SUMMARY NOTES OF THE NOVEMBER 13, 2013, MEETING OF THE ROOT RIVER WATERSHED RESTORATION PLAN ADVISORY GROUP

INTRODUCTION

The November 13, 2013, meeting of the Root River Watershed Restoration Plan Advisory Group was convened at the Racine County Ives Grove Office Complex at 9:05 a.m. The meeting was called to order by Susan Greenfield, Executive Director of the Root-Pike Watershed Initiative Network (Root-Pike WIN). Attendance was taken by circulating a sign-in sheet.

In attendance at the meeting were the following individuals:

Advisory Group Members	
Susan Greenfield, Co-Chair	Executive Director, Root-Pike Watershed Initiative Network
Jeff Martinka, Co-Chair	Executive Director, Southeastern Wisconsin Watersheds Trust, Inc. (Sweet Water)
Michael G. Hahn, Secretary	Chief Environmental Engineer, Southeastern Wisconsin Regional Planning Commission
Joseph E. Boxhorn	Senior Planner, Southeastern Wisconsin Regional Planning Commission
Allison Chernouski	Program Coordinator, Root-Pike Watershed Initiative Network
Chris Clayton	Urban River Restoration, River Alliance of Wisconsin
Thomas Friedel	Administrator, City of Racine
Stevan M. Keith	Sustainability and Environmental Engineer, Milwaukee County Architecture, Engineering, and Environmental Services Division
Julie L. Kinzelman	Laboratory Director/Research Scientist, City of Racine Health Department
Michael A. Luba	NR Basin Supervisor, Wisconsin Department of Natural Resources
Christopher Magruder	Community Environmental Liaison, Milwaukee Metropolitan Sewerage District
Monte G. Osterman	Supervisor, Racine County Board of Supervisors
Aaron W. Owens	Planner, Southeastern Wisconsin Regional Planning Commission
Chad Sampson	County Conservationist, Racine County
Thomas M. Slawski	Principal Specialist-Biologist, Southeastern Wisconsin Regional Planning Commission
Melissa H. Warner	Commissioner, Village of Caledonia Storm Water Utility District
Guests	
Ann Dee Allen	Senior Public Involvement and Outreach Specialist, Southeastern Wisconsin Regional Planning Commission
Beverly Saunders	Senior Specialist-Biologist, Southeastern Wisconsin Regional Planning Commission

Ms. Greenfield welcomed the attendees to the meeting and thanked them for their participation and commitment to the process of developing the watershed restoration plan. She reminded the Group members of 1) upcoming public stakeholder meetings on December 4, 2013, February 26, 2014, and July 17, 2014 (at which the final plan will be presented), and 2) Advisory Group meetings on February 12, 2014, and May 14, 2014. Mr. Hahn also thanked the Advisory Group for their continued participation in this process.

REVIEW OF SUMMARY NOTES FROM OCTOBER 2, 2013, MEETING OF THE ROOT RIVER WATERSHED RESTORATION PLAN ADVISORY GROUP

Mr. Hahn stated that he would not be conducting a detailed review of the summary notes of the October 2, 2013, Advisory Group meeting. He asked whether there were any questions or comments on the notes. No questions or comments were offered by the Advisory Group.

REVIEW OF PARTIAL PRELIMINARY DRAFT CHAPTER V, "DEVELOPMENT OF TARGETS AND ALTERNATIVE MEASURES," OF SEWRPC COMMUNITY ASSISTANCE PLANNING REPORT NO. 316 (CAPR NO. 316), "*A RESTORATION PLAN FOR THE ROOT RIVER WATERSHED*"

Mr. Hahn reviewed the section on flooding targets for Racine County. He stated that this section applies only to Racine County, because 1) the Milwaukee Metropolitan Sewerage District (MMSD) has an established program of watercourse system planning for the Root River in Milwaukee County and 2) Racine County requested that flooding be specifically examined as part of this planning effort.

Mr. Hahn stated that 204 structures have been identified in the one-percent-annual-probability flood hazard areas in the portions of the Root River watershed in Racine County. He added that about 80 percent of these structures are concentrated in the Island Park area of the City of Racine. He noted that the others are scattered throughout the watershed. He explained that the one-percent-annual-probability flood constitutes the standard for flood mitigation.

Mr. Hahn noted that for flooding and stormwater quantity problems, an appropriate target would be to provide flood and stormwater management systems which reduce the exposure of people to drainage-related inconvenience and to health and safety hazards and reduce the exposure of real and personal property to damage through inundation. Regarding standards to be met to achieve that target, he cited the provision of three elements: 1) a minor stormwater management system with adequate capacity to infiltrate, store, and/or convey the runoff from a 10-percent-annual-probability storm while providing acceptable levels of access to property and traffic service, 2) a major system to adequately infiltrate, store, and/or convey the runoff from a 1-percent-annual-probability storm without causing significant property damage or safety hazards, and 3) an emergency overflow route to convey the peak rate of runoff to receiving streams during rain events with probabilities less than 1 percent.

Ms. Greenfield noted that flooding related to stormwater does not appear to be considered an issue in the City of Racine and asked whether this was due to the presence of park land. Mr. Hahn replied that while the park land helps, the reason for this is that the flooding problems in the City are related to overflow of water from streams and the River.

Mr. Hahn noted that having the spillway capacity to pass the peak rate of runoff during a 0.2-percent-annual-probability flood, as required by the Wisconsin Department of Natural Resources (WDNR) for a Significant Hazard dam, constitutes the target for Horlick Dam.

Mr. Osterman commented that the paragraph describing the Horlick dam targets is confusing to the layman. He explained that to someone who has not been involved in these discussions, upgrading the spillway capacity implies building a bigger dam. He asked that the paragraph be rewritten to make clear that this additional spillway capacity could be provided through removal of the dam. Mr. Hahn responded that the wording will be revised to make this clear.

[Secretary's Note: The following sentence was added after the first sentence of the third full paragraph on page 20:

> "The additional spillway capacity could be provided through modifications to the dam, or the dam could be removed to eliminate the potential downstream hazard to life and property."]

Ms. Greenfield asked whether the plan will address the impact that removing Horlick Dam would have upon flooding. She explained that there are concerns that removing the dam would result in an increase in flooding upstream from the dam. Mr. Hahn replied that this understanding is not correct. He explained that removing the dam would result in a decrease in flooding upstream. He noted that the fact that Old Mill Road floods during the one-percent-annual-probability flood under the existing condition and would continue to flood under the alternative in which the dam abutments are raised may be the source of this confusion.

Ms. Greenfield asked Mr. Hahn to send her an electronic mail message explaining the effect of removing Horlick dam on flooding. Mr. Hahn replied that he would do this.

Mr. Osterman asked whether modeling was conducted to examine the effects of removing Horlick dam on downstream flooding. Mr. Hahn replied that modeling was not conducted. He explained that, based on a comparison of the upstream watershed area and the potential large runoff volume from that area relative to the small amount of floodwater storage provided by the impoundment upstream of the dam, it was the Commission staff's professional opinion that removal of the dam would not significantly increase large flood flows downstream from the dam. He added that based upon that judgment, modeling was not considered necessary in this instance.

[Secretary's Note: Mr. Hahn sent an electronic mail message to Ms. Greenfield elaborating on this situation. To more clearly describe the effects of Horlick dam and its impoundment on peak flood flows, the second sentence in the last partial paragraph on page 37 of Chapter V under the "Issues of Concern" and "Water Quantity" subheadings was deleted and replaced with the following:

> "The effect of the Horlick dam and its impoundment in attenuating large flood peaks would be expected to be negligible (i.e., there would be no significant difference in peak flows between conditions with the dam in place and with the dam removed) because during floods the runoff volume from the approximately 190-square mile watershed tributary to the dam would be very large relative to the active storage volume above the normal impoundment level. Thus, within the range of dam modifications considered under the alternatives described below, including modifications to increase spillway discharge capacity and modifications to fully or partially remove the dam, no significant difference in flood peaks would be expected."

> The first sentence in the fifth full paragraph on page 39 of Chapter V under the "Baseline Condition" and "Surface Water and Groundwater Quantity Considerations" subheadings was revised to read as follows (Bold text is included here to denote language changed or added onto the text. Text will not be bold in the report):

> "**As noted previously under the "Water Quantity" subheading in the "Issues of Concern" subsection, t**he Horlick dam and impoundment as currently configured (see Figure V-A) **do not significantly attenuate peak flood flows**.]

Mr. Hahn reviewed the section on flooding alternatives on pages 18 and 19. He indicated that for flooding along the mainstem of the Root River in the City of Racine, the available alternative approaches include a variety of structural and nonstructural components. He stated that an opportunity to address flooding issues will be arising through the Federal Emergency Management Agency (FEMA) Risk Mapping, Assessment, and Planning (RiskMAP) program. He explained that this is a program that emphasizes flood mitigation. He suggested that it would be beneficial for the City of Racine to be involved in this program. He noted that this program begins with a discovery phase that is intended to identify problems, followed by mapping, analysis, and mitigation phases. He said that he anticipates that a RiskMAP project may begin in the Root River watershed in 2014 or 2015.

Mr. Hahn indicated that SEWRPC is developing updated floodplain delineations along the Root River mainstem and tributaries in Milwaukee County under a program funded by the Milwaukee County Automated Mapping and Land Information System Steering Committee and the Milwaukee Metropolitan Sewerage District (MMSD). He added that as a part of that study, a hydrological model is being developed to compute flood flows throughout the watershed, including the Racine County portion. He noted that information developed as part of this project would be available for use in the RiskMAP program.

Mr. Hahn stated that the SEWRPC staff's extensive experience with flood mitigation planning has shown that nonstructural approaches are the most feasible approaches to use when the flood hazard is scattered, as it is in Racine County outside of the City of Racine. He added that SEWRPC staff reviewed stormwater studies conducted by Racine County municipalities. He noted that this review identified stormwater quality-related analyses related to municipal separate storm sewer discharge permits, but little planning work directed toward addressing stormwater quantity issues.

Ms. Greenfield asked whether stormwater management will become more important with climate change. Mr. Hahn replied that it would. He explained that the climate projections for Southeastern Wisconsin indicate that more intense rainfalls will occur. He added that the projections also indicate that these storms could be followed by drier periods. He noted that this is an area where we are starting to be able to quantify the anticipated changes.

Mr. Osterman mentioned that the City of Waukesha has applied for a diversion of water from Lake Michigan for public water supply purposes under the Great Lakes-St. Lawrence Basin Water Resources Compact. He noted that under the City's proposal, the required return flow would be discharged into the Root River. He added that the average return flow would be about 10 million gallons per day (mgd) and would increase mean discharge by about one third of its present volume. He asked how this would affect flooding and whether the City of Waukesha has discussed this proposal with SEWRPC staff. Mr. Hahn replied that relative to the discharge that occurs during the one-percent-annual-probability flood, 10 mgd is a small amount of water. He explained that 10 mgd is approximately equal to 16 cubic feet per second (cfs). He noted that flow during the one-percent-annual-probability flood is on the order of about 6,000 cfs. He stated that the additional flow if Waukesha were permitted to return flow via the River would not have a significant impact on flood conditions. He added that except for providing data to the City when requested, SEWRPC staff has not been involved in the application process.

[Secretary's Note: Mr. Hahn's statement during the meeting accurately describes SEWRPC's level of involvement in the Waukesha application. The following is noted as a clarification of SEWRPC's role in the Waukesha application process:

Pursuant to the terms of Section 208 of the Federal Clean Water Act, SEWRPC is the formally designated areawide water quality planning agency for the Southeastern Wisconsin Region. State law requires that an areawide water quality planning agency delineate water supply service areas for public water supply systems within the planning area for which the agency is designated. State law requires that these water supply service areas be consistent with the applicable approved areawide water quality management plan. In December 2008, SEWRPC completed a water supply service area delineation for the City of Waukesha. As required by State law, the water supply service area was approved by each city and town within the area, and is subject to WDNR approval as a component of the City of Waukesha's water supply service area plan.]

The Advisory Group discussed potential effects of discharging the return flow into the Root River. The points made during this discussion include:

- Mr. Hahn indicated that the regional water supply plan (RWSP) recommended that the City of Waukesha be provided with a Lake Michigan water supply and that implementation of this recommendation was qualified as being subject to rigorous environmental review. He noted that the RWSP also recommended that the City conduct active management of return flow in which flows are diverted away from the receiving water during flooding and treated wastewater from the City of Waukesha be discharged to supplement low flows in the Fox River. He added that his understanding is that this is not an option because of how the Compact is being interpreted.

- Ms. Greenfield expressed concerns that during high flows sewage overflows or partially-treated sewage would be discharged to the Root River. Mr. Hahn and Mr. Luba replied that this is not the way that wastewater treatment plants are engineered. They explained that the return flow pipeline would originate from the plant outfall which discharges treated water and not the collection system. They indicated that any overflows would occur within the collection system and would go to the Fox River. Mr. Luba added that any concerns about overflows could be avoided by extending the return flow pipeline to Lake Michigan.

- Ms. Kinzelman noted that the water quality modeling of the Root River presented in the City of Waukesha's application did not account for the presence of Horlick dam and expressed concern that the additional water from the return flow could promote release of sediment or nutrients from the impoundment. She added that this might require stricter effluent limitations for nutrients. Mr. Slawski added that the addition of 10 mgd of return flow could affect sediment transport and nutrient dynamics during smaller flow events and could affect water chemistry during low flow periods.

- Mr. Luba noted that Waukesha's return flow will constitute a new discharge. He explained that this means that the return flow will need to meet the requirements of the discharge permit as of the day that the discharge begins without a compliance schedule. He noted that Waukesha's wastewater treatment plant currently has the most stringent effluent limitations in southeastern Wisconsin. He added that the Department is drafting an environmental impact statement on Waukesha's proposed diversion and return flow. He indicated that this is tentatively scheduled to be completed by March or April 2014.

- Mr. Hahn stated that the draft watershed restoration plan references the Waukesha diversion application and the pending environmental impact statement. He added that SEWRPC staff will examine the environmental impact statement if it is released by a date that allows sufficient time for examination and incorporation of its findings into the watershed restoration plan. He indicated that SEWRPC staff will not conduct an independent study of the return flow proposal.

At Mr. Hahn's request Mr. Boxhorn reviewed the subsection on alternative measures to reduce instream concentrations of fecal indicator bacteria. He noted that while fecal indicator bacteria are contributed by both urban and rural nonpoint sources, the targets for reductions that were previously presented call for about five sixths of the reductions to come from urban nonpoint sources. He added that this should be kept in mind during the discussion of alternative measures to reduce loadings of fecal indicator bacteria.

Mr. Boxhorn described the first alternative – "coordinated programs to detect and eliminated illicit discharges to storm sewer systems." He explained that this alternative would entail shifting effort from annually screening and examining those major outfall that have not shown evidence of illicit discharges to outfalls of any size that are considered likely to be conveying water contaminated with sanitary wastewater. He noted that the watershed-based municipal stormwater discharge permit for the Menomonee River watershed has incorporated this change. He added that three municipalities that are partially located in the Root River watershed—the Cities of Greenfield, Milwaukee, and West Allis—are covered under this permit. Ms. Kinzelman commented that a modified illicit discharge detection and elimination procedure in which all outfalls would be periodically assessed is a good suggestion. She added that the plan should support this by including a recommendation for instream water quality monitoring, including event-based monitoring. Mr. Boxhorn replied that the plan will include recommendations regarding monitoring.

Mr. Boxhorn described the second alternative – "expanded inspection and maintenance of private onsite wastewater treatment systems (POWTS)." Ms. Greenfield asked whether it has been challenging to ensure maintenance and inspection of POWTS such as mound systems. Mr. Sampson replied that this is an ongoing issue. He noted that Racine County has been addressing this through maintenance agreements.

Mr. Boxhorn described the third alternative – "strengthening and expanding pet litter management programs." Ms. Greenfield asked whether there has been any water quality monitoring at the Johnson Park dog park, noting that dog excrement is washed into the River at this site. Ms. Kinzelman responded that her staff samples just downstream from the dog park. She commented that it is hard to capture an effect from the dog park in the data. Mr. Boxhorn noted that the SEWRPC field crew observed that dogs congregate at the sandy area near the River in this park. Ms. Kinzelman indicated that bacterial concentrations within the sand could be examined and the sources of the bacteria characterized, noting that she has conducted several studies of this type. She suggested that this could be added to the recommended monitoring.

Mr. Boxhorn described the fourth alternative – "management of horse manure on trails and roads." Mr. Magruder noted that the higher concentration stated for *E. coli* in dry horse manure seems inconsistent with the statement that drying reduces the numbers of *E. coli* in horse manure by 95 percent and asked for further explanation. Mr. Boxhorn replied that as the manure dries it loses mass due to evaporation of water. He added that when this is taken into account, the process of drying reduces *E. coli* numbers by about 95 percent, but concentrations are higher because of the reduced mass. Ms. Kinzelman asked whether bacterial growth would occur if the manure is rehydrated. Mr. Boxhorn replied that he was unable to find data on this.

Mr. Boxhorn described the fifth alternative – "implementation of best management practices to abate urban nonpoint source pollution." Ms. Greenfield stated that MMSD has done a good job of promoting and installing green infrastructure practices. Mr. Magruder noted that some of these practices are currently being field tested. Mr. Hahn noted that MMSD has developed a regional green infrastructure plan for its service area.

Ms. Kinzelman commented that soil amendments to promote infiltration could be implemented as part of development.

Mr. Keith stated that the Fund for Lake Michigan has funded a study relating to green infrastructure for the Menomonee River Watershed Group. He explained that this study consists of a review of municipal codes and ordinances to assess their favorability for the implementation of green infrastructure measures.

Mr. Boxhorn described the sixth alternative – "agricultural manure and barnyard runoff management."

Mr. Boxhorn described the seventh alternative – "programs to control nuisance animals." Ms. Kinzelman suggested that the plan contain a recommendation to include measures to deter the presence of waterfowl and gulls in the design of stormwater ponds. Mr. Hahn noted that this could be done through provision of a buffer of natural vegetation around these ponds.

Mr. Boxhorn described the eighth alternative – "disinfection of wastewater treatment plant (WWTP) effluent," and the ninth alternative – "maintaining and upgrading marina waste management facilities."

Mr. Boxhorn described the 10th alternative – "examination of sandy banks to waterbodies to determine whether they act as reservoirs of bacteria originating in stormwater that flows over them." Ms. Kinzelman commented that streambeds may also act as reservoirs of bacteria. She added that bacteria may also accumulate in biofilms and that outfalls may produce biofilms that shed bacteria into the River during flow events. Mr. Boxhorn asked Ms. Kinzelman whether she could provide the SEWRPC staff with literature references on biofilms. Ms. Kinzelman replied that she would provide such references.

[Secretary's Note: Subsequent to the meeting Ms. Kinzelman sent an electronic mail message to the SEWRPC staff containing literature references and a description of results from her research regarding fecal indicator bacteria and biofilms.]

Mr. Boxhorn described the 11th alternative – "restricting livestock access to streams." Ms. Greenfield asked whether there were many livestock in the Root River watershed. Mr. Sampson replied that there are some. He noted that the regulations in NR 151 do not allow unlimited access to streams. He indicated that, in Racine County, his office responds to complaints regarding trampling of streambanks. He explained that installing fencing is the usual option to restrict livestock access to streams. He noted that some farmers maintain that allowing cattle to be near the streams keeps brush down near the streambanks. He said that the standard for access ramps is that they should be about 10 feet wide and consist of base stone with traffic bond.

Mr. Hahn asked whether there was an exception to the access restrictions during hot weather. Mr. Sampson replied that during these times there are no restrictions on access. He added that his office tries to work with farmers during these periods to control access.

Mr. Boxhorn reviewed the subsection on the evaluation of alternative measures. He indicated that for evaluation purposes, he grouped them into three categories: alternatives that address point source pollution, alternatives that address urban nonpoint source pollution, and alternatives that address rural nonpoint source pollution.

Mr. Boxhorn reviewed the subsection evaluating alternatives that address point source pollution. He noted that only one of the alternatives, disinfection of effluent from WWTPs, addresses point source pollution. He indicated that, based upon 1) a comparison of the loads of fecal indicator bacteria contributed by these plants to the required load reductions and 2) the documented local impacts of the discharges from these plants on bacterial concentrations in the receiving waters, adding disinfection to the treatment processes of the three WWTPs that discharge into streams of the watershed would have only a small effect on concentrations of fecal indicator bacteria on the streams these plants discharge into and on portions of the surface water system downstream from the receiving waters.

Ms. Warner asked how much it would cost to add disinfection to the treatment processes at these plants. Mr. Boxhorn indicated that he did not know.

[Secretary's Note: Subsequent to the meeting the SEWRPC staff developed a rough estimate of the costs of adding disinfection through chlorination and dechlorination to the treatment processes at the Union Grove WWTP. This estimate was developed using data from J. Darby, M. Heath, J. Jacangelo, F. Loge, P. Swaim and G. Tchobanoglous, *Comparison of UV Irradiation to Chlorination: Guidance for Achieving Optimal UV Performance*, Water Environment Research Foundation, 1995, as cited in U.S. Environmental Protection Agency, *Wastewater Technology Fact Sheet: Chlorine Disinfection,* USEPA Publication EPA 832-F-99-062, September 1999. Costs were adjusted to 2013 costs using the Engineering News-Record Construction Cost Index.

The data in the cited reference covered a range of WWTP design flows between 1 mgd and 100 mgd. The design flow of the Union Grove WWTP is 2.0 mgd.

Using the data in the cited reference, cost curves were developed that relate costs to design flows for three elements of the capital cost: chlorination, dechlorination, and facilities related to chlorination needed to meet the requirements of the universal fire code. A similar cost curve was developed for annual operations and maintenance costs. Based upon these curves, the capital cost of adding disinfection through chlorination to the treatment processes at the Union Grove WWTP is estimated to be $2.4 million. Annual operation and maintenance costs are estimated to be $138,000.

Specific analyses were not conducted on disinfection using methods other than chlorination; however, information is available to compare the costs of two other disinfection methods to the costs of chlorination. As indicated in U.S. Environmental Protection Agency, *Wastewater Technology Fact Sheet: Ultraviolet Disinfection,* USEPA Publication EPA 832-F-99-064, September 1999, the total costs of disinfection using ultraviolet irradiation can be competitive with disinfection through chlorination, when the dechlorination step is included. As indicated in U.S. Environmental Protection Agency, *Wastewater Technology Fact Sheet: Ozone Disinfection,* USEPA Publication EPA 832-F-99-063, September 1999, the costs of disinfection through ozonation are generally high in comparison with other disinfection techniques.

The design flows of the Yorkville and Fonk's Mobile Home Park WWTPs are 0.15 and 0.10 mgd, respectively. Because the design flows of these plants are outside of the range for which cost data were available, specific cost estimates for adding disinfection to their treatment processes were not developed. Given the sizes of these plants it would be expected that these costs would be less than those required to add disinfection at the Union Grove WWTP; however, it is possible that they may be substantial.

The costs of disinfection systems are dependent on a number of factors including the manufacturer, the characteristics of the site, the capacity of the plant, the characteristics of the wastewater to be disinfected, and the specific disinfection method and system chosen. The estimates given above represent "typical" values found in the literature and may not be representative of the costs associated with installing and operating a disinfection system at a particular site.

The following paragraph was inserted after the first partial paragraph on page 32:

"Preliminary planning-level estimates indicate that the capital cost of adding disinfection to the treatment process at the Union Grove WWTP is likely to be about $2.4 million with annual operation and maintenance costs of $138,000.Adding disinfection at the other two plants in the watershed would be less costly, but likely still substantial."

The first full paragraph on page 32 was revised as follows (Bold text is included here to denote language changed or added onto the text. Text will not be bold in the report.):

"The conclusion of this evaluation is that adding disinfection to the treatment processes at the three WWTPs that discharge to surface waters of the Root River watershed would have only a small effect on concentrations of fecal indicator bacteria on the streams receiving discharges from these plants and on those portions of the surface water system that are located downstream of the receiving waters **and the expense of such modifications could be considerable**.]

Ms. Kinzelman indicated that the stream reaches near the three WWTPs are degraded, and that increasing the quality of the effluent may improve the habitat in these reaches. She also noted that the fecal indicator bacterial contributions from these plants are small relative to other sources. Ms. Warner pointed out that the fecal contributions discharged from these plants have a human source.

Mr. Boxhorn said that Ives Grove Ditch, and the pertinent reaches of the East and West Branches of the Root River Canal are not likely to attract recreational users. He added that the loads contributed by the WWTPs are relatively small and that limited stream reaches appear to be impacted by the discharges.

> [Secretary's Note: The Fonk's Mobile Home Park WWTP discharges into the East Branch of the Root River Canal, the Union Grove WWTP discharges into the West Branch of the Root River Canal, and the Yorkville WWTP discharges into Ives Grove Ditch.]

Mr. Magruder stated that these plants might be a source of human pathogens. Ms. Kinzelman noted that the survivability of pathogens relative to sediment-associated fecal indicator bacteria is not well understood. Ms. Kinzelman and Mr. Magruder noted that there needs to be human exposure to the pathogens in order for their presence to constitute a hazard to human health.

Mr. Clayton asked what level of treatment is performed at these plants. Mr. Luba replied that these plants perform primary and secondary treatment. He noted that it is likely that the Yorkville WWTP will be unable to meet new permit conditions relative to discharges of chloride and phosphorus. He added that if this happens, they will need to connect to the City of Racine's system. Mr. Boxhorn noted that the regional water quality management plan update (RWQMPU) recommends that the Yorkville WWTP be abandoned and its service area be connected to the Racine system when the plant reaches the end of its useful life.

Mr. Hahn stated that for the Yorkville WWTP, the plan will reiterate the recommendation to abandon the plant and connect its service area to the Racine system. He noted that the other two WWTPs are subject to oversight by the WDNR. He commented that in view of the small effect that adding disinfection would have, it is hard to make a case for spending public resource on adding it.

> [Secretary's Note: The following paragraph was added after the first full paragraph on page 32:
>
> "It should be noted that the RWQMPU recommends that the Yorkville WWTP be abandoned when it reaches the end of its useful life and that the sewer service area of the Yorkville Sewer Utility District No. 1 be connected to the sewerage system tributary to the City of Racine WWTP. It is anticipated that the plant will be at the end of its useful life if it is unable to meet new permit conditions relative to discharges of chloride and phosphorus. Abandoning the plant and connecting its service area to the sewerage system tributary to the Racine WWTP would end its discharges of fecal indicator bacteria to surface waters of the Root River watershed."]

Mr. Friedel asked why these plants are not required to disinfect the effluent they discharge. Mr. Luba responded that this is based on the location and nature of the receiving water. Ives Grove Ditch and the upstream reaches of the East and West Branches of the Root River Canal are dredged ditches with low water quality. He noted that they are classified as limited aquatic life waters.

> [Secretary's Note: Effluent limitations for wastewater treatment plants are set forth in Chapters NR 210, Sewage Treatment Works," and NR 217, "Effluent Limitations for Phosphorus," of the *Wisconsin Administrative Code*. Disinfection of wastewater treatment plant effluent is required only in those cases where the WDNR has made a determination that the discharge of wastewater poses a risk to human and animal health. The

information that the Department shall use in identifying human and animal health risks are specified in NR 210.06(3).

The following paragraph was added after the third paragraph on page 27:

"It should be noted that disinfection of wastewater effluent is required only where the WDNR has made a determination that the discharge of wastewater poses a risk to human and animal health. The requirements of the *Wisconsin Administrative Code* related to effluent limitations and disinfection requirements that are applicable to the wastewater treatment plants that discharge to streams in the Root River watershed are summarized in Appendix I."

A copy of Appendix I is attached herein as Exhibit A.]

Mr. Osterman commented that the plan should include a recommendation that these WWTPs disinfect their effluent. He explained that this sets policy and creates a mind set in which other actors in the watershed feel obligated to address their activities that contribute to creating water quality problems.

Mr. Hahn thanked the Advisory Group for their discussion of the disinfection alternative. He indicated that SEWRPC staff will consider this discussion. He stated that as the areawide water quality planning agency for the Southeastern Wisconsin Region, SEWRPC has a responsibility to make recommendations based on the facts as we determine them. He indicated that based upon points raised in the discussion, it is likely that the watershed restoration plan will make a recommendation for the Yorkville WWTP. He added that the plan might not recommend that disinfection be added to the treatment processes at the other two plants since a case cannot be made for doing it.

[Secretary's Note: Determination of the facts as referred to above includes consideration of the input of advisory bodies convened by SEWRPC to review plans as they are developed. As has been demonstrated throughout the review process conducted by the Root River Advisory Group, the SEWRPC staff seriously considers suggestions from Group members, and often drafts plan modifications in response to those suggestions. However, the SEWRPC staff must ultimately be able to justify plan recommendations based on the facts as determined through application of sound planning principles. The situation described in the preceding paragraph is a case where the SEWRPC staff must weigh all pertinent factors and reach a conclusion consistent with its role as the areawide water quality planning agency for the Southeastern Wisconsin Region.]

Mr. Boxhorn reviewed the subsection evaluating alternatives that address urban nonpoint source pollution. He stated that the conclusions of the evaluation were: 1) the recommendations of the watershed restoration plan should focus on urban stormwater management and coordinated programs to detect and eliminate illicit discharges to storm sewer systems; 2) the watershed restoration plan could incorporate recommendations for maintaining and upgrading marina waste management facilities, but should not give them heavy emphasis; and 3) the watershed restoration plan should incorporate measures to control nuisance animals and pet litter only in response to identified water quality problems resulting from these sources.

Mr. Boxhorn reviewed the subsection evaluating alternatives that address rural nonpoint source pollution. He stated that the conclusions of the evaluation were: 1) recommendations of the watershed restoration plan should emphasize agricultural manure management and barnyard runoff management, 2) restricting livestock access to waterbodies could be included by subsuming it under agricultural manure management and barnyard runoff management, 3) the watershed restoration plan should incorporate measures to address horse manure on trails and roads only in response to identified water quality problems resulting from these sources, and 4) it would be acceptable for expanded inspection and maintenance programs for private onsite wastewater treatment systems to be implemented in accordance with the deadlines set forth in Section SPS 383.255 of the *Wisconsin Administrative Code.*

REVIEW OF PARTIAL PRELIMINARY DRAFT CHAPTER IV, "CHARACTERIZATION OF THE WATERSHED," OF SEWRPC COMMUNITY ASSISTANCE PLANNING REPORT NO. 316 (CAPR NO. 316), "*A RESTORATION PLAN FOR THE ROOT RIVER WATERSHED*"

Mr. Hahn noted that development of Chapter IV, "Characterization of the Watershed," is an ongoing process that would continue for the near future as additional information becomes available and is incorporated and as text is drafted for the habitat focus area.

At Mr. Hahn's request, Mr. Slawski presented data on existing and potential riparian buffers in the Root River watershed.

[Secretary's Note: Mr. Slawski's presentation is attached herein as Exhibit B.]

Mr. Slawski stated that the riparian buffer is the boundary between the water's edge and disturbed landscape. He noted that environmental corridors are not synonymous with buffers. He explained that some primary environmental corridors include developed land uses. He added that there can also be considerable fragmentation of environmental corridors. Mr. Hahn noted that there is no extension of sanitary sewer service into primary environmental corridors. He explained that the idea is to not enable extensive development in such corridors.

Mr. Osterman asked whether the minimum 200-foot width of primary environmental corridors includes the width of the stream. Mr. Slawski replied that it does.

Mr. Slawski noted that the RWQMPU recommended a 75-foot riparian buffer for streams. He explained this was based primarily on the effects of the buffer on instream water quality based on removal of sediment and nutrients. Mr. Sampson asked whether the recommendation is 75 feet on each side of the stream. Mr. Slawski replied that it is. He noted that in order to achieve many buffer functions, larger buffers than this are required.

Mr. Slawski stated results of the buffer analysis are shown on the maps in the Riparian Buffer appendix. He explained that the buffer analysis identified the existing riparian buffers. He added that the analysis also identified all agricultural and open lands into which buffers could potentially be extended based on three widths: the 75-foot minimum recommended buffer width, a 400-foot minimum core habitat width for wildlife protection, and a 1,000 optimal core habitat width for wildlife habitat protection. He noted that the analysis also assessed whether the areas identified had some protection from development. He explained that this protection may be through public ownership; private protections, such as land trust or conservancy ownership; being an identified one-percent-annual-probability floodway or floodplain; or being identified as an Advanced Identification of Wetland Disposal (ADID) wetland or water. He noted that floodways have not been identified in Racine County. He indicated that the existing and potential buffers shown in hatching on the maps in the appendix are those without any protection. Mr. Hahn noted that additional work will need to be done on the vulnerability of the areas in Racine County. He suggested that because of Racine County's application of a general floodplain overlay district in which no filling is permitted without the provision of compensatory floodwater storage, the degree of vulnerability in floodplains in the County is not as great as the analysis indicates.

Ms. Greenfield asked whether this information will be used to create a list of critical areas to target for reducing pollutant loads. Mr. Slawski replied that it will be done in general terms. Mr. Hahn noted that the RWQMPU produced maps showing the relative contributions of nonpoint source pollutant loads by subwatershed.

Mr. Slawski suggested a prioritization scheme relative to riparian buffers. He indicated that the highest priority should be to protect the existing riparian buffers. He continued that after this it is necessary to decide how much additional land to add to the buffers, including how far these should extend from the streambank. He explained that the idea is to try to target a level of protection. Mr. Hahn stated that staff will identify specific projects to the extent possible. He indicated that some issues better lend themselves to this than others. He noted that the buffer analysis points toward areas where some projects should be targeted. He indicated that the plan will also provide a more definite framework for decision making.

Mr. Clayton asked whether the plan will address policy considerations. Mr. Hahn replied that it will to some extent. He cited the example of the Town of Mukwonago's zoning ordinance as a potential approach.

Mr. Martinka stated that he would like to see the plan recommend specific projects. He explained it is valuable to be able to cite plan recommendations in support of grant proposals.

Mr. Sampson said that in his experience, the main goals of agricultural landowners in installing buffers are financial payments and creation of habitat for hunting. He noted that agricultural programs allow payments for buffer widths of up to 150 feet. He recommended considering installing buffers in floodplain locations first, followed by locations with steep slopes. He noted that an additional goal some landowners have is to be able to harvest hay in the buffer. He indicated that any talking points related to their goals that he could bring to agricultural landowners would be very helpful. Mr. Slawski asked whether high groundwater recharge is desirable to landowners. Mr. Sampson replied that it may be.

DATE AND TIME OF NEXT PUBLIC STAKEHOLDER MEETING

Ms. Greenfield thanked everyone in attendance for their participation and noted that the next Root River Restoration Planning Group (stakeholder group) meeting will be held at 5:30 p.m. on December 4, 2013, at Racine County Ives Grove Office Complex.

ADJOURNMENT

There being no further business, the meeting was adjourned by unanimous consent at 12:23 p.m.

COMMENTS BY ROGER CHERNIK, PRESIDENT, RIVER BEND NATURE CENTER ON CHAPTER IV OF SEWRPC CAPR 316 SUBMITTED SUBSEQUENT TO THE OCTOBER 30, 2013, ROOT RIVER WATERSHED RESTORATION PLAN PUBLIC STAKEHOLDER MEETING

At the October 30, 2013, meeting of the Root River Restoration Planning Group, Mr. Chernik commented that canoe and kayak rental data presented in Chapter IV may not present an accurate reflection of rentals occurring at River Bend Nature Center because they only include data from late spring and early summer. He subsequently provided additional data regarding rentals and other recreational activities at River Bend to SEWRPC staff via electronic mail. The email messages from Mr. Chernik are included herein as Exhibit C.

[Secretary's Note: The last two sentences of the last paragraph on page 111 of Chapter IV were revised to read (Bold text is included here to denote language changed or added onto the text. Text will not be bold in the report.):

"For the **24-week** period beginning **in mid-May 2013** and ending **at end of October 2013**, River Bend Nature Center reported **966 hours of canoe and kayak rentals to 1,256 individuals.** The average daily rentals over this period were about **5.8** hours per day **to 7.5 individuals. River Bend Nature Center also reported about 480 hours of fishing by 320 children attending summer camps at the Center during 2013.**"]

ADDITIONAL HORLICK DAM FREEBOARD AND COST ANALYSES

Subsequent to the November 13, 2013, meeting of the Advisory Group, SEWRPC staff completed additional analyses regarding freeboard and costs related to the alternatives examined for Horlick dam. This resulted in additional cost estimate information for the various alternatives. The revised costs are summarized in Table V-D of draft Chapter V of SEWRPC CAPR 316. A copy of the revised table is included herein as Exhibit D.

As a result of these additional analyses, several changes were made to the text of Chapter V. These are documented below by alternative.

Alternative 1—Full Notch of Current Dam Spillway for 0.2-Percent-Annual-Probability (500-Year) Flood Capacity
Additions were made to the cost section of the description of this alternative to reflect the different, additional assumptions regarding freeboard.

[Secretary's Note: The following paragraph was added after the second full paragraph on page 46:

"The modifications included in Alternative 1 provide approximately 0.5 foot of freeboard to the tops of the existing left and right concrete abutments for the maximum 0.2-percent-annual-probability flood elevation. Freeboard is the difference between the water surface elevation on the upstream side of Horlick dam and the top of the dam abutments. Freeboard provides a level of safety against overtopping of the abutments, since such overtopping could potentially cause structural and safety concerns for the dam. The potential for failure of the existing concrete abutments under Alternative 1, if they were to be overtopped, was judged to be lower than for the earthen embankments called for under Alternative 2 (described below). Thus, a lesser freeboard was judged to be acceptable for this systems-level analysis. However, to provide a cost comparison to Alternative 2 that is based on the provision of the same amount of freeboard for the 0.2-percent-annual-probability flood, Alternative 1 was modified. That modification called for lowering the entire dam spillway by 5.4 feet to elevation 624.5 feet above NGVD 29. Based on the same cost assumptions listed previously, the systems-level present worth cost estimate, including capital and operation and maintenance costs, for the Alternative 1 modifications to achieve two feet of freeboard is $521,000 (see Table V-D).[84]

[84]*The determination of an acceptable level of freeboard if Alternative 1 were selected for implementation would depend on specific considerations of the detailed project design and possible regulatory requirements, and 0.5 foot of freeboard could be appropriate. Thus, the scenario under which Alternative 1 calls for two feet of freeboard can be considered to represent a possible upper level for project costs.*"]

Alternative 2—Lengthen Current Dam Spillway and Raise Abutments for 0.2-Percent-Annual-Probability (500-Year) Flood Capacity
Additions were made to the cost section of the description of this alternative to reflect the different, additional assumptions regarding freeboard.

[Secretary's Note: The first paragraph on page 47 was revised to read (Bold text is included here to denote language changed or added onto the text. Text will not be bold in the report.):

"This alternative modifies the dam to safely pass the 0.2-percent-annual-probability (500-year recurrence interval) flood by lengthening the spillway crest and raising the top of both abutments. This alternative maintains the spillway crest at elevation 629.9

feet above NGVD 29 and lengthens the crest by approximately 20 feet, utilizing the old fishway area, to a total crest length of 140 feet. Both the left and right abutments would be rebuilt to a top elevation of 638.0 feet above NGVD 29, **and adjacent earthen embankments would be added, providing approximately two feet of freeboard to the tops of the embankment sections based on the maximum 0.2-percent-annual-probability flood elevation. Because of the potential for the embankments to erode due to overtopping, a higher freeboard was selected for this alternative than for Alternatives 1, 3, and 4.**[86] Also included in this alternative is raising Old Mill Drive to elevation 640.0 feet above NGVD 29 which is described later in this section. These changes would enable safe conveyance of the 0.2-percent-annual-probability flood within the dam spillway (see Figure V-C).

Modifications associated with Alternative 2 would minimally alter both the flood and normal flow profiles between the dam and STH 31 in comparison to the Baseline Condition. The 0.2- and one-percent-annual-probability (500-year and 100-year recurrence interval, respectively) flood stage elevations would be lowered approximately 0.7 foot at the dam crest relative to the corresponding flood elevations under the Baseline Condition. The one- and 0.2-percent-annual-probability flood profiles under Alternative 2 are essentially the same as under the Baseline Condition in the vicinity of STH 31. Dam tailwater elevations associated with this alternative would remain the same as under the Baseline Condition.

[86]***As noted in the sections of this chapter describing Alternatives 1, 3, and 4, modifications to those alternatives were developed which would provide approximately two feet of freeboard to the tops of the left and right concrete abutments of the Horlick dam based on the maximum 0.2-percent-annual-probability flood elevation. The inclusion of estimated systems-level project costs with two feet of freeboard enables comparison of Alternatives 1, 3, and 4 with Alternative 2 based on the same freeboard condition that was considered appropriate for Alternative 2 because of the possibility of embankment failure if overtopped. The determination of an acceptable level of freeboard if Alternatives 1, 3, or 4, were selected for implementation would depend on specific considerations of the detailed project design and possible regulatory requirements, and 0.5 foot of freeboard could be appropriate for Alternatives 1, 3, and 4. Thus, the scenarios under which those three alternatives call for two feet of freeboard can be considered to represent a possible upper level for project costs.”***

The footnote in the chapter at the end of the first sentence of the first paragraph above was retained.]

Alternative 3—Modify Current Fishway in Addition to Alternative 1 Changes
Costs were updated and additions were made to the cost section of the description of this alternative to reflect the different, additional assumptions regarding freeboard.

[Secretary’s Note: The fourth sentence on the last full paragraph of page 50 was revised to read:

“Based on these assumptions, the systems-level present worth cost estimate, including capital cost and operation and maintenance is **$605,000**.”

The following paragraph was added after the first full paragraph on page 51:

"Alternative 3 provides approximately 0.5 foot of freeboard to the tops of the existing left and right concrete abutments for the maximum 0.2-percent-annual-probability flood elevation. The potential for failure of the existing concrete abutments under Alternative 3, if they were to be overtopped, was judged to be lower than for the earthen embankments called for under Alternative 2. Thus, a lesser freeboard was judged to be acceptable for this systems-level analysis. However, to provide a cost comparison to Alternative 2 that is based on the provision of the same amount of freeboard for the 0.2-percent-annual-probability flood, Alternative 3 was modified. That modification called for lowering the entire dam spillway by 5.4 feet to elevation 624.5 feet above NGVD 29 as well as lowering and shortening the fishway. Based on the same cost assumptions listed previously, the systems- level present worth cost estimate, including capital and operation and maintenance costs, for the Alternative 3 modifications to achieve two feet of freeboard is $655,000 (see Table V-D).[89]

[89]*The determination of an acceptable level of freeboard if Alternative 3 were selected for implementation would depend on specific considerations of the detailed project design and possible regulatory requirements, and 0.5 foot of freeboard could be appropriate. Thus, the scenario under which Alternative 3 calls for two feet of freeboard can be considered to represent a possible upper level for project costs.*"]

Alternative 4—Complete Notch of Current Dam Spillway
Additions were made to the cost section of the description of this alternative to reflect the different, additional assumptions regarding freeboard.

[Secretary's Note: The following paragraph was added after the second full paragraph on page 54:

"Alternative 4 provides approximately 0.5 foot of freeboard to the tops of the existing left and right concrete abutments for the maximum 0.2-percent-annual-probability flood elevation. The potential for failure of the existing concrete abutments under Alternative 3, if they were to be overtopped, was judged to be lower than for the earthen embankments called for under Alternative 2. Thus, a lesser freeboard was judged to be acceptable for this systems-level analysis. However, to provide a cost comparison to Alternative 2 that is based on the provision of the same amount of freeboard for the 0.2-percent-annual-probability flood, Alternative 4 was modified. That modification called for widening the crest length at elevation 621.0 feet above NGVD 29 by 15 feet. Based on the same cost assumptions listed previously, the systems-level present worth cost estimate, including capital and operation and maintenance costs, for the Alternative 4 modifications to achieve two feet of freeboard is $533,000 (see Table V-D).[94]

[94]*The determination of an acceptable level of freeboard if Alternative 4 were selected for implementation would depend on specific considerations of the detailed project design and possible regulatory requirements, and 0.5 foot of freeboard could be appropriate. Thus, the scenario under which Alternative 4 calls for two feet of freeboard can be considered to represent a possible upper level for project costs.*"]

Alternative 5—Full Removal of Dam
Additions were made to the description of this alternative to reflect the different, additional assumptions regarding freeboard.

[Secretary's Note: The following paragraph was added after the third full paragraph on page 54:

"Alternative 5 provides approximately four feet of freeboard to the tops of the remaining left and right concrete abutment sections of the Horlick dam based on the maximum 0.2-percent-annual-probability flood elevation. However, while unlikely, failure of one or both abutments under the Alternative 5 configuration would not be expected to create a significant uncontrolled release of water, since there would be no impoundment of water under this condition."]

ROOT RIVER WRP SUMMARY NOTES 11/13/2013 MTG (00214707).DOC
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Exhibit A

SEWRPC Community Assistance Planning Report No. 316

A RESTORATION PLAN FOR THE ROOT RIVER WATERSHED

Appendix I

SEWRPC MEMORANDUM TO FILE REQUIREMENTS OF THE *WISCONSIN ADMINISTRATIVE CODE* RELATED TO EFFLUENT LIMITATIONS AND DISINFECTION REQUIREMENTS APPLICABLE TO WASTEWATER TREATMENT PLANTS IN THE ROOT RIVER WATERSHED

ROOT RIVER WRP SUMMARY NOTES 11/13/2013 MTG (00214707).DOC
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12/20/13

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MEMORANDUM TO FILE

TO: Files

FROM: Joseph E. Boxhorn

DATE: May 25, 2012, revised December 19, 2013

SUBJECT: **REQUIREMENTS OF THE *WISCONSIN ADMINISTRATIVE CODE* RELATED TO EFFLUENT LIMITATIONS AND DISINFECTION REQUIREMENTS APPLICABLE TO WASTEWATER TREATMENT PLANTS IN THE ROOT RIVER WATERSHED**

At the May 2, 2012 meeting of the Advisory Committee for the Root River watershed restoration plan, questions arose as to whether concentrations of phosphorus and bacteria detected in water quality samples collected from stream sites located downstream from wastewater treatment plants (WWTPs) might indicate that discharges from the plants are contributing to degraded water quality in the receiving waters. The purpose of this memorandum is to document the results of a review of the effluent limitation and disinfection requirements set forth in the *Wisconsin Administrative Code* that apply to these WWTPs.

BACKGROUND

Three WWTPs discharge into streams within the Root River watershed. Two are municipally-owned and the third is privately owned. The municipally-owned plants are the Village of Union Grove WWTP, which discharges into the West Branch of the Root River Canal, and the Yorkville Sewer Utility No. 1's plant, which discharges into Ives Grove Ditch. The privately-owned plant serves the Fonk's Mobile Home Park and discharges into the East Branch of the Root River Canal. The locations of these WWTPs are shown on Map 108 of SEWPRC Technical Report No. 39, *Water Quality Conditions and Sources of Pollution in the Greater Milwaukee Watersheds*." The important point about the locations is that all three WWTPs discharge into upstream reaches of their respective receiving waters.

The water use objective for the stream reaches that each of these WWTPs discharge into, as codified in Chapter NR 102, "Water Quality Standards for Wisconsin Surface Waters," of the *Wisconsin Administrative Code*, is limited aquatic life. In each case, the stream flows into another stream or stream reach which has a water use objective of limited forage fish. Farther downstream, each stream flows into another stream or a stream reach that have objectives of warm water fish and aquatic life. These water use objectives are important because the codified water use objective of a waterbody is a factor in determining the water quality criteria that apply to the waterbody and the effluent limitations applicable to point sources discharging into the waterbody.

APPLICABLE WATER QUALITY CRITERIA

Chapter NR 102 also sets forth water quality criteria for surface waters of the State. The following water quality criteria apply to limited aquatic life waters:

- Dissolved oxygen concentration is not to fall below 1.0 mg/l,
- pH is to remain between 6.0 and 9.0 standard units, and

- Membrane filter fecal coliform counts may not exceed 200 colonies per 100 ml as a geometric mean or exceed 400 colonies in more than 10 percent of all samples during any month.

It is important to note that NR 102.06(6)d specifically excludes limited aquatic life waters from Wisconsin's water quality criteria for phosphorus.

The following water quality criteria apply to limited forage fish waters:

- Dissolved oxygen concentration is not to fall below 3.0 mg/l,

- pH is to remain between 6.0 and 9.0 standard units,

- Membrane filter fecal coliform counts may not exceed 200 colonies per 100 ml as a geometric mean or exceed 400 colonies in more than 10 percent of all samples during any month, and

- Total phosphorus concentration is not to exceed 0.075 mg/l.

Similar criteria apply to warm water fish and aquatic life waters, except that for these waters dissolved oxygen concentration is not to fall below 5.0 mg/l.

EFFLUENT LIMITATIONS

Effluent limitations for WWTPs are set forth in Chapters NR 210, "Sewage Treatment Works," and NR 217, "Effluent Standards and Limitations for Phosphorus." The effluent limitations set forth in the code for WWTPs discharging into limited aquatic life waters are shown in Table 1. A few explanations are in order. First, the code gives the Wisconsin Department of Natural Resources the authority to impose more stringent effluent limitations than those specified where necessary to meet water quality standards for water receiving the treated discharge.[1] Similarly, the code also gives the Department the authority to impose effluent limitations for pollutants other than those specified where necessary to meet water quality standards for water receiving the treated discharge.[2]

Second, under conditions specified in NR 210.07(4), a permitted WWTP may request that the Department substitute an effluent limitation for 5-day carbonaceous biochemical oxygen demand (CBOD5) for 5-day biochemical oxygen demand (BOD5). The conditions necessary for this substitution involve paired sampling of effluent for BOD5 and CBOD5 and, in some circumstances, sampling for ammonia nitrogen and nitrate nitrogen.

Third, NR 217.04(2) allows permitted WWTPs to seek alternative effluent limitations for total phosphorus where achieving an effluent limitation of 1.0 mg/l is not practically achievable, where operation of specific biological removal technologies will achieve a level of performance equivalent to a 1.0 mg/l effluent limitation, or where phosphorus-deficient wastewaters necessitate the addition of

[1]*Set forth in NR 210.05(3)f.*

[2]*Set forth in NR 210.05(4).*

phosphorus in order to assure efficient operation of the plant and to achieve compliance with other effluent standards.

Finally, NR 217.10 through NR 217.19 describe the circumstances under which, and the methodology for, the Department to impose water quality-based effluent limitations.

DISINFECTION REQUIREMENTS

Disinfection of wastewater effluent is required only in those cases where the Department has made a determination that the discharge of wastewater poses a risk to human and animal health. NR 210.06(3) specifies that the following information shall be used in identifying human and animal health risks:

- Proximity of the wastewater outfall to swimming beaches and other waters which have a high level of human contact recreational activities.
- Proximity of the wastewater outfall to public drinking water supply intakes.
- Proximity of the wastewater outfall to wetlands which support populations of waterfowl subject to disease outbreaks, which may be caused by the discharge of wastewater which has not been disinfected.
- The quality of the wastewater being discharged.
- Dilution and mixing characteristics of the wastewater with the receiving water.
- Bacterial indicator organism levels or sanitary survey results from sampling conducted in the vicinity of the wastewater outfall and near the sites used for recreational purposes.
- The classification of the receiving water and downstream waters as determined in s. NR 104.02 (1)
- The detention time of the wastewater treatment system. Except in extenuating circumstances, the discharge of wastewater to surface water from a treatment system with a detention time of 180 days or longer does not pose a risk to human and animal health.
- Other factors that are necessary to determine if there is a risk posed to human and animal health by the discharge of wastewater that has not been disinfected.

When a requirement for disinfection is imposed, the following effluent limitations apply:

- The geometric mean of fecal coliform bacteria in samples collected over 30 consecutive days is not to exceed 400 mg per 100 ml.[3]

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[3]*Presumably the units in this effluent limitation represent a typographical error in NR 210.06(2)a with the intent being that the geometric mean not exceed 400 colonies per 100 ml. If this is intended as a mass, it represents cell counts that are on the order of* 10^{11} *to* 10^{12} *cells per 100 ml (This is based on an assumption that most of the fecal coliform cells are* E. coli *and have a density of about 1.09 g/ml, a length (Footnote Continued)*

- Total residual chlorine in the effluent is not to exceed 0.1 mg/l.

MONITORING REQUIREMENTS

Monitoring requirements for WWTP influent and effluent are set forth in NR 210.04. Influent is required to be monitored for flow, BOD5 and suspended solids. Effluent is required to be monitored for BOD5, suspended solids, and pH. This section gives the Department the authority to adjust monitoring requirements on a case-by-case basis depending upon the characteristics of the wastewater and the potential for the wastewater to degrade water quality.

* * *

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of about 1.5 µm and a diameter of 0.9 µm. If it is assumed that the bacterial cells are from fecal coliform species other than E. coli, *this estimate may be low.).*

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Table 1

EFFLUENT LIMITATIONS FOR PUBLICLY OWNED TREATMENT WORKS AND PRIVATELY OWNED SEWAGE TREATMENT PLANTS DISCHARGING INTO LIMITED AQUATIC LIFE WATERS[a]

Constituent	30-day Average (mg/l)	7-day Average (mg/l)	Minimum Removal Efficiency (percent)	Minimum Concentration (mg/l)	Range (standard units)	Code Reference
Biochemical Oxygen Demand (5-day)	20	30	85	- -	- -	NR 210.05(3)(a)
Suspended Solids	20	30	85	- -	- -	NR 210.05(3)(b)
pH	- -	- -	- -	- -	6.0-9.0	NR 210.05(3)(c)
Dissolved Oxygen	- -	- -	- -	4.0	- -	NR 210.05(3)(d)
Carbonaceous Biochemical Oxygen Demand (5-day)[b]	16	25	85	- -	- -	NR 210.05(3)(e)
Total Phosphorus[c,d]	1.0	- -	- -	- -	- -	NR 217.04(1)(a)

[a]NR 210.05(4) gives the Department the authority to set more stringent effluent limitations for biochemical oxygen demand, suspended solids, pH, dissolved oxygen, and carbonaceous biochemical oxygen demand than those specified where necessary to meet water quality standards for the waters receiving the discharge

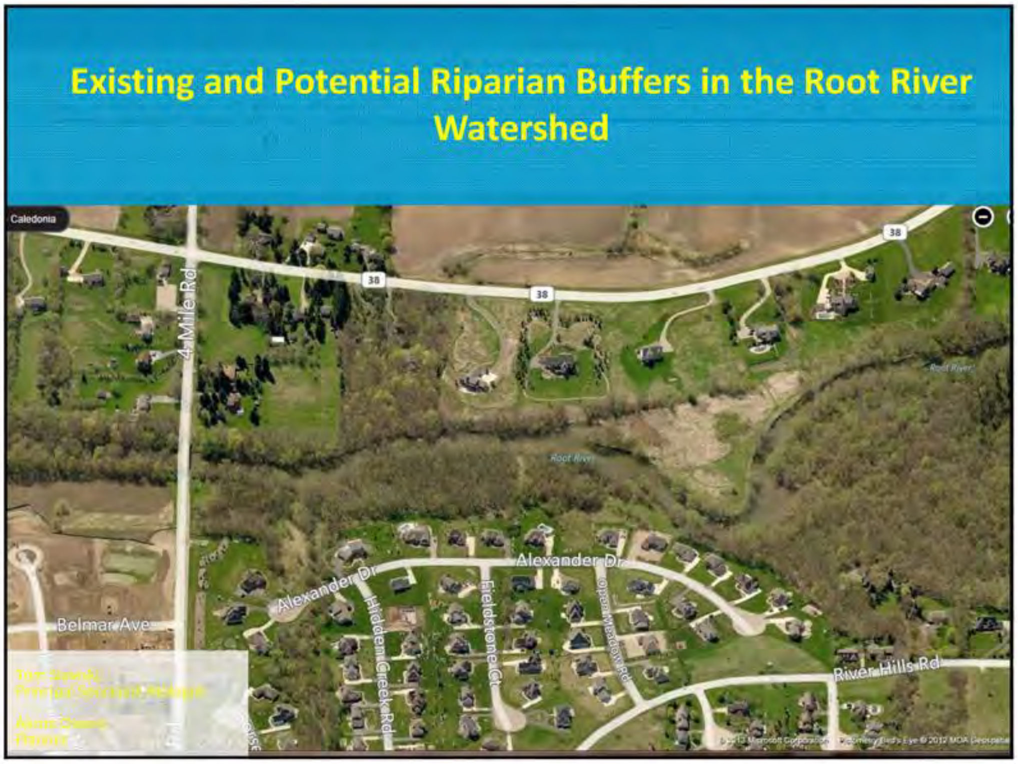
[b]Under certain circumstances specified in NR 210.07(4), a permittee may request that the Department substitute an effluent standard for carbonaceous biochemical oxygen demand for biochemical oxygen demand.

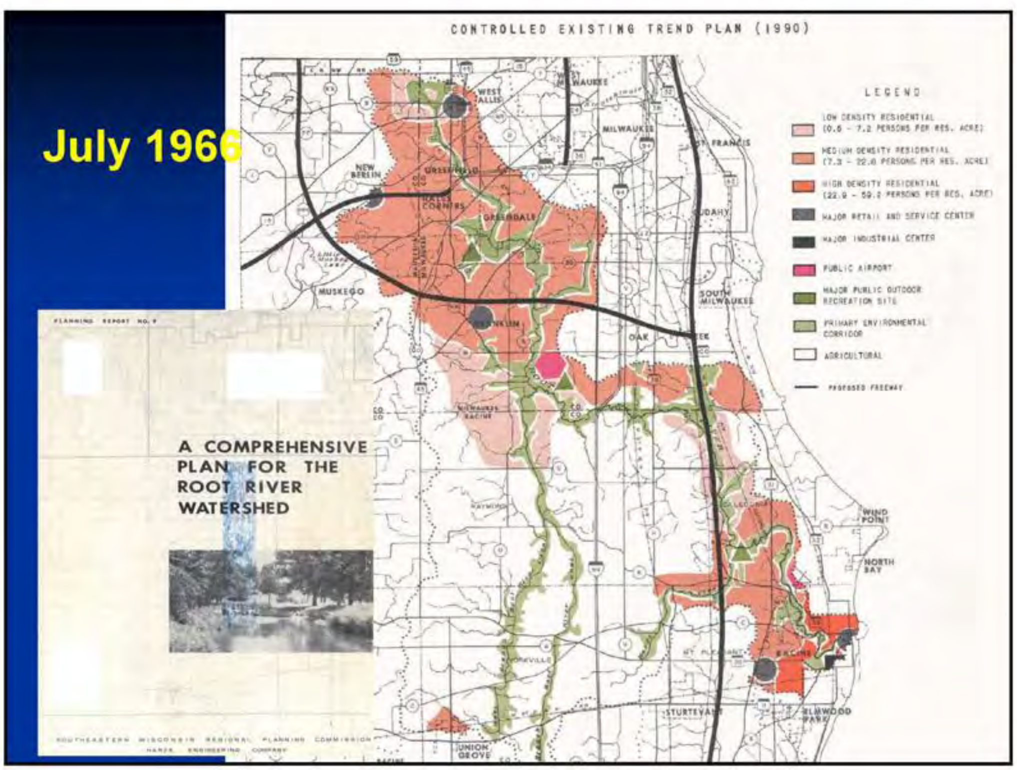
[c]NR 217.04(2) allows permittees to seek alternative effluent limitations where achieving an effluent limitation of 1.0 mg/l is not practically achievable, where operation of specific biological removal technologies will achieve a level of performance equivalent to a 1.0 mg/l effluent limitation, or where phosphorus-deficient wastewaters necessitate the addition of phosphorus to assure efficient operation and compliance with other effluent standards.

[d]NR 217.10 through NR 217.19 contains a provision and mechanism for the Department to develop water quality-based effluent limitations for total phosphorus .

Source: Wisconsin Department of Natural Resources.

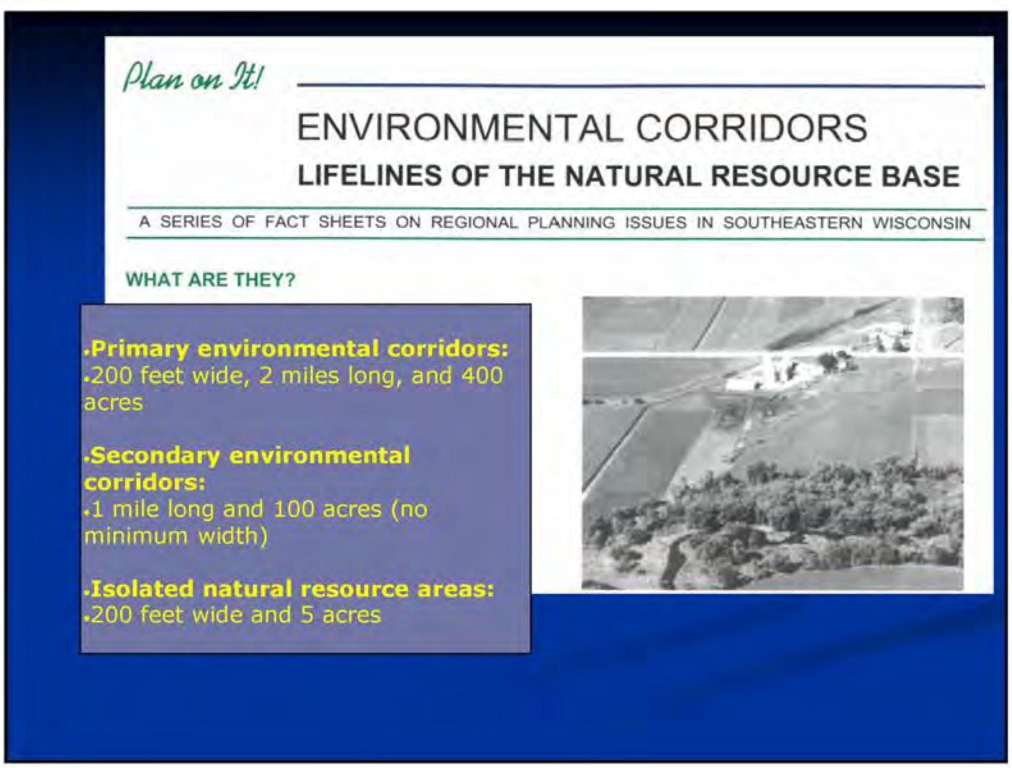
Exhibit B



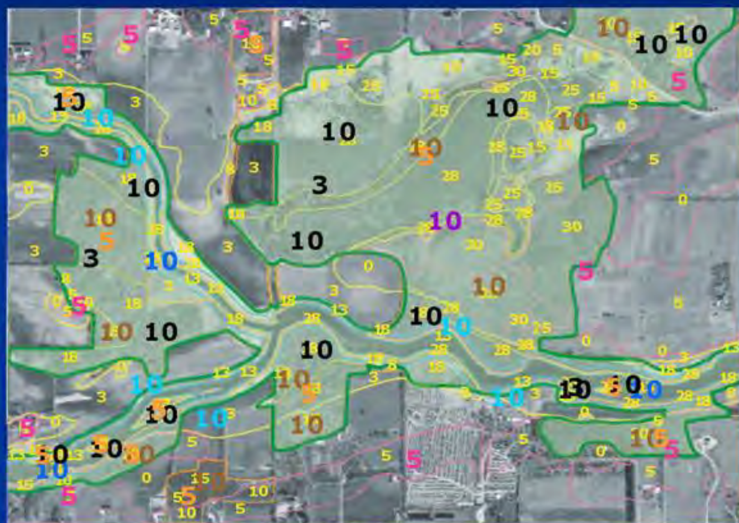


PRELIMINARY DRAFT


"The regional land use plan recommends the preservation of primary environmental corridors in essentially natural open uses, and encourages as well the preservation of secondary environmental corridors and isolated natural resource areas."
SEWRPC Planning Report no 48, 2035 Regional Land Use Plan, June 2006


Plan on It!
ENVIRONMENTAL CORRIDORS
LIFELINES OF THE NATURAL RESOURCE BASE
A SERIES OF FACT SHEETS ON REGIONAL PLANNING ISSUES IN SOUTHEASTERN WISCONSIN
WHAT ARE THEY?
•Primary environmental corridors:
•200 feet wide, 2 miles long, and 400 acres
•Secondary environmental corridors:
•1 mile long and 100 acres (no minimum width)
•Isolated natural resource areas:
•200 feet wide and 5 acres

An Example of the Environmental Corridor Delineation Process



Environmental Corridor Criteria and Mapping

Essential ecological elements, natural beauty, and overall quality of life:

- Lakes and Streams
- Shoreland
- Floodplain
- Wetlands
- Wet Soils
- Woodlands
- Wildlife Habitat
- Steep Slope
- Prairies

Additional recreational, aesthetic, ecological, and cultural elements:

- Existing & potential park and open space sites
- Historic Sites
- Scenic areas & vistas
- Natural Area and Critical Species Habitat Sites

Primary Environmental Corridor Composition: Residential, Commercial, Industrial

Land Use Description	FREQUENCY	SUM_ACRES
Single-Family (low density)	81	41.04
Single-Family (medium density)	17	4.44
Single-Family (suburban density)	6	5.87
Multi-Family Low Rise	6	1.45
Retail Sales and Service--Intensive	3	0.07
Retail Sales and Service--Intensive (unused land)	3	0.02
Manufacturing (unused land)	3	0.01
Wholesaling and Storage	2	0.21
Extractive	3	2.87

Primary Environmental Corridor Composition: Transportation

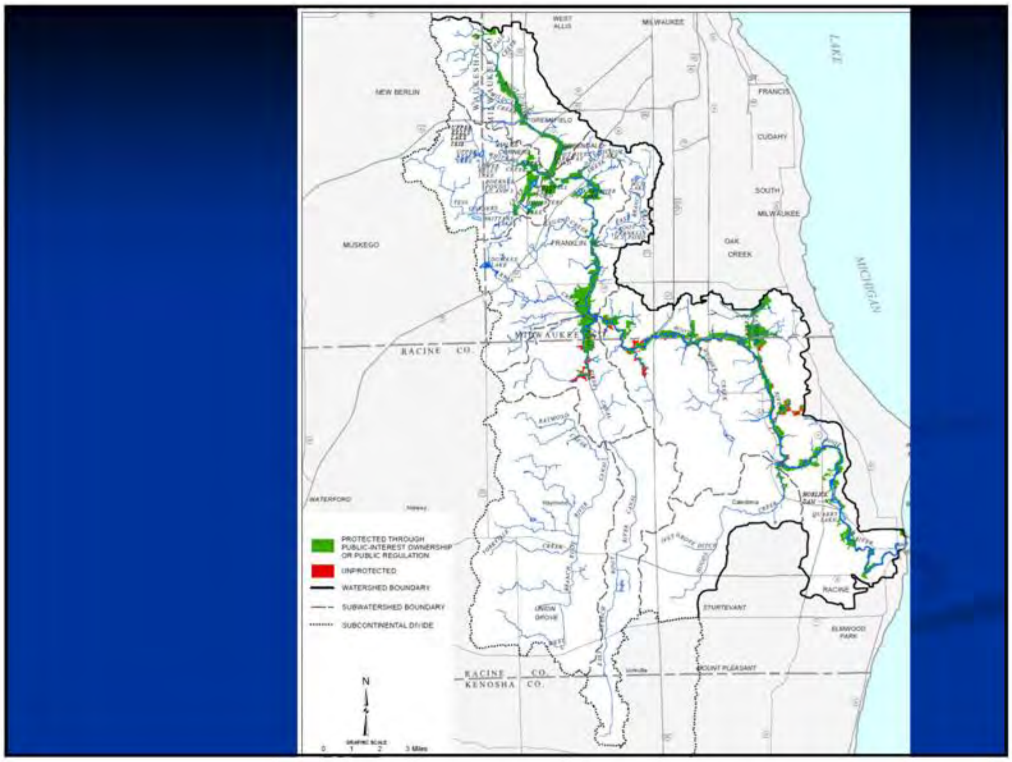
Land Use Description	FREQUENCY	SUM_ACRES_
Freeway	2	16.49
Freeway (wetland)	10	8.58
Standard Arterial Street and Expressway	25	42.42
Standard Arterial Street and Expressway (wetland)	12	2.74
Local and Collector Streets	41	51.83
Local and Collector Streets (wetland)	1	0.11
Off-Street Parking (Residential-Related)	1	0.08
Off-Street Parking (Retail Sales and Services-Related)	3	0.43
Off-Street Parking (Communications and Utilities-Related)	1	0.01
Off-Street Parking (Recreation-Related)	9	6.50
Rail-Related (Track Right-of-Way)	5	9.59
Rail-Related (Track Right-of-Way) (wetland)	5	15.49

Primary Environmental Corridor Composition: Communication, Utilities, Government

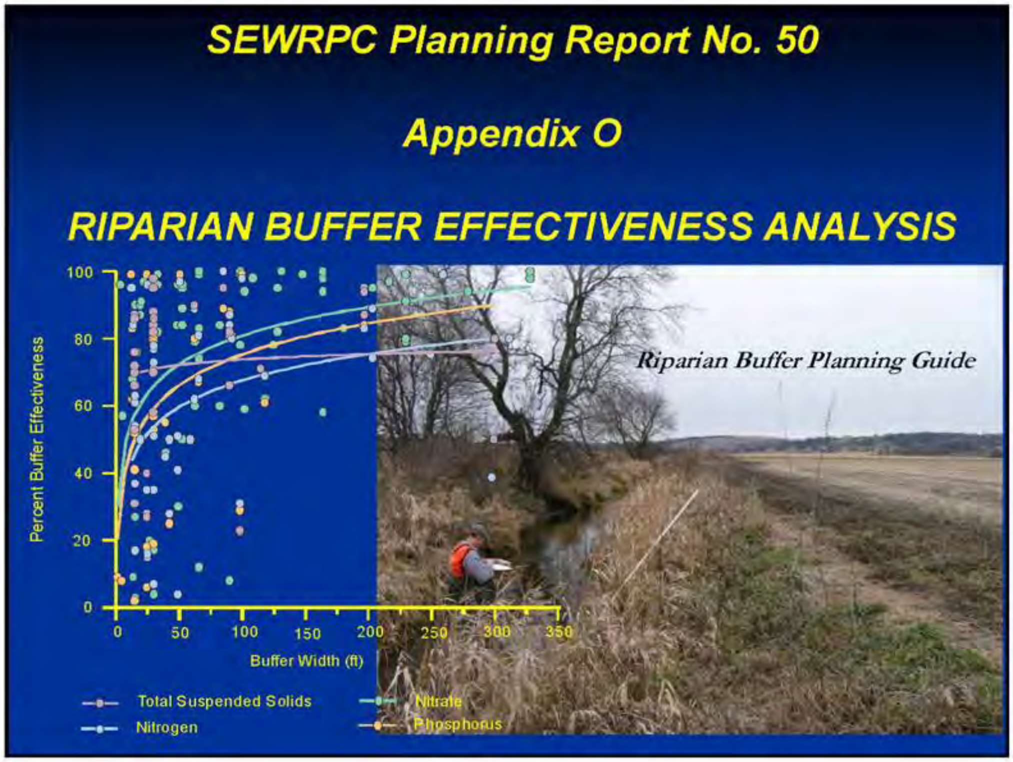
Land Use Description	FREQUENCY	SUM_ACRES_
Communications and Utilities	4	2.17
Communications and Utilities (wetland)	4	3.31
Administrative, Safety, and Assembly (Local)	2	0.17
Administrative, Safety, and Assembly (Regional)(unused land)	2	0.29
Educational (Regional)	2	1.10
Educational (Regional)(unused land)	1	0.61
Group Quarters (Regional)(unused land)	3	2.11
Cemetaries (Local)	1	0.16

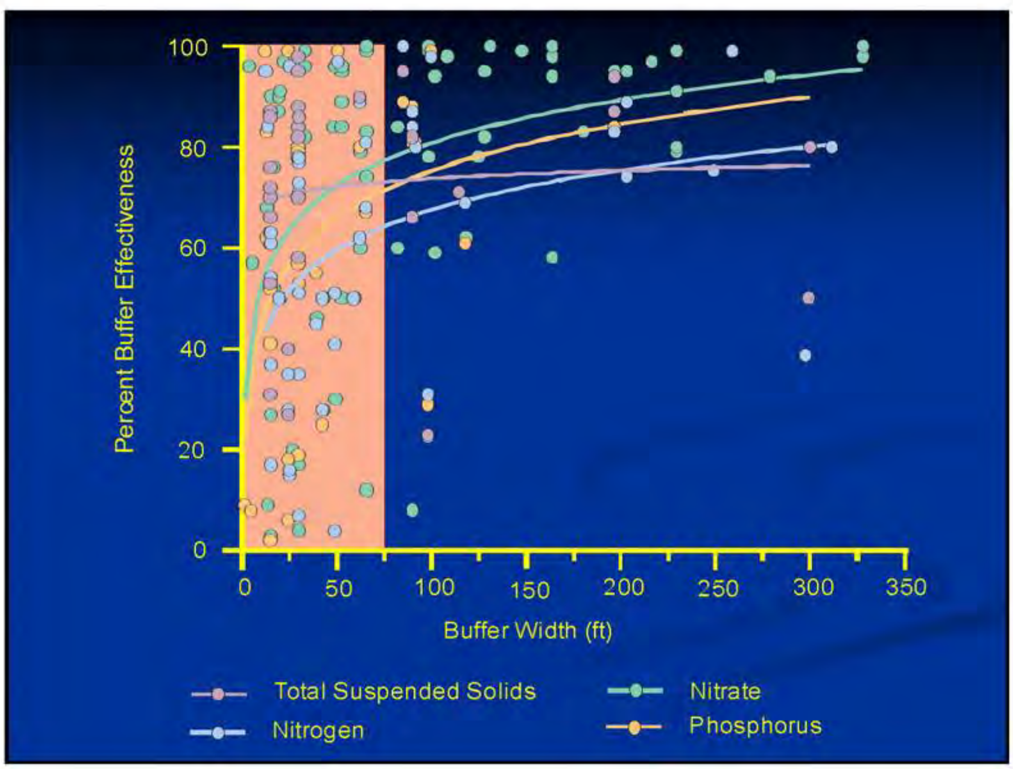
Primary Environmental Corridor Composition: Recreational, Agriculture, Open Lands

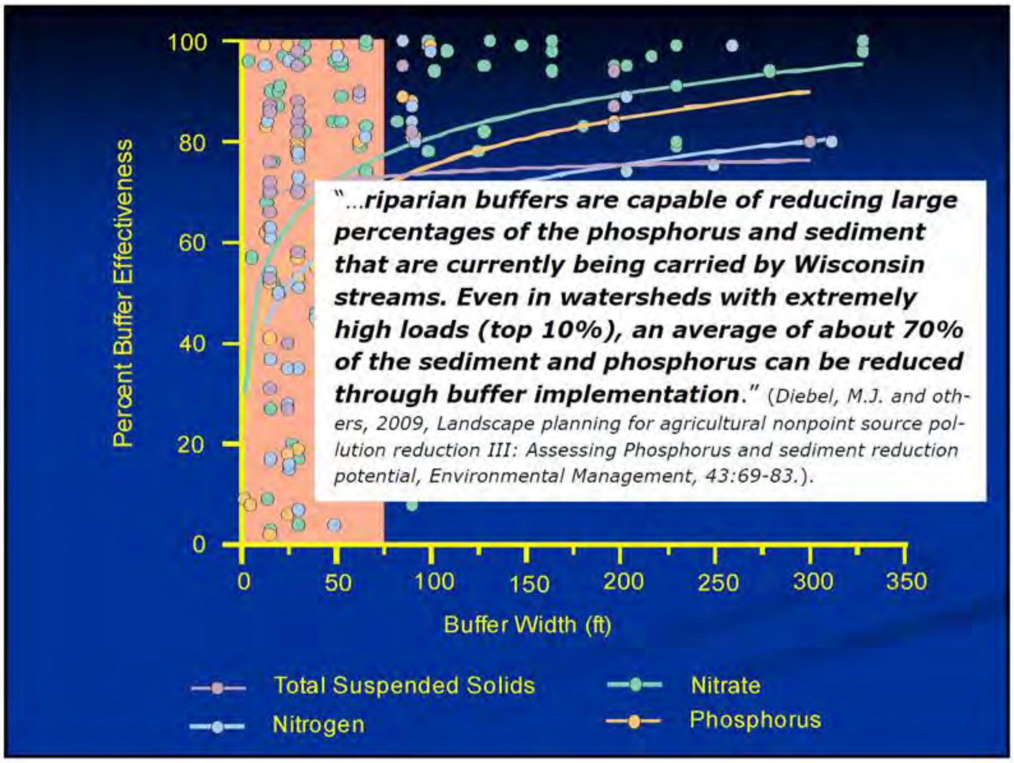
Land Use Description	FREQUENCY	SUM_ACRES
Cultural/Special Recreation Areas (Public)	1	0.68
Land-Related Recreation Areas (Public)	80	246.09
Land-Related Recreation Areas (Public)(wetlands)	3	1.55
Land-Related Recreation Areas (Nonpublic)	12	64.13
Water-Related Recreation Areas(Public)	3	8.20
Water-Related Recreation Areas(Nonpublic)	4	3.36
Cropland	74	62.80
Cropland (wetland)	12	20.32
Pasture and Other Agriculture	81	145.44
Orchards and Nursery	4	0.19
Wetlands	348	3416.07
Unused Lands (Urban)	78	123.08
Unused Lands (Rural)	151	253.42
Woodlands	227	1452.38
Surface Water	135	477.30

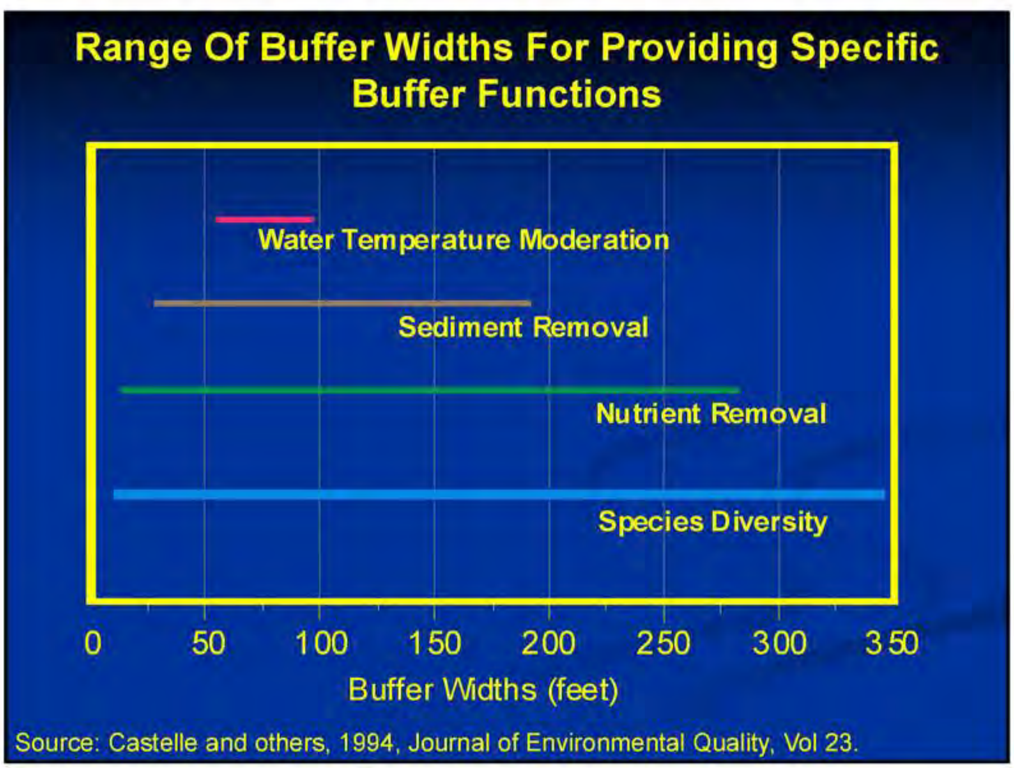

PROTECTED THROUGH PUBLIC-INTEREST OWNERSHIP OR PUBLIC REGULATION
UNPROTECTED
WATERSHED BOUNDARY
SUBWATERSHED BOUNDARY
SUBCONTINENTAL DIVIDE
WATERFORD
NEW BERLIN
MUSKEGO
FRANKLIN
CUDAHY
SOUTH MILWAUKEE
OAK CREEK
LAKE
MICHIGAN
RACINE CO.
KENOSHA CO.
STURTEVANT
RACINE
ELMWOOD PARK
UNION GROVE
MOUNT PLEASANT
N
GRAPHIC SCALE
0 1 2 3 Miles


Some communities have adopted the Environmental Corridor Concept into their land use ordinances, whereas other communities have not.

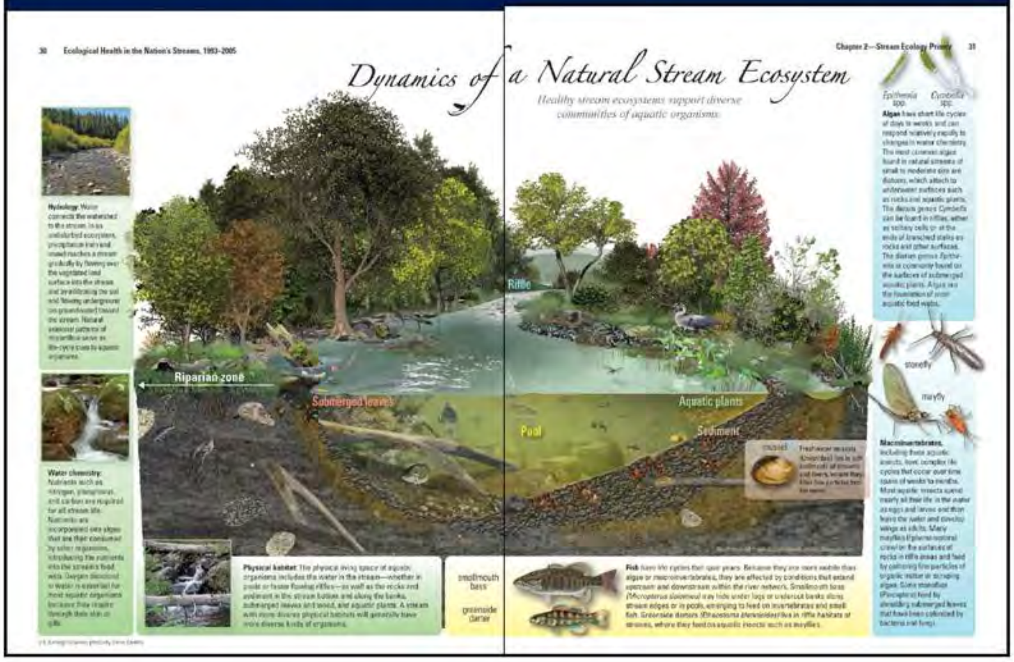

SEWRPC Planning Report No. 50
Appendix O
RIPARIAN BUFFER EFFECTIVENESS ANALYSIS
Riparian Buffer Planning Guide
Percent Buffer Effectiveness
Buffer Width (ft)
Total Suspended Solids
Nitrogen
Nitrate
Phosphorus

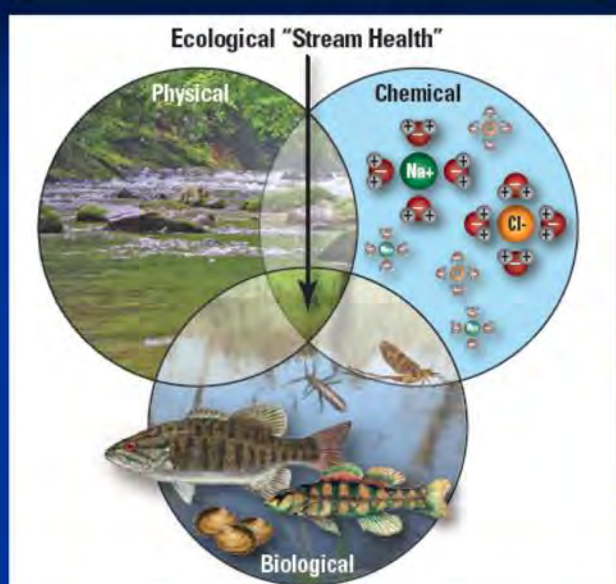

Percent Buffer Effectiveness
Buffer Width (ft)
Total Suspended Solids
Nitrogen
Nitrate
Phosphorus


100
80
60
40
20
0
Percent Buffer Effectiveness
0
50
100
150
200
250
300
350
Buffer Width (ft)
"...riparian buffers are capable of reducing large percentages of the phosphorus and sediment that are currently being carried by Wisconsin streams. Even in watersheds with extremely high loads (top 10%), an average of about 70% of the sediment and phosphorus can be reduced through buffer implementation." (Diebel, M.J. and others, 2009, Landscape planning for agricultural nonpoint source pollution reduction III: Assessing Phosphorus and sediment reduction potential, Environmental Management, 43:69-83.).
Total Suspended Solids
Nitrogen
Nitrate
Phosphorus


Range Of Buffer Widths For Providing Specific Buffer Functions
Water Temperature Moderation
Sediment Removal
Nutrient Removal
Species Diversity
0
50
100
150
200
250
300
350
Buffer Widths (feet)
Source: Castelle and others, 1994, Journal of Environmental Quality, Vol 23.

Prioritization Scheme (USGS, Ecological Health in the Nation's Streams, 1993–2005)





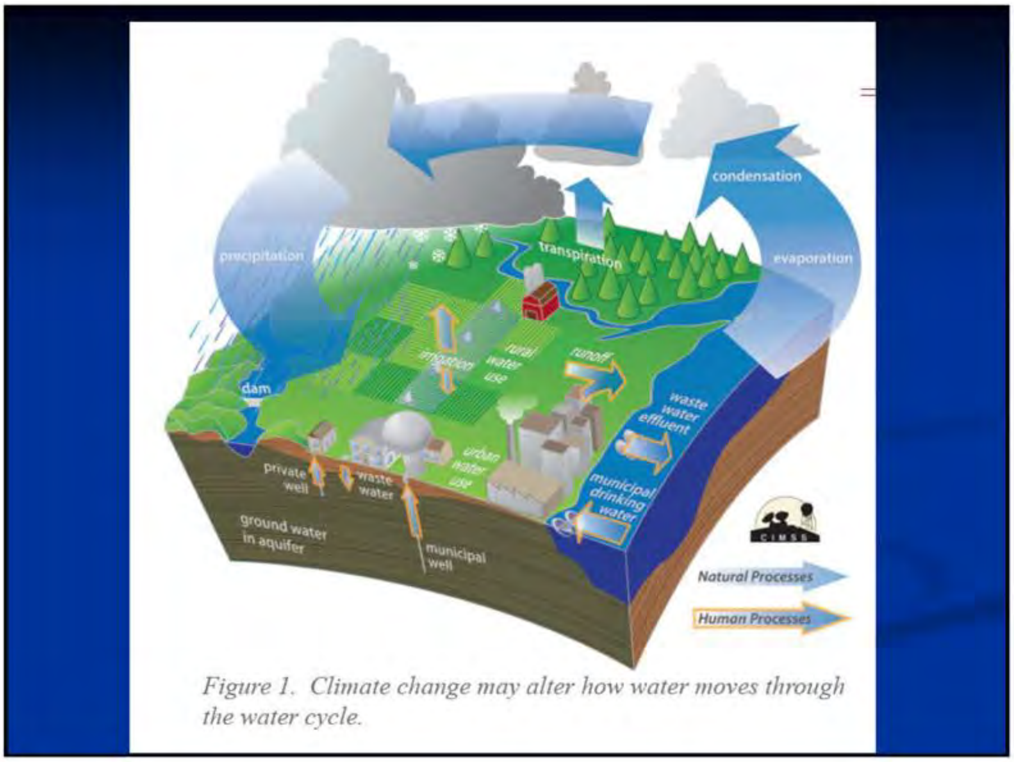
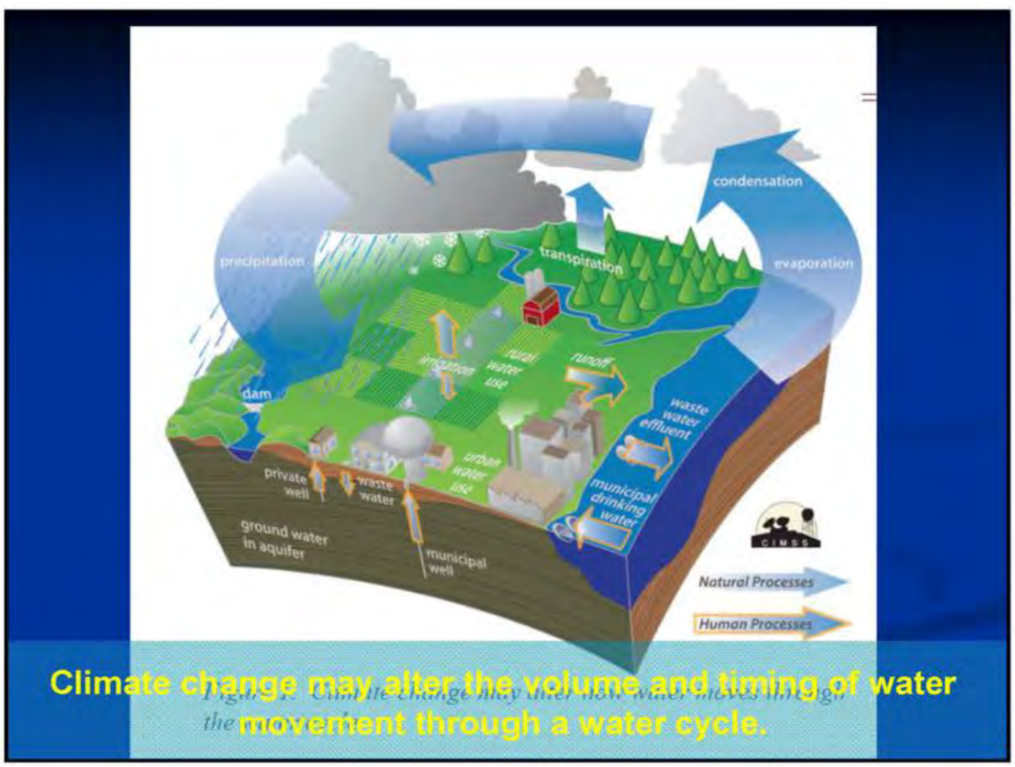
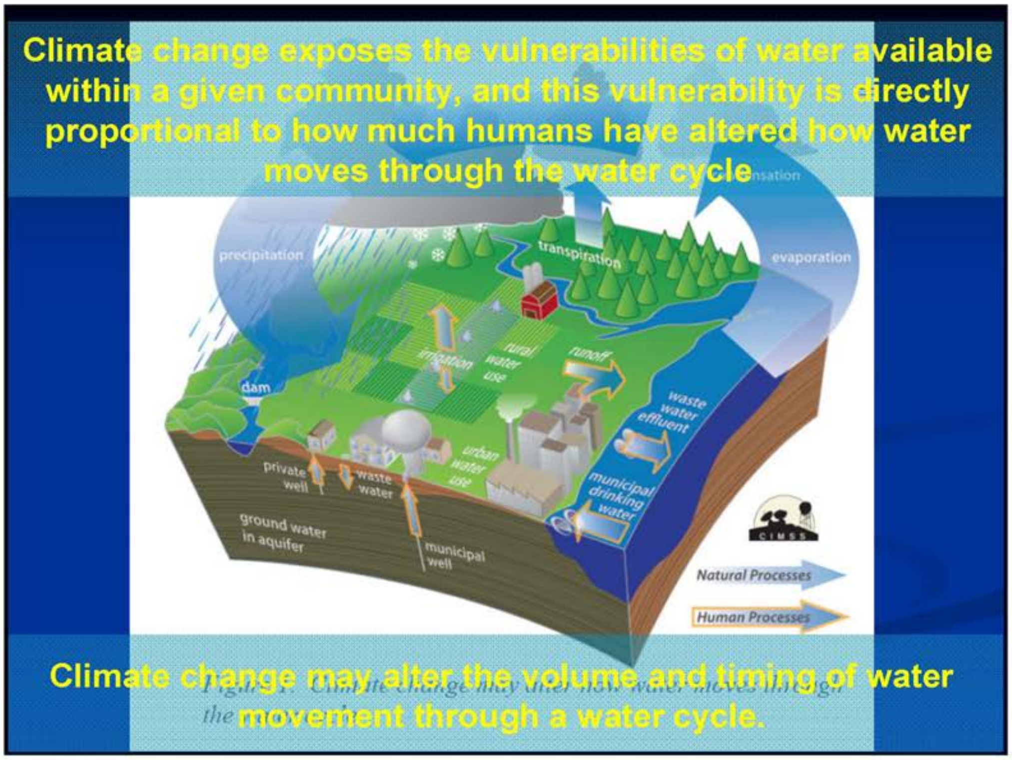
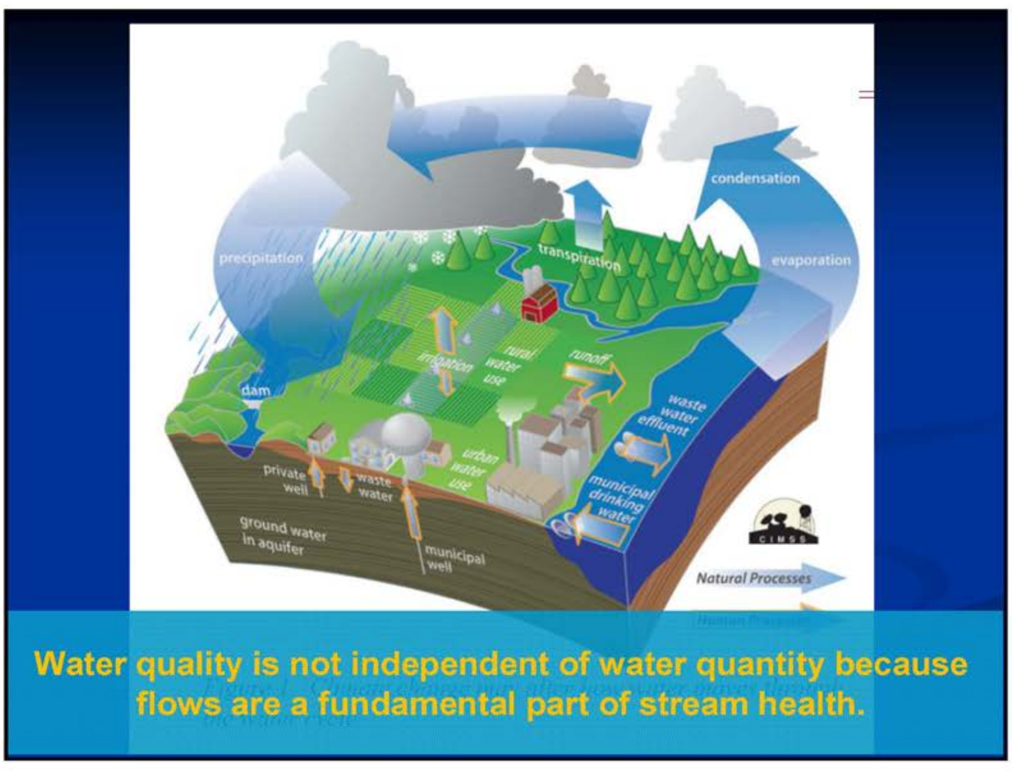
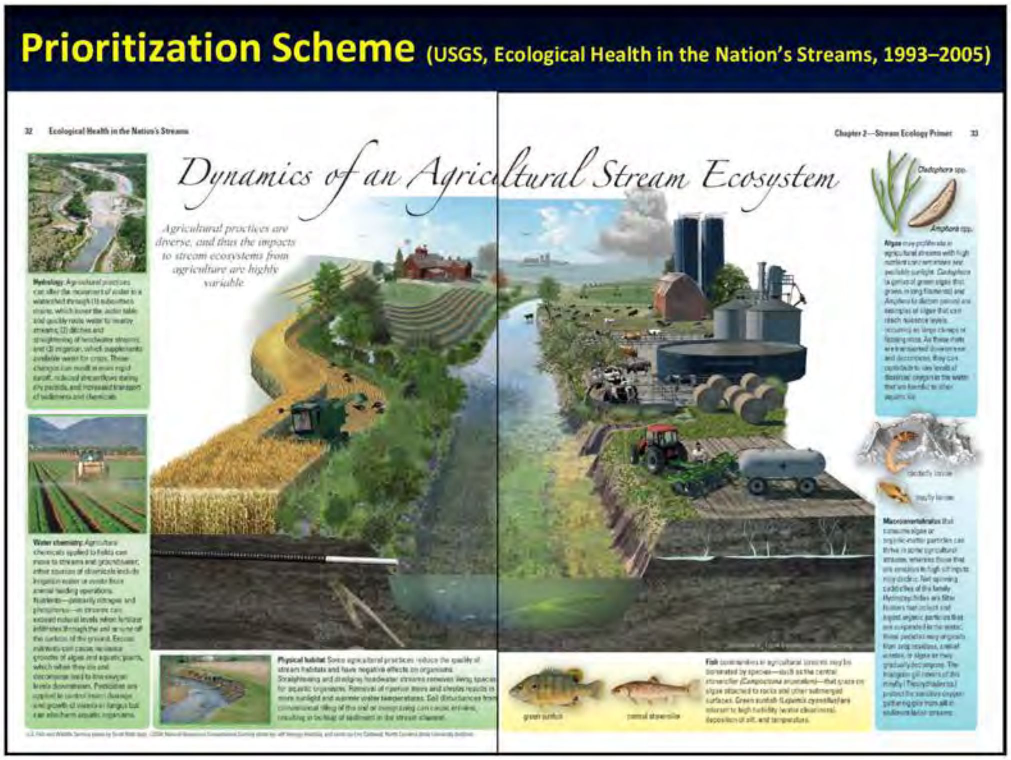


Figure 1. Climate change may alter how water moves through the water cycle.




Climate change exposes the vulnerabilities of water available within a given community, and this vulnerability is directly proportional to how much humans have altered how water moves through the water cycle
precipitation
transpiration
evaporation
dam
irrigation
rural water use
runoff
waste water effluent
urban water use
municipal drinking water
private well
waste water
ground water in aquifer
municipal well
CIMSS
Natural Processes
Human Processes
Climate change may alter the volume and timing of water movement through a water cycle.


condensation
precipitation
transpiration
evaporation
dam
irrigation
rural water use
runoff
waste water effluent
urban water use
municipal drinking water
private well
waste water
ground water in aquifer
municipal well
CIMSS
Natural Processes
Water quality is not independent of water quantity because flows are a fundamental part of stream health.

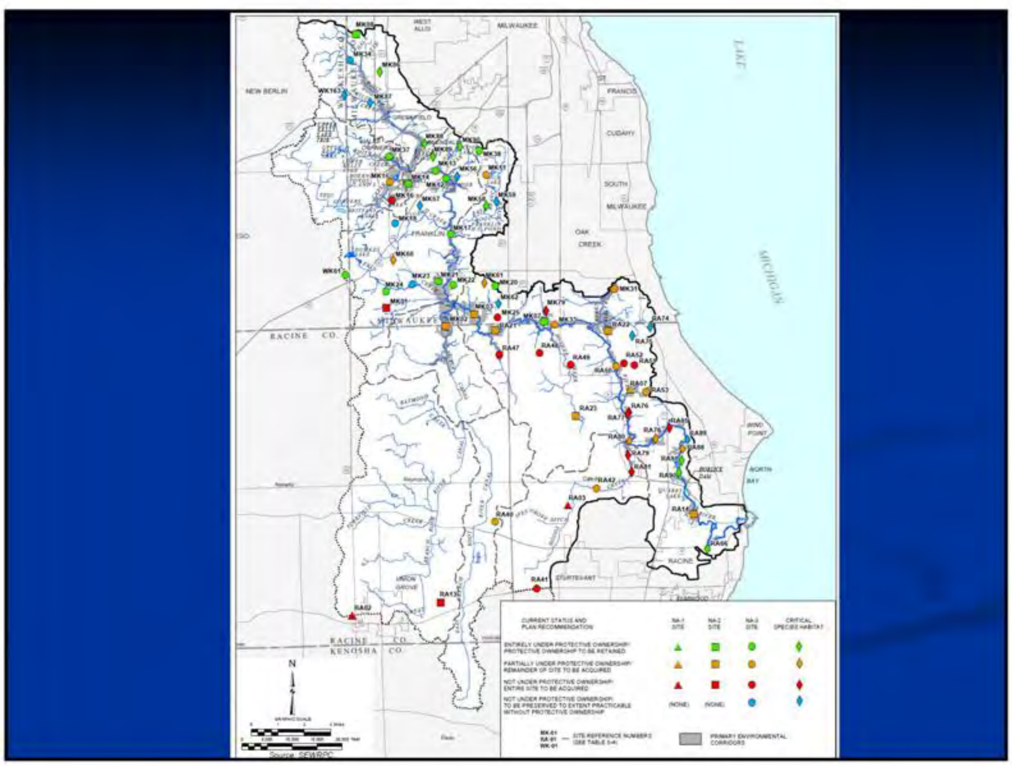

Prioritization Scheme (USGS, Ecological Health in the Nation's Streams, 1993–2005)
Dynamics of an Agricultural Stream Ecosystem
Agricultural practices are diverse, and thus the impacts to stream ecosystems from agriculture are highly variable.


Prioritization Scheme (USGS, Ecological Health in the Nation's Streams, 1993–2005)
Dynamics of an Urban Stream Ecosystem
Urban development may have significant impacts on stream ecosystems that are often obvious to the casual observer.


Prioritization Scheme (USGS, Ecological Health in the Nation's Streams, 1993–2005)
Dynamics of an Urban Stream Ecosystem
The presence of healthy streams in watersheds with substantial human influence indicates that it is possible to maintain and restore healthy stream ecosystems


The health of a stream depends on the health of the landscape!


Many other species also depend on clean water!
Banded Darter
Starhead Topminnow


LAKE
MICHIGAN
RACINE CO.
KENOSHA CO.
N

"Build ecological resilience"
through fish passage enhancement
creation and/or expansion of riparian buffers
Erosion control enforcement
Protection of groundwater recharge areas

Sometimes multiple dimensions need to be reconstructed to recreate these *Dimensions of Connectivity*

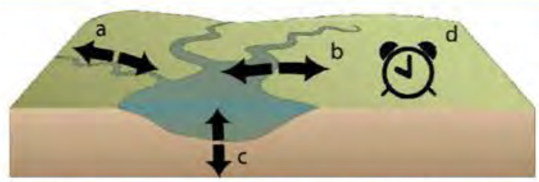
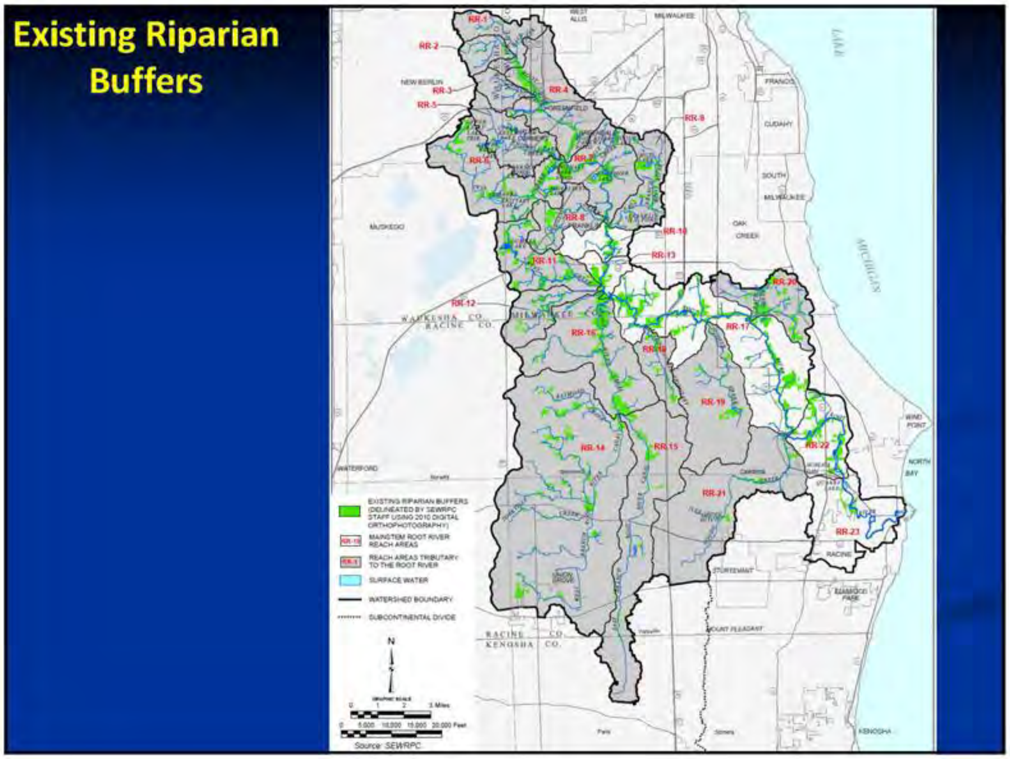


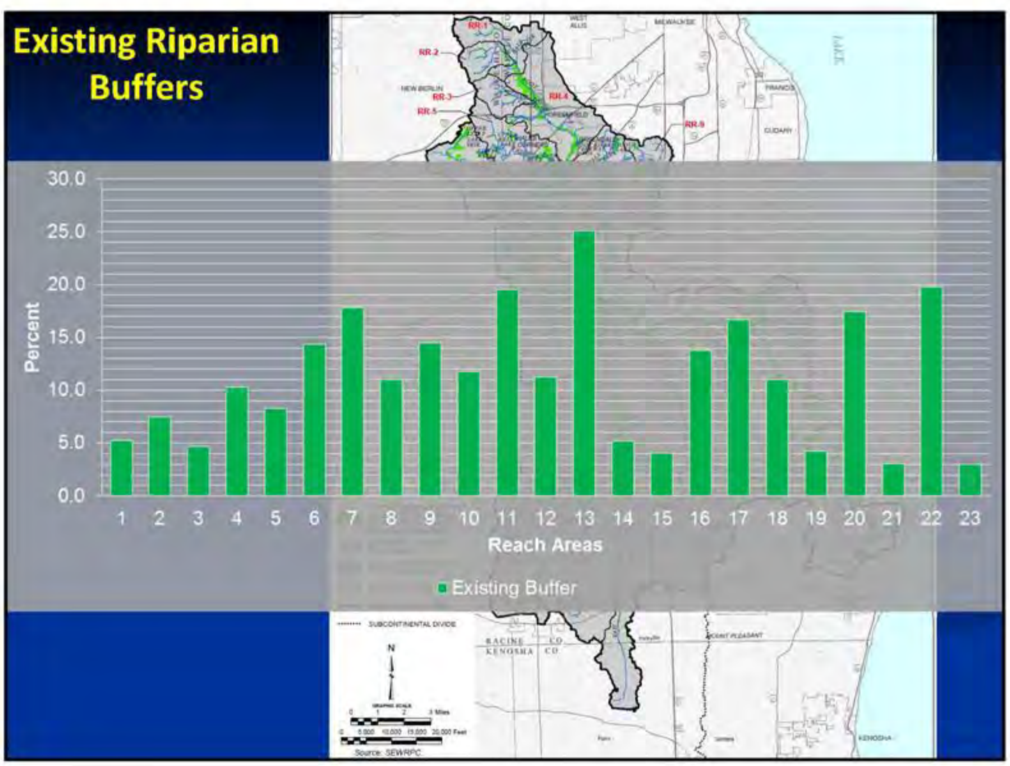
Figure 6. Four dimensions of connectivity within lotic ecosystems (after Ward 1989). a) longitudinal connectivity (channel ←→ channel). b) lateral connectivity (channel ←→ floodplain). c) vertical connectivity (channel ←→ groundwater). d) temporal connectivity (across time). [Modified from symbols courtesy of the Integration and Application Network (ian.umces.edu/symbols/), University of Maryland Center for Environmental Science].

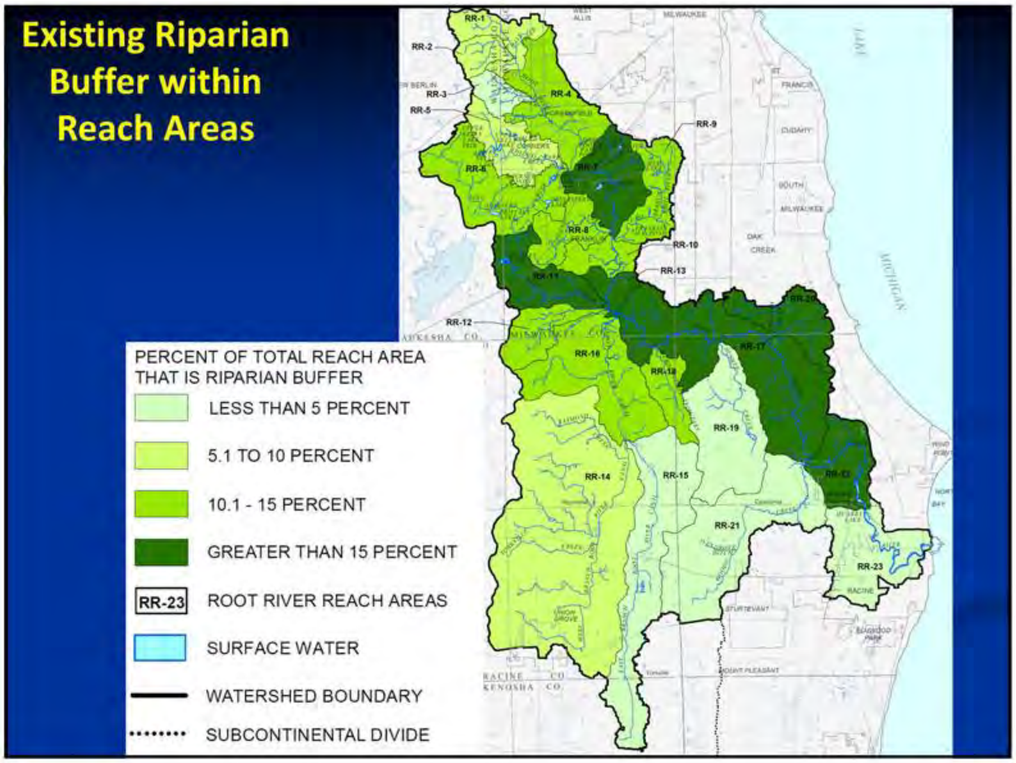
McDonough et al (2011)

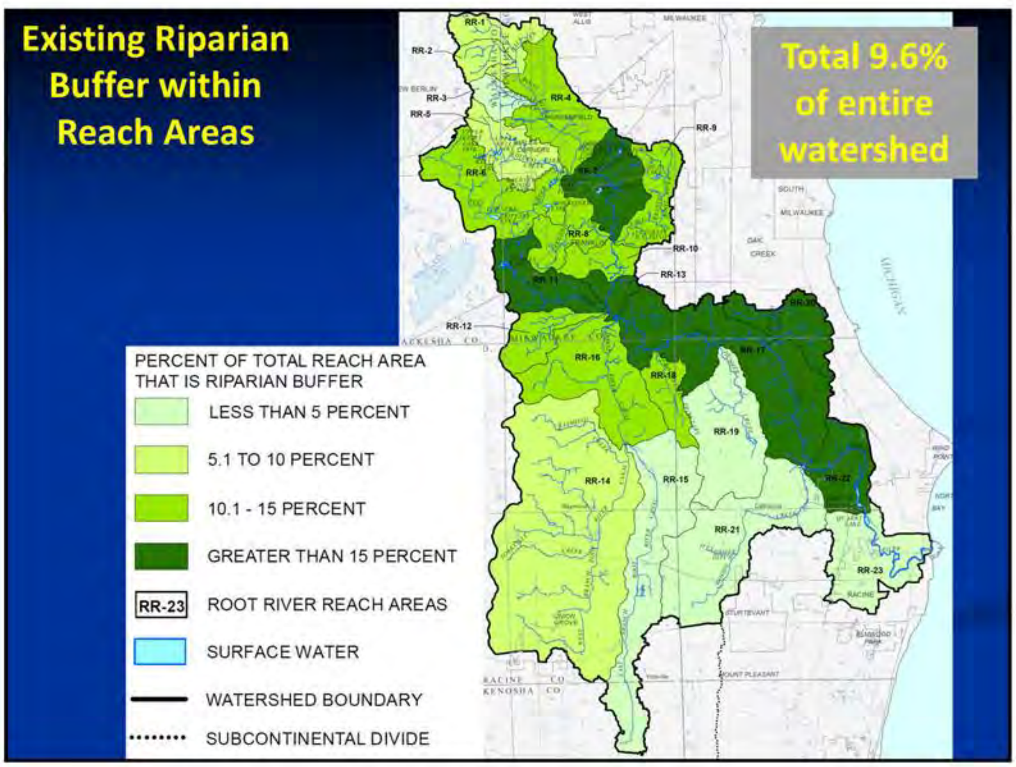
Application of buffer width assessment

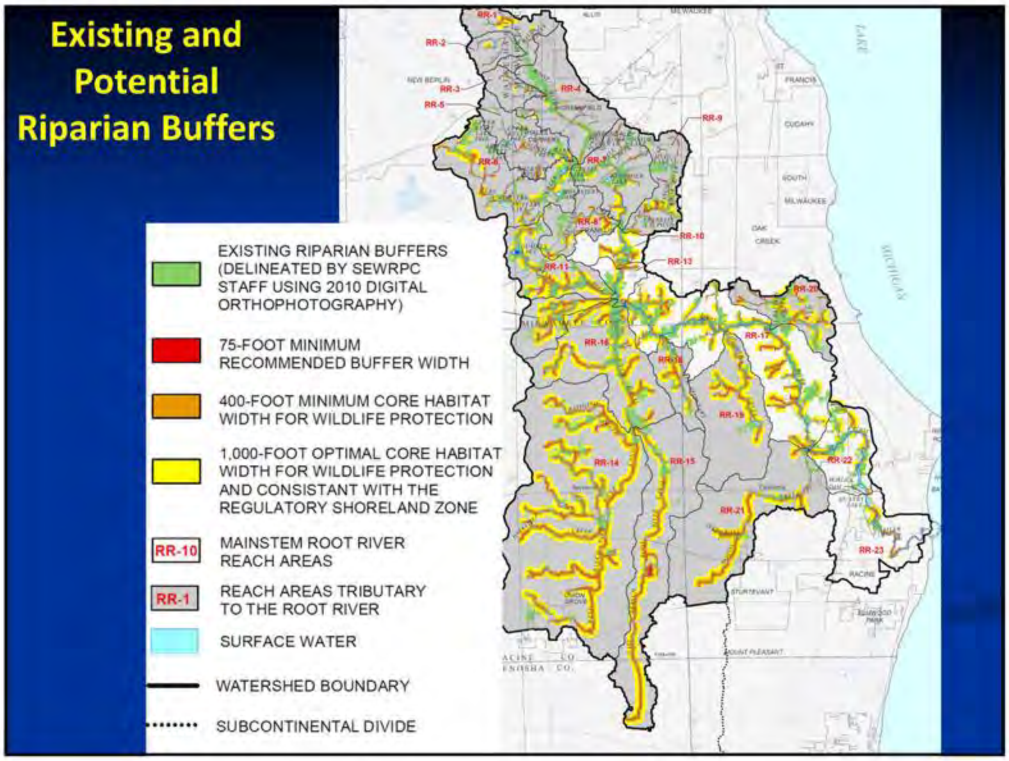
See http://www.sewrpc.org/SEWRPC/Environment.htm

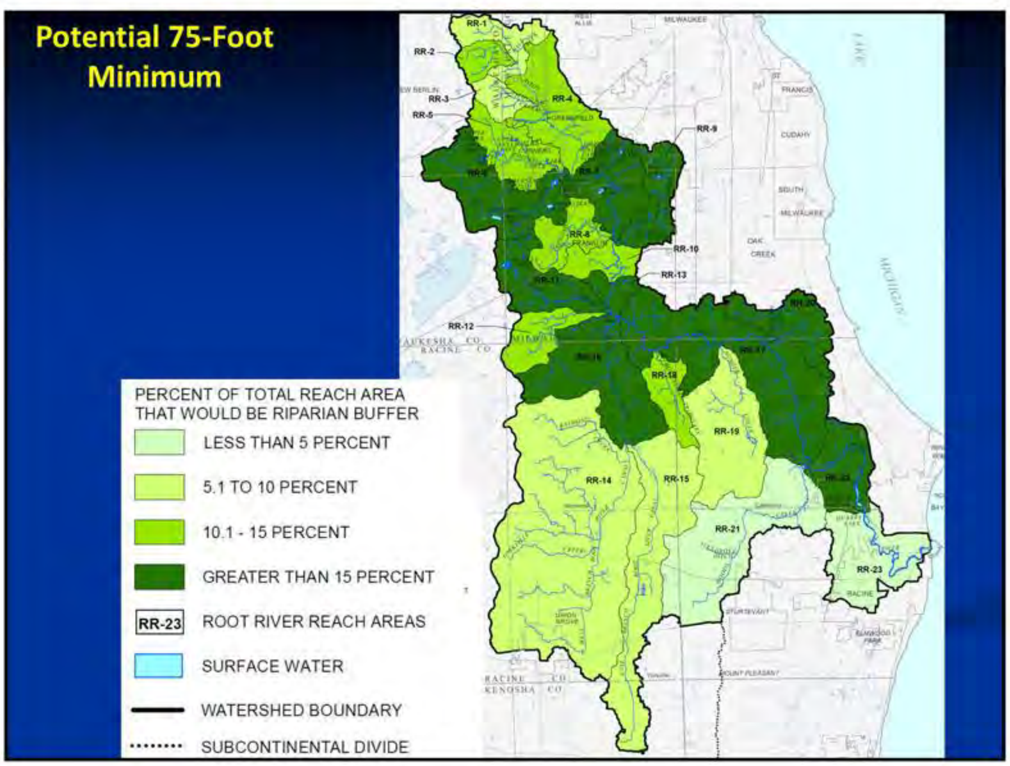

Existing Riparian Buffers
RR-1
RR-2
RR-3
RR-4
RR-5
RR-6
RR-7
RR-8
RR-9
RR-10
RR-11
RR-12
RR-13
RR-14
RR-15
RR-16
RR-17
RR-18
RR-19
RR-20
RR-21
RR-22
RR-23
EXISTING RIPARIAN BUFFERS (DELINEATED BY SEWRPC STAFF USING 2010 DIGITAL ORTHOPHOTOGRAPHY)
MAINSTEM ROOT RIVER REACH AREAS
REACH AREAS TRIBUTARY TO THE ROOT RIVER
SURFACE WATER
WATERSHED BOUNDARY
SUBCONTINENTAL DIVIDE
WAUKESHA CO.
RACINE CO.
KENOSHA CO.
LAKE MICHIGAN
Source: SEWRPC

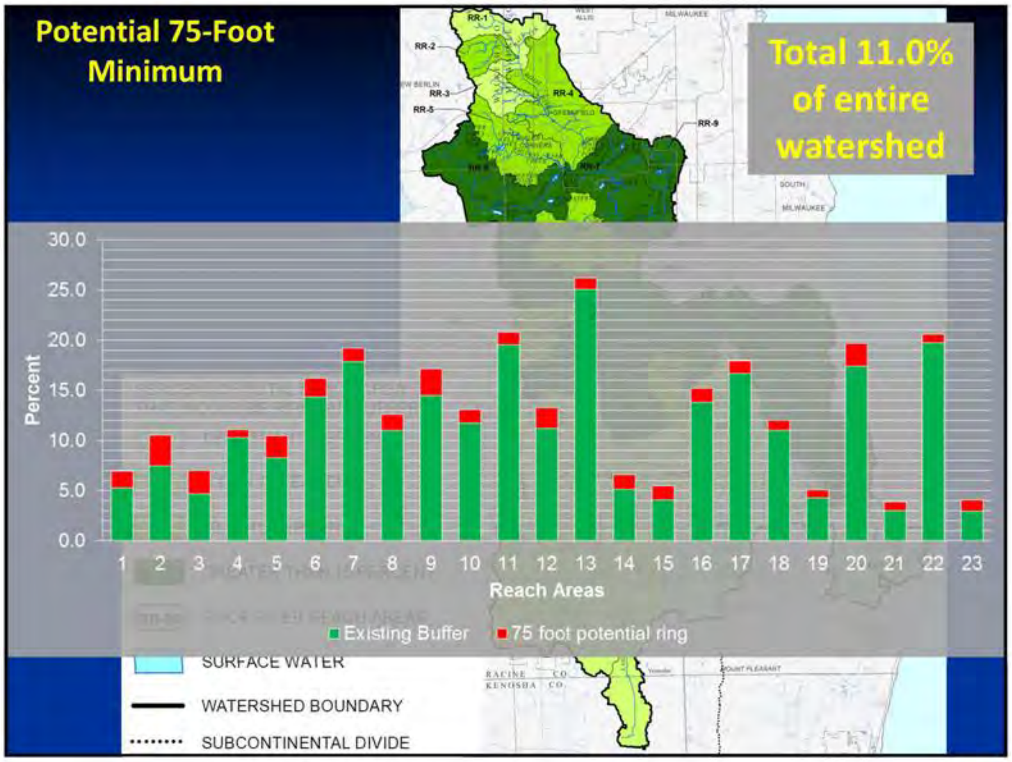

Existing Riparian Buffers
Percent
30.0
25.0
20.0
15.0
10.0
5.0
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Reach Areas
Existing Buffer

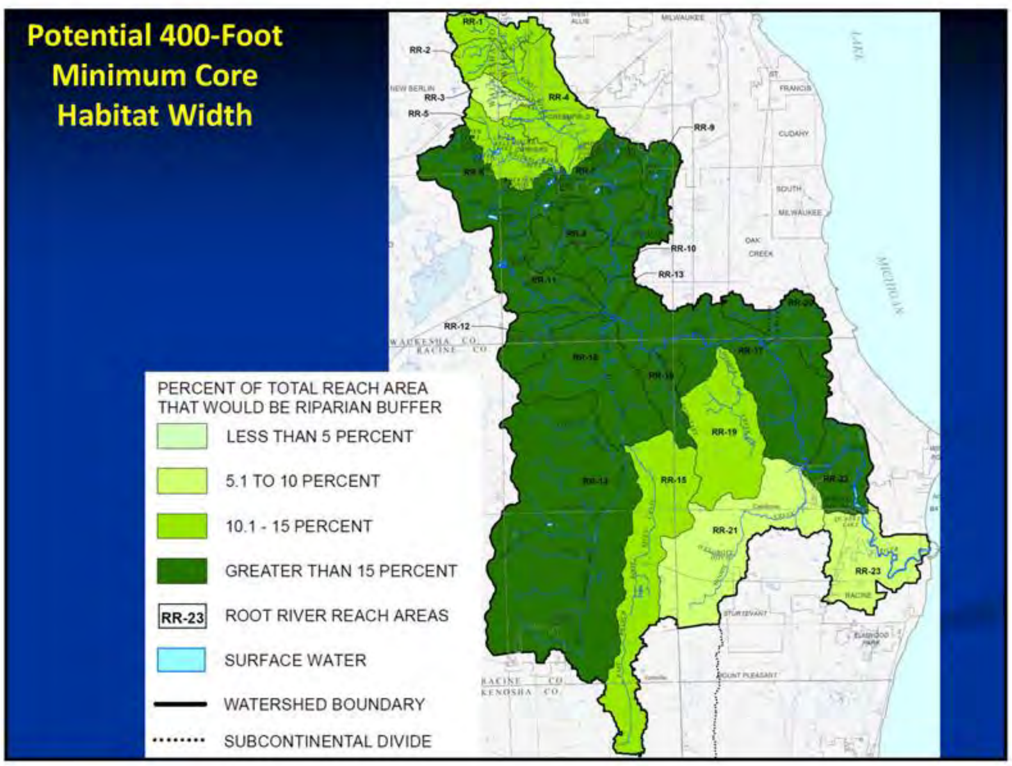

Existing Riparian Buffer within Reach Areas
PERCENT OF TOTAL REACH AREA THAT IS RIPARIAN BUFFER
LESS THAN 5 PERCENT
5.1 TO 10 PERCENT
10.1 - 15 PERCENT
GREATER THAN 15 PERCENT
RR-23
ROOT RIVER REACH AREAS
SURFACE WATER
WATERSHED BOUNDARY
SUBCONTINENTAL DIVIDE

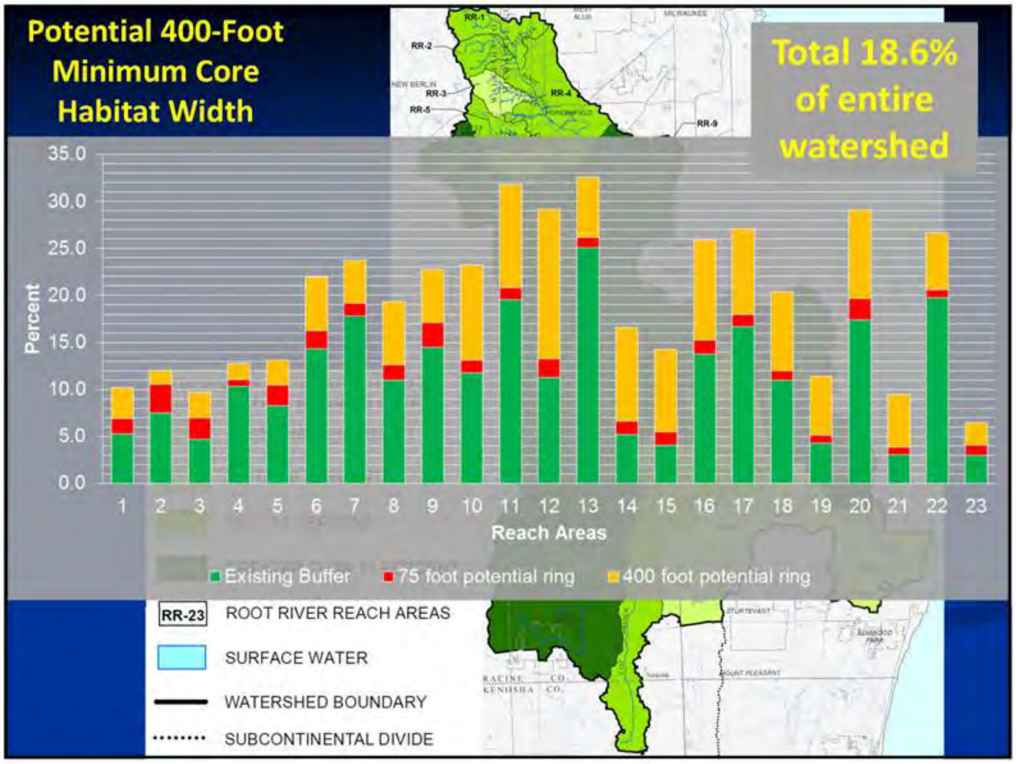

Existing Riparian Buffer within Reach Areas
Total 9.6% of entire watershed
PERCENT OF TOTAL REACH AREA THAT IS RIPARIAN BUFFER
LESS THAN 5 PERCENT
5.1 TO 10 PERCENT
10.1 - 15 PERCENT
GREATER THAN 15 PERCENT
RR-23
ROOT RIVER REACH AREAS
SURFACE WATER
WATERSHED BOUNDARY
SUBCONTINENTAL DIVIDE

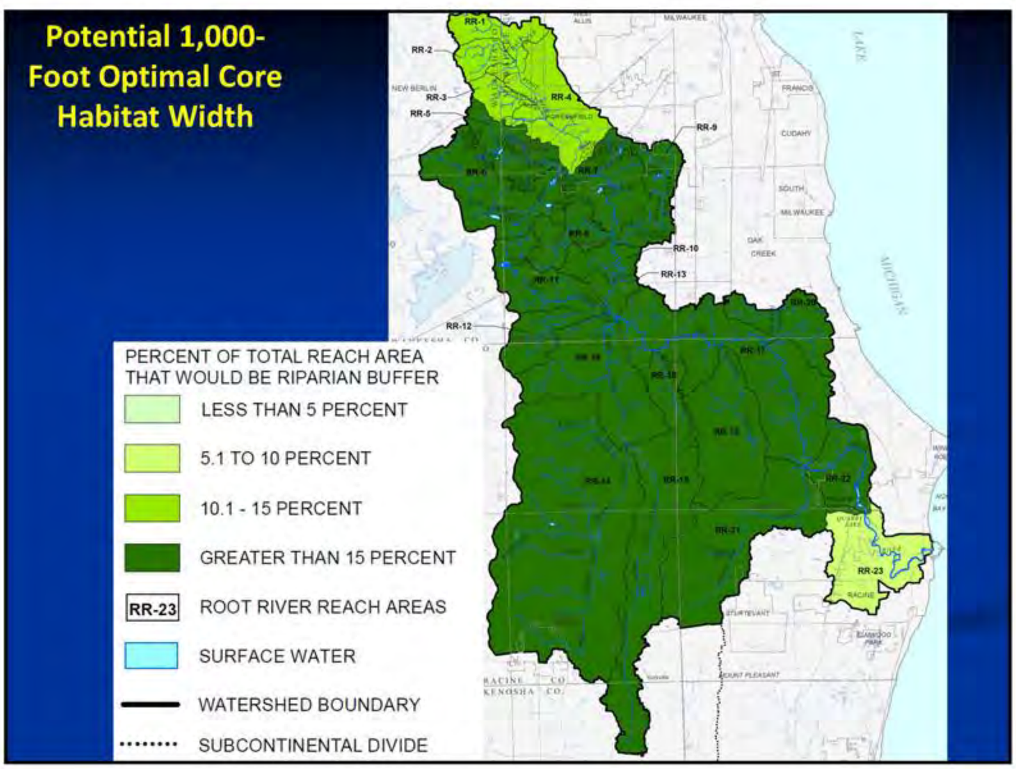

Existing and Potential Riparian Buffers
EXISTING RIPARIAN BUFFERS (DELINEATED BY SEWRPC STAFF USING 2010 DIGITAL ORTHOPHOTOGRAPHY)
75-FOOT MINIMUM RECOMMENDED BUFFER WIDTH
400-FOOT MINIMUM CORE HABITAT WIDTH FOR WILDLIFE PROTECTION
1,000-FOOT OPTIMAL CORE HABITAT WIDTH FOR WILDLIFE PROTECTION AND CONSISTANT WITH THE REGULATORY SHORELAND ZONE
RR-10 MAINSTEM ROOT RIVER REACH AREAS
RR-1 REACH AREAS TRIBUTARY TO THE ROOT RIVER
SURFACE WATER
WATERSHED BOUNDARY
SUBCONTINENTAL DIVIDE

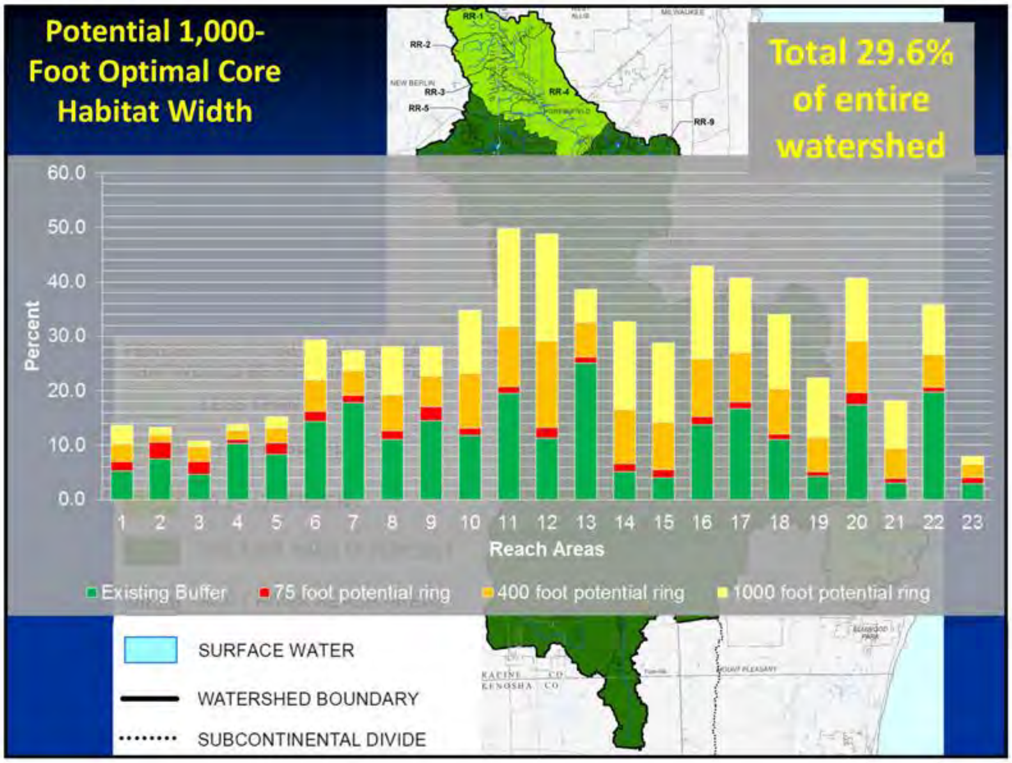

Potential 75-Foot Minimum
PERCENT OF TOTAL REACH AREA THAT WOULD BE RIPARIAN BUFFER
LESS THAN 5 PERCENT
5.1 TO 10 PERCENT
10.1 - 15 PERCENT
GREATER THAN 15 PERCENT
RR-23 ROOT RIVER REACH AREAS
SURFACE WATER
WATERSHED BOUNDARY
SUBCONTINENTAL DIVIDE

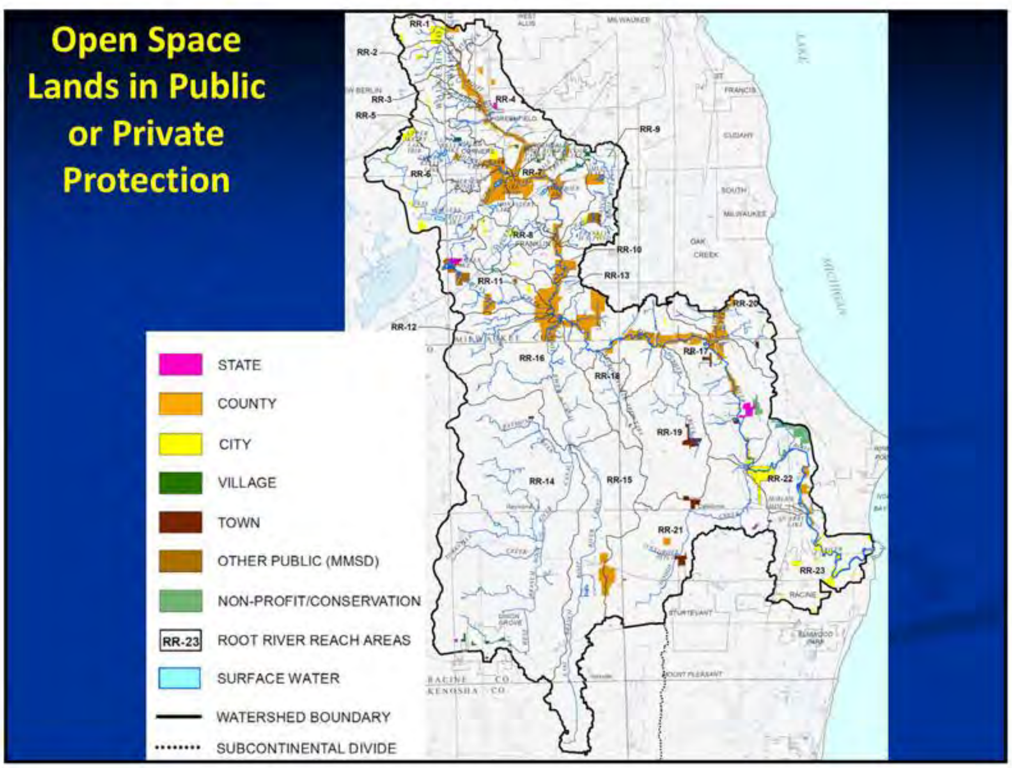

Potential 75-Foot Minimum
Total 11.0% of entire watershed
Percent
Reach Areas
Existing Buffer
75 foot potential ring
SURFACE WATER
WATERSHED BOUNDARY
SUBCONTINENTAL DIVIDE

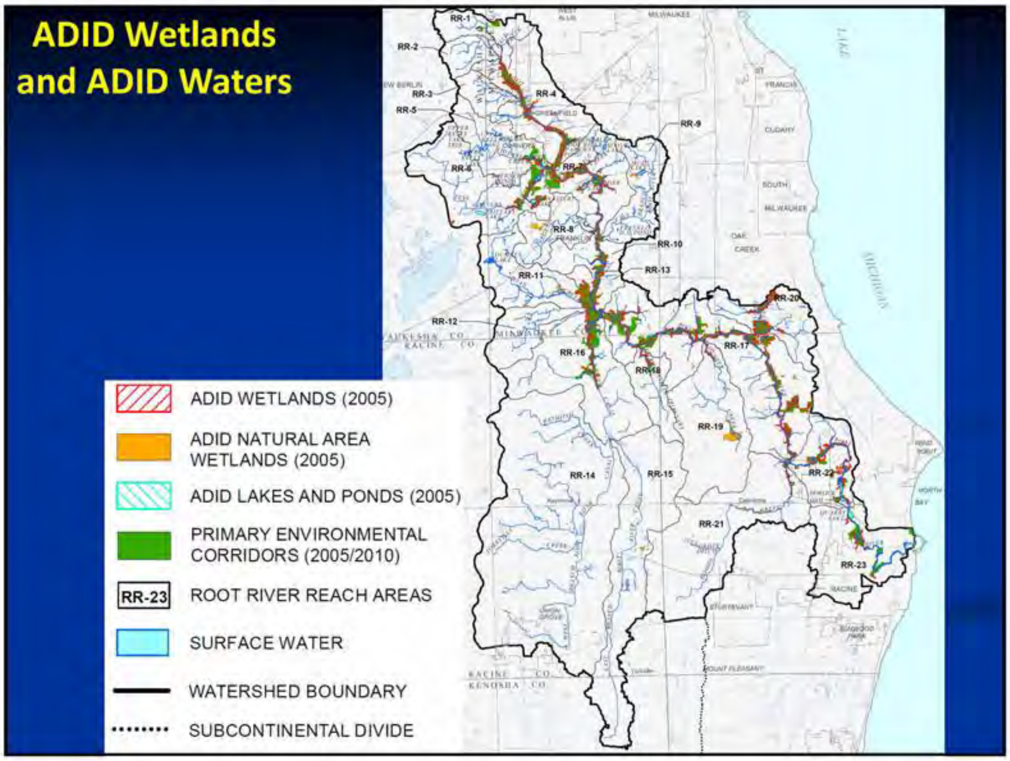

Potential 400-Foot Minimum Core Habitat Width
PERCENT OF TOTAL REACH AREA THAT WOULD BE RIPARIAN BUFFER
LESS THAN 5 PERCENT
5.1 TO 10 PERCENT
10.1 - 15 PERCENT
GREATER THAN 15 PERCENT
RR-23 ROOT RIVER REACH AREAS
SURFACE WATER
WATERSHED BOUNDARY
SUBCONTINENTAL DIVIDE

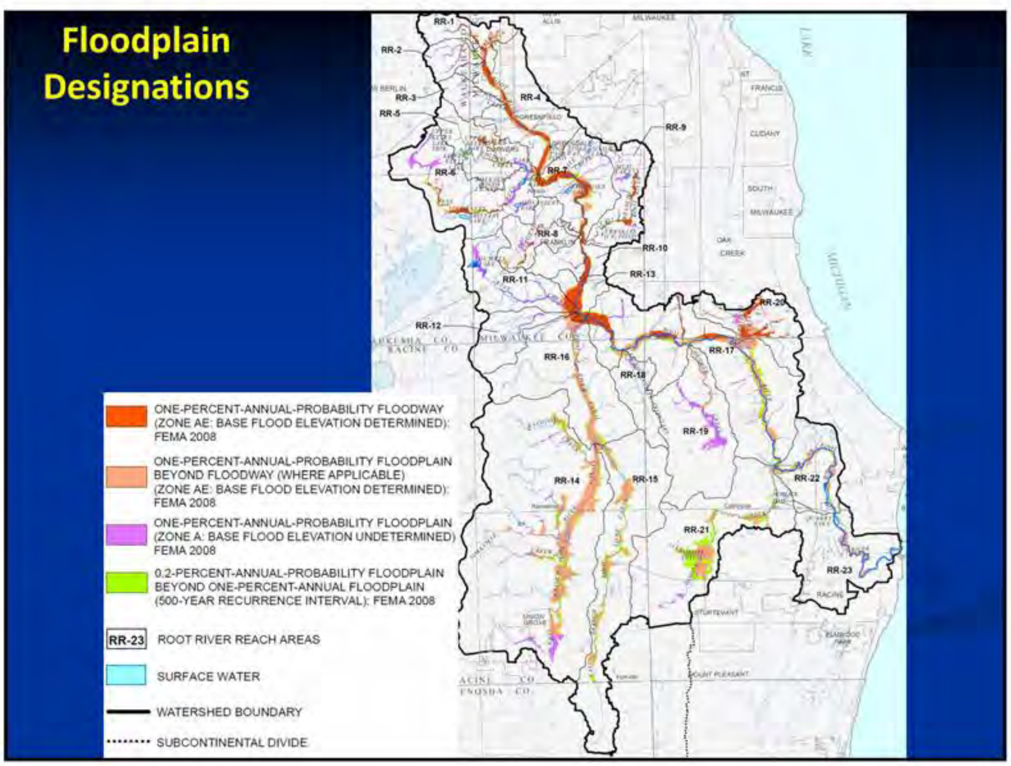

Potential 400-Foot Minimum Core Habitat Width
Total 18.6% of entire watershed
Percent
Reach Areas
Existing Buffer
75 foot potential ring
400 foot potential ring
RR-23 ROOT RIVER REACH AREAS
SURFACE WATER
WATERSHED BOUNDARY
SUBCONTINENTAL DIVIDE

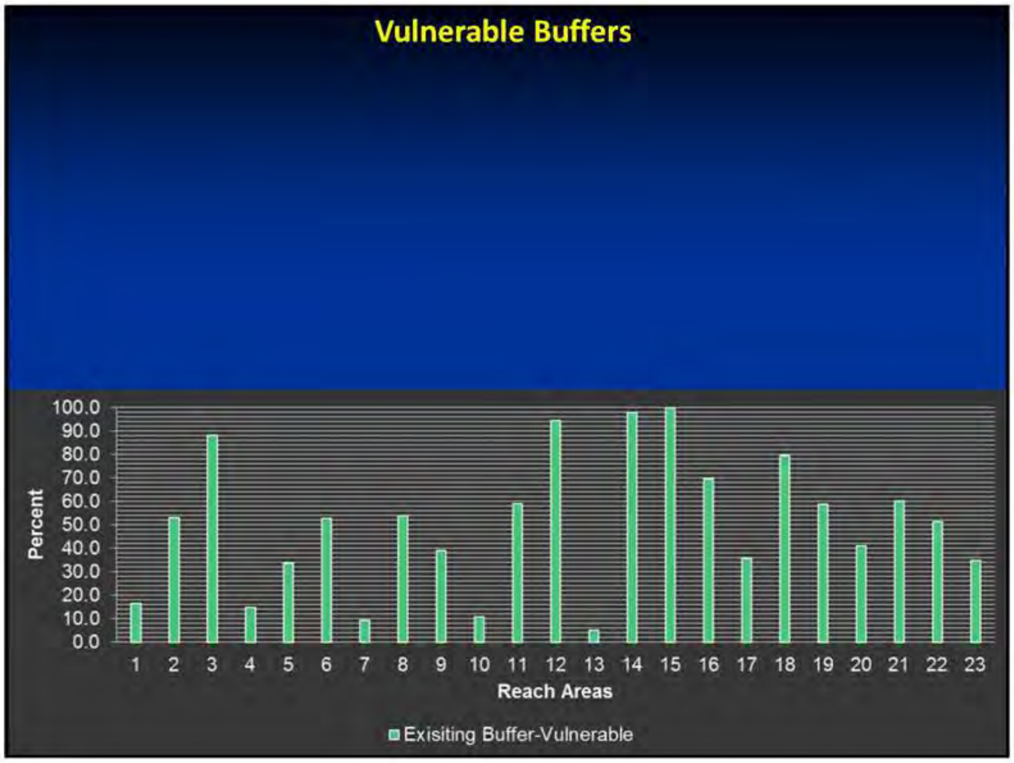

Potential 1,000-Foot Optimal Core Habitat Width
PERCENT OF TOTAL REACH AREA THAT WOULD BE RIPARIAN BUFFER
LESS THAN 5 PERCENT
5.1 TO 10 PERCENT
10.1 - 15 PERCENT
GREATER THAN 15 PERCENT
RR-23 ROOT RIVER REACH AREAS
SURFACE WATER
WATERSHED BOUNDARY
SUBCONTINENTAL DIVIDE

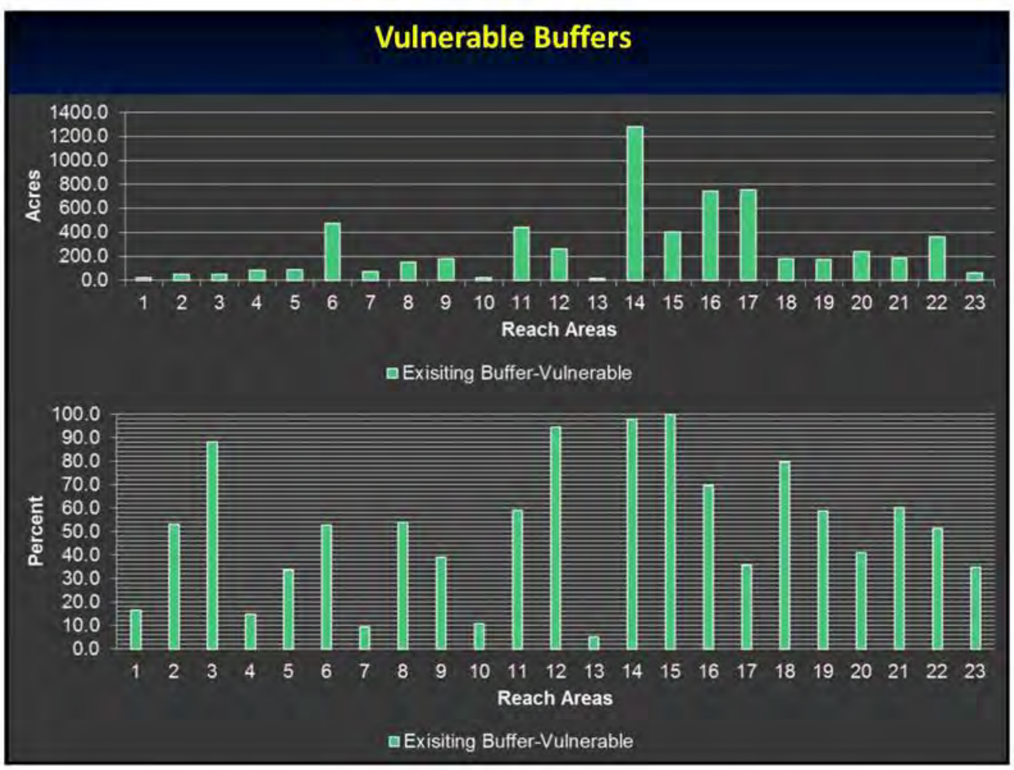

Potential 1,000-Foot Optimal Core Habitat Width
Total 29.6% of entire watershed
Percent
60.0
50.0
40.0
30.0
20.0
10.0
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Reach Areas
Existing Buffer
75 foot potential ring
400 foot potential ring
1000 foot potential ring
SURFACE WATER
WATERSHED BOUNDARY
SUBCONTINENTAL DIVIDE

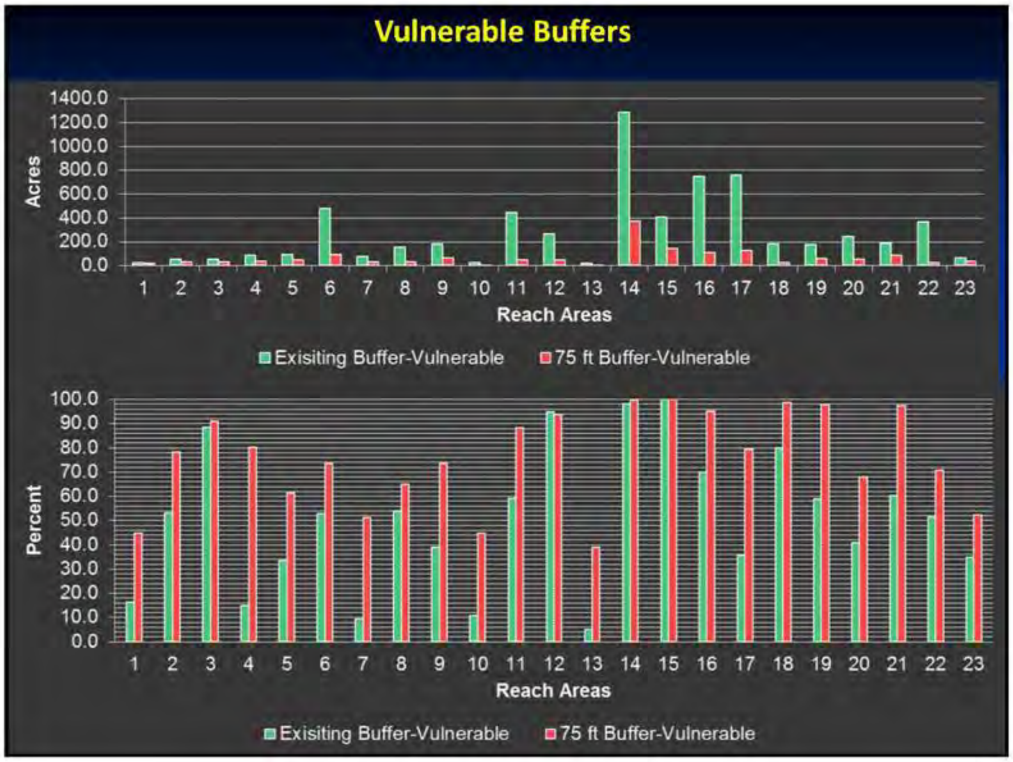

Open Space Lands in Public or Private Protection
STATE
COUNTY
CITY
VILLAGE
TOWN
OTHER PUBLIC (MMSD)
NON-PROFIT/CONSERVATION
RR-23 ROOT RIVER REACH AREAS
SURFACE WATER
WATERSHED BOUNDARY
SUBCONTINENTAL DIVIDE

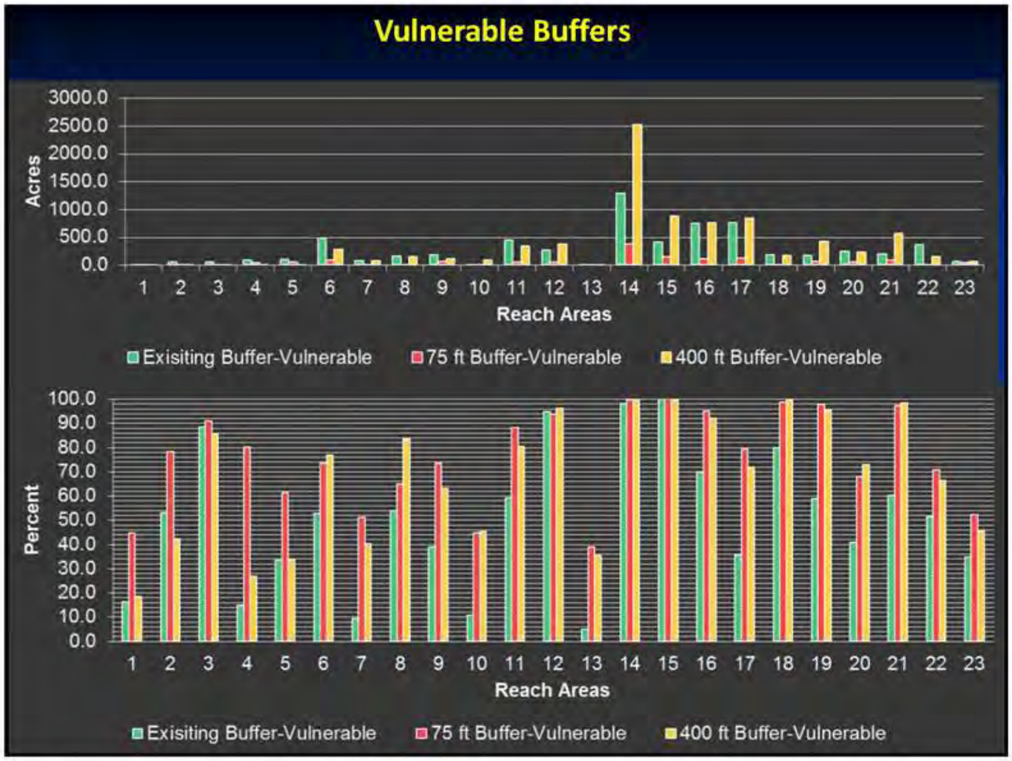

ADID Wetlands and ADID Waters
ADID WETLANDS (2005)
ADID NATURAL AREA WETLANDS (2005)
ADID LAKES AND PONDS (2005)
PRIMARY ENVIRONMENTAL CORRIDORS (2005/2010)
RR-23 ROOT RIVER REACH AREAS
SURFACE WATER
WATERSHED BOUNDARY
SUBCONTINENTAL DIVIDE

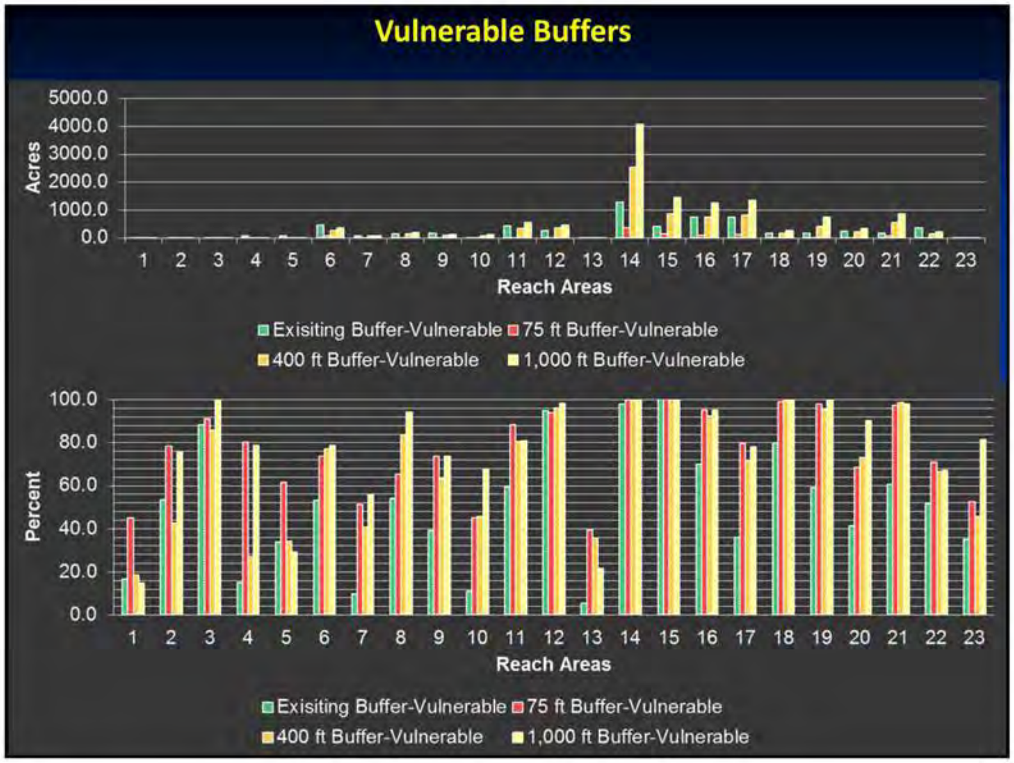

Floodplain Designations
ONE-PERCENT-ANNUAL-PROBABILITY FLOODWAY (ZONE AE: BASE FLOOD ELEVATION DETERMINED): FEMA 2008
ONE-PERCENT-ANNUAL-PROBABILITY FLOODPLAIN BEYOND FLOODWAY (WHERE APPLICABLE) (ZONE AE: BASE FLOOD ELEVATION DETERMINED): FEMA 2008
ONE-PERCENT-ANNUAL-PROBABILITY FLOODPLAIN (ZONE A: BASE FLOOD ELEVATION UNDETERMINED) FEMA 2008
0.2-PERCENT-ANNUAL-PROBABILITY FLOODPLAIN BEYOND ONE-PERCENT-ANNUAL FLOODPLAIN (500-YEAR RECURRENCE INTERVAL): FEMA 2008
RR-23 ROOT RIVER REACH AREAS
SURFACE WATER
WATERSHED BOUNDARY
SUBCONTINENTAL DIVIDE

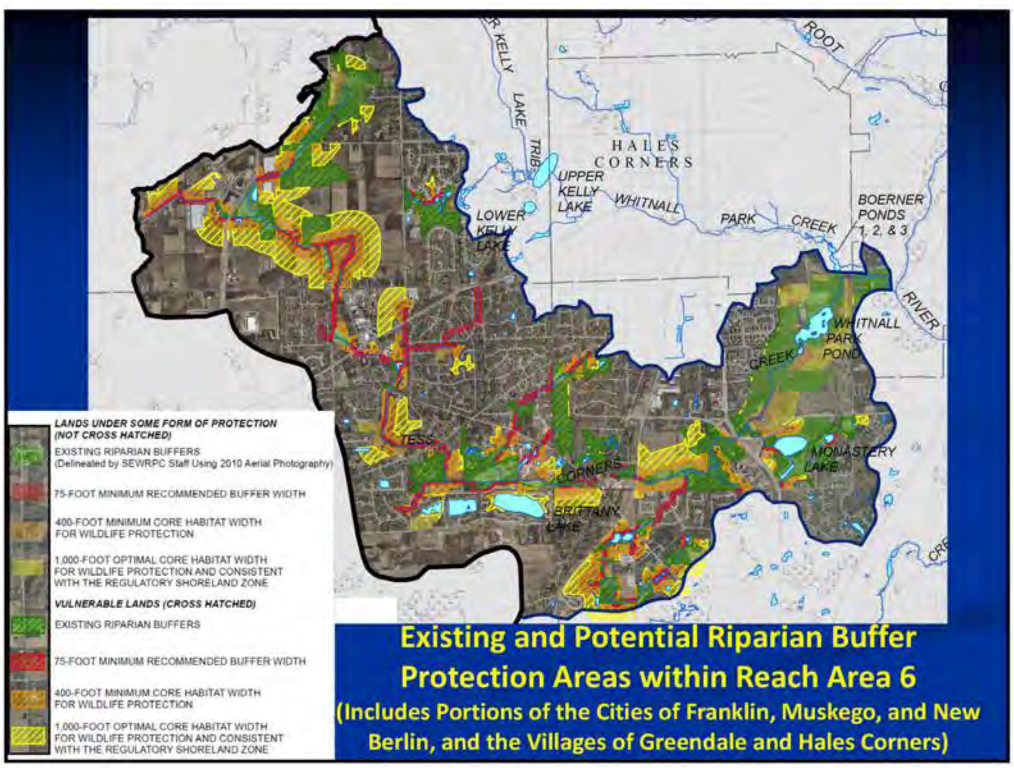

Vulnerable Buffers
Percent
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Reach Areas
Exisiting Buffer-Vulnerable

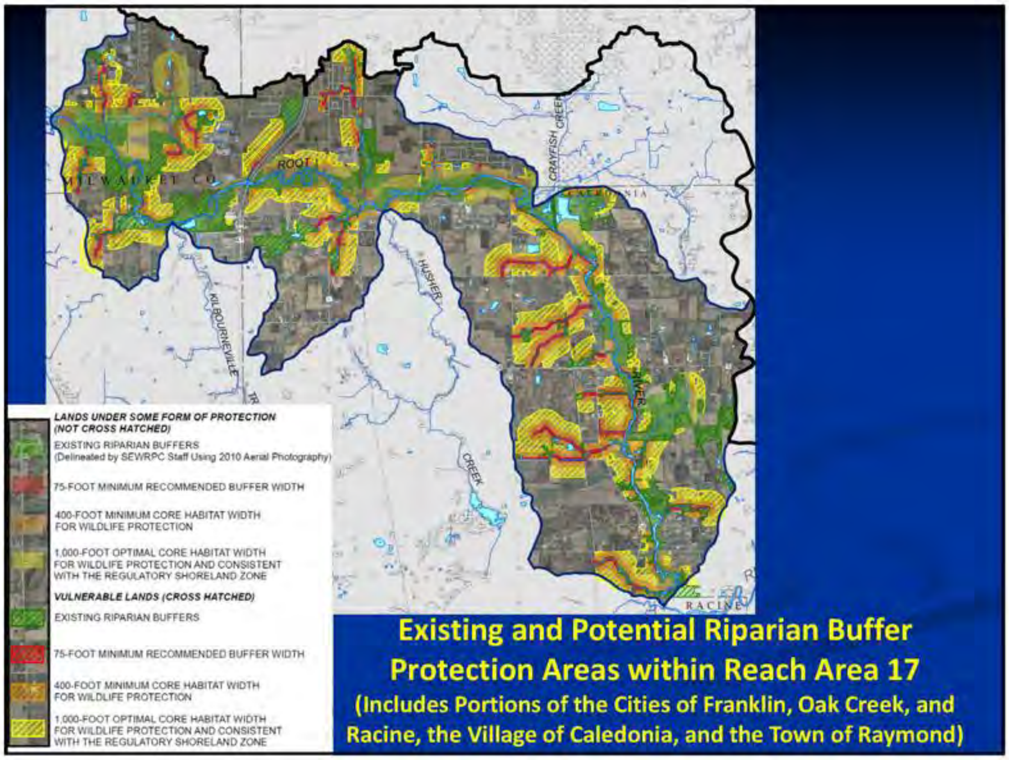

Vulnerable Buffers
Acres
1400.0
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Reach Areas
Exisiting Buffer-Vulnerable
Percent
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Reach Areas
Exisiting Buffer-Vulnerable

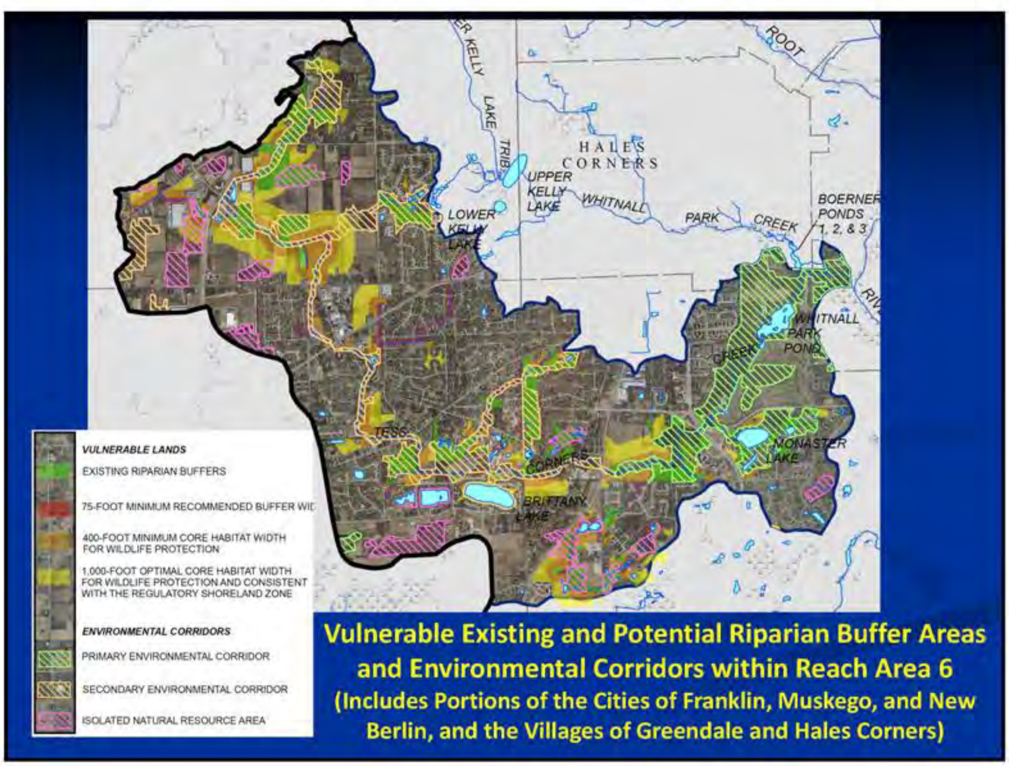

Vulnerable Buffers
Acres
Reach Areas
Exisiting Buffer-Vulnerable
75 ft Buffer-Vulnerable
Percent
Reach Areas
Exisiting Buffer-Vulnerable
75 ft Buffer-Vulnerable

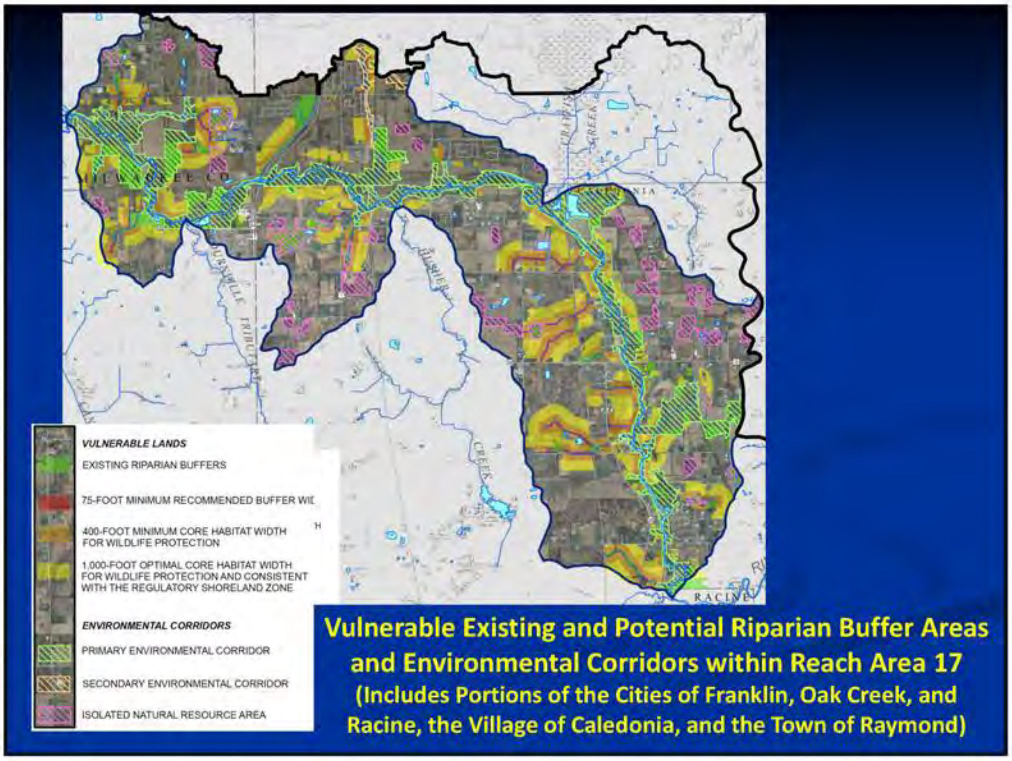

Vulnerable Buffers
Acres
Reach Areas
Exisiting Buffer-Vulnerable
75 ft Buffer-Vulnerable
400 ft Buffer-Vulnerable
Percent
Reach Areas
Exisiting Buffer-Vulnerable
75 ft Buffer-Vulnerable
400 ft Buffer-Vulnerable

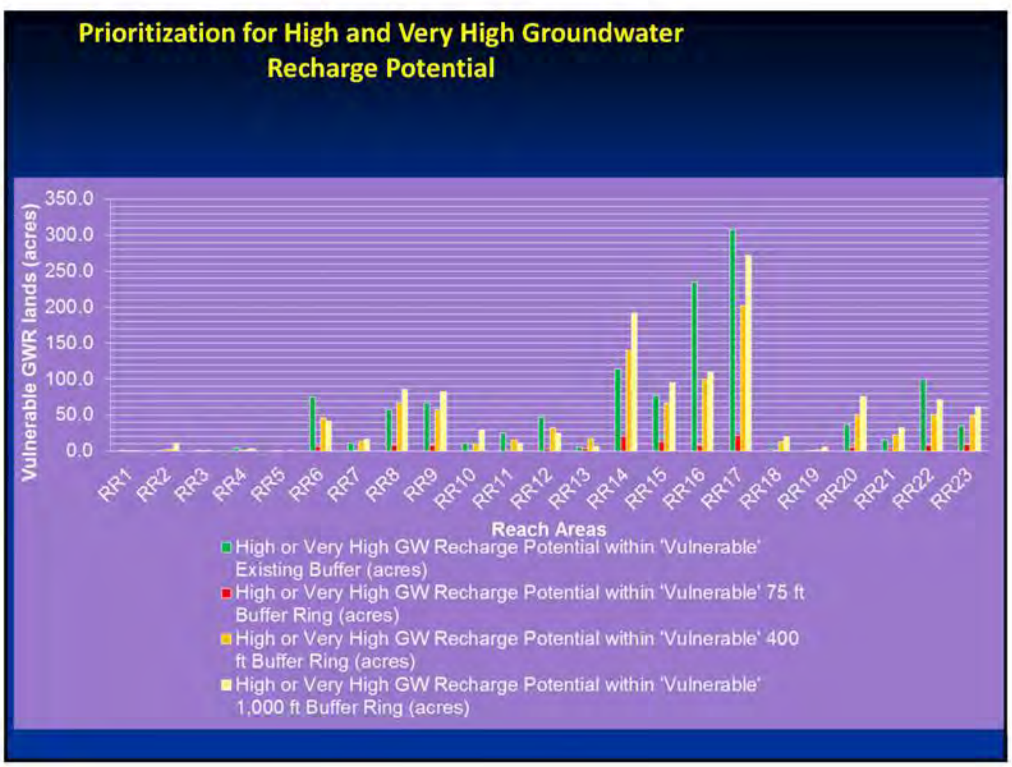

Vulnerable Buffers
5000.0
4000.0
3000.0
2000.0
1000.0
0.0
Acres
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Reach Areas
Exisiting Buffer-Vulnerable
75 ft Buffer-Vulnerable
400 ft Buffer-Vulnerable
1,000 ft Buffer-Vulnerable
100.0
80.0
60.0
40.0
20.0
0.0
Percent
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Reach Areas
Exisiting Buffer-Vulnerable
75 ft Buffer-Vulnerable
400 ft Buffer-Vulnerable
1,000 ft Buffer-Vulnerable

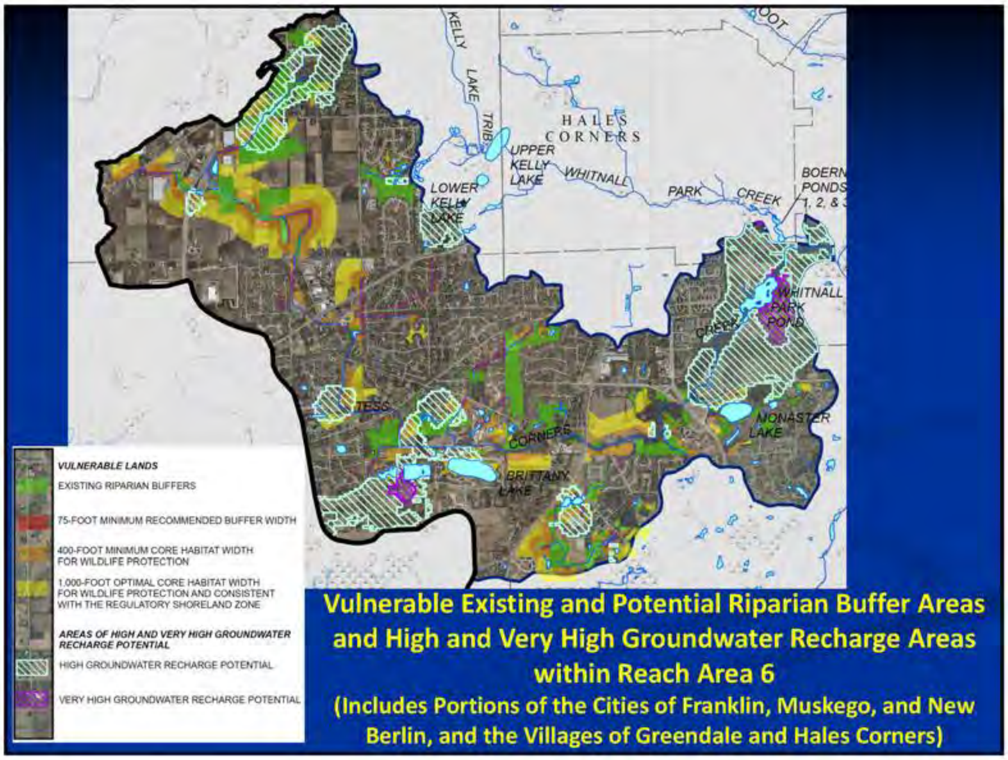

HALES CORNERS
UPPER KELLY LAKE
LOWER KELLY LAKE
WHITNALL PARK CREEK
BOERNER PONDS 1, 2, & 3
ROOT RIVER
WHITNALL PARK POND
MONASTERY LAKE
BRITTANY LAKE
LANDS UNDER SOME FORM OF PROTECTION (NOT CROSS HATCHED)
EXISTING RIPARIAN BUFFERS (Delineated by SEWRPC Staff Using 2010 Aerial Photography)
75-FOOT MINIMUM RECOMMENDED BUFFER WIDTH
400-FOOT MINIMUM CORE HABITAT WIDTH FOR WILDLIFE PROTECTION
1,000-FOOT OPTIMAL CORE HABITAT WIDTH FOR WILDLIFE PROTECTION AND CONSISTENT WITH THE REGULATORY SHORELAND ZONE
VULNERABLE LANDS (CROSS HATCHED)
EXISTING RIPARIAN BUFFERS
75-FOOT MINIMUM RECOMMENDED BUFFER WIDTH
400-FOOT MINIMUM CORE HABITAT WIDTH FOR WILDLIFE PROTECTION
1,000-FOOT OPTIMAL CORE HABITAT WIDTH FOR WILDLIFE PROTECTION AND CONSISTENT WITH THE REGULATORY SHORELAND ZONE
Existing and Potential Riparian Buffer Protection Areas within Reach Area 6
(Includes Portions of the Cities of Franklin, Muskego, and New Berlin, and the Villages of Greendale and Hales Corners)

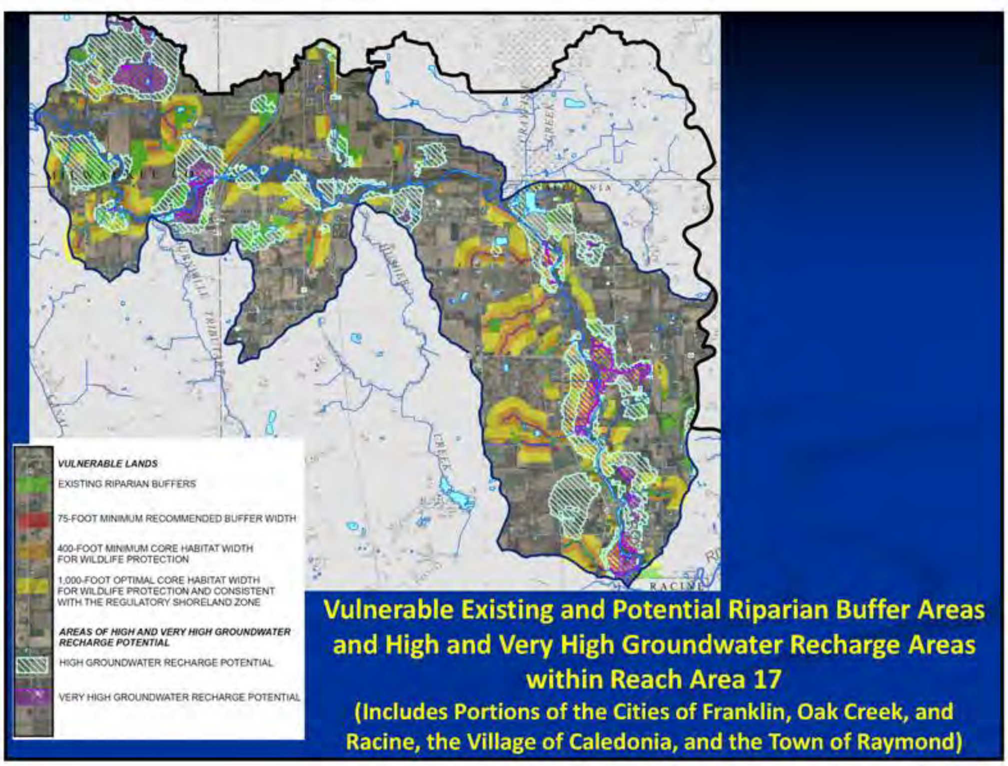

ROOT
CRAYFISH CREEK
HUSHER
KILBOURNEVILLE
CREEK
RIVER
RACINE
LANDS UNDER SOME FORM OF PROTECTION (NOT CROSS HATCHED)
EXISTING RIPARIAN BUFFERS (Delineated by SEWRPC Staff Using 2010 Aerial Photography)
75-FOOT MINIMUM RECOMMENDED BUFFER WIDTH
400-FOOT MINIMUM CORE HABITAT WIDTH FOR WILDLIFE PROTECTION
1,000-FOOT OPTIMAL CORE HABITAT WIDTH FOR WILDLIFE PROTECTION AND CONSISTENT WITH THE REGULATORY SHORELAND ZONE
VULNERABLE LANDS (CROSS HATCHED)
EXISTING RIPARIAN BUFFERS
75-FOOT MINIMUM RECOMMENDED BUFFER WIDTH
400-FOOT MINIMUM CORE HABITAT WIDTH FOR WILDLIFE PROTECTION
1,000-FOOT OPTIMAL CORE HABITAT WIDTH FOR WILDLIFE PROTECTION AND CONSISTENT WITH THE REGULATORY SHORELAND ZONE
Existing and Potential Riparian Buffer Protection Areas within Reach Area 17
(Includes Portions of the Cities of Franklin, Oak Creek, and Racine, the Village of Caledonia, and the Town of Raymond)

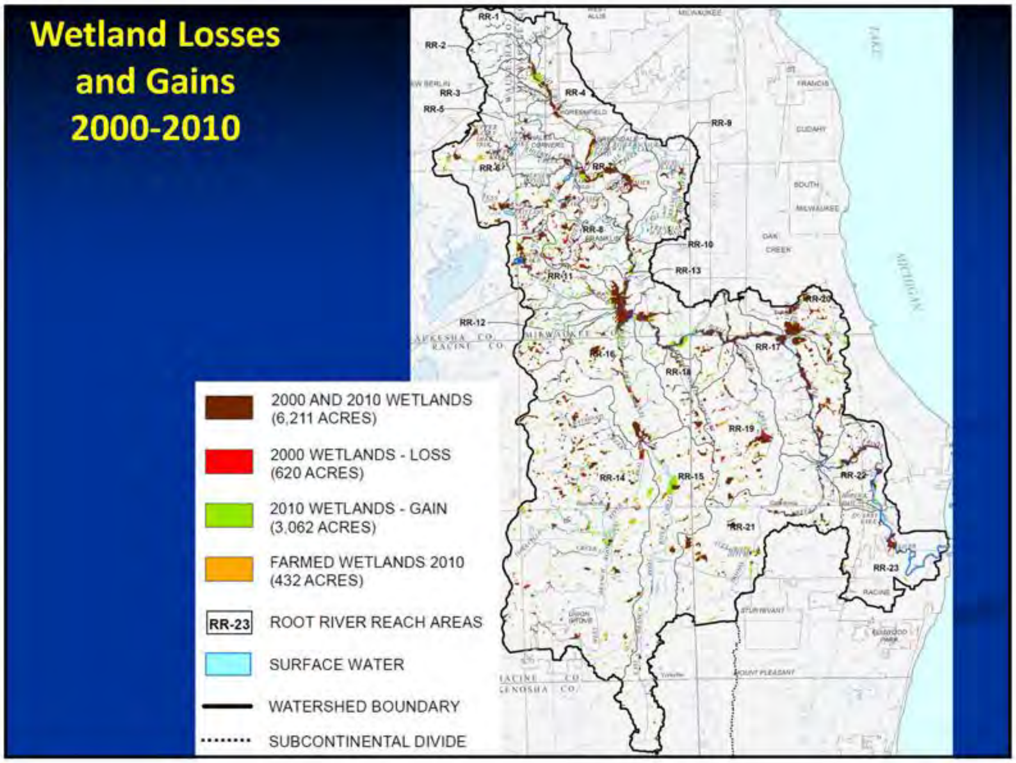

KELLY LAKE TRIB
ROOT
HALES CORNERS
UPPER KELLY LAKE
LOWER KELLY LAKE
WHITNALL PARK CREEK
BOERNER PONDS 1, 2, & 3
WHITNALL PARK POND
MONASTER LAKE
TESS CORNERS CREEK
BRITTANY LAKE
VULNERABLE LANDS
EXISTING RIPARIAN BUFFERS
75-FOOT MINIMUM RECOMMENDED BUFFER WID
400-FOOT MINIMUM CORE HABITAT WIDTH FOR WILDLIFE PROTECTION
1,000-FOOT OPTIMAL CORE HABITAT WIDTH FOR WILDLIFE PROTECTION AND CONSISTENT WITH THE REGULATORY SHORELAND ZONE
ENVIRONMENTAL CORRIDORS
PRIMARY ENVIRONMENTAL CORRIDOR
SECONDARY ENVIRONMENTAL CORRIDOR
ISOLATED NATURAL RESOURCE AREA
Vulnerable Existing and Potential Riparian Buffer Areas and Environmental Corridors within Reach Area 6
(Includes Portions of the Cities of Franklin, Muskego, and New Berlin, and the Villages of Greendale and Hales Corners)

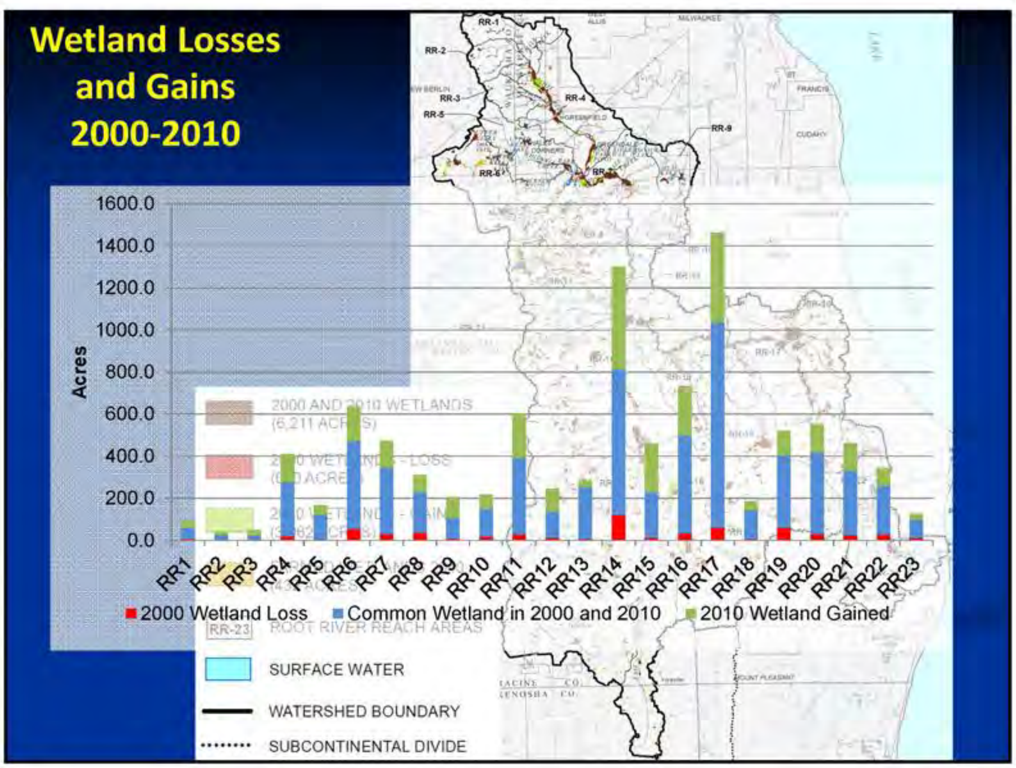

VULNERABLE LANDS
EXISTING RIPARIAN BUFFERS
75-FOOT MINIMUM RECOMMENDED BUFFER WI
400-FOOT MINIMUM CORE HABITAT WIDTH FOR WILDLIFE PROTECTION
1,000-FOOT OPTIMAL CORE HABITAT WIDTH FOR WILDLIFE PROTECTION AND CONSISTENT WITH THE REGULATORY SHORELAND ZONE
ENVIRONMENTAL CORRIDORS
PRIMARY ENVIRONMENTAL CORRIDOR
SECONDARY ENVIRONMENTAL CORRIDOR
ISOLATED NATURAL RESOURCE AREA
Vulnerable Existing and Potential Riparian Buffer Areas and Environmental Corridors within Reach Area 17
(Includes Portions of the Cities of Franklin, Oak Creek, and Racine, the Village of Caledonia, and the Town of Raymond)

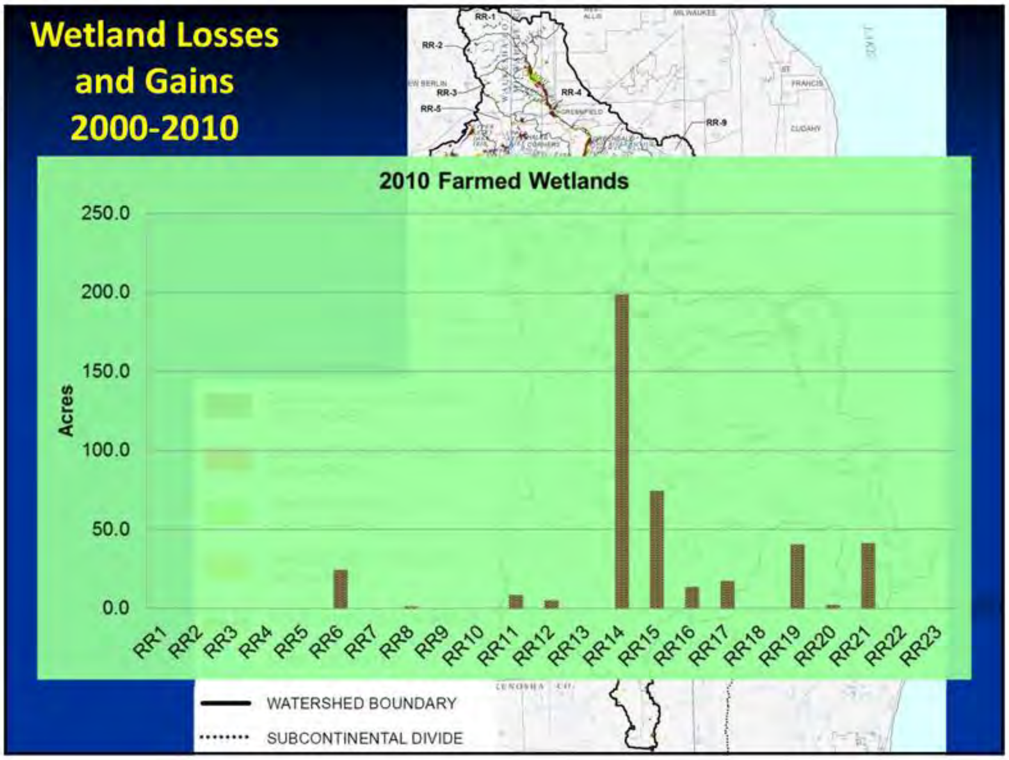

Prioritization for High and Very High Groundwater Recharge Potential
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
Vulnerable GWR lands (acres)
RR1 RR2 RR3 RR4 RR5 RR6 RR7 RR8 RR9 RR10 RR11 RR12 RR13 RR14 RR15 RR16 RR17 RR18 RR19 RR20 RR21 RR22 RR23
Reach Areas
High or Very High GW Recharge Potential within 'Vulnerable' Existing Buffer (acres)
High or Very High GW Recharge Potential within 'Vulnerable' 75 ft Buffer Ring (acres)
High or Very High GW Recharge Potential within 'Vulnerable' 400 ft Buffer Ring (acres)
High or Very High GW Recharge Potential within 'Vulnerable' 1,000 ft Buffer Ring (acres)

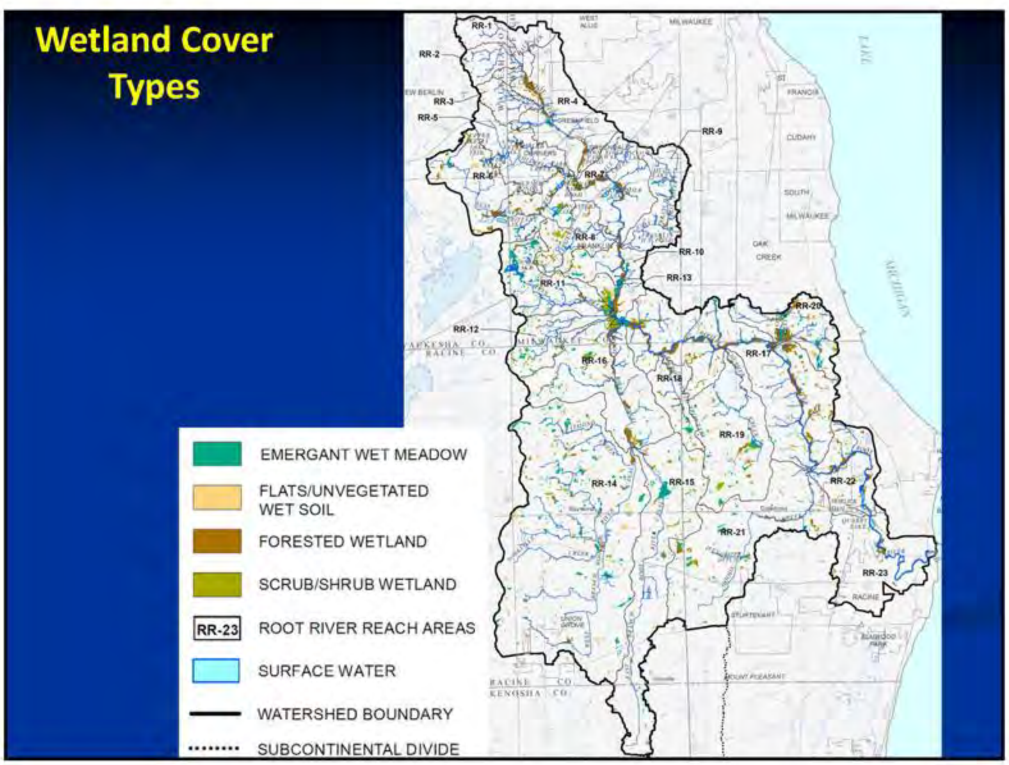

KELLY
LAKE
TRIB
HALES
CORNERS
UPPER
KELLY
LAKE
WHITNALL
PARK
CREEK
LOWER
KELLY
LAKE
BOERN
PONDS
1, 2, & 3
WHITNALL
PARK
POND
MONASTER
LAKE
TESS
CORNERS
BRITTANY
LAKE
VULNERABLE LANDS
EXISTING RIPARIAN BUFFERS
75-FOOT MINIMUM RECOMMENDED BUFFER WIDTH
400-FOOT MINIMUM CORE HABITAT WIDTH FOR WILDLIFE PROTECTION
1,000-FOOT OPTIMAL CORE HABITAT WIDTH FOR WILDLIFE PROTECTION AND CONSISTENT WITH THE REGULATORY SHORELAND ZONE
AREAS OF HIGH AND VERY HIGH GROUNDWATER RECHARGE POTENTIAL
HIGH GROUNDWATER RECHARGE POTENTIAL
VERY HIGH GROUNDWATER RECHARGE POTENTIAL
Vulnerable Existing and Potential Riparian Buffer Areas and High and Very High Groundwater Recharge Areas within Reach Area 6
(Includes Portions of the Cities of Franklin, Muskego, and New Berlin, and the Villages of Greendale and Hales Corners)

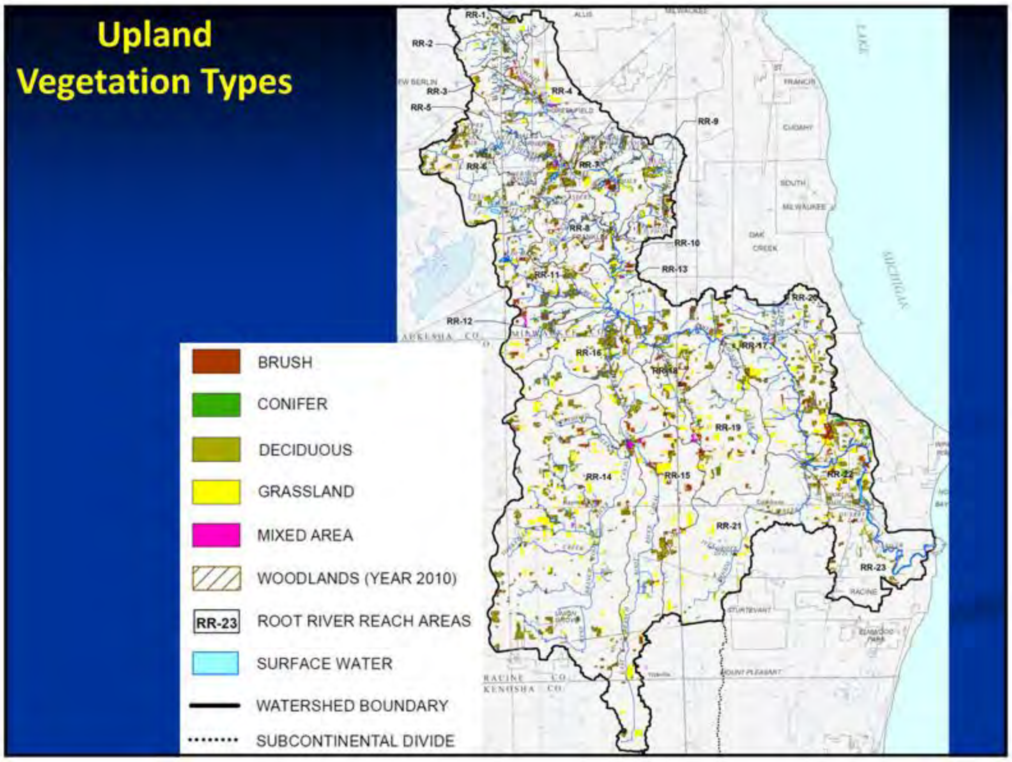

CREEK
RACINE
VULNERABLE LANDS
EXISTING RIPARIAN BUFFERS
75-FOOT MINIMUM RECOMMENDED BUFFER WIDTH
400-FOOT MINIMUM CORE HABITAT WIDTH FOR WILDLIFE PROTECTION
1,000-FOOT OPTIMAL CORE HABITAT WIDTH FOR WILDLIFE PROTECTION AND CONSISTENT WITH THE REGULATORY SHORELAND ZONE
AREAS OF HIGH AND VERY HIGH GROUNDWATER RECHARGE POTENTIAL
HIGH GROUNDWATER RECHARGE POTENTIAL
VERY HIGH GROUNDWATER RECHARGE POTENTIAL
Vulnerable Existing and Potential Riparian Buffer Areas and High and Very High Groundwater Recharge Areas within Reach Area 17
(Includes Portions of the Cities of Franklin, Oak Creek, and Racine, the Village of Caledonia, and the Town of Raymond)

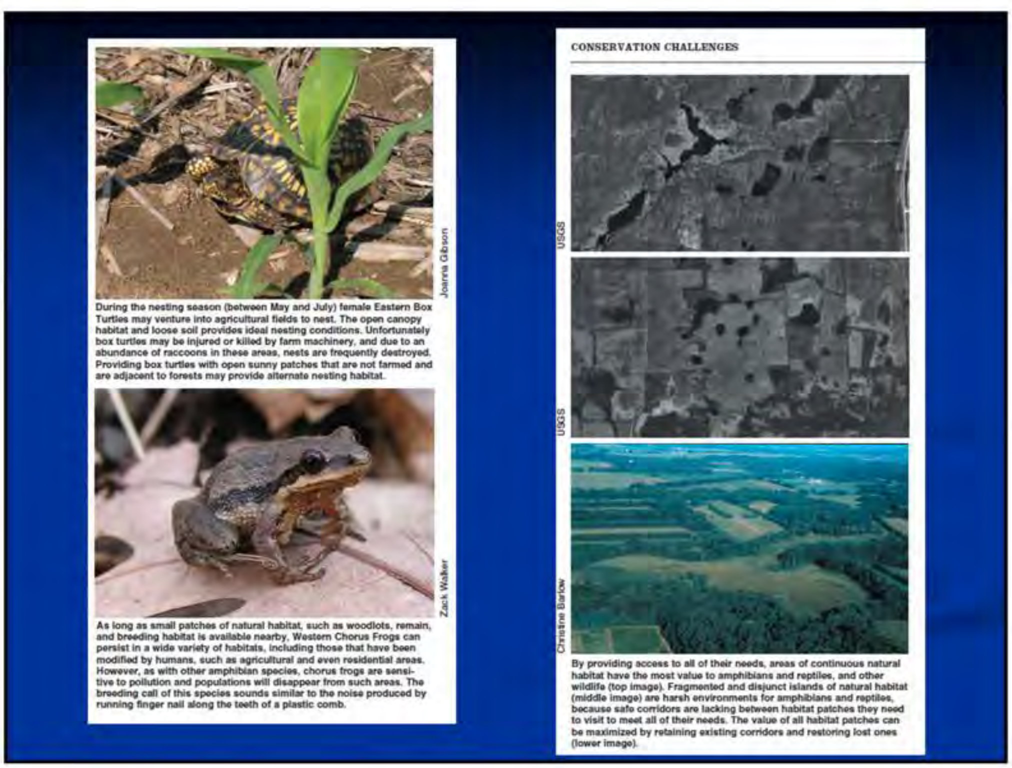

Wetland Losses
and Gains
2000-2010
2000 AND 2010 WETLANDS
(6,211 ACRES)
2000 WETLANDS - LOSS
(620 ACRES)
2010 WETLANDS - GAIN
(3,062 ACRES)
FARMED WETLANDS 2010
(432 ACRES)
RR-23
ROOT RIVER REACH AREAS
SURFACE WATER
WATERSHED BOUNDARY
SUBCONTINENTAL DIVIDE


Wetland Losses
and Gains
2000-2010
Acres
1600.0
1400.0
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
RR1 RR2 RR3 RR4 RR5 RR6 RR7 RR8 RR9 RR10 RR11 RR12 RR13 RR14 RR15 RR16 RR17 RR18 RR19 RR20 RR21 RR22 RR23
2000 Wetland Loss
Common Wetland in 2000 and 2010
2010 Wetland Gained
SURFACE WATER
WATERSHED BOUNDARY
SUBCONTINENTAL DIVIDE


Wetland Losses and Gains 2000-2010
2010 Farmed Wetlands
Acres
250.0
200.0
150.0
100.0
50.0
0.0
RR1 RR2 RR3 RR4 RR5 RR6 RR7 RR8 RR9 RR10 RR11 RR12 RR13 RR14 RR15 RR16 RR17 RR18 RR19 RR20 RR21 RR22 RR23
WATERSHED BOUNDARY
SUBCONTINENTAL DIVIDE


Wetland Cover Types
EMERGANT WET MEADOW
FLATS/UNVEGETATED WET SOIL
FORESTED WETLAND
SCRUB/SHRUB WETLAND
RR-23 ROOT RIVER REACH AREAS
SURFACE WATER
WATERSHED BOUNDARY
SUBCONTINENTAL DIVIDE


Upland
Vegetation Types
BRUSH
CONIFER
DECIDUOUS
GRASSLAND
MIXED AREA
WOODLANDS (YEAR 2010)
RR-23
ROOT RIVER REACH AREAS
SURFACE WATER
WATERSHED BOUNDARY
SUBCONTINENTAL DIVIDE
RR-1
RR-2
RR-3
RR-4
RR-5
RR-6
RR-8
RR-9
RR-10
RR-11
RR-12
RR-13
RR-14
RR-15
RR-16
RR-17
RR-19
RR-21
RR-22
RR-23
LAKE
MICHIGAN
RACINE CO
KENOSHA CO


Joanna Gibson
During the nesting season (between May and July) female Eastern Box Turtles may venture into agricultural fields to nest. The open canopy habitat and loose soil provides ideal nesting conditions. Unfortunately box turtles may be injured or killed by farm machinery, and due to an abundance of raccoons in these areas, nests are frequently destroyed. Providing box turtles with open sunny patches that are not farmed and are adjacent to forests may provide alternate nesting habitat.
Zack Walker
As long as small patches of natural habitat, such as woodlots, remain, and breeding habitat is available nearby, Western Chorus Frogs can persist in a wide variety of habitats, including those that have been modified by humans, such as agricultural and even residential areas. However, as with other amphibian species, chorus frogs are sensitive to pollution and populations will disappear from such areas. The breeding call of this species sounds similar to the noise produced by running finger nail along the teeth of a plastic comb.
CONSERVATION CHALLENGES
USGS
USGS
Christine Barlow
By providing access to all of their needs, areas of continuous natural habitat have the most value to amphibians and reptiles, and other wildlife (top image). Fragmented and disjunct islands of natural habitat (middle image) are harsh environments for amphibians and reptiles, because safe corridors are lacking between habitat patches they need to visit to meet all of their needs. The value of all habitat patches can be maximized by retaining existing corridors and restoring lost ones (lower image).


Prioritization for habitat connectivity
CONSERVATION CHALLENGES
USFWS
USFWS
Seasonal wetlands, such as prairie pothole wetlands, are one of the most important and threatened habitats for amphibians and reptiles in the Midwest. Seasonal wetlands once interspersed much of the Midwestern landscape, but due to extensive ditching, draining, and tilling for agriculture and development, widespread degradation or outright loss of much of these aquatic habitats has taken place.
Wisconsin DNR
Roads and urban development often result in considerable amphibian and reptile population declines as they "break-up" or fragment once continuous areas of natural habitat. This aerial photograph highlights how wetland and forested habitats have been fragmented by houses and roads. Amphibians and reptiles living in this environment face considerable risk from continued loss of habitat, road mortality, and isolation of populations.
North Dakota Fish and Game
Many species of amphibians and reptiles need access to multiple habitats to meet their life history needs. For example, Western Chorus Frogs breed in seasonal and permanent wetlands, such as prairie pothole wetlands (shown above), but spend the remainder of the year in surrounding grassland and prairie habitats. Outside of the breeding season they are rarely encountered as they seek moist refuge under ground surface cover. It is important that landowners and land managers integrate the concept of multiple habitat use into management plans to help ensure the conservation of the many species of amphibians and reptiles that rely on more than one habitat type.
LANDSCAPE SCALE AND CONNECTIVITY
of the habitats themselves is crucial for management

Boxhorn, Joseph E.

From: ROGER Chernik <rkchernik@gmail.com>
Sent: Thursday, November 07, 2013 4:11 PM
To: Boxhorn, Joseph E.
Subject: Re: River Bend Canoe/Kayak Rentals

Categories: Blue Category, Red Category

Joe,

We had 1-1/2 hours of fishing on the Root River for each of 320 children attending our summer camps. There were and are on an on-going basis, water science programs using the ox-bow pond which is essentially part of the Root River. I can quantify if you are interested. We are also doing much land restoration on upland and wetland areas and beginning run-off control and infiltration. It is vey labor intensive as you know. I will attempt to quantify next month as we retire for the season but I believe we dealt with at least 5-7 acres this year. Two additional rain gardens and a bio-swale were built this fall.

Roger

Roger

On Thu, Nov 7, 2013 at 8:37 AM, Boxhorn, Joseph E. <jboxhorn@sewrpc.org> wrote:

Hi Roger,

Thanks for sending the data on rentals. We'll incorporate it into the report.

At last week's meeting you indicated that there was other usage of the River at River Bend that did not involve rentals. Do you have any data on that? If you don't have data, could you send me a description of what it encompasses and about how much of it is happening.

Thanks,

Joe

==

Joseph E. Boxhorn, Ph.D. Senior Planner

Southeastern Wisconsin Regional Planning Commission

N239 W1812 Rockwood Drive

P.O. Box 1607

Waukesha, WI 53187-1607

Phone: 262-547-6722 ext. 244

Fax: 262-547-1103

E-mail: jboxhorn@sewrpc.org

Web: www.sewrpc.org

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From: ROGER Chernik [mailto:rkchernik@gmail.com]
Sent: Friday, November 01, 2013 4:30 PM
To: Boxhorn, Joseph E.
Subject: River Bend Canoe/Kayak Rentals

PRELIMINARY DRAFT

Joe,

Use for 2013, mid-May through October at River Bend was 966 hours of rental to 1256 individuals. Roughly, for the 24 week period that is 40 hours per week and 52 people per week.

The people visiting us in the first half of June were given accurate information to that date but usage picked up dramatically as summer camp, school vacations and warm weather came about. We expect greater usage next year as word of River Bend spreads in the community.

Hope this helps.

Please note one of your UW Extension colleagues, Murali Vedula is on the River Bend Board of Directors.

Roger Chernik

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Exhibit D

Table V-D

HORLICK DAM ALTERNATIVE SUMMARY—COSTS

Alternative	Capital Cost[b,c] (dollars)	Annual Operation and Maintenance (dollars)[d]	Total Present Worth Cost (dollars)	Two or More Feet of Freeboard for the 0.2-percent-annual-probability (500-year) event[a]	
				Capital Cost[b,c] (dollars)	Total Present Worth Cost (dollars)
Alternative 1–Lower Crest for 500-Year Capacity	$390,000	$4,500	$461,000	$450,000	$521,000
Alternative 2–Lengthen Spillway for 500-Year Capacity	$910,000[e]	$4,300	$978,000	$910,000	$978,000
Alternative 3–Alt 1 with Fishway	$530,000	$4,700	$605,000	$580,000	$655,000
Alternative 4–Full Notch of Dam for 500-Year Capacity	$440,000	$2,100	$473,000	$500,000	$533,000
Alternative 5–Dam Removal	$540,000	$ 700	$551,000	$540,000	$551,000

NOTE: Additions/changes are highlighted.

[a]*Under this scenario, Alternatives 1, 3, and 4 were modified to provide approximately two feet of freeboard to the tops of the left and right concrete abutments of the Horlick dam based on the maximum 0.2-percent-annual-probability (500-year) flood elevation. The modifications included in Alternatives 2 and 5 already provide a minimum of two feet of freeboard to the tops of the adjacent abutments, thus there were no changes to their costs. Annual operation and maintenance costs are unchanged. These modifications for Alternatives 1, 3, and 4 were developed to provide a level of freeboard consistent with Alternative 2. The determination of an acceptable level of freeboard if any of Alternatives 1 through 4 were selected for implementation would depend on specific considerations of the detailed project design and possible regulatory requirements. The relative present worth cost ranking of the five alternatives is the same, whether the cost is based on 0.5 foot or two feet of freeboard under Alternatives 1, 3, and 4. The scenarios under which Alternatives 1, 3, and 4 call for two feet of freeboard can be considered to represent possible upper levels for project costs.*

[b]*Capital costs based upon year 2013 conditions. Engineering News-Record Construction Cost Index: 12,208.*

[c]*These are systems-level planning costs and the WDNR has indicated that even after the final design stage, the average dam reconstruction change order amount is 40 percent of the initial capital cost estimate, mainly due to unforeseen site conditions once construction begins.*

[d]*Based on an interest rate of 6 percent and a project life of 50 years.*

[e]*Capital cost includes $240,000 for raising Old Mill Drive.*

Source: SEWRPC.

#214967
300-1106
MGH/LLK/pk
11/25/13