

# Root River Watershed Restoration Plan: Report on Chapter IV (partial) and Chapter V (partial)

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# Partners and Funding Agencies



Municipalities and Counties of the Root River Watershed



# Plan Approach

1. Summarize Recommendations of the Regional Water Quality Management Plan Update (RWQMPU)
2. Evaluate Implementation of the RWQMPU
3. Inventory Recent and Ongoing Projects, Programs, and Initiatives and Integrate these Into Recommendations
4. Review and Refine Initially Identified Focus Issues
5. Characterize the Watershed Concentrating on Features Related to the Focus Issues

# Plan Approach

6. Identify Targets to be Achieved by the End of the Plan Period
7. For Each Target, Identify Actions to be Taken
8. Identify Foundation Actions
9. Present Actions in Addition to those Recommended in the RWQMPPU
10. Develop an Implementation Strategy

The plan is being documented in:

SEWRPC Community Assistance Planning Report  
No. 316, *A Restoration Plan for the Root River  
Watershed*

# Report Chapters

- I. Introduction
- II. Summary of recommendations of the RWQMPU for the Root River and evaluation of implementation to date
- III. Inventory of relevant plans, programs, and initiatives
- IV. Characterization of the watershed
- V. Description of targets to be achieved and alternative management measures
- VI. Recommended watershed restoration plan
- VII. Implementation strategies



# Chapter IV—Characterization of the Root River Watershed



# Water Quality in Streams





# Nutrients

- Limit the growth of plants and algae: adding them can cause growth
- Phosphorus
  - Total Phosphorus
  - Dissolved Phosphorus
- Nitrogen
  - Total Nitrogen
  - Inorganic Nitrogen
    - Ammonia, Nitrate, Nitrite
  - Organic Nitrogen



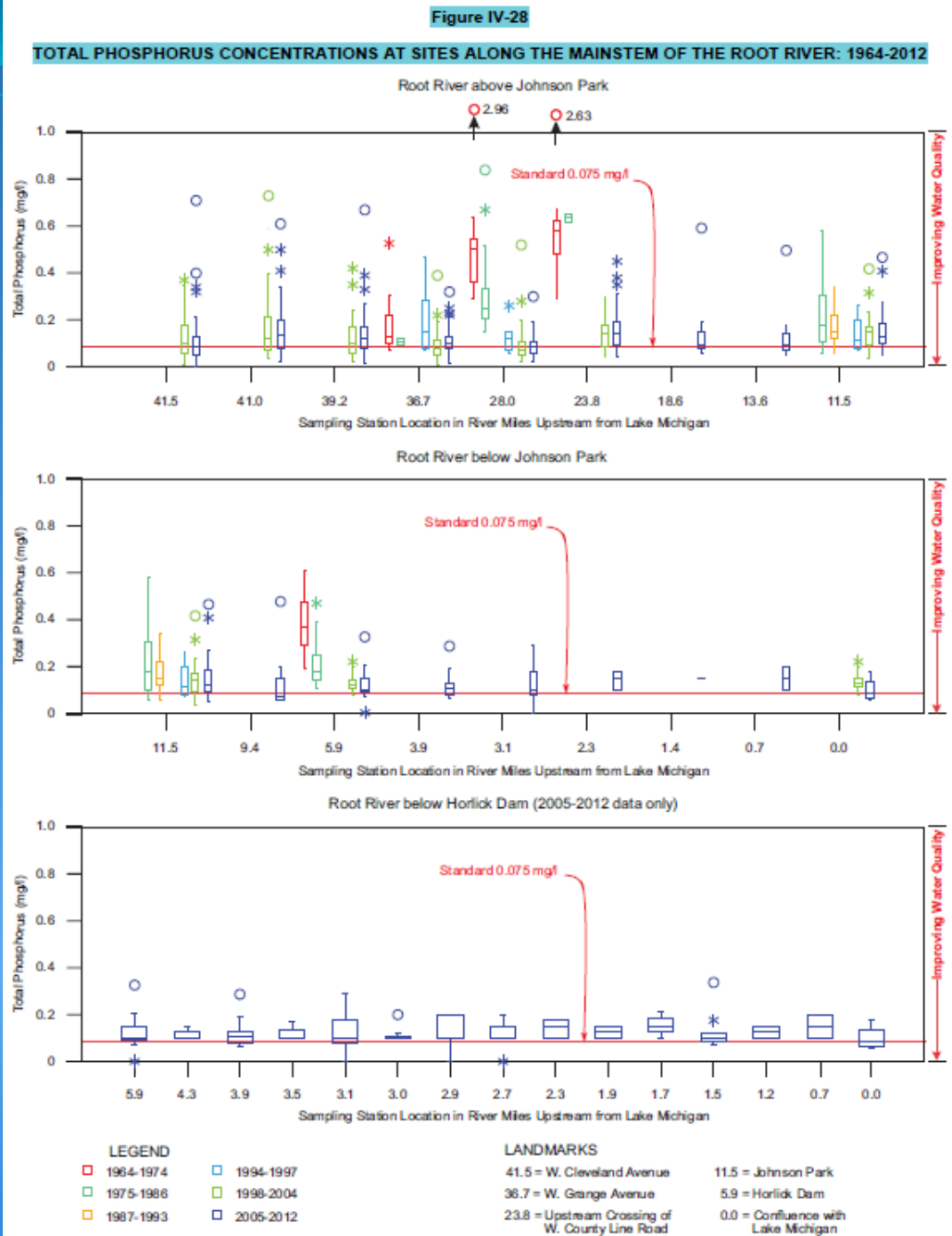
*Cladophora*



Dense aquatic plant growth

# Total Phosphorus

- Phosphorus is usually the limiting factor
- Averages 2005-2012
  - Median = 0.100 mg/l
  - Mean = 0.120 mg/l
- Long-term decline
- No change between 1998-2004 and 2005-2012
- Mostly exceeds water quality criterion



NOTE: See Figure IV-7 for description of symbols.

See Table IV-10 for location of sample sites.

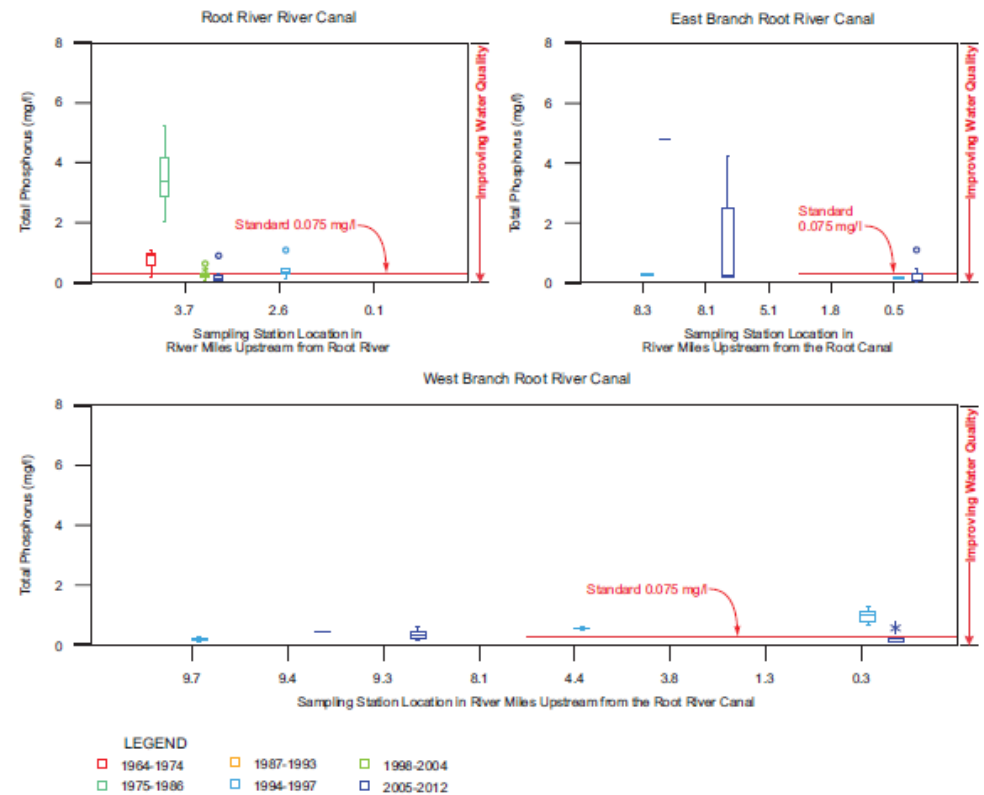
Source: U.S. Geological Survey, Wisconsin Department of Natural Resources, University of Wisconsin-Extension, Milwaukee Metropolitan Sewerage District, City of Racine Health Department, and SEWRPC.

# Total Phosphorus

- Some very high concentrations in East Branch Root River Canal
- High everywhere that it has been sampled

Figure IV-29

## TOTAL PHOSPHORUS CONCENTRATIONS AT SITES ALONG THE ROOT RIVER CANAL AND ITS BRANCHES: 1964-2012



NOTES: See Figure IV-7 for description of symbols.

See Table IV-10 for location of sample sites.

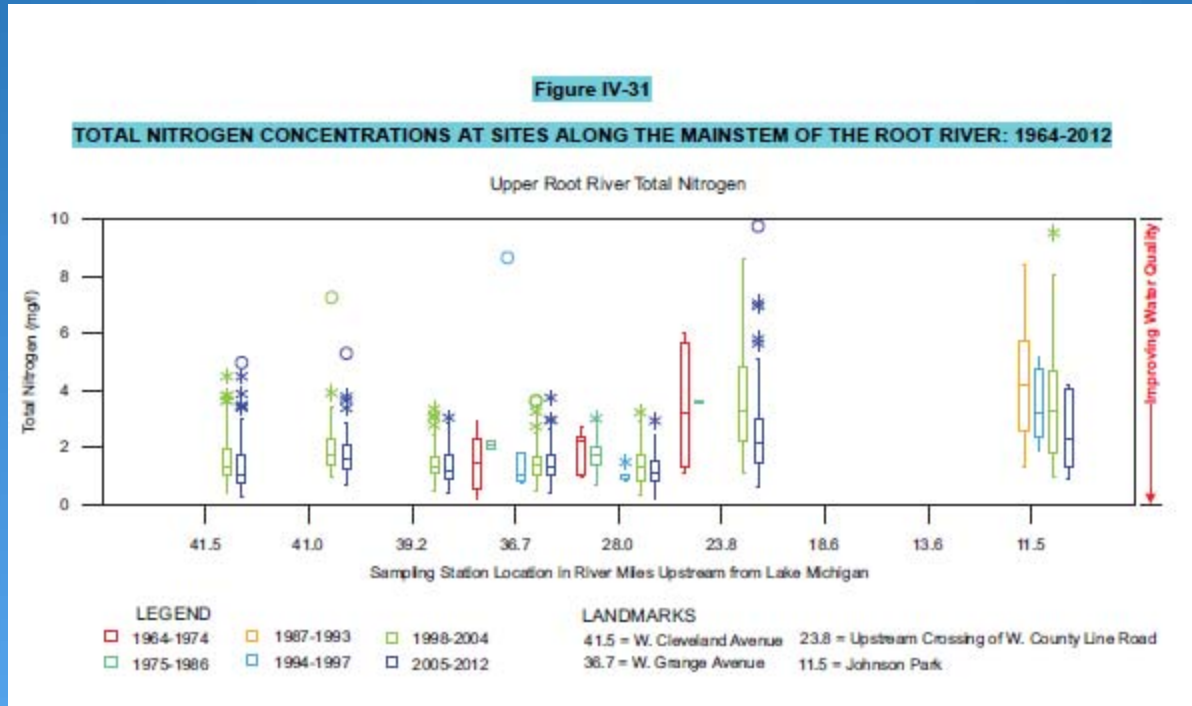
Because of exceptionally high total phosphorus concentrations at some sampling stations in the Root River Canal system, the scales on the graphs of this figure has been extended to 8.0 mg/l.

Nondesignated streams that are classified as limited aquatic life waters are specifically excluded from coverage under Wisconsin's water quality criterion for phosphorus. Because of this, no standard is shown for some sampling stations along the East and West Branches of the Root River Canal.

Source: U.S. Geological Survey, Wisconsin Department of Natural Resources, City of Racine Health Department, and SEWRPC.



# Total Nitrogen



- Concentration increases from upstream to downstream

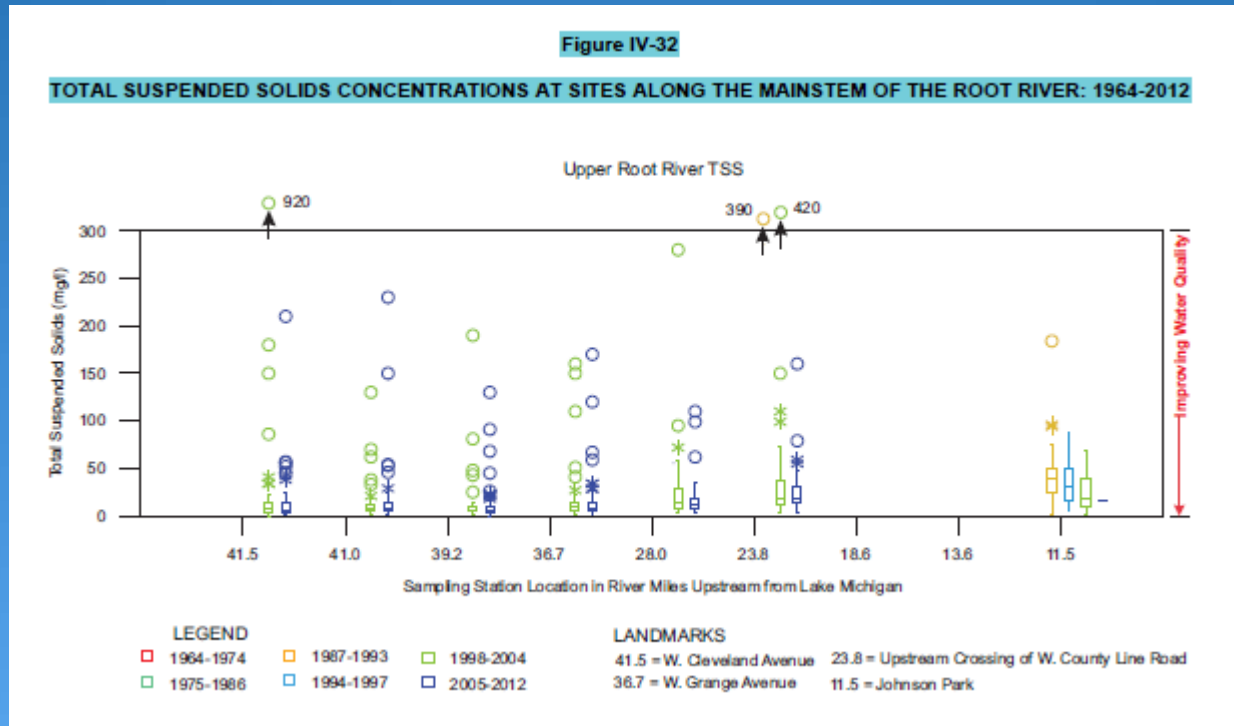
# Suspended Materials

- Total Suspended Solids
  - Bulk concentration of solids
- Chlorophyll-a
  - Concentration of phytoplankton
- Turbidity
  - Water Clarity



Turbid water carrying suspended solids

# Total Suspended Solids



- Higher concentrations in less urbanized areas
- Highly variable → related to flow

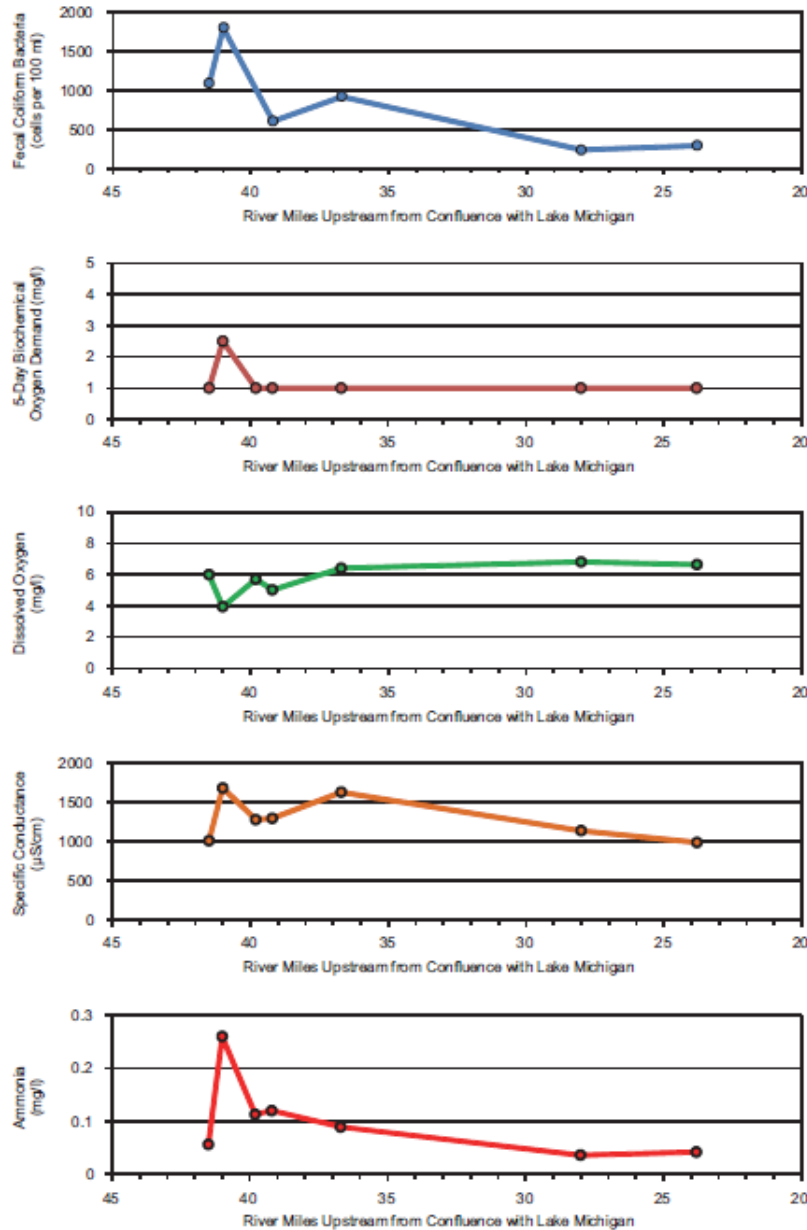


# Conclusions of Stream Water Quality Inventory

- Fecal indicator bacteria concentrations are high everywhere
- Total Phosphorus concentrations are high everywhere
- Dissolved Oxygen concentrations are low in upstream reaches
- Some areas have large swings of dissolved oxygen
  - Result from dense beds of aquatic plants and algae
  - Driven by high concentrations of phosphorus

Figure IV-37

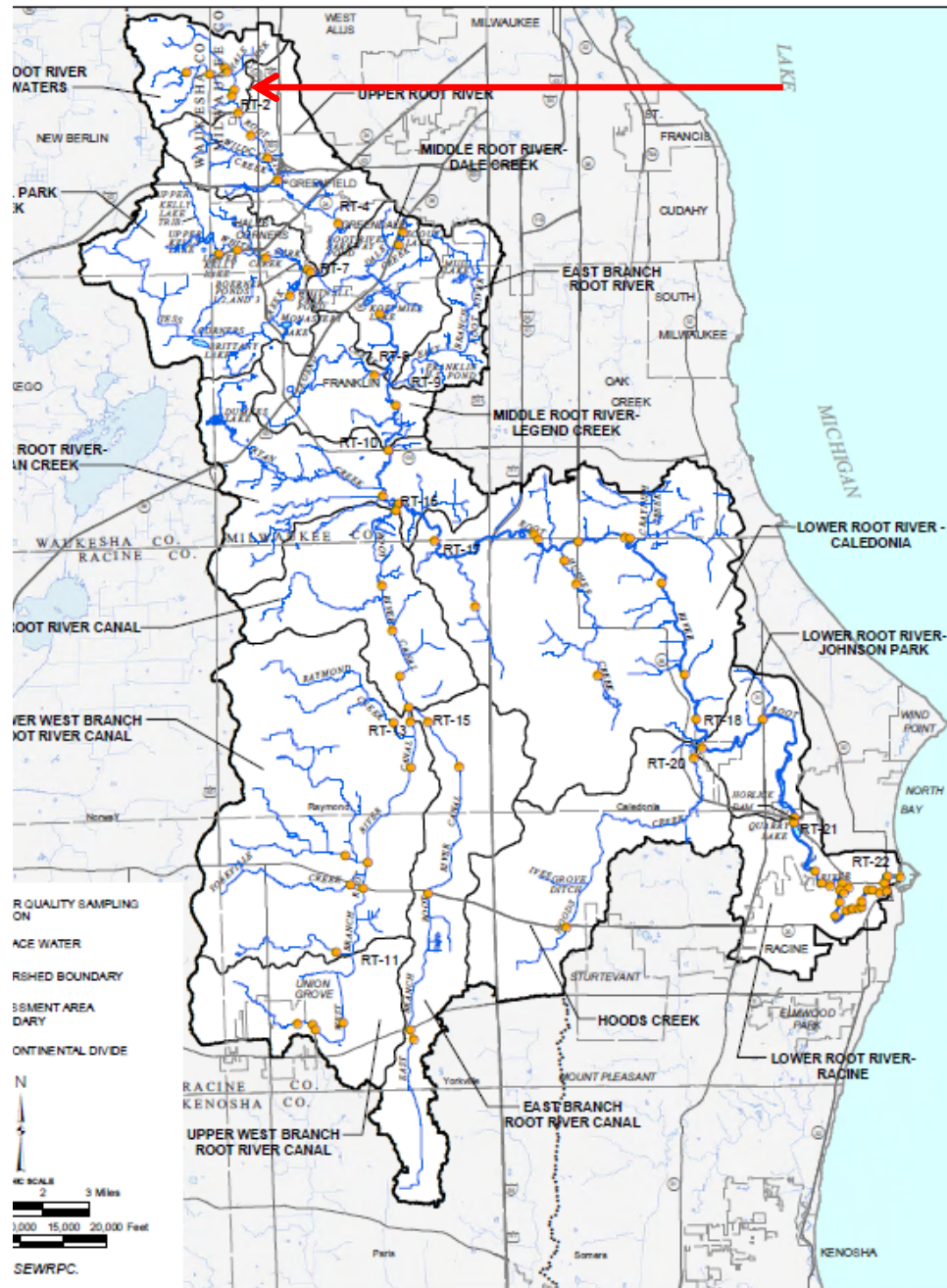
**MEDIAN VALUES OF FIVE WATER QUALITY CONSTITUENTS AT SAMPLING STATIONS ALONG UPPER REACHES OF THE MAINSTEM OF THE ROOT RIVER: 1998-2012**



Source: U.S. Geological Survey, Wisconsin Department of Natural Resources, Milwaukee Metropolitan Sewerage District, and SEWRPC.

Map IV-21

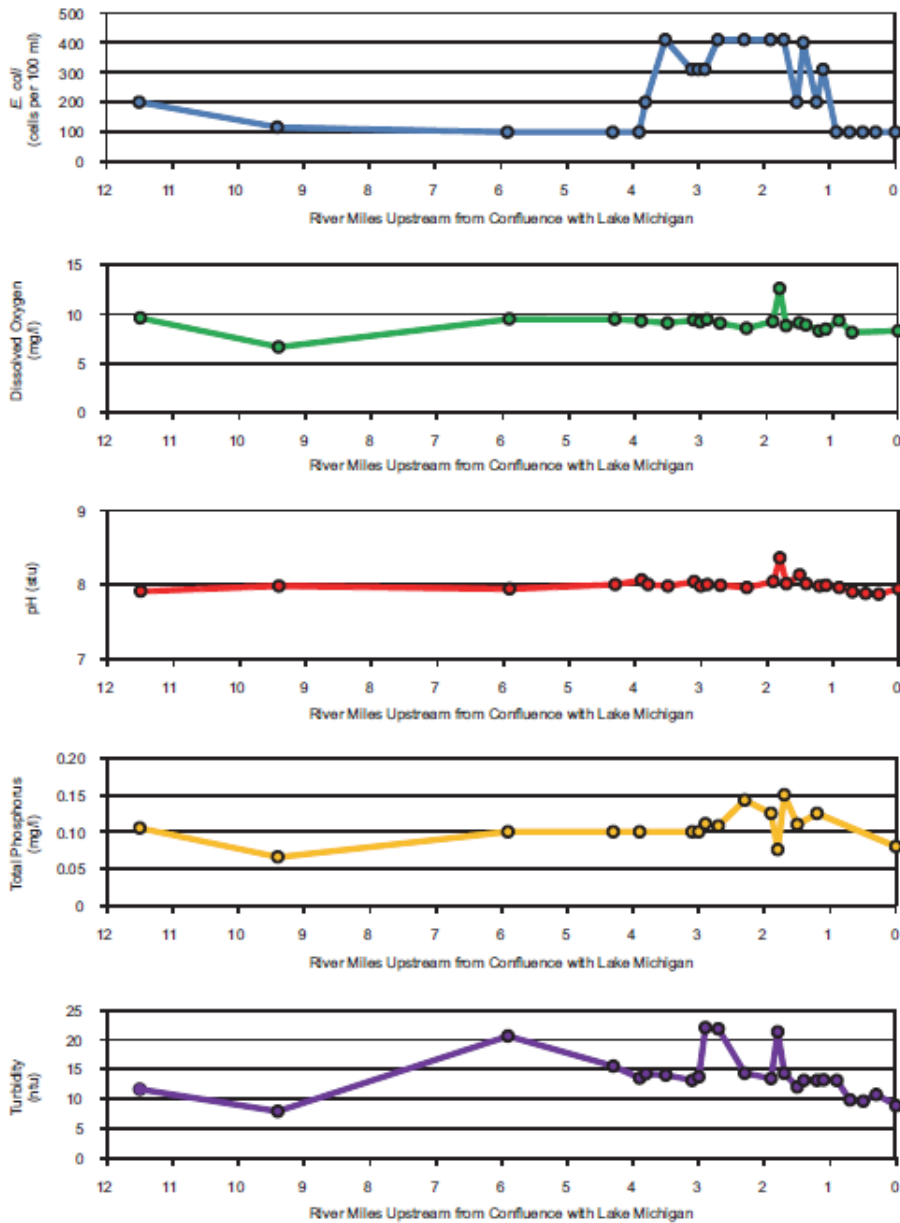
**FACE WATER QUALITY SAMPLING STATIONS WITHIN THE ROOT RIVER WATERSHED: 1964-2012**



PRELIMINARY DRAFT

Figure IV-38

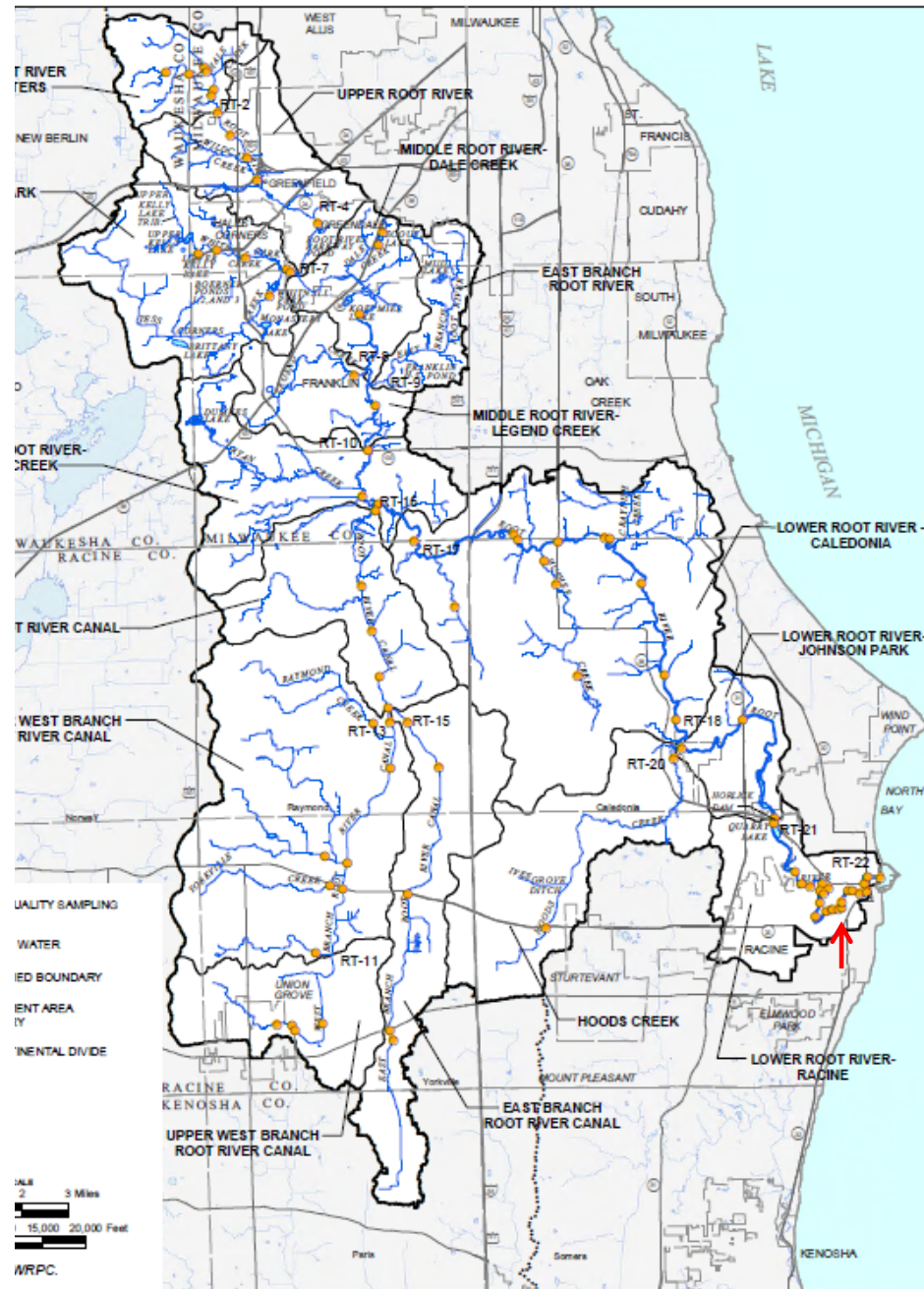
**MEDIAN VALUES OF FIVE WATER QUALITY CONSTITUENTS AT SAMPLING STATIONS ALONG LOWER REACHES OF THE MAINSTEM OF THE ROOT RIVER: 2005-2012**



Source: U.S. Geological Survey, University of Wisconsin-Extension, Wisconsin Department of Natural Resources, City of Racine Health Department, and SEWRPC.

Map IV-21

**ICE WATER QUALITY SAMPLING STATIONS WITHIN THE ROOT RIVER WATERSHED: 1964-2012**



PRELIMINARY DRAFT



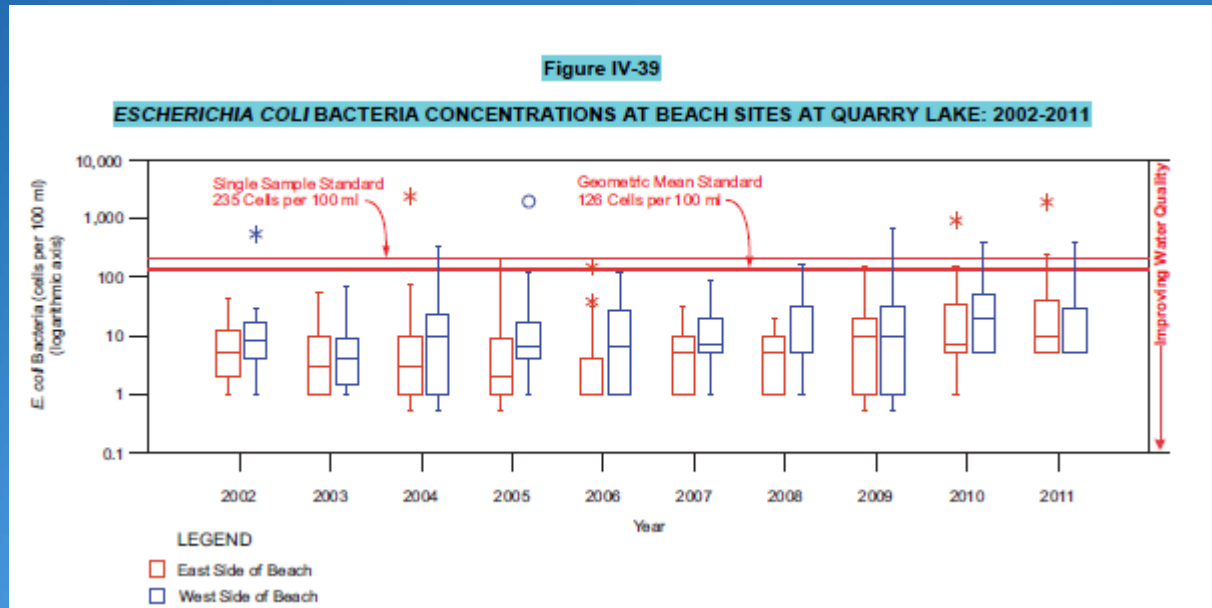
# Water Quality in Lakes and Ponds



# Water Quality in Lakes and Ponds

- Few long-term data available
- Quarry Lake
  - *E. coli* counts
- Scout Lake
  - Dissolved oxygen, water temperature, total phosphorus, secchi depth, chlorophyll-a
- Upper Kelly Lake
  - Total phosphorus, chlorophyll-a, secchi depth
- Single samples on a few others

# Quarry Lake *E. coli*: 2002-2011

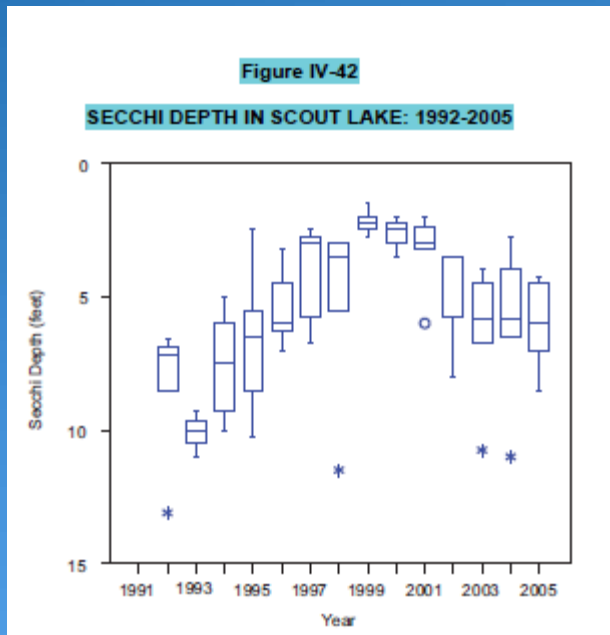


- Swimming beach
- Concentrations are pretty good with occasional exceedences and beach advisories

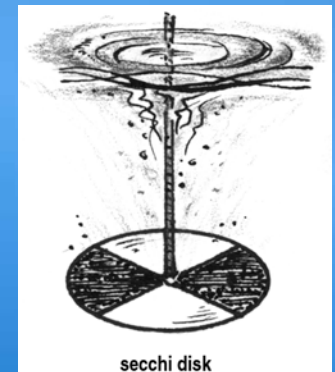




# Secchi Depth in Scout Lake: 1992-2005



- Decreasing water clarity through the 1990s
- Water clarity roughly stable 2002-2005



# Trophic Status of Lakes and Ponds

- Trophic status = biological productivity
  - Oligotrophic = Low productivity
  - Mesotrophic = Moderate productivity
  - Eutrophic = High productivity
- Driven by nutrient availability
  - Inputs of nutrients lead to increased productivity
- The lakes and ponds we have data from in the Root River watershed all appear to be eutrophic

# Achievement of Water Use Objectives

- Do the waterbodies comply with the water quality criteria that apply to their designated use?
- Assessed percent of samples in compliance with criteria for
  - Water temperature
  - Dissolved oxygen concentration
  - Chloride concentration
  - Total phosphorus concentration
  - Fecal indicator bacteria concentration



Table IV-17

WATER QUALITY CHARACTERISTICS OF STREAMS, LAKES, AND PONDS IN THE ROOT RIVER WATERSHED: 2005-2012<sup>a</sup>

Stream Reach	Stream Length (miles)	Codified Water Use Objective <sup>b</sup>	Percent of Samples Meeting Water Quality Criteria (total number of samples indicated in parentheses)									
			Dissolved Oxygen	Temperature		Chloride		Total Phosphorus	Bacteria			
				Sublethal	Acute	Chronic	Acute		Fecal Coliform Bacteria		<i>Escherichia coli</i>	
Single Sample	Geometric Mean	Single Sample	Geometric Mean									
Upper Root River-Headwaters Assessment Area												
Root River above Cleveland Avenue	1.1	FAL	57.5 (73)	--	--	100.0 (74)	100.0 (74)	46.6 (73)	26.0 (73)	16.4 (73)	--	--
Root River between the intersection of W. National Avenue and W. Oklahoma Avenue and Cleveland Avenue	0.5	FAL	48.3 (263)	91.7 (22)	100.0 (184)	71.6 (76)	97.4 (76)	18.8 (80)	16.0 (75)	9.3 (75)	--	--
Hale Creek	1.0	FAL	--	--	--	--	--	--	--	--	--	--
West Branch Root River <sup>c</sup>	2.5	LAL	--	--	--	--	--	--	--	--	--	--
Upper Root River Assessment Area												
Root River between W. Cold Spring Road and the intersection of W. National Avenue and W. Oklahoma Avenue	0.8	FAL	22.9 (376)	94.9 (39)	100.0 (282)	96.1 (76)	100.0 (76)	26.5 (83)	29.7 (74)	14.9 (74)	--	--
Root River between W. Grange Avenue and W. Cold Spring Road	2.5	FAL	37.2 (392)	97.4 (38)	100.0 (291)	89.9 (79)	98.7 (79)	24.4 (86)	26.8 (82)	14.6 (71)	0.0 (6)	0.0 (6)
104th Street Branch	1.0	FAL	--	--	--	--	--	--	--	--	--	--
Wildcat Creek	1.6	FAL	--	--	--	--	--	--	--	--	--	--
Unnamed Tributary 5 to Root River	0.8	FAL	--	--	--	--	--	--	--	--	--	--
Unnamed Tributary 4 to Root River	1.0	FAL	--	--	--	--	--	--	--	--	--	--
Unnamed Tributary 3 to Root River	0.4	FAL	--	--	--	--	--	--	--	--	--	--
Whitnall Park Creek Assessment Area												
Whitnall Park Creek upstream from the former Hales Corners WWTP	0.6	LAL	--	--	--	--	--	--	--	--	--	--
Whitnall Park Creek downstream from the former Hales Corners WWTP	2.4	LFF	--	--	--	--	--	--	--	--	--	--
Upper Kelly Lake Tributary	0.8	LAL	--	--	--	--	--	--	--	--	--	--
Northwest Branch Whitnall Park Creek	1.4	FAL	--	--	--	--	--	--	--	--	--	--
North Branch Whitnall Park Creek	0.4	FAL	--	--	--	--	--	--	--	--	--	--
Tess Corners Creek	4.0	LFF	--	--	--	--	--	--	--	--	--	--

# Achievement of Water Use Objectives

- Dissolved Oxygen
  - Mainstem above W. Grange Avenue usually below criterion
  - Mainstem between County Line Road and 5 Mile Road occasionally below criterion
  - Raymond Creek often below criterion
  - Legend Creek and lower reaches of East Branch Root River Canal occasionally below criterion
  - Scout Lake deep water below criterion during stratification
  - Other locations are generally in compliance

# Achievement of Water Use Objectives

- Temperature
  - Generally complies with the acute temperature criteria
  - There are rare exceedences of the sublethal temperature criteria
- Chloride
  - Only have data on mainstem in Milwaukee County
  - Chloride concentrations almost always comply with the acute criterion
  - Chloride concentrations occasionally exceed the chronic criterion
  - Few winter data

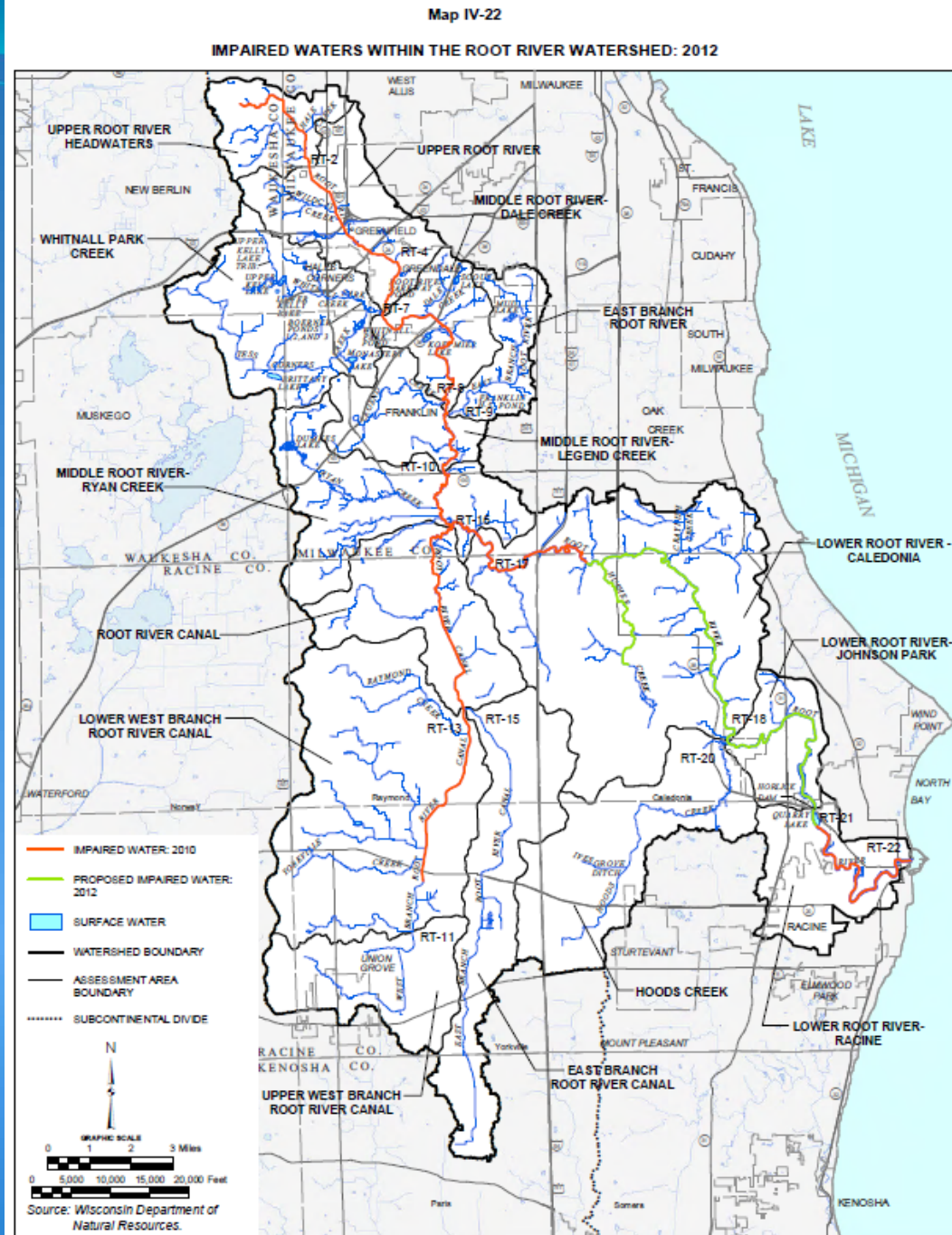


# Achievement of Water Use Objectives

- Total Phosphorus
  - Concentrations usually exceed the criterion everywhere
- Fecal Indicator Bacteria
  - Fecal coliform bacteria concentrations usually exceed the State's geometric mean and single sample criteria
  - *E. coli* concentrations usually exceed the USEPA recommended geometric mean and single sample criteria
  - *E. coli* concentrations in Quarry Lake usually comply with the USEPA recommended geometric mean and single sample criteria

# Impaired Waters

- Required by Clean Water Act
- State submits list every two years
- Mainstem of Root River
- West Branch Root River Canal
- Husher Creek





# Chapter V—Development of Targets and Alternative Measures





# Developing Targets

- Begin with a definition of the main problems related to each focus area
  - As revealed by the inventories in Chapter IV
  - Constitutes a refining of the focus area
- Points to overall strategies for addressing the problems

# Sources of Targets

- Starting point is the recommendations and analyses in the Regional Water Quality Management Plan Update
- Draw from relevant State and Federal standards
- Draw from the goals and objectives of related plans and efforts that address the overall strategy

# Water Quality Targets

- Water quality problems are related to concentrations of dissolved oxygen, nutrients, and chloride
- Dissolved oxygen concentrations
  - Chronically low in some locations
  - Wide swings in concentration over the day at other locations
- Drivers of dissolved oxygen problems:
  - Nutrient additions → Widespread in watershed
  - Additions of sanitary wastewater → At least one site



# Water Quality Targets

- Overall strategy → Reduce contributions of nutrients to surface waters
- Focus on phosphorus
  - Phosphorus acts to limit productivity in freshwater systems
- Also address total suspended solids (TSS)
  - Much of the phosphorus entering waters are in or attached to particles
  - TSS is used as a surrogate for other pollutants in urban stormwater regulations

# Targets: Load Reductions

Source	Total Phosphorus (pounds)	TSS (pounds)
Urban		
NR 151-related	2,268	1,388,338
Other measures	2,932	869,032
Subtotal	5,200	2,257,370
Rural		
NR 151-related	8,440	18,961,880
Other measures	8,180	13,691,100
Subtotal	16,620	32,652,890
<b>Total</b>	<b>21,820</b>	<b>34,910,260</b>

# Associated Water Quality

Condition	Total Phosphorus (mg/l)		Total Suspended Solids (mg/l)	
	Mean	Range of Assessment Area Means	Mean	Range of Assessment Area Means
Existing (2000)	0.133	0.072-0.381	23.8	6.3-57.2
Recommended Plan (2020)	0.117	0.063-0.345	16.6	4.9-38.4

# Compliance with Phosphorus Standards

Condition	RWQMPU recommended 0.10 mg/l (percent)		State Criterion 0.075 mg/l (percent)	
	Mean	Range of Assessment Area Means	Mean	Range of Assessment Area Means
Existing (2000)	68	32-82	--	--
Recommended Plan (2020)	72	41-84	63	29-81



# Next Steps

- Continue and complete characterization of the watershed
  - Biological conditions
    - Fish, macroinvertebrates, mussels
  - Invasive species
  - Buffer analyses
  - Stream Characteristics
  - Flooding (Racine County)
  - Recreational access

## Next Steps

- Continue identifying targets to be achieved by the end of the plan implementation period
- Identify and develop alternative measures for achieving targets

# Project Web Site

- <http://www.sewrpc.org/SEWRPC/Environment/Root-River-Watershed-Restoration-Plan.htm>
- Presentations from RRRPG meetings
- Summary notes from Advisory Group meetings
- Draft chapters as they are completed
- Comment screen

