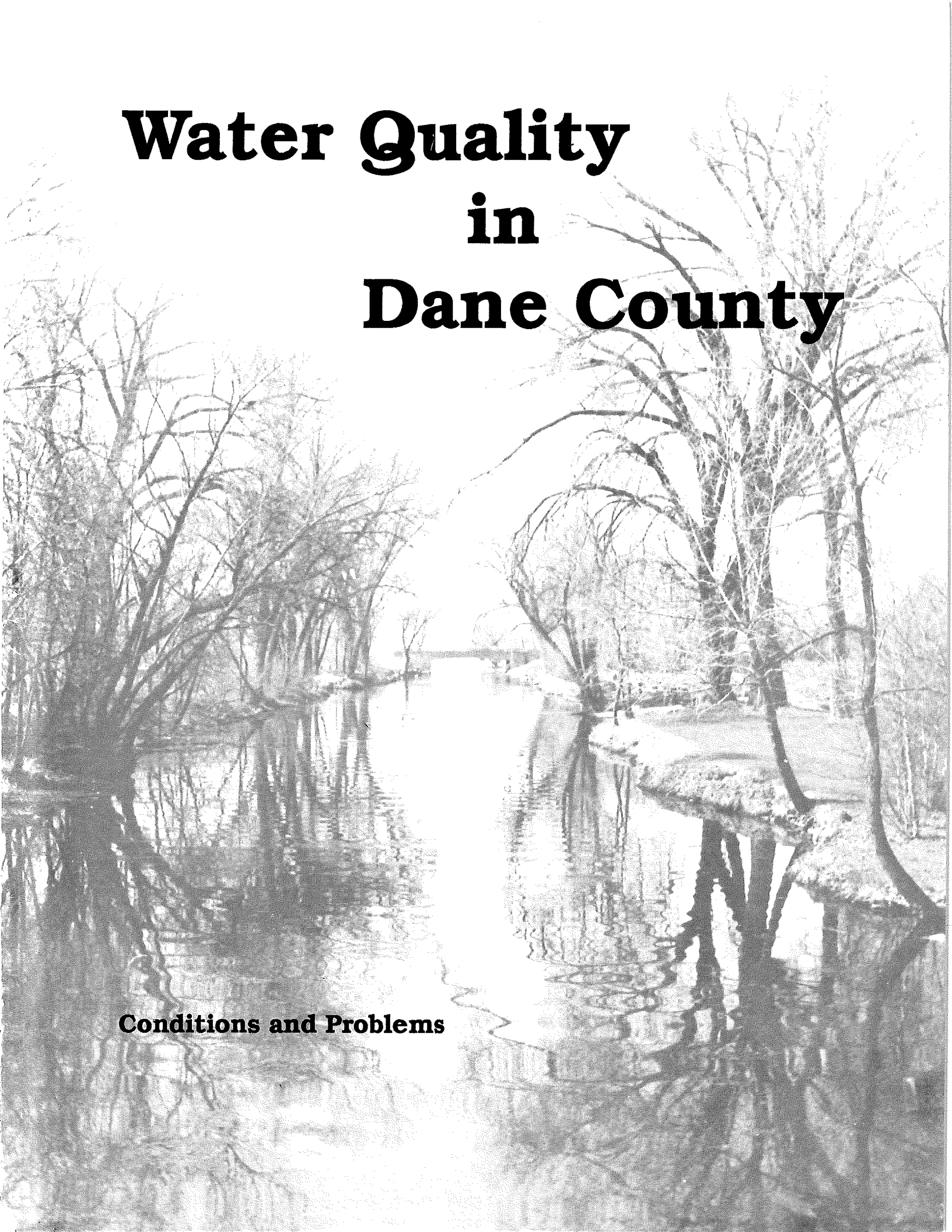
Water Quality in Dane County



Conditions and Problems

WATER QUALITY IN DANE COUNTY

Conditions and Problems

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December 1991

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WATER QUALITY

IN

DANE COUNTY

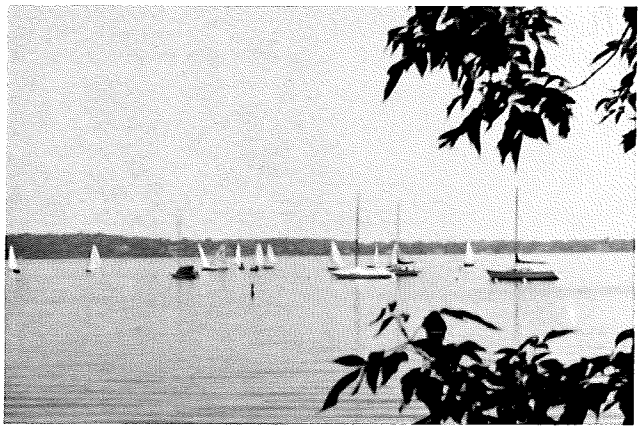
Conditions and Problems

Prepared by the Staff
of the Dane County Regional Planning Commission

January 1992

INTRODUCTION

This brochure summarizes water quality information from recent monitoring in Dane County, describes the general status of surface water and groundwater conditions, and highlights important water quality problems. Water quality trends are also indicated, where possible, based on earlier water quality monitoring data.



Dane County has an abundance of water bodies that are highly valued in providing scenic beauty, water supply and recreational enjoyment for residents and visitors. There are 37 named lakes in the county, covering 33 square miles, and 68 named streams, extending 475 miles. Groundwater is also plentiful; it sustains stream baseflow and provides residents with all of their drinking water supply.

The map on page 3 displays major lakes and streams in Dane County, as well as the four river basins and 18 smaller-sized watersheds that drain to individual water bodies. Approximately 18 percent of the 1,200 square miles in the county lies within the Wisconsin River drainage basin, 22 percent within the Sugar-Pecatonica River basin, 22 percent within the Koshkonong Creek-Maunesha River basin, and 38 percent within the Yahara River basin.

While good water quality is of high priority to area residents and management agencies, water pollution problems are still evident in Dane County. There are several land use activities that pose threats to water quality. "Nonpoint" source pollution (stormwater runoff) from both urban and rural land areas is often of principal concern. Sediment, nutrients, pesticides, metals and other pollutants from soil erosion and runoff from streets, parking lots and cropland can degrade water quality and fish habitat conditions. Groundwater and most lakes and streams in the county have been negatively affected by or are at risk from this kind of pollution. In fact, sedimentation problems from nonpoint pollution are evident in virtually every stream in the county.

More discrete sources of pollution, such as the 20 municipal wastewater treatment plants, assorted industrial discharges, hundreds of active or abandoned waste disposal sites, and thousands of septic tank systems and leaking underground storage tanks, are also of concern. These "point" sources of pollution have degraded both surface water and groundwater quality at several sites across the county, although in many circumstances regulatory programs have now been instituted to prevent or limit potential pollution from such sources. Major investments have been made, for example, in upgrading wastewater treatment plants over the last 15-20 years.

MONITORING ACTIVITIES

The Dane County Regional Planning Commission, in cooperation with various local, state and federal agencies, sponsors and coordinates a countywide water resource monitoring program. The U.S. Geological Survey conducts stream water chemistry and nonpoint pollution monitoring. The Wisconsin Department of Natural Resources (DNR) performs stream habitat, biotic index (aquatic insect), fish and lake monitoring, as well as public and private well water monitoring. Private well sampling for pesticides has been carried out by the Wisconsin Department of Agriculture, Trade and Consumer Protection and DNR. The Madison Metropolitan Sewerage District also conducts private well monitoring as part of its sludge application (Metrogro) program. In addition, the District monitors surface water quality as part of its wastewater treatment plant operations.

The monitoring program is designed to gather information to characterize water quality conditions, trends and problems in water bodies throughout Dane County. These characterizations are important in order to deter-

DNR's Dick Lathrop measuring water clarity in Lake Monona with secci disk.

mine suitable uses and to indicate where resource management and protection activities should be focused.

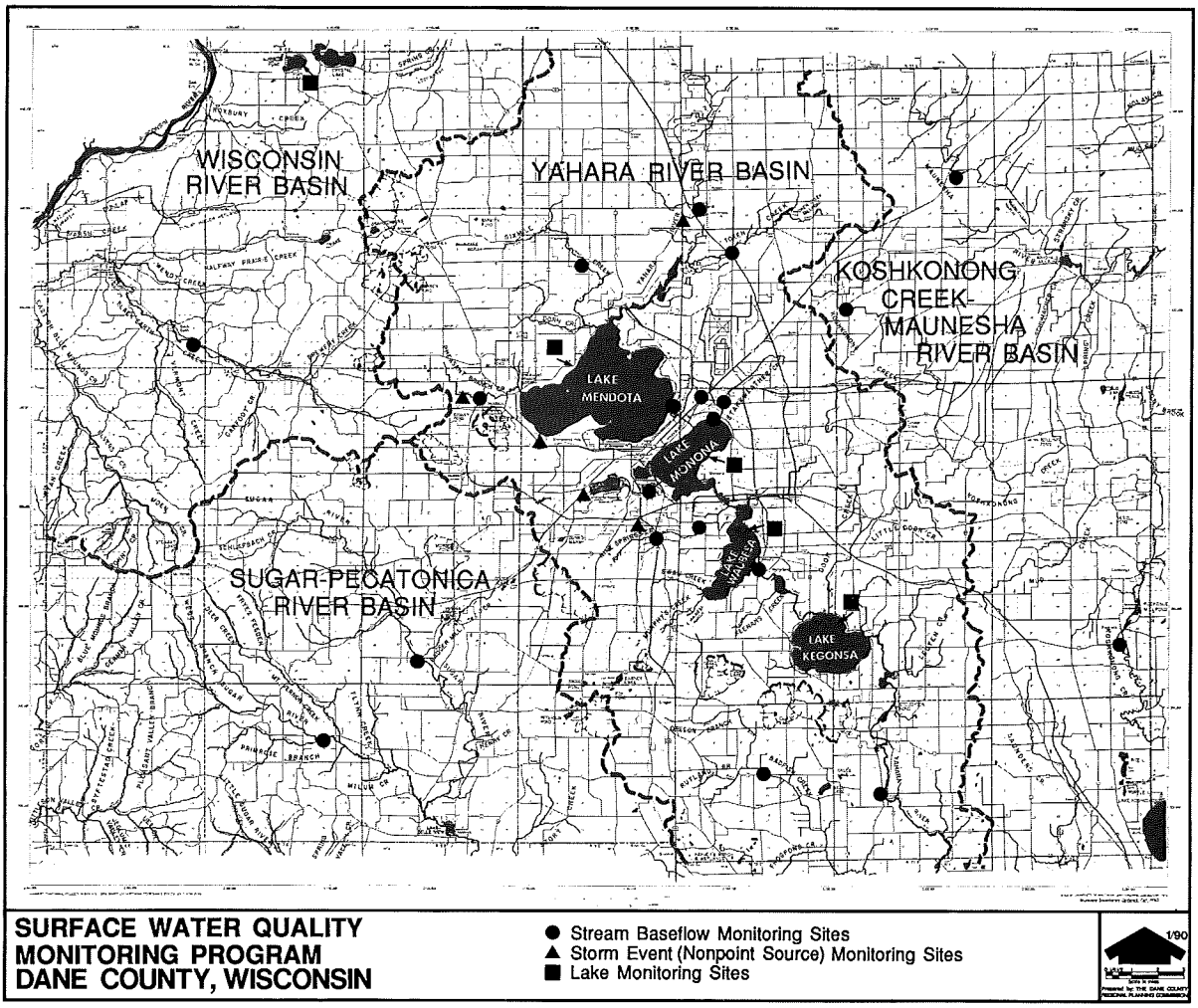
The monitoring program emphasizes periodic baseflow water chemistry sampling at stream stations, with biological index/habitat surveys, storm event and lake sampling also included as part of overall monitoring activities. Baseflow water chemistry monitoring indicates stream water quality conditions during dry-weather conditions, which occur most of the time and represent the most critical conditions for survival of fish and other aquatic life and for recreational use.

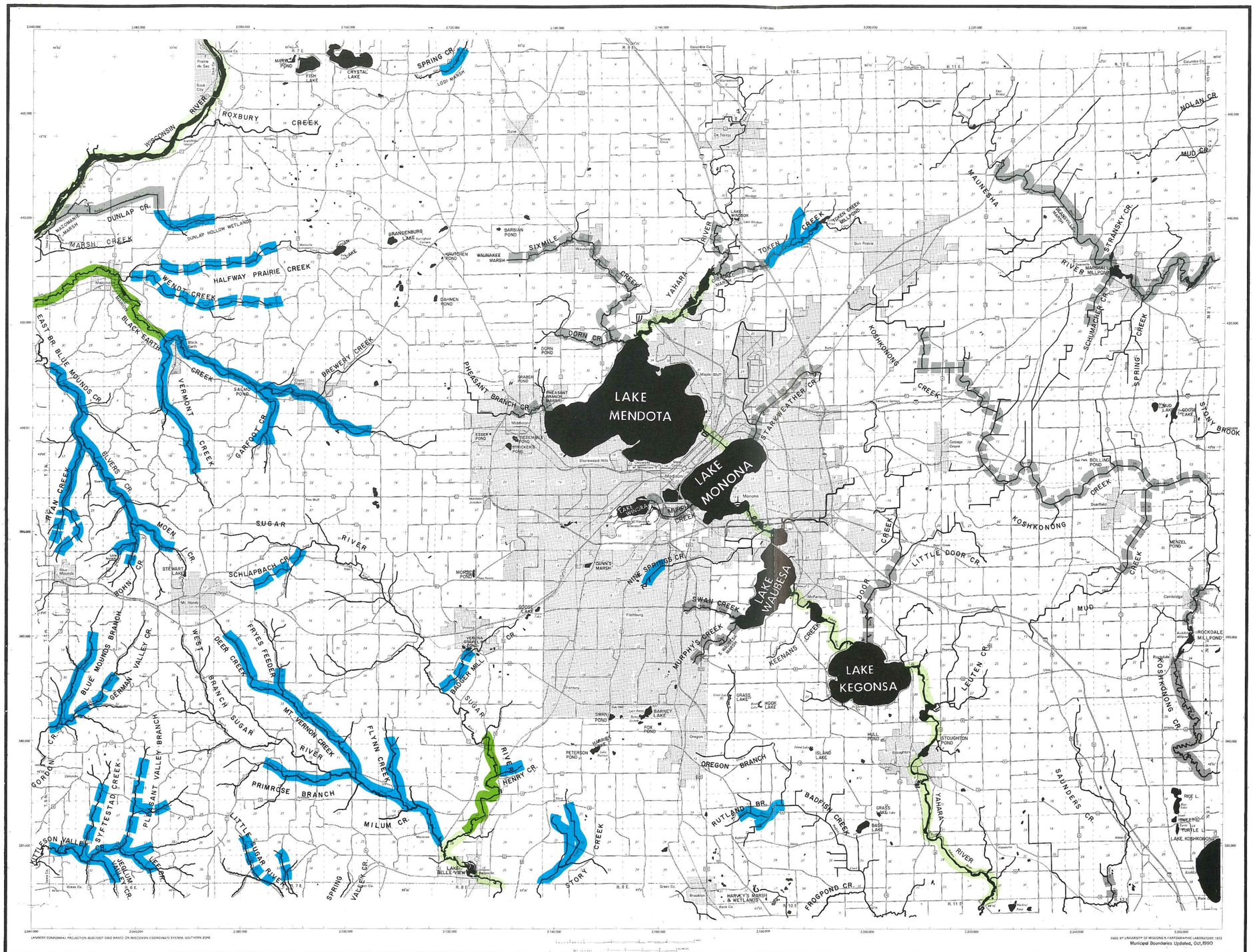
Biological surveys reveal long-term water quality trends based on the sensitivity of aquatic insects to dissolved oxygen and conventional pollutants. Habitat surveys display physical streambank, stream bottom and morphology conditions, which are important factors in determining potential use.

Storm event monitoring can display pollutant loadings (concentrations and volumes) caused by water runoff washing sediment and other pollutants off the land during rainstorms. Lake monitoring is important in understanding the physical and biological behavior and response of complex lake ecosystems, which are highly variable on a seasonal and short-term basis. It is essential to have this information in order to judge the effectiveness of programs controlling pollutant loadings to lakes. All of the specified monitoring activities are important in assessing surface water quality, resource uses and specific management problems. The various monitoring activities have been conducted on priority water bodies in each of the four major river basins in the county. Figure 1 displays the location of surface water monitoring stations.

Groundwater quality monitoring is also conducted, primarily through municipal and other public well water sampling that is performed by state (e.g., DNR) and municipal agencies on a regular basis (at least every 3-5 years). This monitoring is important in determining if groundwater is polluted and not suitable for drinking water purposes.

Figure 1





STREAM FISHERY RESOURCES
DANE COUNTY, WISCONSIN

- Trout
- Forage fish with trout potential
- Northern pike-Panfish
- Forage fish with northern pike-Panfish spawning use
- Smallmouth bass
- Northern pike-Panfish-Smallmouth bass-Catfish-Walleyes-Rough fish
- Forage fish or rough fish
- Streams
- Lakes
- Major Basin Divide

1/90

0 1/2 1 2 3
Scale in miles

Prepared by: THE DANE COUNTY REGIONAL PLANNING COMMISSION

WATER RESOURCES
DANE COUNTY, WISCONSIN

WISCONSIN RIVER BASIN

YAHARA RIVER BASIN

KOSHKONONG CREEK-MAUNESHA RIVER BASIN

SUGAR-PECATONICA RIVER BASIN

LAKE MENDOTA

LAKE MONONA

LAKE WAUBESA

LAKE KEGONSA

LAKE BELLE VIEW

Major Basin Divide

Non-Contributing Basin

Lakes

Rivers & Streams

1/90

0 1/4 1/2 1 2 3

Scale in miles

Prepared by: THE DANE COUNTY REGIONAL PLANNING COMMISSION

LAMBERT CONFORMAL PROJECTION 4000 FOOT GRID BASED ON WISCONSIN COORDINATE SYSTEM, SOUTHERN ZONE

EASE BY UNIVERSITY OF WISCONSIN CARTOGRAPHIC LABORATORY 1973

Municipal Boundaries Updated, Oct, 1990

GENERAL SURFACE WATER CONDITIONS

Water resource conditions are influenced in large part by the predominant geology of a watershed. The western third of Dane County, known as the "driftless area," is the only part of the county where glaciation is not evident. This area is characterized by steep ridges and valleys drained by fast-flowing streams, generally without natural lakes or impoundments. Most of the streams are fed by springs and seeps flowing from water-bearing layers of bedrock exposed on hillsides. Largely because of steep gradients, cool water temperatures and high dissolved oxygen levels, most of the county's trout streams are located in this part of the county (e.g., Black Earth, Mt. Vernon, Story and Kittleson Valley Creeks--see page 5). These streams generally have fair to good water quality but are commonly affected by nonpoint source pollution, as well as streambank erosion problems.

The large valley of the Wisconsin River, also found in the western part of the county, consists of deep sand and gravel deposits and extensive marshes in the floodplain of the river. Fish and Crystal Lakes are located in this area. Fish Lake is a high-quality lake which has recently begun to suffer from declining water quality.

To the east of the "driftless area" is an area of glacial end moraines, located at a major drainage divide where the headwaters of many streams of the Wisconsin, Sugar and Yahara River basins originate. The moraines include hills and mixed deposits of glacial till (including clay, silt and boulders with sand and gravel layers) which were deposited and left behind as the glaciers retreated.

East of the moraines, in the center of the county, is the Yahara River valley. Here deep glacial deposits dammed up large valleys, forming a chain of lakes and wetlands. The four largest and most heavily used lakes in the county are found here. They include Lakes Mendota, Monona, Waubesa and Kegonsa, which are all connected by the Yahara River. These are fertile lakes that support abundant algal and rooted aquatic plant growth and a diverse warm water fishery, such as northern pike, bass and panfish. Streams in the Yahara River valley are generally flatter and more sluggish than those in the "driftless area," and fewer are spring-fed. Token Creek is a notable exception, since it receives a large volume of groundwater discharge from adjacent springs. Extensive ditching and wetland drainage have been done on and near certain water bodies, resulting in impacts to water quality and habitat values.

The eastern part of the county is known as the drumlin and marsh region. This area includes many small drumlin hills interspersed with shallow glacial deposits which created an extensive system of interconnected wetlands with poorly defined drainage. Small streams wind slowly through the lowlands and there are few springs supplying streamflow. The only lakes in this area are small stream impoundments (e.g., Rockdale and Marshall millponds), or shallow, marshy lakes. No trout streams are present. A warm water fishery predominates in the two major streams of the area--Koshkonong Creek and the Maunesha River. Extensive ditching and wetland drainage in this area have also affected water quality and habitat conditions.

GENERAL GROUNDWATER CONDITIONS

The groundwater in Dane County generally is of good quality. Calcium, magnesium and bicarbonate are the principal constituents of groundwater in the county.

Calcium and magnesium concentrations are relatively high and are responsible for very hard water. Other groundwater constituents commonly found in lower concentrations are iron, manganese, sodium, sulfate, chloride, and nitrate. Although good groundwater quality commonly exists, groundwater has been affected in different areas of the county by certain land use activities, such as landfills, fertilizer/pesticide applications, and leaking underground storage tanks.

The principal aquifers (water-bearing geologic formations) that supply groundwater in the county consist of the sandstones of Late Cambrian geologic age, underlying all of the county, and shallow deposits of alluvium and sand and gravel outwash, occurring mainly in river valleys. The Cambrian sandstone aquifer (often termed the lower aquifer) is used primarily for municipal water supplies, while the sand and gravel aquifer and sandstone and dolomite rock units of Ordovician age (part of the upper or local aquifer system) are used for rural domestic supplies (see Fig. 2).

Groundwater supplies nearly all of the water in Dane County used for household, commercial and industrial uses. Public water supplies account for about 80 percent of the county's groundwater use. Over 50 million gallons per day of groundwater is withdrawn and used, amounting to approximately 150 gallons per person per day.

After water is used, it is usually returned to surface water or groundwater in the same general location from which it was withdrawn. This maintains the hydrologic balance between surface water and groundwater systems. Most of the water used in the county's central urban area, however, is diverted around the Yahara Lakes system after use, to avoid wastewater pollution impacts to the lakes. The diversion creates a hydrologic imbalance that results in lowering groundwater levels, declining stream baseflows and wetland dewatering in the central urban area. These effects indirectly influence water quality and aquatic habitat conditions, and are particularly evident in the Yahara River and major tributaries.

Groundwater impacts can also occur from population growth and development. Urban growth not only increases groundwater withdrawals for water supply, but it can alter the pattern and rate of groundwater replenishment or recharge. This occurs from impervious surfaces, such as buildings, roads and parking lots, being constructed over what was previously open land. As a result, precipitation may quickly wash off the land surface, contributing to nonpoint source water pollution, rather than infiltrating into the soil and supplementing the groundwater system and stream baseflow.

Figure 2

GENERALIZED AQUIFER SYSTEM IN DANE COUNTY

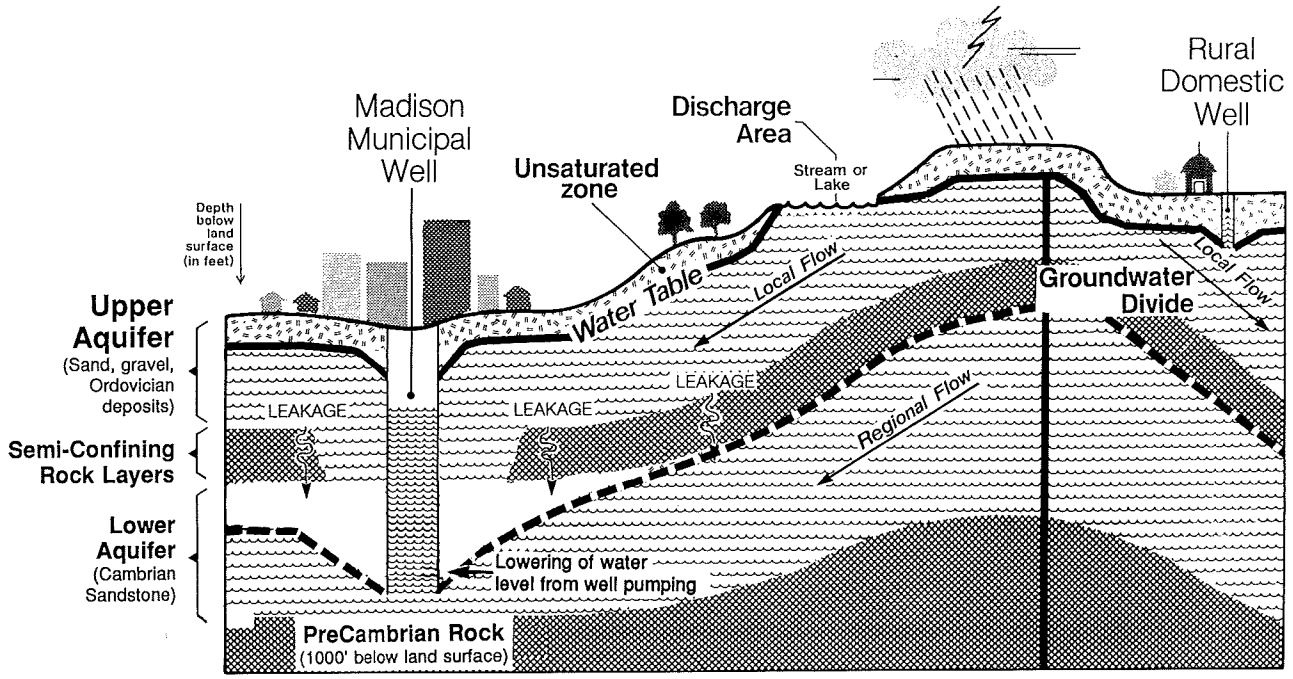
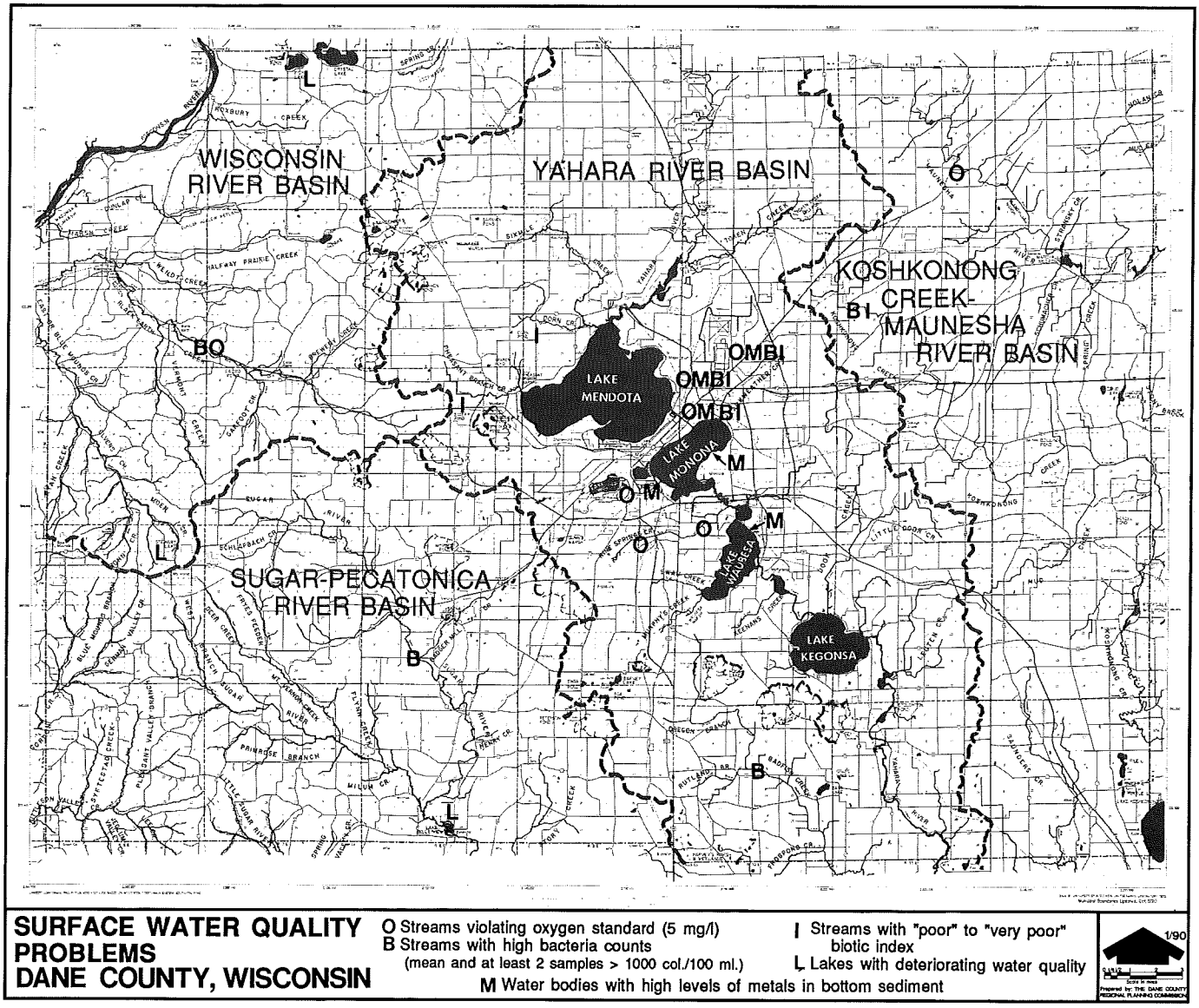


Figure 3



MONITORING RESULTS AND WATER QUALITY PROBLEMS

Streams

Baseflow monitoring data for 1989-91 were used to compare the relative pollution of monitored streams, as well as to identify locations where water quality standards were violated.

Monitoring results indicate that dissolved oxygen concentrations in samples for several streams were below the minimum concentration of 5 milligrams/liter specified in DNR regulations for warm water fisheries (see Fig. 3). Low dissolved oxygen levels during baseflow periods indicate substantial decomposition of organic material, sediment oxygen demand, aquatic plant respiration or discharges from point sources of pollution. The streams that violate this standard, however, do not receive wastewater treatment plant discharges; thus, other causes are suspected of reducing dissolved oxygen levels.

Many monitored streams also have bacteria counts during low-flow periods that exceed maximum levels for body-contact water recreation according to State Division of Health guidelines. Pollution may be occurring from animal waste, inadequately disinfected wastewater treatment plant discharges or other unidentified sources of bacteria.

Results from single water samples for metals, such as lead and zinc, that may pose toxicity concerns for aquatic life were also compared to DNR water quality standards. The chronic toxicity standard for lead was exceeded on one stream (East Branch Starkweather Creek)

and the standard for zinc was nearly exceeded on the main stem of Starkweather Creek. Other metals, such as mercury and copper, measured in water samples from monitored streams did not violate standards. The relatively high lead and zinc levels in the water of Starkweather Creek may be the result of leaching from bottom sediments contaminated in the past by municipal and industrial waste discharges to the creek.

Bottom sediments containing organic compounds and metals are of more prominent concern, as compared to actual water contamination, for certain water bodies in the county. Sediment in Starkweather Creek and Murphy (Wingra) Creek, as well as Monona Bay and deep water areas of Lake Monona and Lake Waubesa, are contaminated with such substances. Detectable levels of PCBs have been found in Starkweather Creek and Wingra Creek, and along the western shore of Lake Monona, indicating widespread contamination. The level of PCB contamination is low, however, compared to other PCB contamination sites across the state. DDT by-products also have been detected in bottom sediment in both branches of Starkweather Creek and in Wingra Creek.

Moderate to high levels of metals, such as mercury, zinc, barium and arsenic, are found in the bottom sediments of both the East and West Branches of Starkweather Creek and in Wingra Creek. Concentrations of these metals in sediment exceed federal criteria for "highly polluted" conditions and may be toxic to certain types of aquatic life. The highest mercury and zinc concentrations have been found in deep sediment from the West Branch Starkweather Creek, which indicate a past direct source of contamination. In part because of this metal contamination, Starkweather Creek has been selected as a sediment dredging and aquatic habitat restoration project by the DNR, City of Madison and Dane County.

There are concerns that sediment containing such metals, notably mercury, can be scoured from these tributary streams into Lake Monona from peak flows caused by large rainstorms. Mercury can then accumulate in fish in the lake. This phenomenon may have already occurred, since large walleyes in both Lake Monona and Lake Waubesa contain levels of mercury exceeding the public health standard (0.5 parts per million) and have been added to the Wisconsin Fish Consumption Health Advisory List.

Water quality has also been compared at stream monitoring stations. This was done to rank the relative pollution impacts to county streams as well as to illustrate which

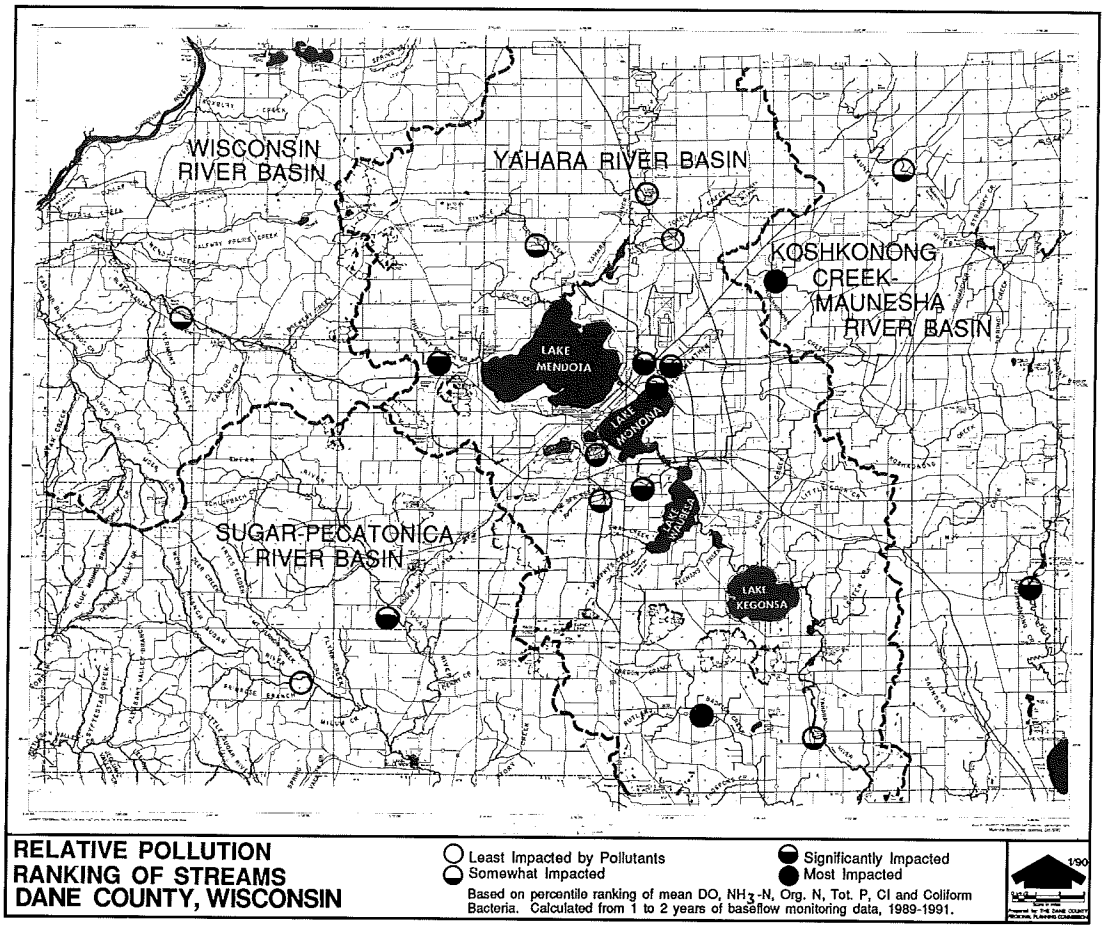
Table 1

COMPARISON AND RELATIVE POLLUTION RANKING OF DANE COUNTY STREAMS BASED ON 1989-91 BASEFLOW WATER QUALITY DATA

	Rank	Score[1]	Monitoring Station	Water Quality Problems[2]
Least Impacted by Pollutants	1	19.4	W. Branch Sugar River near Mt. Vernon @ Hwy. 92	--
	2	26.9	Token Creek at Highway 51	--
	3	28.7	Yahara River near Windsor	--
Somewhat Impacted	4	35.2	Black Earth Creek above Black Earth	Dissolved Oxygen (DO), Bacteria
	5	38.0	Maunesha River south of Highway 151	DO
	6	40.7	Nine Springs Creek at Highway 14	DO
	7	48.1	Sixmile Creek near Waunakee @ Mill Road	--
	7	48.1	Yahara River near Dunkirk	Ammonia-Nitrogen (NH_3)
	7	48.1	Murphy (Wingra) Creek @ Beld Street	DO
Significantly Impacted	10	52.8	Sugar River near Verona @ Riverside Road	Bacteria, NH_3
	11	55.6	Nine Springs Creek @ Moorland Road	DO
	12	56.5	West Branch Starkweather Creek @ Milwaukee St.	DO, Bacteria, Poor Biotic Index (BI)
	13	63.0	Koshkonong Creek near Rockdale @ Hoopen Rd.	NH_3
	14	64.8	Main Stem Starkweather Creek	DO, Bacteria, NH_3, Poor BI
	15	67.6	E. Branch Starkweather Creek @ Milwaukee St.	DO, Bacteria, NH_3, Metals, Poor BI
	16	72.2	Pheasant Branch Creek @ Highway 12	NH_3, Poor BI
	17	83.3	Badfish Creek at County Highway A	Bacteria
Most Impacted	18	88.0	Koshkonong Creek near Sun Prairie @ Bailey Rd.	Bacteria, NH_3, Poor BI

[1]Average percentile ranking based on individual percentile rankings for mean dissolved oxygen, ammonia nitrogen, organic nitrogen, total phosphorus, chloride, and membrane filter fecal coliform bacteria. Mean values calculated from one to two years of baseflow monitoring data (1989-1991).
[2]Violations of water quality standards or guidelines for dissolved oxygen, fecal coliform bacteria, ammonia-nitrogen or heavy metals. Also streams with poor Hilsenhoff Biotic Index Classification.

Figure 4



indicator pollutants are of concern at each monitoring station. Table 1 indicates the relative ranking of the 18 stream monitoring stations in Dane County, based on average values of six key indicators of pollution: dissolved oxygen, ammonia nitrogen, organic nitrogen, total phosphorus, chloride, and fecal coliform bacteria. Results are also displayed in Figure 4. It should be kept in mind that because of monitoring program constraints, one station is usually being used to characterize conditions for the entire stream, but in actuality water quality can vary significantly in different reaches of a stream; thus, results are not truly representative of the whole water body.

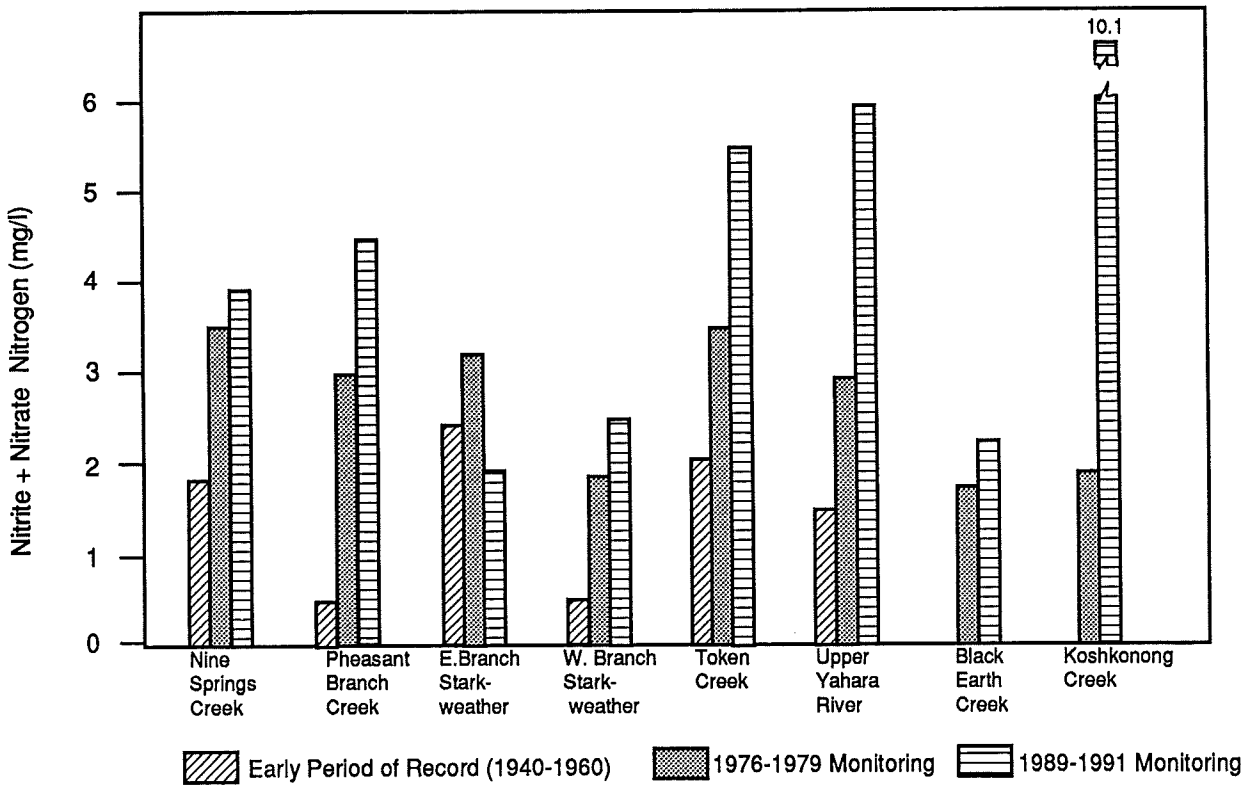
The relative pollution ranking shows that streams most affected by pollutants are small streams receiving discharges from major wastewater treatment plants--Badfish Creek (Madison Metropolitan Sewerage District discharge) and Koshkonong Creek (City of Sun Prairie discharge). These streams, however, have shown dramatic improvements in water quality over the last ten years, as a result of major advancements in wastewater treatment.

Recent baseflow monitoring results also have been compared to results obtained in the late 1970s. Notable comparisons and changes include the following:

1)**The concentration of nitrate-nitrogen in most county streams has continued to increase** (see Fig. 5). The median concentration increase in these streams has been over 1 mg/l since the late 1970s. While nitrate in streams is not a major water quality concern, the monitoring results indicate that nitrate levels in groundwater, which sustains stream baseflow, are increasing.

Increases in the concentration of nitrate-nitrogen are associated with continued agricultural use of nitrogen fertilizer and subsequent leaching of nitrate into the shallow groundwater table which sustains stream baseflow. Other possible sources of nitrate leachate to groundwater include septic tank systems, animal waste from barnyards and residual waste deposits. The impacts of these other sources are usually localized, though, and are not perceived to be sufficient to account for the widespread nature of the observed baseflow nitrate increase.

Figure 5: NITRITE & NITRATE NITROGEN-HISTORICAL COMPARISON OF MEAN BASEFLOW CONCENTRATIONS IN DANE COUNTY STREAMS



2)**The concentration of ammonia-nitrogen in most streams has decreased.** The largest reductions are a result of improved wastewater treatment.

3)**Baseflow concentrations of phosphorus have generally decreased or stayed the same.** Decreases in baseflow phosphorus concentrations are probably associated with improvements made at municipal wastewater treatment plants. Several treatment plants discharging to monitored streams have been upgraded since the late 1970s.

4)**The concentration of chloride in almost all county streams has increased.** The median concentration increase in these streams has been over 13 mg/l since the late 1970s. Increases in chloride are associated with continued use of road salt, which leaches into groundwater, or increased discharges from treatment plants. The two streams with the highest increases are receiving municipal wastewater treatment plant discharges.

Storm runoff monitoring conducted on a targeted number of streams also has revealed in-stream water quality and pollutant loading problems that can occur from precipitation events. For instance, monitoring of Black Earth Creek indicated that dissolved oxygen concentrations were lowered as a result of a summer rainfall to levels that violated minimum DNR standards for trout streams for a period of 30 hours. Although dissolved oxygen was low and undoubtedly stressed aquatic life, no fish kills were reported from this event. Oxygen reductions were likely caused by a combination of factors, including high oxygen demand from organic materials in runoff and high water temperatures.

Monitoring of Pheasant Branch Creek revealed high ammonia-nitrogen concentrations during spring runoff events. Concentrations above recommended toxicity criterion for aquatic life have occurred.

Recent monitoring of urban runoff by the U.S. Geological Survey and DNR has shown concentrations of heavy metals, pesticides and PAHs (polycyclic aromatic hydrocarbons) at levels that can pose toxicity concerns for aquatic life. Much of this monitoring has been done at the Monroe Street detention basin west of Lake Wingra. Monitoring results show the detention basin is effective in controlling much of the heavy metals in runoff from this predominantly residential area, although pesticides are not as effectively controlled.

Lakes

The Yahara River lakes (Mendota, Monona, Waubesa and Kegonsa) are among the highest valued and most extensively studied water resources in the county. The lakes experience substantial algal and rooted aquatic plant growth that is fueled by nutrients, particularly phosphorus, in lake water. Because of their high fertility, the lakes are classified as eutrophic (i.e., nutrient rich). Lake water quality and habitat conditions have been affected by an exotic plant species, Eurasian water milfoil, which has become abundant in the lakes.

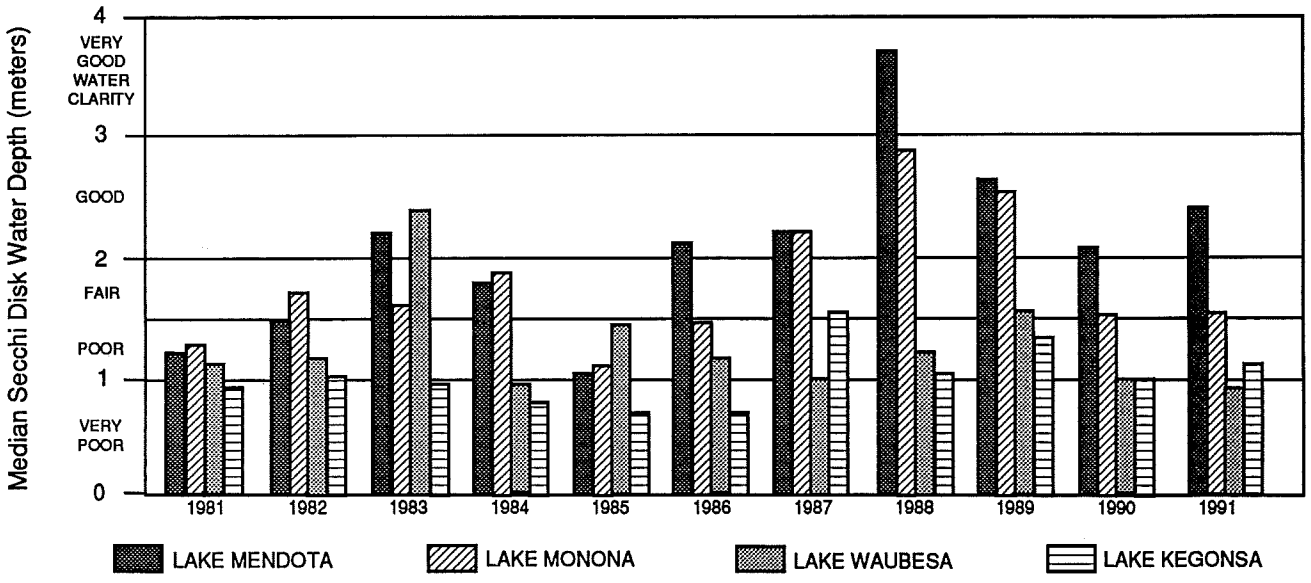
Most of the phosphorus and sediment loadings to lakes is from nonpoint source pollution. Monitoring data indicate that a large proportion of annual phosphorus and sediment loadings in tributary streams is delivered during a few major storms, often in February, March and April, and that pollutant concentrations change dramatically during the course of a storm event. Pollution from runoff can have longer-term or permanent effects on lakes as compared to streams. Since lakes do not "flush" pollutants as rapidly as streams, lakes generally do not respond quickly to pollution control programs. Phosphorus and water clarity measurements for the Yahara lakes have been regularly recorded by the DNR since the mid-1970s. Summarized water clarity results are displayed in Figure 6. Water clarity in the lakes is determined by the maximum depth to which a black and white secchi disk can be seen from the lake's surface. Water clarity is influenced in large part by the amount of algae that exists. The more algae there is in a lake, the "greener" the lake appears, and water clarity is diminished. On the other hand, when there is less algae, sunlight can penetrate deeper and stimulate the growth of rooted plants.

The water clarity of the Yahara lakes has varied between lakes and has changed over time in each lake. In general, water clarity improved during the 1980s, with the best water clarity being observed in 1988. However, the water clarity of Lakes Waubesa and Kegonsa continues to be poor to very poor.

The general improvement in water clarity is associated with reduced algal growth resulting from decreased phosphorus concentrations in all four Yahara lakes since the late 1970s. For example, the mean total phosphorus concentration (0.07 mg/l) in Lake Mendota for the period 1982-1989 is much lower than that measured in the mid-1970s (0.12 mg/l). This decrease may have occurred from lower than normal spring runoff (which often contributes much of the annual phosphorus loading to lakes) in most years from 1977 to 1988, and as a result of the 1988 drought.

Research is also being conducted in Lake Mendota to determine if water clarity can be improved by managing the fish population and increasing algae consumption.

Figure 6: YAHARA LAKES SUMMER WATER CLARITY



Generally, other lakes in Dane County have not been extensively monitored. Fish Lake is a notable exception, where monitoring has revealed declining water quality due to high phosphorus loadings. Agricultural runoff and failing septic systems are potential sources of the problem. There are also water quality concerns for impoundments, such as Lake Belle View in the Village of Belleville, Stewart Lake in the Village of Mt. Horeb and the Marshall Millpond in the Village of Marshall. These impoundments are eutrophic and suffer from extensive sedimentation, largely as a result of nonpoint pollution. Impoundments are generally shallow and quite small compared to their watershed size, and sedimentation can occur rapidly when flowing water is stopped or slowed because of dams. Local communities are currently evaluating different remediation measures, with dredging often being explored as a possible management action.

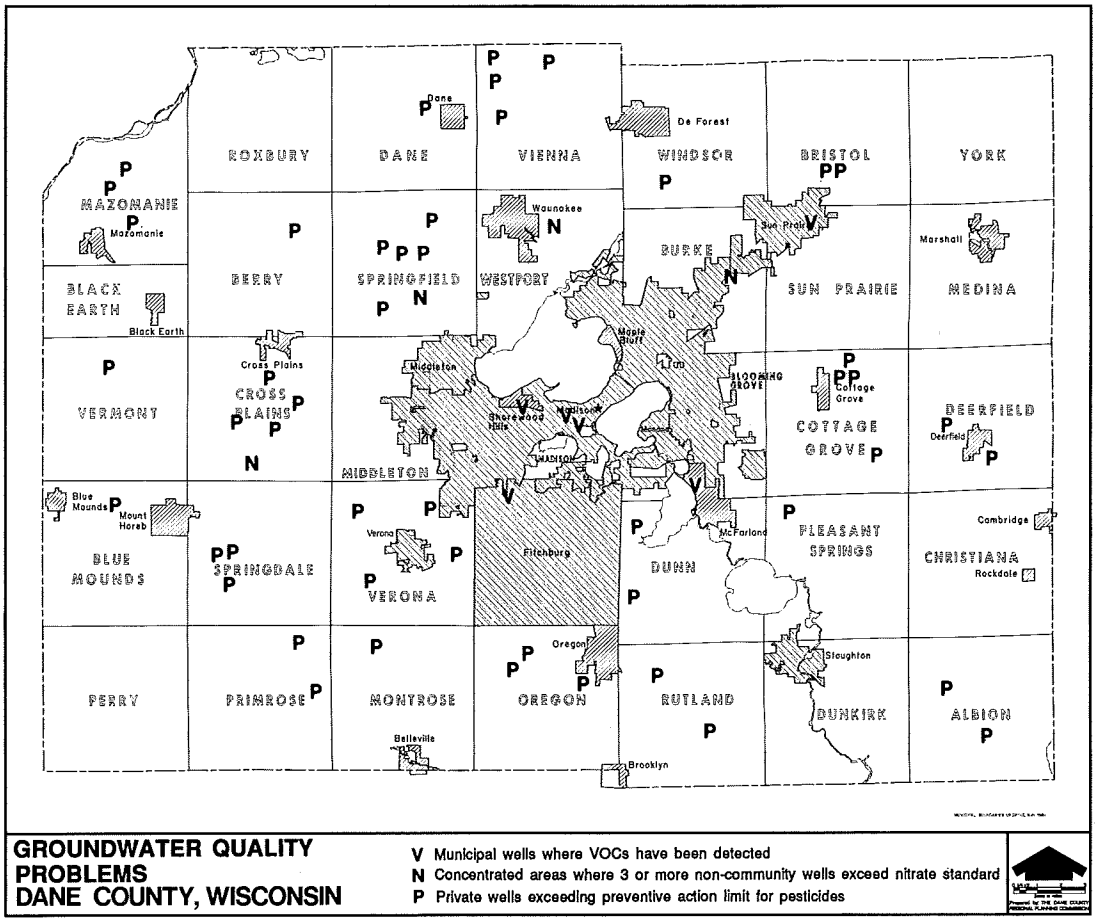
Groundwater

Groundwater quality problems have arisen from various land use activities in Dane County. A relatively high concentration of nitrate-nitrogen is common in the shallow aquifer system. Annual monitoring of several hundred rural domestic wells indicates that about one-third exceed the recommended DNR public drinking water standard for nitrate-nitrogen of 10 milligrams per liter. (This standard has been established based on health concerns for infants under six months of age, rather than adults or older children.) Areas in the county where several non-community wells (e.g., restaurant, church and service station wells) have tested above the nitrate standard are displayed in Figure 7.

Elevated nitrate concentrations have likely resulted from fertilizer use and private sewage system wastes. No municipal wells, however, have exceeded the nitrate standard, probably because municipal wells are drilled to deeper depths where nitrate concentrations are lower.

Also of concern is the widespread discovery of common agricultural pesticides (e.g., atrazine) in private water supplies. Monitoring conducted by the Wisconsin Department of Agriculture, Trade and Consumer Protection in 1990 showed that approximately 30 percent of the 263 samples from rural wells in Dane County contained atrazine. The distribution of wells tainted with pesticides is fairly random and widespread across the county, and the concentrations are quite low. Those wells which exceeded the DNR precautionary groundwater standard (preventive action limit) for atrazine are shown in Figure 7. Preventive action limits function as

Figure 7



GROUNDWATER QUALITY PROBLEMS DANE COUNTY, WISCONSIN

V Municipal wells where VOCs have been detected
N Concentrated areas where 3 or more non-community wells exceed nitrate standard
P Private wells exceeding preventive action limit for pesticides

an early warning device to alert agencies that low levels of pollution are developing and that some management action may be necessary to prevent pollution levels from increasing.

In addition, volatile organic chemicals (VOCs) have been detected in some private and municipal wells as a result of hazardous chemical disposal in nearby landfills and leaking underground storage tanks (see Figure 7). Common VOCs that have been found are benzene, trichlorethylene and tetrachloroethylene, which are associated with petroleum products and household and industrial solvents. These VOCs have exceeded DNR groundwater enforcement standards at several monitoring sites, and selected wells have now been abandoned.

Sodium and chloride levels also have been increasing in the aquifers beneath the City of Madison as well as in area lakes (see Fig. 8). This is associated with salt use for road deicing. The highest concentrations of these constituents are found in three downtown wells (unit wells #2, 3 and 4), which are no longer actively used, and in Lake Wingra. Chloride concentrations, while increasing, are significantly below levels of water quality or health concern. Sodium concentrations in the wells exceed a federal advisory level of 20 mg/l, which is applicable only to people on very low sodium diets.

SUMMARY

The quality of Dane County's surface water and groundwater is generally good. However, water resource monitoring has indicated that there are significant stream, lake and groundwater quality problems. Twelve of the 18 stream monitoring stations have high bacteria levels, low dissolved oxygen concentrations and/or poor biotic index/habitat conditions. Bottom sediments contaminated with metals (e.g., mercury) and PCBs, which can pose aquatic life and human health concerns, are found in Lakes Monona and Waubesa and tributary streams.

Groundwater quality has been widely affected by nitrate-nitrogen and salt (chloride). Approximately one-third of the private, shallow wells tested in the county exceed the recommended public drinking water standard for nitrate-nitrogen. Chloride levels in certain municipal wells in the city of Madison have risen significantly. Numerous private and some municipal wells also have been contaminated by volatile organic chemicals (VOCs), and common agricultural pesticides have been detected in about 30 percent of the rural wells tested.

While certain water resource information and problems have been revealed through monitoring activities, much is still unknown due to program limitations. The current monitoring program should be continued and expanded in order to determine if additional pollutants and water bodies are of management concern. The identification of problems and trends through monitoring activities provides the basis for future resource protection and problem prevention programs.

Figure 8: CHLORIDE CONCENTRATIONS IN A CITY OF MADISON WELL AND AREA LAKES