

Totals may not sum due to rounding.

[1]1976 estimate.

[2]Standard errors calculated from tributary loading estimates used in making adjustments.

Table 1

TABLE 2

SUMMARY OF 1979 ESTIMATED ATMOSPHERIC, INDUSTRIAL, MUNICIPAL AND TRIBUTARY PHOSPHORUS LOADING DATA TO THE GREAT LAKES
(All values are in metric tonnes/year)

	SUPERIOR	MICHIGAN	HURON	ERIE	ONTARIO	ST. LAWRENCE RIVER	TOTAL
Atmospheric	3,997	2,969	2,331	1,550	311	-	11,157
(standard error)	(564)	(408)	(349)	(250)	(77)		(821)
Direct Industrial Discharge	45	13	6	50	103	26	243
Direct Municipal Discharge	159	371	144	2,840	2,316	179	6,009
Tributary: Monitored	1,479	3,690	1,363	5,323	2,509[1]	43	14,406
(standard error)	(112)	(220)	(44)	(302)	(582)	(11)	(702)
Adjustment for Unmonitored Area	939	616	380	1,098	691	303	4,026
(standard error)[2]	(127)	(62)	(23)	(49)	(134)	(71)	(214)
TOTALS[3]	6,619	7,659	4,224	10,861	5,930	551	35,841

Totals may not sum due to rounding.

[1]Includes Buffalo River.

[2]Standard errors calculated from tributary loading estimates used in making adjustments.

[3]The above totals for Lakes Huron, Erie, and Ontario do not include interlake transfer through connecting channels. Total estimated loadings to these lakes are given in Tables 6.4, 6.5 and 6.6

TABLE 3

SUMMARY OF 1980 ESTIMATED ATMOSPHERIC, INDUSTRIAL, MUNICIPAL AND TRIBUTARY PHOSPHORUS LOADING DATA TO THE GREAT LAKES

(All values are in metric tonnes/year)

	SUPERIOR	MICHIGAN	HURON	ERIE	ONTARIO	ST. LAWRENCE RIVER	TOTAL
Atmospheric	3,997	2,969	2,331	1,550	311		11,157[1]
(standard error)	(564)	(408)	(349)	(250)	(77)		(821)
Direct Industrial Discharge	42	37	2	82	62	29	254
Direct Municipal Discharge	143	431	121	2,370	2,060	189	5,314
Tributary: Monitored	1,109	2,381	1,553	8,260	2,383[2]	31	15,718
(standard error)	(241)	(132)	(134)	(251)	(109)	(3)	(410)
Adjustment for Unmonitored Area	1,121	756	643	1,513	676	203	4,913
(standard error)[3]	(212)	(71)	(50)	(59)	(48)	(21)	(242)
TOTALS[4]	6,412	6,574	4,650	13,775	5,492	452	37,356

Totals may not sum due to rounding.

[1] 1979 estimate.

[2] Includes Buffalo River.

[3] Standard errors calculated from tributary loading estimates used in making adjustments.

[4] The above totals for Lakes Huron, Erie, and Ontario do not include interlake transfer through connecting channels. Total estimated loadings to these lakes are given in Tables 6.11, 6.12 and 6.13.

TABLE 4

ATMOSPHERIC LOADING TO THE GREAT LAKES[1]

(Metric tonnes/year)

COMPONENT	MICHIGAN		SUPERIOR		HURON		ERIE		ONTARIO	
Total P	1,700	(290)	1,600	(190)	1,100	(760)	770	(300)	490	(250)
Reactive Si as SiO_2	7,700	(1,300)	26,000	(3,150)	8,900	(1,500)	-	-	-	-
Chloride	83,000	(14,300)	55,000	(6,700)	49,000	(8,200)	20,000	(7,800)	15,600	(8,000)
Sulfate	135,000	(23,300)	218,000	(26,500)	229,000	(38,500)	108,000	(42,000)	88,000	(45,000)
Total N	10,000[2]	(2,600)	56,000	(6,800)	52,000	(8,700)	35,000	(13,600)	21,000	(10,800)
Pb	1,300	(220)	640	(78)	770	(130)	640	(250)	270	(140)
Fe	5,000	(860)	9,900	(1,200)	4,600	(770)	2,600	(1,000)	530	(270)
Cu	280	(50)	370	(45)	770	(130)	200	(80)	72	(37)
Cd	43	(8)	57	(7)	77	(13)	38	(15)	30	(15)
Zn	1,800	(300)	2,600	(315)	-	-	900	(350)	-	-
Ca	104,000	(17,900)	33,000	(4,000)	50,000	(8,500)	23,000	(9,000)	31,000	(16,000)
Mg	23,000	(3,900)	5,800	(700)	8,300	(1,400)	10,300	(4,000)	6,600	(3,400)
Na	16,000	(2,750)	14,800	(1,800)	45,000	(7,600)	20,600	(8,000)	18,700	(9,600)
K	10,000	(1,700)	13,000	(1,600)	32,000	(5,400)	15,500	(6,000)	9,100	(4,700)
PCB	1.2-11.6	(0.2-2.0)	1.6-16	(0.2-2.0)	1.2-12	(0.2-2.0)	0.5-5.0	(0.2-2.0)	0.4-4.0	(0.2-2.0)

[1]IJC PLUARG Task C Report

[2]From Uttormark, 1974

TABLE 5

TRACE ELEMENT INPUTS BY MAJOR ROUTES*

TRACE ELEMENT	TRIBUTARY (10^3 kg/yr^{-1})	EROSION	ATMOSPHERE
Al	17,500	75,000	4,990
Fe	36,000	2,300	2,770
Mn	850	4,100	640
Zn	500	1,800	1,100
Cu	230	540	120
Pb	180	240	640
Cd	12	75	11
Co	15	700	25
Ca	18,400	280,000	79,800
Mg	8,800	250,000	15,500

*From Allen and Halley, 1980.

TABLE 6

CONCENTRATION, WET DEPOSITION AND TOTAL DEPOSITION OF TRACE ORGANICS TO THE GREAT LAKES*

COMPOUNDS	CONCENTRATION		DEPOSITION (10^3 kg/yr)									
	AIR	RAIN/SNOW	SUPERIOR		MICHIGAN		HURON		ERIE		ONTARIO	
	ng/m^3	mg/L	Wet	Total	Wet	Total	Wet	Total	Wet	Total	Wet	Total
ΣPCB	0.4 -3	10-100	2.0	9.8	1.4	6.9	1.5	7.2	0.68	3.1	0.48	2.3
ΣDDT	0.01-0.05	1-10	0.33	0.58	0.23	0.4	0.25	0.43	0.11	0.19	0.08	0.14
α-BHC	0.25-0.4	1-35	1.0	3.3	0.68	2.3	0.77	2.4	0.34	1.1	0.24	0.77
γ-BHC (Lindane)	1 -4	1-15	0.33	15.9	0.23	11.2	0.25	11.6	0.11	5.0	0.08	3.7
Dieldrin	0.01-0.1	0.5-30	0.13	0.54	0.09	0.38	0.10	0.55	0.04	0.17	0.03	0.13
HCB	0.1 -0.3	1-4	0.13	1.7	0.09	1.2	0.10	1.2	0.04	0.53	0.03	0.39
p,p'-methoxychlor	1	1-20	0.52	8.3	0.36	5.9	0.40	6.1	0.18	2.6	0.13	1.9
α-Endosulfan	1	1-10	0.13	7.9	0.09	5.6	0.10	5.8	0.04	2.5	0.03	1.8
β-Endosulfan	1	1-12	0.2	8.0	0.14	5.6	0.15	5.8	0.07	2.5	0.05	1.9

*from Eisenreich, 1980.

TABLE 7

TRACE METAL LOADING TO THE GREAT LAKES. ESTIMATED LOADING AND RANGE.**

(kg $ha^{-1} yr^{-1}$)

	Zn	Pb	Cu	Cd	Ni	Fe
SUPERIOR	1	0.15	0.1	0.01	0.04	1.0
MICHIGAN	#	0.3	0.1	0.01	0.1	#
HURON	#	0.1	0.05	0.01	0.015	0.8
ERIE	#	0.3	0.06	0.03	0.03	1.3
ONTARIO	0.5	0.2	0.05	0.015	0.04	0.8

- Estimate not possible from reported data.

** - From Allen and Halley

TABLE 8

WATERSHED-MEAN LOADINGS 1975-1977*
(g/ha/d)

PARAMETER	AG 1	AG 3	AG 4	AG 5	AG 10	AG 13
Sulphate	163.8	172.3	186.6[1]	151.8	162.3	144.0
Nitrogen	93.9	108.0	110.9	105.6	115.1	91.5
Calcium	22.4	31.8	21.0	24.7	43.9	16.0
Sodium	28.0	17.5	25.3	20.3	22.1	23.4
Chloride	20.8	27.7	25.4	16.5	24.7	19.9
Potassium	15.3	27.8	23.5	18.3	15.0	28.3
Magnesium	15.7	11.2	11.7	13.1	36.6	11.9
Phosphate	7.5	10.1	8.2	7.9	9.9	12.6
Zinc[2]	1.19	1.23	3.46[1]	.66	1.99	.77
Lead[2]	.19	.20	.12	.15	.13	.18
Copper[2]	.17	.07	.26	.23	.06	.16
Cadmium[2]	.05	.03	.07	.03	.06	.02
PCBs	.0016	.0026	.0021	.0013	.0017	.0023

[1]Omitting 1 extreme high value.
[2]Values shown only for metals with at least 3 samples.

*From Sanderson and LaValle (1979).

REGION V ENVIRONMENTAL MANAGEMENT REPORT

ATTACHMENT A

~~GREAT LAKES~~

Great Lakes Water Quality Board

Report to the International Joint Commission

1982 Report on Great Lakes Water Quality

November 1982
Windsor, Ontario

4. Areas of Concern

INTRODUCTION

In 1981, the Water Quality Board identified and described environmental degradation in 39 site-specific areas of concern in the Great Lakes Basin. These areas were divided into two classes:

1. Class "A" - those areas exhibiting significant environmental degradation and severe impairment of beneficial uses; 18 Class "A" areas were identified.

2. Class "B" - those areas exhibiting environmental degradation and possible impairment of beneficial uses; 21 Class "B" areas were identified.

All available environmental data - fish, sediment, and water - were used to identify, evaluate, and classify each area of concern from a technical perspective; the specific procedure followed and the factors considered by the Board are given in the Appendix.

This year, the Board undertook an evaluation of remedial measures for the 18 Class "A" areas of concern to determine if they would correct the environmental problems.

To conduct this evaluation, the Water Quality Board requested the jurisdictions to update information which had been presented in last year's report: environmental data, causes of the environmental problems, and present remedial programs. Each jurisdiction also provided the Board with additional, specific information about present and proposed remedial programs. The Board evaluated this information, in order to determine whether environmental problems could be solved and beneficial uses restored. The Board considered:

1. The nature of the environmental problem.

2. The nature of the remedial programs in place or planned.

3. The schedule to initiate or complete these programs.

4. Factors which would preclude timely and satisfactory resolution of the problem and restoration of uses, including cost, technical considerations, and further definition of the issue.

5. Expected date by which the problems would be resolved and uses restored.

Based on its evaluation, the Board reached one of the following conclusions for each area of concern:

1. Remedial measures currently in operation will resolve the identified environmental problems and restore beneficial uses over the near term (5 to 10 years).

2. Remedial measures currently in operation will not resolve the identified problems and restore uses over the near term:

   A. However, additional programs and measures have been imposed, and these will be adequate and timely.

   B. Additional programs and measures have been imposed, and environmental problems will eventually be resolved and uses restored. However, there is a long lag time between completion and operation of the remedial measures and the response of the environmental system.

   C. Even though all reasonable remedial measures have been or are being taken, it is doubtful whether the environmental problems will be completely resolved and uses restored.

   D. There are apparently no firm programs additionally planned that will resolve problems and restore uses.

3. Insufficient information has been received or is available in order to make a reasonable judgement as to whether control measures are adequate, or to decide when such measures may be required.

The specific guidelines to evaluate the technical data and to evaluate remedial measures for each Class "A" area of concern are given in the Appendix, along with relevant data and information and the sources of these data and information.

To better understand the Board's findings, knowledge of the types and sources of pollutants is required. Pollutants can be considered in four broad categories:

1. "Conventional" pollutants - a term which includes nutrients, substances which consume oxygen upon decomposition, materials which produce an oily or a sludge deposit on the bottom, and bacteria. Conventional pollutants include phosphorus, nitrogen, chemical oxygen demand, biochemical oxygen demand, oil and grease, volatile solids, and total and fecal coliform.

2. Metals - including mercury, lead, zinc, iron, and cadmium.

3. "Conventional" toxic substances - including phenol, cyanide, ammonia, and chlorine.

4. Toxic substances - complex organic chemicals, usually chlorinated, which can persist and can bioaccumulate.

Many varied problems result from the release of pollutants into the ecosystem. Nutrient enrichment can stimulate excess aquatic growth, resulting in taste and odor problems in drinking water, altered fish habitat and changes in species, and restricted recreational use of water and beaches.

Excess aquatic growth and oxygen-consuming pollutants can depress the dissolved oxygen level in the water, further affecting the fishery.

Waste discharges or silt, which can blanket the sediment, disrupt the benthic community. Since other aquatic species depend on the benthos as a food source, the aquatic community is disrupted.

Several metals and some "conventional" toxic substances, e.g. cyanide, are directly lethal to fish and other aquatic life. Others, e.g. phenol, can taint fish flesh, and still others, e.g. mercury, can result in harm to man when he consumes fish which contain them.

Many toxic substances can produce adverse environmental and human health effects. Such substances can derive from both agricultural and industrial sources. Familiar chemicals are PCB, DDT, dioxin, and mirex. However, for many other toxic substances, at the concentration at which they are present in the Great Lakes ecosystem, the environmental and human health effects are not sufficiently well understood. A conservative stance is generally considered appropriate for these substances.

Sources of pollutants fall into six general categories: municipal and industrial discharges, waste disposal sites, combined sewer overflows, urban land runoff, agriculatural land runoff, and in-place pollutants.

GENERIC CONSIDERATIONS

In conducting the evaluations of remedial measures in specific areas of concern, the Board identified a number of shortcomings of a general nature common to most of the remedial efforts. These common factors are discussed below in relation to the types of pollutants identified with the environmental problems manifest in each area of concern.

From these common factors, the Board has drawn general conclusions about the efficacy of remedial programs in general and specific measures in particular to abate identified pollution and to ensure future protection of the Great Lakes ecosystem.

MUNICIPAL AND INDUSTRIAL DISCHARGES

Many regulatory initiatives over the past decade were designed to control the discharge of "conventional" pollutants, metals, and "conventional" toxic substances. Wastewater treatment facilities are now operational, or will soon be operational at most municipal and industrial sources in the Great Lakes Basin. More than $7.25 billion has been spent over the past ten years for construction of municipal facilities alone. Municipal facilities generally provide for secondary treatment or equivalent and phosphorus removal if required. Pretreatment requirements have been developed in many cases so that municipal facilities can effectively treat industrial wastes.

The Water Quality Board concludes that those facilities presently in operation, and those which will become operational within the next five years should, collectively, abate the discharge of "conventional" pollutants, metals, and "conventional" toxic substances.

The Board notes several exceptions, however, where progress is not satisfactory: facilities will not become operational within the next five years, or no remedial measures are planned. Municipal and industrial waste treatment facilities are generally inadequate for the Grand Calumet River/Indiana Harbor Canal area, and additional industrial pre-treatment programs are required for facilities in the Black River, Ohio; the Buffalo River, New York; the Niagara River, New York; and the Cornwall, Ontario-Massena, New York area of the St. Lawrence River.

The Board notes that many programs and measures have been implemented to identify and control the release of toxic substances from municipal and industrial facilities. Notable among these are:

1. Efforts to systematically identify sources of toxic substances, e.g. Michigan's Critical Materials Register which, based upon consideration of environmental and human health effects, has identified substances for which production and use information is required; Wisconsin's development of a production and use inventory of toxic substances for the lower Fox River; New York's industrial chemicals use survey, which helps direct the state's monitoring program; and Ontario's hazardous contaminants program, which has identified chemicals requiring further evaluation in terms of environmental and human health effects and exposure potential.

2. Requirements to test effluents to establish the presence and effects of toxic substances.

3. Effluent limitations based on best available treatment and/or on best professional judgement.

4. Development of industrial pre-treatment programs for toxic substances.

For the most part, efforts to control the release of toxic substances are conducted on a facility-by-facility or a substance-by-substance basis; a comprehensive management strategy, although closer than it was five years ago, as reflected by the above activities, is not yet a reality. The Board encourages continuation of ongoing studies and data-gathering programs. These are necessary activities which should lead to such firm program requirements as standards, regulations, and effluent limitations. The Board is nonetheless concerned that, without a comprehensive management strategy, toxic substances in the Great Lakes ecosystem cannot be controlled in a cost-effective manner. This is especially true for such severely polluted areas as the Grand Calumet River/Indiana Harbor Canal; the Buffalo River, New York; and the Niagara River, New York.

The approaches followed by both the United States and Canada allow for development of control strategies for all pollutants, including toxic substances, discharged directly from municipal and industrial facilities into the receiving water. The basis for control in the United States is the NPDES permit system, developed under the Clean Water Act. The NPDES permit details pollution control requirements and compliance schedules for each discharger. Effluent limitations are based upon national technology-based guidelines and, where necessary, on water quality standards. In Ontario, effluent limitations are specified as required in Certificates of Approval or Control Orders.

The Board notes a legislative disparity in the United States. Legislation in some states, e.g. New York and Michigan, allows imposition of effluent limitations and pre-treatment regulations more strict than those mandated by the federal government. However, laws in other states, e.g. Wisconsin, mandate that state requirements must comply with and not exceed federal requirements; exceptions are permitted where federal requirements have not been promulgated. However, if requirements more stringent than existing federal limitations and regulations were required, the state could not implement them.

Some industries discharge their wastes to municipal sewerage systems. Requirements have been developed for treatment of these wastes prior to their discharge, in order to protect municipal facilities and to ensure that the wastes receive adequate treatment. Pretreatment programs are generally in place for conventional pollutants, and are in various stages of development for toxic substances.

In Canada, a model "By-Law to Control Industrial Waste Discharges to Municipal Sewers" was prepared several years ago by a joint committee of the Ontario Ministry of the Environment and the Ontario Municipal Engineers Association. The model bylaw suggests permissible concentrations for constituents of industrial waste, based on known toxicities or potential adverse effects at the municipal facility. Application of the model bylaw by municipalities is discretionary, and is tailored to the local problems identified.

In June 1978, the U.S. Environmental Protection Agency published "General Pretreatment Regulations for Existing and New Sources of Pollution." The regulations provide for national pretreatment standards and include general discharge prohibitions for certain nondomestic wastes as well as standards applicable to specific industrial categories.

WASTE DISPOSAL SITES

Toxic substances from hazardous waste disposal sites have, or have the potential to adversely affect several areas of the Great Lakes ecosystem, notably the Grand Calumet River/Indiana Harbor Canal; the Black River, the Cuyahoga River, and the Ashtabula River, Ohio; the Niagara River, New York and Ontario; and the St. Lawrence River at Massena, New York. These sites have been addressed on a case-by-case basis. Clean-up, if required, has been effected through voluntary measures by site owners, court orders and, in the United States, by funds made available through the Comprehensive Environmental Response, Compensation and Liability Act ("Superfund"). These efforts are indicative of the implementation of a comprehensive control strategy for existing waste disposal sites.

In Ontario, hazardous waste disposal sites which have the potential to adversely affect the ecosystem have been identified by the province. Needed remedial measures have been undertaken by municipalities and industries or by the province. Legislation is also being considered to address the matter of liability which can arise during the active operating phase of hazardous waste disposal sites.

Both Canada and the United States are devoting particular attention to the siting, design, construction, and operation of new waste treatment and disposal facilities in order to ensure that there are no adverse impacts on ecosystem quality. These comprehensive programs also emphasize public understanding of the necessity for secure treatment and disposal facilities.

COMBINED SEWER OVERFLOWS AND URBAN LAND RUNOFF

Combined sewer overflows and urban land runoff contribute nutrients, bacteria, and untreated waste directly into the receiving water. The problems associated with these discharges vary greatly from one location to another and, in some cases, use impairment may not exist. Measures to partially correct problems arising from these sources have been or are being implemented at several municipalities in the Great Lakes Basin. The Board notes that construction programs are underway on the Milwaukee Estuary, Wisconsin and on the Detroit River (Canadian side and the Ecorse River basin in Michigan). A construction program will begin for the Buffalo River, when funds become available in 1984. However, these measures are expensive; planning and construction schedules for complete resolution of the problems stretch over many years, and are dependent on the level of funding available.

The Board also notes the studies and planning under way on the St. Marys River at Sault Ste. Marie, Ontario; the St. Clair River at Sarnia, Ontario; the Rouge River, Michigan; the Maumee River, Ohio; Hamilton Harbour, Ontario; and the St. Lawrence River at Cornwall, Ontario. These efforts will consider the extent of the problems resulting from combined sewer overflows, the benefits to be derived from controls, the control options which are available, and the costs involved. The Board trusts that these studies and planning will lead to appropriate control programs.

The City of Detroit has concluded from a recently completed study that, although pollutant loads to the Detroit River from combined sewer overflows could be reduced, no significant improvement in water quality would result. Any load reductions and improvements would be masked by direct surface runoff from the City of Detroit and by combined sewer overflows in the Rouge River Basin.

Municipalities along the Grand Calumet River/Indiana Harbor Canal have completed combined sewer overflow studies and are forwarding reports to the State of Indiana for review and recommendations for action.

The December 14, 1981 amendments to the U.S. Clean Water Act address funding for combined sewer overflow programs. Section 2 of the act defines categories which are eligible for funding under the Construction Grants Program; combined sewer overflows are not listed. However, Section 5 allows the governor of a state to specifically request the Administrator of the U.S. Environmental Protection Agency to fund a combined sewer overflow project, provided that the state certifies that correction of a combined sewer overflow problem is a major priority for that state. The above changes are effective October 1, 1984.

Beginning October 1, 1982, the Administrator will have available an additional $200 million per fiscal year specifically for marine bays and estuaries, including those in the Great Lakes Basin, which are subject to lower water quality because of combined sewer overflows. These monies are to be considered like a construction grant appropriation. Grants will be used as deemed appropriate by the Administrator, upon demonstration of water quality benefits by the governor of a state.

The 1982 Canada-Ontario Agreement provides resources, until March 1985, for the construction of municipal waste collection and treatment facilities in the Great Lakes Basin. Funding is shared among the municipal, provincial, and federal governments. The correction of problems related to combined sewer overflows is addressed by this Agreement, insofar as the funding relates to construction of sanitary sewers.

AGRICULTURAL LAND RUNOFF

Agricultural land runoff contributes to environmental problems in many tributaries to the Great Lakes, including two of the eighteen Class "A" areas of concern: the Saginaw River Basin/Saginaw Bay, Michigan and the Maumee River Basin, Ohio. The Water Quality Board notes the number and diversity of programs in the Maumee River Basin to demonstrate the effectiveness of no-till and associated soil conservation techniques to control this source of pollution. The Board strongly urges the continuation of these programs, both to improve the water quality in the river basin as well as in the western basin of Lake Erie.

The Water Quality Board also notes the major demonstration program underway in the Saginaw River Basin/Saginaw Bay area. The Board believes that adequate protection of Saginaw Bay can only be achieved through the implementation of nonpoint source control measures.

IN-PLACE POLLUTANTS

The Water Quality Board, in its review and evaluation of Class "A" areas of concern, has concluded that, in general, remedial programs presently in place or proposed will significantly improve ecosystem quality in the Great Lakes Basin. However, even with the completion and satisfactory operation of remedial works, environmental problems will remain, because of the presence of in-place pollutants. For several areas of concern, natural processes will eventually restore the area ecosystem. This is especially true for the connecting channels, where contaminanted sediment will eventually be transported downstream, deposited, buried with clean sediment, and effectively isolated from the remainder of the ecosystem.

However, for harbors, embayments, and estuaries, these processes will occur only slowly, if at all. Remedial measures, such as dredging, will have only limited beneficial effect. It is, therefore, doubtful whether certain of the areas of concern will be fully restored to the quality levels called for in the Agreement and to support all beneficial uses, even with implementation of all reasonable remedial measures.

The principal reasons are modification of land use patterns in the drainage basin, especially through industrial and urban development, and modification of the geometry of the water body through construction of bulkheads and loading docks and through deep-channel dredging. These hydrological changes have imposed additional constraints on the assimilative capacity of these waters.

The Class "A" areas particularly affected are the Grand Calumet River/ Indiana Harbor Canal area; the Rouge River and the Raisin River, Michigan; the Maumee River, the Cuyahoga River, and the Ashtabula River, Ohio; the Buffalo River, New York; and Hamilton Harbour, Ontario.

The Board urges further study to determine to what extent the environmental quality of these areas can be restored and whether the remainder of the Great Lakes can be adequately protected. Evaluations for each of the abovementioned areas of concern should also consider alternative measures to deal with in-place pollutants, technological and fiscal limitations, social and economic implications, and public opinion. The goals of these studies and evaluations are to establish whether the requirements and obligations of the Agreement can be met and adequate protection of the Great Lakes achieved.

EVALUATION OF REMEDIAL PROGRAMS

Table 1 on page 5 summarizes the Board's evaluation of the adequacy of remedial programs to correct environmental problems for the 18 Class "A" areas of concern. More detailed statements of the Board's evaluation and of the environmental issues are presented in the pages following. Details regarding the environmental data and the remedial programs, as submitted by the jurisdictions, are given in the Appendix.

FOX RIVER AND SOUTHERN GREEN BAY, WISCONSIN

ISSUE

Southern Green Bay has historic eutrophication problems. Although municipal and industrial facilities generally meet the 1.0 mg/L phosphorus effluent limitation, the additional stress on the system as a result of these discharges have not been determined with any certainty. The phosphorus budget and dynamics of Green Bay is being studied, including the relation of phosphorus to phytoplankton growth and the effects of phytoplankton and oxygen-consuming organic substances on dissolved oxygen levels.

Dissolved oxygen levels in the lower Fox River have improved considerably since 1972, as a result of installation of wastewater treatment facilities.

The potential for ammonia toxicity problems is thought to exist near the mouth of the river and for some distance out into the bay. No problems, however, have been documented to date.

Sediments in the Fox River and near the river mouth in Green Bay are heavily polluted with conventional contaminants and heavy metals, including: volatile solids, chemical oxygen demand, total Kjeldahl nitrogen, phosphorus, ammonia, oil and grease, lead, zinc, and mercury. PCB and DDT are also present.

The area fishery continues to improve in amount and diversity but is still impaired. Concentrations of PCB in fish flesh routinely exceed the U.S. FDA action level. Low or trace levels of industrial chemicals, pesticides, and their breakdown products, including pentachlorobenzene, α-lindane, DDT, hexachlorobenzene, nonachlor, pyridine carboxamide, and tri-, tetra-, and pentachlorophenol are also present.

WATER QUALITY BOARD EVALUATION

The Water Quality Board concludes that the remedial works now in operation are not adequate to fully resolve the identified environmental problems resulting from municipal and industrial discharges (Evaluation = 2B). However, the Board recognizes that major improvements in the water quality of the lower Fox River have been achieved over the past 10 years as a result of Wisconsin's pollution control programs.

For control of conventional pollutant parameters, facilities are now in place on the lower Fox River between Lake Winnebago and the DePere Dam, and are planned for the sector between the DePere Dam and the mouth at Green Bay. All controls should be fully installed and in operation on or before January 1, 1985. Municipalities and industries have responded to the discharge requirements with no significant delinquencies in meeting construction schedules and discharge permit requirements. The works will consist of wastewater treatment for industrial and municipal dischargers sufficient to implement the waste load allocation requirements and to meet water quality standards even during periods of low flow and high temperature. Operation of the facilities will also solve the BOD-related dissolved oxygen and ammonia problems of the lower Fox River and Green Bay.

The Board also concludes that there are no firm program requirements apparent for the control of many of the toxic pollutant parameters. However, the Board recognizes that there are insufficient data currently available with which to design such requirements. The Board also notes Wisconsin's efforts to develop the necessary information bases for assessment and control (Evaluation = 2D).

Based on the information available, it is expected that problems associated with pollutants in the sediment will be resolved over the longer term (Evaluation = 2B).

MILWAUKEE ESTUARY, WISCONSIN

ISSUE

The Milwaukee Estuary, including Milwaukee Harbor and inflowing tributaries (Milwaukee River, Menomonee River, and Kinnickinnic River), contain heavily polluted sediments, contaminated fish, and degraded water.

Current water quality problems are primarily related to combined sewer overflows and in-place pollutants.

Sediments contain high levels of conventional pollutants and heavy metals, including oil and grease, chemical oxygen demand, total Kjeldahl nitrogen, total phosphorus, lead, zinc, cadmium, and copper. PCB, DDT, and chlordane are also present in some sediments.

Most fish samples contain PCB in excess of the U.S. FDA action level of 5.0 mg/kg (maximum 88 mg/kg). DDT levels in some fish (maximum 2.98 mg/kg) exceed the Agreement objective of 1.0 mg/kg. Also present at low or trace levels are hexachlorobenzene, α- and γ-lindane, cis- and trans-chlordane, dieldrin, trans-nonachlor, and mercury.

Water samples from Milwaukee Harbor exceed the Agreement objectives for conductivity, ammonia, zinc, cadmium, mercury, lead, and copper. PCB, dieldrin, and DDT have been detected in some area discharges.

Bacterial counts increase as a result of combined sewer overflows after heavy rainfall, and area beaches are subject to closure.

WATER QUALITY BOARD EVALUATION

The Water Quality Board concludes that remedial works currently in operation will not resolve identified environmental problems in the Milwaukee Estuary; however, Wisconsin and the courts have imposed a schedule and additional measures which will resolve the municipal and combined sewer overflow related problems (Evaluation = 2B). These additional works will consist of those facilities set forth in the approval of the Master Facilities Plan issued in June 1981. These include additional treatment capabilities at existing facilities and combined sewer overflow detention and treatment. The court-ordered schedule for installing and placing these controls into operation is given in the Appendix. A pretreatment program is also under development to reduce the industrial impact on sludge and on treatment plant effluent quality.

A firm implementation schedule, which will result in meeting water quality standards in the Milwaukee Estuary, and which could include removal of in-place pollutants, currently exists in the Dane County court order. An intensive study to determine the appropriate means to achieve the water quality standards is currently underway (Evaluation = 2B).

WAUKEGAN HARBOR, ILLINOIS

ISSUE

The sediments in Waukegan Harbor and in the North Ditch are grossly contaminated with PCB (maximum concentration 500,000 mg/kg). PCB is also present in water (concentrations up to several µg/L) and in fish (maximum average concentration 77.4 mg/kg); the U.S. FDA action level for PCB in fish is 5.0 mg/kg. Signs have been posted warning the public not to eat fish caught in the harbor.

Because of restrictions on the dredging and disposal of contaminated sediments, restrictions have been imposed on navigation.

WATER QUALITY BOARD EVALUATION

The Water Quality Board concludes that remedial works currently in operation are not adequate and any proposed measures are subject to the outcome of litigation. Hence, the Board cannot evaluate the effectiveness of such measures at this time (Evaluation = 2D).

GRAND CALUMET RIVER AND INDIANA HARBOR CANAL, INDIANA

ISSUE

All sediments in the lower portion of the Grand Calumet River and Indiana Harbor Canal are heavily polluted for all conventional pollutants and for heavy metals; the concentrations are among the highest in the Great Lakes System. Sediments also have high levels of organic chemicals associated with heavy industry. Consequently, restrictions on the dredging and disposal of contaminated sediments have resulted in restrictions on dredging for navigation.

Fish are not generally found in the River or Canal: the area fishery is virtually nonexistent. When found, the fish are small and in poor physical condition. The fish are contaminated with PCB, α-lindane, hexachlorobenzene, pentachloranoisole, cis-nonachlor, cis- and trans-chlordane, oxychlordane, DDD, DDE, and dieldrin.

Very few macroinvertebrates are present, since their habitat - the bottom sediments in the River and Canal - are oily silt and sludge.

Water samples exceed Agreement objectives for copper, lead, selenium, iron, zinc, ammonia, mercury, phenol, and conductivity; and exceed Indiana standards for ammonia, cyanide, phenol, phosphorus, chloride, fluoride, mercury, and oil and grease. PCB was also measurable in the water column.

Outflow from the Grand Calumet River and Indiana Harbor Canal also has an adverse environmental impact on the adjacent nearshore of Lake Michigan. Elevated concentrations or violations have been reported for cadmium, phenol, and ammonia; and phosphorus, chloride, and sulphate concentrations appear to be increasing.

Elevated bacteriological levels occur after rainfall as a result of combined sewer overflows to the Grand Calumet River. East Chicago may also contribute by the discharge of inadequately treated sewage. Consequently, recreational use of the water is restricted: Hammond Lake Front Park is permanently closed, and Jerose Park, in East Chicago, was closed during 1981.

WATER QUALITY BOARD EVALUATION

The Water Quality Board concludes that remedial measures currently in place will not resolve the identified environmental problems in the Grand Calumet River and Indiana Harbor Ship Canal. Additional measures are in the process of being implemented at several of the municipal and industrial *facilities in the area; although these measures will reduce pollutant loads, they will not be adequate to resolve the environmental problems. At one sewage treatment plant, there has been only limited progress to upgrade wastewater treatment facilities and to provide pretreatment; enforcement action is pending and agreement is being sought on an abatement compliance schedule.*

Action is being taken against industrial waste landfills as information becomes available.

There are no plans to address in-place pollutants.

Since the drainage basin is heavily developed, and since there is little natural flow, it is doubtful whether the environmental problems will ever be completely resolved. The State of Indiana has proposed to designate these waters as suitable for only certain, restricted uses (Evaluation = 2C).

In addition, insufficient information is available to conclude whether present and proposed water quality standards and effluent limitations will ensure protection of the adjacent waters of Lake Michigan and the achievement of the Agreement objectives in these waters (Evaluation = 3).

ST. MARYS RIVER, MICHIGAN AND ONTARIO

ISSUE

Sediments along the Ontario shoreline of the St. Marys River, downstream of the industrialized section of Sault Ste. Marie, contain high levels of iron, zinc, phenol, cyanide, and oil; the benthic fauna are impaired. Ontario has placed restrictions on the disposal of dredged materials.

Phenol concentrations in excess of the Agreement objective extend across the international boundary. Ammonia levels exceed the Agreement objective, and cyanide levels exceed the Ontario objective.

Bacteriological contamination from sewer system overflows along the Sault Ste. Marie, Ontario waterfront and from the Sault Ste. Marie, Ontario sewage treatment plant has restricted recreational use in some areas.

Mercury contamination in larger sizes of certain fish species has resulted in consumption advisories; the former contamination sources were, however, upstream in Lake Superior.

WATER QUALITY EVALUATION

The Water Quality Board concludes that the remedial measures currently in place along the Ontario side of the St. Marys River are not adequate to resolve current environmental problems. Additional measures being imposed by Ontario are expected to correct the transboundary phenolics problem by 1987. Further measures for the control of local bacteria and other identified problems are to be put in place and in operation by 1988. Through these programs and through natural physical and biochemical processes, improvement in benthic fauna is expected over the longer term (Evaluation = 2B).

The Water Quality Board concludes that remedial measures currently in place along the Michigan side of th- St. Marys River are adequate to ensure protection of the river ecosystem (Evaluation = 1).

SAGINAW RIVER SYSTEM AND SAGINAW BAY, MICHIGAN

ISSUE

Historically, eutrophication has been a pronounced water quality problem in Saginaw Bay. In fact, due to its hydrology, eutrophication may always be characteristic of the bay. The total phosphorus load to Saginaw Bay from the Saginaw River decreased from 1044 t/a in 1974 to 409 t/a in 1979. This decrease is due to phosphorus removal efforts by municipal treatment plants, the detergent phosphorus ban in Michigan, and reduced tributary flow rates. The municipal phosphorus loads in 1979, 1980, and 1981 were 211, 220, and 232 t/a, respectively. This slight increase is due in part to an increase in the number of facilities reported, an increase in the total flow treated, and to poor performance by one or more of the municipal facilities; nonetheless, the point source phosphorus load to Saginaw Bay appears to have stabilized. This overall load reduction and the attendant improvements in water quality in Saginaw Bay since the early 1970's have resulted is a marked decrease in the number of taste and odor complaints from communities getting drinking water from the bay.

The total phosphorus load to Saginaw Bay from the Saginaw River increased, however, in 1980 from the load reported for 1979. This increase is primarily due to higher tributary flow and nonpoint land runoff. The impact of this increase on water quality in Saginaw Bay is not known.

Runoff from agricultural land in the basin contributes suspended solids, nutrients, organic matter, and pathogenic organisms to Saginaw Bay. Siltation and associated turbidity degrades fish habitat, fills surface drainage ways, and fills the main navigation channel from the bay into the Saginaw River. The nutrient and organic matter contributed by agricultural activities adversely affects the dissolved oxygen level in the Saginaw River. Loadings from agricultural sources vary substantially from year to year, depending on the amount of rainfall and whether major rainfall events occur before crops have grown sufficiently to protect the soil.

Sediments in the Saginaw River contain elevated levels of PCB, in excess of U.S. EPA's dredge disposal guidelines. Sediments in the Pine River are contaminated with PBB.

Fish from Saginaw Bay, the Saginaw River, and its tributaries contain PCB and chlorinated dioxins in excess of the U.S. FDA guidelines. Fish from the Pine River contain PBB. Fish consumption bans are in effect for portions of the area rivers, and a fish consumption advisory is in effect for Saginaw Bay.

WATER QUALITY BOARD EVALUATION

The Water Quality Board concludes that programs to control phosphorus from municipal discharges are adequate (Evaluation = 1), and notes that there is a nonpoint source control demonstration project in operation; however, there are no firm requirements in place or planned to continue control of excessive nonpoint phosphorus loadings from tributaries (Evaluation = 2D).

The Board further concludes that remedial works currently in operation are inadequate to resolve toxic contamination problems principally associated with industrial discharges. Additional studies have been instituted to confirm the adequacy of control measures for chlorinated hydrocarbons and to establish the impacts, if any, on Saginaw Bay of contamination problems in tributaries to the bay (Evaluation = 3).

Dredging has been carried out at some locations to remove contaminated sediments. Studies are underway to determine the feasibility and benefits of removing contaminated sediments at other locations (Evaluation = 3).

ST. CLAIR RIVER, ONTARIO AND MICHIGAN

ISSUE

Sediment at several locations along the Ontario shoreline of the St. Clair River remains contaminated with PCB, mercury, lead, chromium, copper, and zinc at levels in excess of the Ontario guidelines for open-water disposal, necessitating confined disposal of dredged materials from maintenance navigation projects. Mercury levels are, however, considerably reduced from levels recorded in the early 1970's.

A marked improvement in the biological community of the river sediment has occurred over the past decade. Residual sediment contamination does, however, slow the recovery of the benthic fauna, adjacent to and downstream of the petroleum and petrochemical complex in Sarnia and Moore Township.

Although mercury levels have also declined markedly in fish, consumption advisories issued by Michigan and Ontario remain in effect, primarily for larger fish. Advisories are also in effect for some fish species because of elevated PCB levels. Fish tainting is still occasionally reported in areas close to industrial sources.

The Agreement objective for phenol in water is exceeded along the Canadian shore, and fecal coliform levels exceed the provincial objective. Bacterial contamination from combined sewer overflows limits local recreational use.

WATER QUALITY EVALUATION

The Water Quality Board concludes that remedial measures currently in place on the Michigan side of the St. Clair River are adequate to ensure protection of the river system (Evaluation = 1).

The Board concludes that remedial measures currently in place on the Ontario side of the St. Clair River are not adequate at this time. The Board notes that, with regard to mercury contamination. remedial measures were taken in the early 1970's. Levels of mercury in fish have declined markedly, and a continued but more gradual decrease is expected through natural processes. The Board notes that Ontario is requiring further remedial measures of Polysar Corporation to address phenolic compounds. The province expects improvements in river water quality as a result. Further, to alleviate the bacterial contamination problem at Sarnia, the province is actively seeking an effective remedial measure under the municipal sewer separation program (Evaluation = 2B).

DETROIT RIVER, MICHIGAN AND ONTARIO

ISSUE

PCB and mercury levels in sediment from the Detroit River exceed Ontario guidelines for open water disposal of dredged material; confined disposal would be required. The majority of the exceedences are along the U.S. shore in the vicinity of the Detroit sewage treatment plant, Great Lakes Steel, and the Rouge River mouth. Studies have been initiated to ascertain the presence and distribution of organic pollutants in the sediments.

Improvements in the distribution and numbers of the pollution-sensitive mayfly have occurred along both sides of the Detroit River since 1968. However, the benthic population along the U.S. shoreline in the vicinity of and downstream of the Rouge River mouth remains highly disrupted, consisting of high densities of sludgeworms.

Mercury levels in fish have decreased considerably as a result of control measures applied to upstream point source dischargers and because of natural purging of the river system. However, both mercury and PCB levels are still elevated, and the fish consumption advisories issued by Michigan and Ontario remain in effect.

Bacterial levels are elevated on the U.S. side of the river as a result of combined sewer overflows and direct urban land runoff into the river. Bacterial levels are also elevated along the Canadian side as a result of municipal discharges; recreational swimming, bathing, and other activities have been occasionally restricted.

The Agreement objectives for phenol, iron, and total dissolved solids are exceeded in some water samples from the Detroit River.

Reductions in phosphorus loads, as a result of measures applied to municipal and industrial point-source discharges on both the Canadian and the U.S. sides of the Detroit River over the past decade, have resulted in improved water quality, from an enrichment point of view, in both the Detroit River and the western basin of Lake Erie.

WATER QUALITY BOARD EVALUATION

The Board concludes that remedial measures currently in operation on the Ontario side of the Detroit River are not adequate. The Board notes, however, that specific measures are in the process of implementation to address the bacterial contamination from municipal dischargers which should alleviate these problems (Evaluation = 2A).

The Water Quality Board concludes that, except for combined sewer overflows, remedial measures currently in place on the Michigan side of the Detroit River are adequate to resolve pollution problems resulting from industrial and municipal direct discharges (Evaluation = 1).

Combined sewer overflows into the Rouge River (discussed below) and from the City of Detroit, and direct land runoff from the City of Detroit contribute a sizeable loading of phosphorus and other pollutants, and control *of these sources could afford a greater measure of protection and improvement to the water quality of the Detroit River and the western basin of Lake Erie. The City of Detroit has concluded that, although pollutant loads to the Detroit River from combined sewer overflows could be reduced, no significant improvement in water quality would result. Any load reductions and improvements would be masked by direct surface runoff from the City of Detroit and by combined sewer overflows in the Rouge River Basin. There are no additional programs planned at the present time to address these sources (Evaluation = 2D).*

Sediments in the Detroit River may continue to be a source of contamination; however, it is not clear whether broad-scale dredging is a viable remedial option. Natural physical and biochemical processes are expected to reduce the contaminant levels and lead to re-establishment of a healthy benthic fauna community (Evaluation = 2C).

ROUGE RIVER, MICHIGAN

ISSUE

The Rouge River, a tributary to the Detroit River, drains a heavily developed industrial area. Historical data show severe degradation of the sediment. Significant control measures have been implemented; however, the river remains seriously impacted by combined sewer overflows and contaminated sediments. Fecal coliform, phenol, iron, and total dissolved solids concentrations in water exceed the Agreement objectives.

WATER QUALITY BOARD EVALUATION

The Water Quality Board concludes that control measures currently in place are not adequate to resolve environmental problems in the Rouge River Basin. The major problems are the result of combined sewer overflows. A major study on combined sewer overflows has been completed and other studies are still in progress. Based on the information available, and considering the benefits to be derived and the costs involved, the court has concluded that measures to correct combined sewer overflows in the Rouge River Basin are not warranted at this time (Evaluation = 2D).

RAISIN RIVER, MICHIGAN

ISSUE

The Raisin River drains a heavily industrialized area south of Detroit. Existing water quality problems result to a great extent from contaminated sediments, which are heavily polluted with volatile solids, oil and grease, and metals; chemical oxygen demand is high.

Fish are contaminated with PCB and other persistent organic compounds.

The Agreement objectives were violated for dissolved oxygen, conductivity, fecal coliform, and several heavy metals in water. The Michigan standard for pH was also violated.

WATER QUALITY BOARD EVALUATION

The Water Quality Board concludes that there are no programs planned to resolve problems associated with contaminated sediment. Further evaluation is necessary to determine whether dredging is a feasible alternative for the removal of in-place pollutants (Evaluation = 3).

MAUMEE RIVER, OHIO

ISSUE

The Maumee River carries a heavy load of soil and nutrients, resulting from agricultural land runoff, to the western basin of Lake Erie. Sediments in the lower Maumee River and in Toledo Harbor are heavily polluted with such conventional pollutants as volatile solids and chemical oxygen demand, and with metals, as a result of past municipal and industrial discharges. Contamination has, however, been decreasing with time as a result of pollution control efforts. Sediments in the outer harbor are less heavily polluted.

The area fishery is impaired. PCB levels in fish exceed the U.S. FDA action level. Several industrial chemicals and pesticides are also present in fish tissue.

The Agreement objectives for dissolved oxygen, conductivity, fecal coliforms, and several heavy metals are also exceeded for water samples from the mouth of the Maumee River.

WATER QUALITY BOARD EVALUATION

The Water Quality Board concludes that the remedial measures currently in operation to control municipal sources of pollution are adequate (Evaluation = 1).

Programs to control nonpoint sources of pollution within the Basin, which are more significant than point sources, are not adequate. While there are major and intensive nonpoint source control demonstration projects on going, the Board notes that these efforts rely on voluntary participation, and the long term acceptance of these programs is unknown (Evaluation = 2B).

Problems related to combined sewer overflows are under study and evaluation. No date is projected for combined sewer overflow controls due to insufficient data on programs and lack of funding (Evaluation = 2D).

Program requirements to control toxic contaminants from industrial sources are being developed. Expected implementation is 1985/86 (Evaluation = 2D).

With the implementation of remedial programs to decrease pollutant loads from both point and nonpoint sources, the natural processes of attrition should remove contaminants from the sediments and fish over the next five to ten years (Evaluation - 2B). However, because of the natural chemistry of the water in the drainage basin and because of existing land use patterns, the water quality in the estuary may never meet all Agreement objectives.

BLACK RIVER, OHIO

ISSUE

Sediments in the lower Black River are heavily polluted with such conventional contaminants as volatile solids, chemical oxygen demand, and oil and grease; nutrients; and metals.

The area fishery is impaired. PCB levels in fish exceed the U.S. FDA action guideline. Several chemicals of industrial origin are also present in fish tissue.

Concentrations in water samples violated Agreement objectives or Ohio EPA water quality standards for nutrients, dissolved oxygen, fecal coliforms, conductivity, cyanide, and several heavy metals.

WATER QUALITY BOARD EVALUATION

The Water Quality Board concludes that the remedial programs in operation are not now adequate; however, the remedial programs under way for municipal and industrial facilities in the area should result in adequate controls of the discharges of wastewater into the river by mid-1986. Because of in-place pollutants, an additional 5 to 10 years will be required for natural processes to correct the environmental problems (Evaluation = 2B). However, the natural chemistry of the drainage area for the Black River and current land use patterns may preclude the river water from attaining all the Agreement objectives. Surveys have been conducted to assess what water uses can be achieved for the area.

CUYAHOGA RIVER (CLEVELAND), OHIO

ISSUE

Few fish are able to survive in the lower Cuyahoga River and in Cleveland Harbor because of depressed dissolved oxygen levels, elevated levels of dissolved solids and ammonia, and polluted bottom sediments.

Sediments are heavily contaminated with such conventional pollutants as volatile solids, chemical oxygen demand, total Kjeldahl nitrogen, and oil and grease; with heavy metals; and with PCB. Although sediment quality has improved with time, dredged materials must be disposed of in confined areas.

Concentrations in water samples exceeded Agreement objectives and/or Ohio standards for dissolved oxygen, ammonia, conductivity, phenol, fecal coliform, and several heavy metals.

WATER QUALITY BOARD EVALUATION

The Water Quality Board concludes that current remedial measures are not adequate. However, major programs to control municipal and industrial discharges, combined sewer overflows, and urban land runoff are underway and should all be in place by 1990. These measures will significantly improve ecosystem quality in the area. They include major construction at municipal treatment plants in Akron and Cleveland. Two large interceptor programs are *under construction or planned. Wastewater treatment systems have been installed at major industries in the area, for the control of conventional and toxic pollutants; the facilities are being reviewed to identify whether additional controls are required for toxic substances. Several hazardous waste disposal sites have been identified, closed, and/or cleaned up.*

However, there is inadequate information available to determine what water quality the current remedial programs will permit. In light of the natural chemistry of the drainage basin, the current intensive land use, and the greatly modified geometry of the navigation section of the river, it is unlikely that the water quality in the river will ever meet the Agreement objectives (Evaluation = 2C).

ASHTABULA RIVER, OHIO

ISSUE

Fish from the lower Ashtabula River, the harbor area, and inflowing tributaries are contaminated with complex organic substances of industrial origin. For several of the compounds, the human health effects are not known. A U.S. FDA action level exists only for PCB; concentrations in fish exceeded this level.

Heavy sediment contamination with conventional pollutants (volatile solids, total Kjeldahl nitrogen, chemical oxygen demand, and oil and grease), heavy metals, and chlorinated organics necessitates confined disposal for dredged materials. Restrictions on dredging have also resulted in restrictions on navigation.

Water samples collected at the mouth of the harbor exceeded the Agreement objectives for conductivity, fecal coliforms, and several heavy metals.

WATER QUALITY BOARD EVALUATION

The Water Quality Board concludes that the remedial works now in operation have significantly improved the ecosystem quality of the Ashtabula River. However, these measures are not adequate to completely resolve the environmental problems related to industrial discharges, hazardous waste sites, and in-place pollutants (sediment). The Board notes that there are investigations underway to address some of these issues. Although firm program requirements have not yet been developed, such measures, when implemented would restore ecosystem quality, although natural attrition will take some time (Evaluation = 2B).

The Board also notes that Field's Brook, a tributary to the Ashtabula River, is a priority site of the "Superfund" program. This is the only site at which "Superfund" monies have been considered for the removal of contaminated sediments from a stream. The Board will closely follow the progress of this activity.

BUFFALO RIVER, NEW YORK

ISSUE

The lower Buffalo River, which drains a heavily populated and highly industrialized basin, and the Buffalo waterfront are very severely polluted.

Almost all sediments are heavily contaminated with conventional pollutants (including nutrients, volatile solids, and oil and grease) and with heavy metals. Many sediments are also contaminated with high concentrations of organic substances primarily of industrial origin. Nine potential or positive carcinogens and eight organic substances having a potential for chronic aquatic toxicity were identified. Each was present at at least one sampling location and at a concentration of at least 5 mg/kg; the concentrations of some substances exceeded 50 mg/kg. PCB and pesticides are also present.

Because of the multiplicity and the concentrations of carcinogens, toxins, heavy metals, and conventional pollutants present, the macroinvertebrate population is severely impaired.

In water samples, the Agreement objectives were exceeded for dissolved oxygen, conductivity, fecal coliform, and several heavy metals.

WATER QUALITY BOARD EVALUATION

The Water Quality Board concludes that remedial measures currently in place will not resolve identified problems in the Buffalo River. However, additional programs are being implemented, notably at the Buffalo and the Lackawanna municipal treatment facilities. These additional measures should be operational by 1985. Significant improvement in ecosystem quality in the area is expected by 1990 (Evaluation = 2B).

There are currently no firm remedial programs to address in-place pollutants. Funds to address combined sewer overflows are expected to be approved in 1984 (Evaluation = 2D).

NIAGARA RIVER, NEW YORK AND ONTARIO

ISSUE

Water, sediment, and fish from the Tonawanda Channel of the Upper Niagara River are severely contaminated. The lower Niagara River also exhibits extensive contamination.

Almost all sediments from the Tonawanda Channel are heavily contaminated with conventional pollutants, heavy metals, and PCB in excess of acceptable concentrations for open-water disposal of dredged materials. Many sediments are also contaminated with high concentrations of other organic substances primarily from industrial sources. Nine potential or positive carcinogens and eight organic substances having a potential for chronic aquatic toxicity were identified. Each was present at at least one sampling location and at a concentration of at least 5 mg/kg; the concentrations of some substances exceeded 50 mg/kg.

Sediments from the lower Niagara River generally exceeded acceptable levels for heavy metals.

A number of organic compounds have also been identified in sediment and water samples taken from the river near industrial landfills.

Numerous organic chemicals of industrial or agricultural origin have been identified in fish. For those substances for which U.S. Food and Drug Administration action levels or Canadian federal consumption guidelines have been established, concentrations are such that most fish are suitable for unrestricted consumption. Advisories are in place for larger specimens of American eel and coho salmon, because of elevated levels of PCB and mirex; although found in the lower Niagara River, these species are generally resident in Lake Ontario.

Agreement or Ontario objectives were exceeded in some water samples for PCB, aldrin/dieldrin, DDT, endrin, phenolics, heptachlor/heptachlor epoxide, endosulfan, fecal and total coliform, and several heavy metals. Most of the observed exceedences were in the Tonawanda Channel and in the lower Niagara River.

The benthic fauna is disrupted in the Tonawanda Channel and in the lower Niagara River. Toxicity was a limiting factor along the shoreline of the upper Niagara River and was also a problem in the lower Niagara River.

WATER QUALITY BOARD EVALUATION

The Water Quality Board concludes that the remedial programs currently in operation for the U.S. side of the Niagara River are not adequate to resolve environmental problems identified in the river. The Board notes, however, that remedial actions taken primarily by the U.S. EPA and the New York Department of Environmental Conservation have increased over the past few years. Specifically the Board recognizes the U.S. Niagara River Agenda (clean-up plan) and the binational Canada-U.S. Niagara River Toxics Committee work, which is currently taking place. Specific efforts of the Canadian agencies in monitoring the ambient environmental conditions of the river are also noted. While the Board is of the opinion that jurisdictions responsible have placed high priority in cleaning up the environmental degradation of the Niagara River, it recognizes that recovery of the Niagara River ecosystem will take a sustained effort. The Board will continue to track the progress of the responsible jurisdictions in implementing the acquired remedial measures to alleviate these problems (Evaluation = 2B).

The Board concludes that remedial measures currently in operation on the Canadian side of the Niagara River are adequate (Evaluation = 1).

HAMILTON HARBOUR, ONTARIO

ISSUE

Contaminants in sediments from several portions of Hamilton Harbour exceed the provincial guideline for open water disposal of dredged materials for nutrients, several heavy metals, and PCB. The greatest contamination is in the area adjacent to municipal and industrial discharge sites and in the deep water central basin. Organochlorine pesticides have also been detected in sediments. Dredged material is disposed of in confined areas.

Agreement or provincial water quality objectives are exceeded for total dissolved solids, zinc, ammonia, phosphorus, iron, cyanide, and phenol. Localized impairment from phenols and cyanide is especially apparent in the area adjacent to the steel mills on the south shore.

Oxygen demand from municipal and industrial discharges, sediments, and algal decay depress hypolimnetic dissolved oxygen levels, especially in the summer, thereby limiting the suitability of the major part of the harbor as a fish habitat.

Aesthetic quality is diminished by poor water clarity and color, as a result of high levels of suspended solids, chlorophyll, and dissolved organics, thereby deterring broader recreational use of the harbor.

WATER QUALITY BOARD EVALUATION

The Water Quality Board concludes that remedial measures currently in operation are not adequate to resolve the environmental problems in Hamilton Harbour. The Board notes that the province has imposed further remedial measures on major industrial dischargers with regard to phenols, cyanide, and suspended solids (Evaluation = 2B); a further strategy is under development by the Ontario Ministry of the Environment for in-place pollutants (Evaluation = 2C).

ST. LAWRENCE RIVER (CORNWALL, ONTARIO - MASSENA, NEW YORK)

ISSUE

Elevated mercury and PCB levels in larger sizes of some fish species continue to necessitate advisories or restrictions on the consumption and commercial sale of these fish. However, the prospects are for declining levels as the impact of controls which are in place or planned is felt. The mercury problem is residual in nature. Some reduction of PCB levels in forage fish has occurred over the last three years, in response to initial controls on Massena-area industrial sources.

Elevated fecal and total coliform levels have resulted in recreational use restrictions at some beaches downstream of Cornwall. There are also localized violations on both sides of the river for some Agreement or jurisdictional objectives including phosphorus, total phenolics, certain heavy metals, PCB, and two organochlorine pesticides.

Contaminants in sediments collected from the mouth of the Grasse River, at Massena, and along the Cornwall, Ontario waterfront exceed jurisdictional guidelines for open water disposal of dredged materials for nutrients, heavy metals, oil and grease, and/or PCB. This contamination is primarily residual.

WATER QUALITY BOARD EVALUATION

The Water Quality Board concludes that remedial works currently in place are not adequate to resolve the principal problem of PCB contamination in fish and sediments. While the Board notes that both the U.S. and Canada have programs underway or planned for control of municipal and industrial discharges by 1985, it also notes that the effects on fish and sediments from previous PCB discharges will probably continue for some time beyond that date (Evaluation = 2B).