

## PRELIMINARY ROOT RIVER PLANNING REPORT COMPLETED

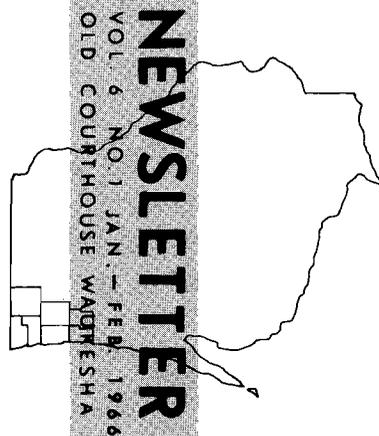
Nearly four years ago, the Commission acted upon a request by the City of Racine for assistance in finding practical and permanent solutions to the serious, costly flooding and critical pollution problems of the Root River, which affected the property and general welfare of its citizens. As a result of this formal request for assistance, the Root River Watershed Committee was created by the Commission with membership including technicians and public officials from the local units of government within the watershed. This advisory committee was given the responsibility of preparing a prospectus necessary to obtain approval and financial support for a comprehensive watershed study, which would provide solutions to the critical water-related problems of the watershed, and of providing policy direction for the execution of such a study once mounted. The study itself has now progressed to the point where a preliminary planning report, containing the factual findings of the study and specific recommendations for the abatement of the water-related problems of the watershed, has been submitted for public evaluation.

### The Watershed Committee

The 18-member Root River Watershed Committee, under the able chairmanship

(continued)

**SOUTHEASTERN  
WISCONSIN  
REGIONAL  
PLANNING  
COMMISSION**



## PLANNING REPORT COMPLETED - continued

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of Mr. Howard Gregg, General Manager of the Milwaukee County Park System, responded in an outstanding way to its responsibilities. The Committee held its first meeting in August 1962, and a prospectus for a comprehensive study of the Root River watershed was published in March 1963. This prospectus outlined the need for; specified the scope, content, and timing of; and recommended means of financing the necessary comprehensive watershed study. Based upon the prospectus, necessary approvals were obtained from the county boards concerned; and the Housing and Home Finance Agency of the Federal Government agreed to participate in the financing. Work on the study was begun in July of 1964. The Harza Engineering Company of Chicago, an engineering firm which specializes in water resources planning and development and which has an international as well as national reputation in its field, was retained to assist the staff in the conduct of the study. Additional consultants retained to assist the staff included Alster and Associates, Inc., photogrammetric engineers of Madison, Wisconsin, who carried out the large-scaled mapping program required, and Professor J. H. Beuscher, of the University of Wisconsin Law School, who carried out the necessary water law study.

### Status of the Committee Work

In December 1965 a preliminary planning report was presented to the watershed committee for its consideration. The 400-page report contains a wealth of technical data, along with preliminary recommendations for abatement of the water-related problems of the watershed. The planning report carefully documents the serious problems of the watershed and recommends solutions which on the surface appear to be surprisingly simple but which required the most careful hydrologic and hydraulic engineering studies in order to verify their physical and financial feasibility: Keep urban development out of the flood plains; systematically eliminate such development already there, along with the major sources of river pollution; and develop the riverine areas for park and open-space use.

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After studying the report and its preliminary recommendations, the Committee agreed that the best procedure to follow would be to hold a series of meetings at which the report would be presented to elected local officials for review and comment before making any recommendations to the Commission. Five such meetings were held during February by the committee with the most favorable local reaction to the recommended plan. Encouraged, the Committee will now reevaluate the plan recommendation and attempt to expedite the final detailing of the plan and approval by the Commission.

### THE WATERSHED

The Root River watershed is a natural drainage area lying in four counties—Kenosha, Milwaukee, Racine, and Waukesha—and in 18 cities, villages, and towns. The watershed is drained by a relatively complex system of stream channels. Two-thirds of the watershed is still in agricultural use, but land use in the headwater portion in southwestern Milwaukee County and eastern Waukesha County is rapidly changing to urban use, a fact which has brought about many of the problems of the Root River which the Commission is trying to help the local units of government to solve.

The watershed committee, after careful initial study, defined four major problems in the watershed which they felt needed solution. These are: flooding, water pollution, park and open-space reservation, and changing land use, particularly in the flood plains of the perennial stream system. The preparation of a long-range plan for the abatement of these problems is, therefore, the primary objective of the watershed study.

### THE STUDY FINDINGS

The preliminary planning report is the result of about 18 months of very intensive work by the watershed committee, the Commission staff, and the Commission consultants. The results of the study to date have been presented in three volumes: the first consisting of the 400-page prelimi-

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nary report already referenced (SEWRPC Planning Report No. 9, Preliminary Planning Report—Root River Watershed); the second consisting of a summary report, a copy of which has been sent to all local public officials within the watershed; and the third consisting of a water law report (SEWRPC Technical Report No. 2, Water Law in Southeastern Wisconsin).

The study findings and recommendations are based upon a carefully designed series of planning and engineering inventories, including the collection of data on the natural resources of the watershed, with particular emphasis on soils and climate as they affect the hydrology of the basin; on the nature and frequency of flooding; on water quality and sources of pollution; on the hydraulic capacities of the channels—a process which involved field measurement of the waterway openings of over 100 bridges and culverts; on historic flood damages; and on water law. Analysis of this data and the preparation of curves and mathematical models permitted the functioning of the stream system to be simulated so that alternate plan solutions could be designed and tested and the annual risk of flood damage could be computed.

The inventories indicated that the March 1960 flood, caused by rainfall and snowmelt, was the most damaging in the watershed within living memory and historical records. Statistical analyses resulted in the assignment of a 100-year recurrence interval to this flood, which means that a flood of this magnitude may be expected to have a 1 percent chance of happening in any given year. It should be noted, however, that it is entirely possible to have two such floods in successive years or even in the same year. The 1960 flood caused damages, largely urban, totaling about \$370,000, with over \$227,000 of these damages being incurred in Racine County and over \$165,000 in the City of Racine alone.

The annual flood damage risk at the present time is calculated to be \$24,000 per year; and if nothing is done to abate the flooding problem in the watershed, this annual risk may be expected to almost triple

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by 1990, when the average annual flood damage risk is estimated at over \$60,000.

An accurate map of the watershed has been prepared as a part of the study indicating the areas that would be inundated by a 100-year recurrence interval flood, such as occurred in 1960; and these areas were found to comprise about 6 percent of the total area of the watershed. The 10-year recurrence interval flood lines have also been mapped.

The inventories revealed that the Root River is the most heavily polluted stream in the Region and that in periods of dry weather the streamflow consists almost entirely of sewage treatment plant effluent. Older residents of the watershed indicate, and conservationists confirm the fact, that at one time there had been a game fishery on the stream; but this was found to have been completely destroyed by pollution. It was found that there are nine major sources of pollution in the watershed, and all but two were found to consist of public sewage treatment plants.

The Commission has, as a matter of policy, indicated that in all of its work it would prepare and explore a number of alternative plans so that the public officials involved could be truly offered a choice of proposed solutions to the problems under consideration. In accordance with this policy, the watershed committee, the staff, and the consulting engineers explored a number of ways in which the water-related problems of the Root River watershed could be abated. These alternatives can best be visualized in terms of various combinations of land use patterns and water control facilities (see Page 7).

With respect to land use, three alternatives available to the people of the Region and the watershed were explored. The first would permit a continued scatteration of low-density residential development throughout the watershed, with no regulation of land use in the flood plains of the perennial stream network. The second would exercise some regulation, preferably at the local level of government, of land use in the flood plain

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areas of the stream network only. The third would exercise some regulation, preferably at the local level of government, of land use development throughout the watershed, whereby it would be possible to channel urban development in a logical pattern outward from existing urban centers into those areas of the watershed that can be readily served by gravity flow sanitary sewer.

Coupled with these three land use plan alternatives, a number of water control facility proposals were explored. These included channel improvements, that is, widening and deepening of the stream channels; the construction of diversion channels to Lake Michigan, one along the Racine-Milwaukee county line and one in the Town of Caledonia near Johnson Park; and the construction of multi-purpose reservoirs in the basin. All of these proposals were analyzed from the standpoint of their costs and benefits, as well as from the standpoint of engineering feasibility.

Based on these studies, a comprehensive watershed development plan is being recommended at this point to the watershed committee by the Commission staff and its consulting engineers. The recommendation does not at this point constitute a final plan to be accepted or rejected but is a basis for public review and evaluation.

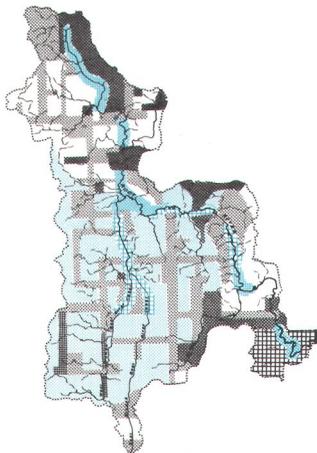
### THE RECOMMENDED PLAN

The plan which is being recommended in the preliminary report contains the following salient proposals:

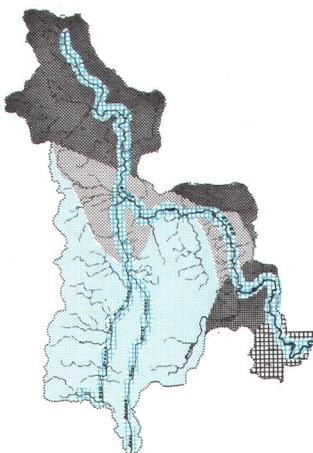
1. Regulation of land use development over the entire watershed through local zoning to assure the logical expansion of urban development into those areas of the watershed that can be readily served by existing centralized gravity flow sanitary sewerage systems. The land use plan being recommended is graphically summarized in a large plan map accompanying the planning report.

# PRINCIPAL WATERSHED PLAN ELEMENTS

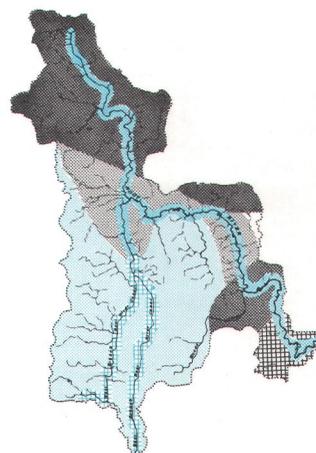
## ALTERNATIVE LAND USE ELEMENTS



**A. UNCONTROLLED EXISTING TREND ALTERNATIVE**  
SCATTERED BASIN-WIDE LOW-DENSITY URBAN DEVELOPMENT OCCURRING WITHOUT REGARD FOR SOIL CAPABILITIES, LOGICAL UTILITY SERVICE AREAS, DEVELOPMENT OPPORTUNITIES, OR PROBLEMS ATTENDANT TO THE RIVERINE AREA

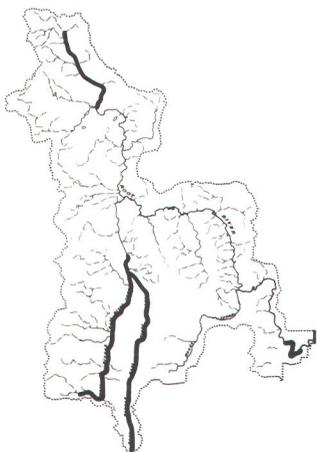


**B. CONTROLLED EXISTING TREND - LAND USE CONTROL ALTERNATIVE**  
LOGICAL EXPANSION OF EXISTING URBAN DEVELOPMENT INTO AREAS WHICH CAN BE READILY SERVED BY GRAVITY-FLOW SANITARY SEWERS, RESERVATION OF AGRICULTURAL LANDS, PROTECTION OF FLOOD PLAINS AND THE RESOURCE BASE, AND FLOOD DAMAGE PREVENTION

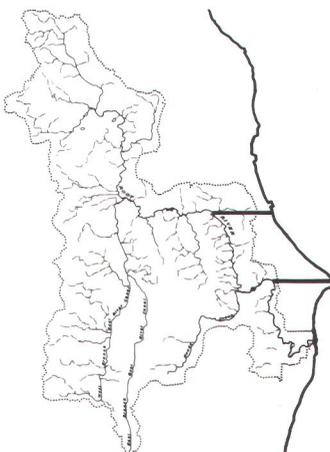


**C. CONTROLLED EXISTING TREND - PARKWAY & RECREATIONAL DEVELOPMENT ALTERNATIVE**  
LOGICAL EXPANSION OF EXISTING URBAN DEVELOPMENT INTO AREAS WHICH CAN BE READILY SERVED BY GRAVITY-FLOW SANITARY SEWERS; RESERVATION OF AGRICULTURAL LANDS; PUBLIC ACQUISITION OF FLOOD PLAINS FOR RECREATION, OPEN-SPACE USES, AND FLOOD DAMAGE PREVENTION

## ALTERNATIVE WATER CONTROL FACILITY ELEMENTS



**A-1. CHANNEL IMPROVEMENT ALTERNATIVES**  
DEEPENING AND WIDENING OF STREAM CHANNELS WITHIN THE CITIES OF WEST ALLIS, GREENFIELD, AND RACINE; CHANNEL MAINTENANCE WITHIN THE ROOT RIVER CANAL AREA AS FLOOD CONTROL MEASURES



**B-1. DIVERSION CHANNEL ALTERNATIVES**  
CONSTRUCTION OF A DIVERSION CHANNEL IN ONE OF TWO POSSIBLE ALTERNATIVE LOCATIONS TO BYPASS FLOOD FLOWS TO LAKE MICHIGAN AS FLOOD CONTROL MEASURES TO PROTECT PARTS OF THE TOWN OF CALEDONIA AND THE CITY OF RACINE



**C-1. MULTI-PURPOSE RESERVOIR ALTERNATIVES**  
CREATION OF OAKWOOD RESERVOIR FOR FLOOD CONTROL, LOW FLOW AUGMENTATION, RECREATION, AND RESIDENTIAL LAND ENHANCEMENT PURPOSES.



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2. Protection of the floodway and flood plain areas along the perennial stream channels. In areas of the watershed which are expected to urbanize by 1990, this protection should be achieved through public acquisition of floodway and flood plain lands for parkway. In the areas which are anticipated to remain largely in agricultural use, at least to the design year of the plan, 1990, this protection should be achieved through local floodway, flood plain, and conservancy zoning.
3. Channel clearance and maintenance, but not widening or deepening, operations in the Root River Canal area, where channels are badly in need of clearance to reduce impedance of streamflow. These relatively inexpensive operations would significantly reduce agricultural flood damages and improve agricultural drainage, a fact of particular importance to farm drainage districts operating in the area.
4. Construction of a multi-purpose recreation and low-flow augmentation reservoir at the junction of the North Branch and the Root River Canal in the City of Franklin.
5. Restoration of Horlick Dam.
6. The public acquisition and removal of residences existing in the floodways and flood plains, both through purchase as they come onto the market and through application of the nonconforming use provisions of local zoning ordinances. If this recommended plan element is adopted, all such residences will be delineated on large-scale maps for the use of local public officials.
7. Abandonment of the Caddy Vista sewage treatment plant and connection of the tributary sewers to the Milwaukee Metropolitan Sewerage System.

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8. Connection of the Frank Pure Food Company plant to the City of Racine sewerage system.
9. Improvement in the degree of sewage treatment provided at the Southern Colony, Union Grove, and Cooper-Dixon Duck Farm, as no practical way exists at this time to connect these waste sources to centralized sewerage systems for exportation of pollutants.

The recommended water pollution control actions, when coupled with plans now being implemented by the Metropolitan Sewerage Commission of the County of Milwaukee for the abandonment of the existing Hales Corners, Greendale, House of Correction, and Franklin sewage treatment plants and connection of the tributary sewers to the metropolitan system, would eliminate six of the nine major sources of stream pollution in the watershed and all of the major sources of pollution on the North Branch and main stem. The plan, by recommending removal of the remaining major sources of pollution and construction of the Oakwood Reservoir, seeks to substantially restore the quality of water in the main stem of the Root River. It is thereby hoped to restore a game fishery, consisting of facultative species, and to make possible the safe use of the stream water for partial body-contact recreation.

Even if all sanitary sewage contribution is removed from the stream, storm water runoff would still continue to contribute pollutants. These pollutants, however, are contributed at a time when the flow in the stream is high and should not, therefore, adversely affect fish life in the water. The plan also recommends improved soil and water conservation practices on the farmlands in the agricultural areas of the basin in order to minimize the effects upon the stream water quality and fish life of runoff from agricultural areas containing fertilizers, herbicides, and pesticides.

The preliminary plan reflects the conviction of the Commission staff and consulting engineers that the flood plains of the perennial streams should be used primarily for the dual purposes of storage and conveyance of

## PLANNING REPORT COMPLETED - continued

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floodwaters and park and open-space reservation and not for flood-vulnerable types of urban development. The study recommends, as one of the first steps toward plan implementation, the protection of the flood plains through flood plain zoning, utilizing three zoning districts. The first is a channel district, which consists of the area between the actual stream banks. This district does not require any local land use regulation as the state exercises full jurisdiction and control. The second is a floodway district, which is defined as the land lying within the 10-year recurrence interval flood inundation lines. This area is needed to move floodwaters and is recommended to be kept in open type uses through local zoning, subdivision control, and official mapping. The third district is a flood plain district, which is defined as the land lying within the 100-year recurrence interval flood inundation lines. This land is needed to store floodwaters; and although land use in this area should be carefully regulated, the regulation need not be as restrictive as in the floodway zone.

The full cost of implementation of the plan, based on a preliminary capital improvement program, included in the report, and resulting in total plan implementation by 1990 with the cost distributed over a 23-year period, is estimated at a little over \$15 million, \$6 million of which would be for improvements located in Racine County and \$9 million in Milwaukee County. This would amount to an average annual cost of about \$397,000 in Milwaukee County and \$268,000 in Racine County or less than 40 cents and \$1.70 per person per year, respectively, based upon present population levels in the two counties. It is possible to reduce these costs to the local units of government concerned by about half through available state and federal aids.

Although the estimated cost of the plan may appear high to some at this time, it is very, very small when compared to the alternatives available, such as the construction of channel improvements or diversion channels to Lake Michigan. Moreover, total plan implementation would result not only in abatement of all of the major water-related problems of the

## PLANNING REPORT COMPLETED - continued

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watershed but would result in the provision of needed park and recreation facilities (implementation of the plan would meet over half of Racine County's total 1990 park requirements), the preservation of one of the prime environmental corridors remaining in the Region in a naturalistic form, and the provision of a ribbon-type parkway as a fine setting for future residential development. Implementation of the plan is conservatively estimated to enhance local land values by about \$1 million, an additional benefit.

### DETAILED DATA AVAILABLE

The Root River Study has produced, in addition to a recommended plan for the solution of the most pressing water-related problems of the basin, a great deal of detailed planning and engineering data useful to local units of government and private developers. This data includes streamflow-duration curves; rainfall intensity-duration-frequency curves for local storm water drainage system design; profiles of all perennial stream channels showing the stream bed elevation and the floodwater surface elevations for the 100-year, 50-year, and 10-year recurrence interval flood flows; and tables giving, for all of the 111 bridges and culverts on the perennial stream system, the upstream and downstream high water elevations for the 100-year, 50-year, and 10-year recurrence interval floods. The data also includes large-scale (1" = 200' with 2-foot contour intervals) topographic maps for those areas of the river where it is anticipated that urban development will occur soon. These maps are based upon a unique system of survey control in which the U. S. Public Land Survey section and quarter-section corners are relocated, monumented, and placed on the state plane coordinate to provide basic survey control, not only for the mapping, but for plan refinement and implementation. The maps, together with the survey control system, enable the 100-year and 10-year flood inundation lines to be accurately described and readily located on the ground for plan implementation. Thus, accurate information is readily available concerning: 1) if a given parcel of land is in the flood plain; and 2) the anticipated frequency and depth of flooding.

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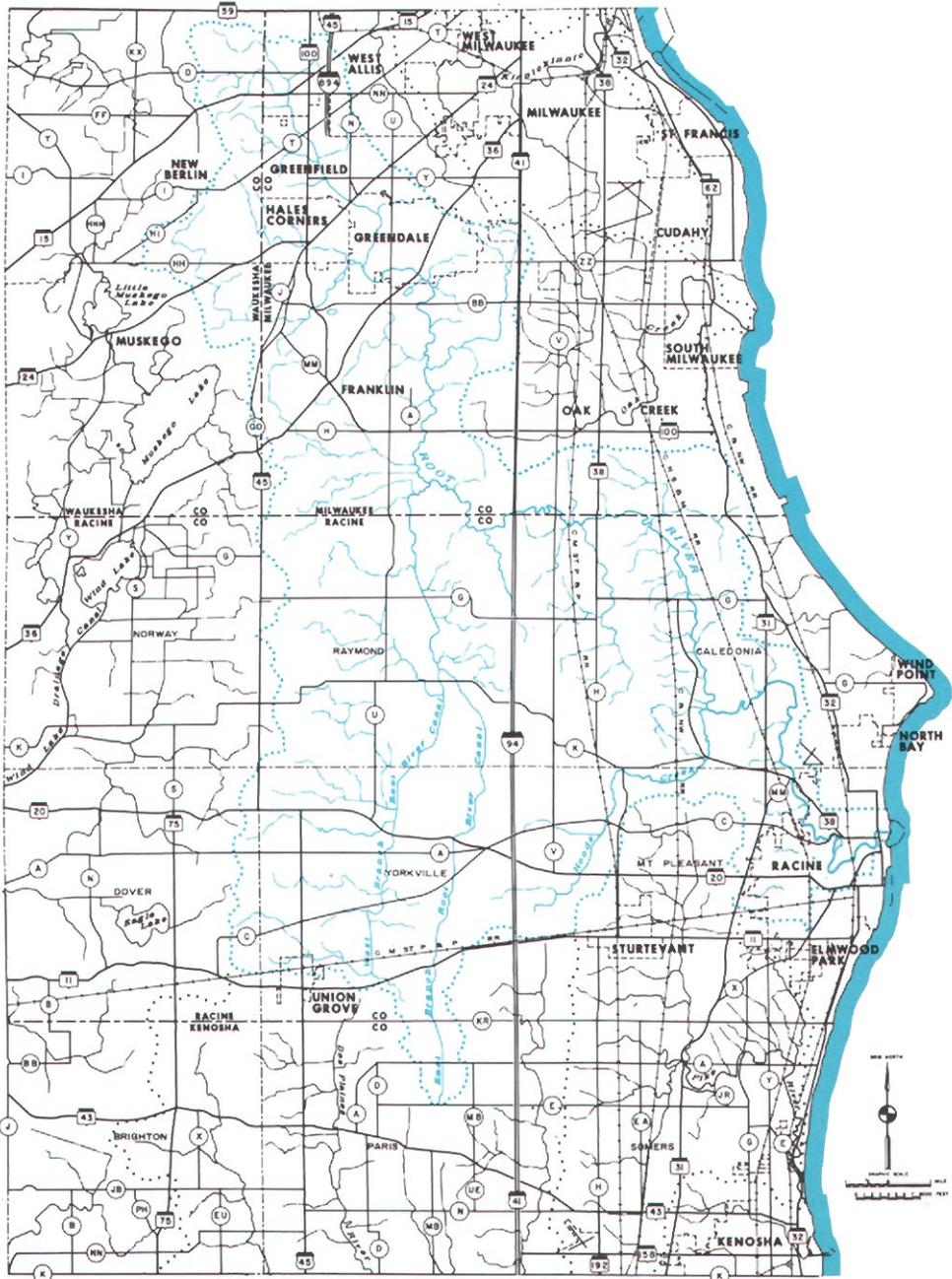
### Local Meetings Held

In order to submit the preliminary plan recommendations for local review and comment prior to a final recommendation, a series of five meetings were held as follows:

1. City of Racine, Towns of Caledonia  
and Mount Pleasant February 3
  
2. Towns of Raymond and Yorkville,  
Village of Union Grove, and the  
Racine County Board February 10
  
3. Cities of Greenfield, New Berlin,  
and West Allis and the Villages of  
Greendale and Hales Corners February 17
  
4. Cities of Franklin, Muskego, and  
Oak Creek February 21
  
5. City of Milwaukee February 23  
Milwaukee County:  
County Board of Supervisors  
Metropolitan Sewerage Commission  
Milwaukee County Park Commission

The Root River Watershed Committee was extremely pleased with the favorable reaction and response of the local officials and citizens to the preliminary plan recommendation. Because of this favorable reaction, every effort will be made by both the advisory committee and the Commission to expedite the approval of the final report and plan recommendations, so that the local implementation phase of the planning program may get underway as soon as possible.

# ROOT RIVER WATERSHED



### WHAT IS WATER POLLUTION?

There are as many answers to this question as there are beneficial water uses and concerned water users. The many divergent viewpoints, however, are probably all encompassed in the general definition of water pollution advanced by the U. S. Public Health Service as: "such contamination, or other alteration of the physical, chemical, or biological properties of any waters . . . , or such discharge of any liquid, gaseous, or solid substance into any waters . . . as will or is likely to create a nuisance or render such waters harmful or detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life."

The application of this general definition in regional planning operations, however, requires the relation of specific existing and potential water quality conditions to specific existing and potential water uses. Within this context, pollution may be said to exist when waters, through the influence of human activities have been rendered unsuitable for specific beneficial water uses which should reasonably be served. This definition of pollution can be applied to a specific body of water only after an extensive study of the existing water quality, environmental conditions, present land and water uses, and reasonable future water uses. Thus, the process of defining water pollution must be an integral part of an areawide, comprehensive planning program for a region and its component watersheds.

This concept can be illustrated by examining its application in the Commission's Root River watershed planning program. The Root River was found to be polluted in the study, not just because its stream water quality had deteriorated from its original natural condition, but because the influence of human activities have so reduced the water quality that

## QUESTION BOX - continued

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the stream can no longer serve water uses which detailed engineering, economic, and planning studies indicate that the stream could and should reasonably support. Thus, the Root River was found to be polluted, not because it cannot support a trout fishery or because it is no longer the clear, idyllic stream cited by an early pioneer voyageur, but because the dissolved oxygen content of its stream waters no longer permits the sustenance of any game fish life, because bacterially its waters are unsafe for boating and for livestock and wildlife watering and because periodically the river emits foul odors. Remedial measures have been suggested in the Root River watershed planning report which would restore the stream water quality to permit four beneficial uses specified by the watershed committee after careful study: facultative fish life, partial body-contact recreation, livestock and wildlife watering, and a proper aesthetic setting for residential and parkway development.

Experience with the Root River watershed study indicates that a workable definition of pollution should be applied to specific water bodies only after an intensive planning effort. It is altogether too easy to use the expression "water pollution" as an emotional accusation. It is far more sensible to define water pollution in terms of the physical facts concerning existing water quality conditions and potential needs and capabilities. And it must always be remembered that problems of both water quality conditions and beneficial water uses are closely related to far more basic problems of land use.

QUOTABLE QUOTE.....

"We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect.....That land is a community is the basic concept of ecology, but that land is to be loved and respected is an extension of ethics."

Aldo Leopold  
From: "A Sand County  
Almanac"

**SOUTHEASTERN WISCONSIN REGIONAL  
PLANNING COMMISSION**

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