

St. Croix Basin Water Resources Planning Status Report 2005

June 9, 2005

Prepared by Pamela J. Davis
St. Croix Basin Water Resources Planning Team Coordinator
&
St. Croix Basin Water Resources Planning Team

Signatory Agencies in Memorandum of Understanding

Minnesota Department of Natural Resources (MDNR)
Minnesota Pollution Control Agency (MPCA)
St. Croix National Scenic Riverway, National Park Service (SACN, NPS)
Wisconsin Department of Natural Resources (WDNR)
Minnesota-Wisconsin Boundary Area Commission (no longer functioning)

Cooperating Members

Chisago County
Metropolitan Council Environmental Services (MCES)
Minnesota Department of Agriculture (MDA)
St. Croix Chippewa Indians of Wisconsin
St. Croix County
St. Croix Watershed Research Station (SCWRS, Science Museum of Minnesota)
United States Geological Survey (USGS)
University of Minnesota (UMN)
University of Wisconsin Extension (UW)

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2005
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Acknowledgements

St. Croix Basin Water Resources Planning Status Report 2005 is dedicated to the St. Croix Basin Water Resources Planning Team and Subcommittee members. When I started working with the Basin Team 10 years ago as one who has never worked with governmental agencies before except as a citizen needing their services, I was wondering how an organization which included federal, state and local employees and other organizations representing specific interests would function. From the very beginning I was extraordinarily impressed with the dedication and thoughtfulness with which the Basin Team members addressed their goals and other members of the Basin Team. It is no wonder that the St. Croix River is a prized waterway rooted in grass root protection with agency support. Governmental agencies have the difficult task of attempting to meet the needs of all interested parties and still protect the water resources. The members of the Basin Team are dedicated to protecting the St. Croix for posterity. They are mindful of what future generations will say about their ability to preserve the water quality of the river. Theirs is a vision of long term planning and protection, not restoration, through interagency cooperation. The St. Croix could not ask to be in better hands.

I am forever thankful for the intimacy I have gained with the St. Croix River. From the very beginning of my Minnesota life, I took to the St. Croix River and immediately became immersed in its beauty. My move to Minnesota was motivated by a desire to change careers and gain an understanding of the natural world from a scientific perspective. Eleven years later my thirst for the science behind nature has metamorphosed into a passion to express my intimate connection with nature artistically. As first the St. Croix inspired my science career, so it is fitting that I will return to the St. Croix as inspiration to start the next stage of my life. Now I am ready to weave its influence into my art.

To all those who introduced me and supported my passion for the St. Croix River, I thank you. In particular I would like to thank Professor Jim Perry at the University of Minnesota for introducing me to the St. Croix as a graduate student; Randy Ferrin and the National Park Service for their constant support and funding; Metropolitan Council Environmental Services, Minnesota Pollution Control Agency and Wisconsin Department of Natural Resources for their funding.

Pamela J. Davis, retiring Basin Team Coordinator.

Executive Summary

When the St. Croix Basin Water Resources Planning Team (Basin Team) was created in 1993 through a cooperative agreement among state and federal agencies, one of its goals stated *develop and implement water resource management projects*. Twelve years after its inception, the Basin Team is tackling the formidable task of implementing a Basin-wide *20% reduction in phosphorus and sediment loading goal*. A lengthy goal-setting process revealed that a 20% reduction in phosphorus loading to Lake St. Croix will approximate the ecological condition of Lake St. Croix circa 1950, before major ecological changes occurred due to increasing eutrophication. Lake St. Croix, situated at the lower end of the St. Croix River, serves as an important integrator site for water quality throughout the St. Croix Basin.

During the initial years of the Basin Team, issues pertaining to the degradation of the water resources of the St. Croix River were identified as Issue Statement (listed below) and prioritized. Biennial Planning Status Reports have been prepared by the Basin Team to document and direct activities for water resource protection based on the Issue Statements (water resources issues) and interagency cooperation. The Basin Team that prepares the planning status reports does not have direct regulatory authority. Therefore these documents are created to guide and facilitate water resources protection and improvement in the St. Croix Basin. The Planning Status Reports are intended for four uses:

- Directing water resources decision making;
- Serving as a source of information for funding opportunities;
- Serving as a vehicle to create a unified plan between the two states of Wisconsin and Minnesota;
- Serving as an internal agency document to highlight basin-wide goals.

The *St. Croix Basin Water Resource Planning Status Report 2001* (Planning Status Report 2001) describes the history of water resource management in the St. Croix Basin, examines the water resources of the Basin, lists other plans developed for the Basin, guides water resource decision making, and provides a vehicle to create a unified plan between the two states of Wisconsin and Minnesota.

The purpose of the *St. Croix Basin Water Resources Planning Status Report 2003* (Planning Status Report 2003) was to document the efforts of the Basin Team in integrative interagency planning and management activities that protect and improve the quality of the surface and ground water resources of the St. Croix River Basin in Minnesota and Wisconsin. Planning Status Report 2003 reviews the work of the Basin Team since the completion of the Planning Status Report 2001. Both Planning Status Reports can be found at www.pca.state.mn.us/water/basins/stcroix/.

St. Croix Basin Water Resources Planning Status Report 2005 (Planning Status Report 2005) focuses on the *development and implementation of water resource goals*. One of the chapters details the products that have been completed towards the Issue Statements (water resources concerns) since the Basin Team's inception. For example, Planning Status Report 2005 describes the process through which the Basin Team developed a 20% phosphorus and sediment loading reduction goal for the St. Croix Basin and the implementation of that goal. The work of the Basin Team towards Goals 1, 2, and 3 are reviewed. The focus of Planning Status Report 2005 is to document the work of the Basin Team since the completion of the Planning Status Report 2003.

St. Croix Basin Water Resources Planning Team Membership

Signatory Agencies in Memorandum of Understanding

Minnesota Department of Natural Resources (MDNR)
Minnesota Pollution Control Agency (MPCA)
St. Croix National Scenic Riverway, National Park Service (SACN, NPS)
Wisconsin Department of Natural Resources (WDNR)
Minnesota-Wisconsin Boundary Area Commission (no longer functioning)

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St. Croix County
St. Croix Watershed Research Station (SCWRS, Science Museum of Minnesota)
United States Geological Survey (USGS)
University of Minnesota (UMN)
University of Wisconsin Extension (UW)

St. Croix Basin Planning Team Staff

Pamela J. Davis, St. Croix Basin Water Resources Planning Team coordinator
James Harrison, St. Croix Basin Water Resources Planning Team conference coordinator

St. Croix Basin Water Resources Planning Status Report 2005

Chapter 1: Introduction

Chapter 1.1: St. Croix Basin Water Resources Planning Status Reports

Rapid population growth with the accompanying land use changes is impacting the water resources of the St. Croix Basin. State, federal and local units of government and other organizations are working cooperatively to address water quality protection and resolve impairments in the St. Croix River Basin. As water resource issues arise, the interagency organization provides a forum for the states to address these concerns. For example, the Nutrient Subcommittee of the Basin Team is working to implement a 20% reduction in phosphorus and sediment loading goal. Minnesota became the first state to pass legislation restricting the use of phosphorus in lawn fertilizer. Since 1999, phosphorus loads from Wisconsin point sources have declined 60%. The Basin Team provides an avenue for the two states to share their strategy to reach a common goal.

The St. Croix Basin Water Resources Planning Team (Basin Team), created by a *Memorandum of Understanding* among units of government, gathered in 1994 to develop water resources goals and a plan to accomplish these goals. The Basin Team established four goals:

Water Resources Goals of the St. Croix Basin Water Resources Planning Team

- Goal #1: Protect and improve the quality of the surface and groundwater resources of the St. Croix Basin.
- Goal #2: Provide a forum for water resources managers to integrate local, state, and federal policy.
- Goal #3: Increase public participation and knowledge in water resource planning and management.
- Goal # 4: Develop and implement water resource management projects.

During a scoping session, issues pertaining to the degradation of the water resources of the St. Croix River were identified as Issue Statements (listed below) and prioritized. Since 2001, biennial Planning Status Reports have been prepared by the Basin Team to document and direct activities for water resource protection based on the Issue Statements (water resources issues) and interagency cooperation. The Basin Team that prepares the planning status reports does not have direct regulatory authority; therefore, these documents are created to guide and facilitate water resources protection and improvement in the St. Croix Basin. The Planning Status Reports are intended for four uses:

- Directing water resources decision making;
- Serving as a source of information for funding opportunities;
- Serving as a vehicle to create a unified plan between the two states of Wisconsin and Minnesota;
- Serving as an internal agency document to highlight basin-wide goals.

The *St. Croix Basin Water Resource Planning Status Report 2001* (Planning Status Report 2001) described the history of water resources management in the St. Croix Basin, examined the water resources of the Basin, listed other plans developed for the Basin, and provided a vehicle to create a unified plan between the two states of Wisconsin and Minnesota to guide water resource decision making.

The purpose of the *St. Croix Basin Water Resources Planning Status Report 2003* (Planning Status Report 2003) was to document the efforts of the Basin Team in integrative interagency planning and management activities that protect and improve the quality of the surface and ground water resources of the St. Croix River Basin in Minnesota and Wisconsin. Planning Status Report 2003 reviewed the work of the Basin Team since the completion of the Planning Status Report 2001. Both Planning Status Reports can be found at www.pca.state.mn.us/water/basins/stcroix/.

St. Croix Basin Water Resources Planning Status Report 2005 (Planning Status Report 2005) focuses on the *development and implementation of water resources management*, defined above as goal #4 of the Basin Team. For example, Planning Status Report 2005 describes the process through which the Basin Team developed its recommendation for a 20% phosphorus and sediment loading reduction goal for the St. Croix Basin and the implementation of that goal. Planning Status Report 2005 also documents the work of the Basin Team since the completion of the Planning Status Report 2003.

Chapter 1.2: St. Croix Basin Water Resources Planning Status Report 2005

The Planning Status Report 2005 contains four chapters. Chapter 1 provides a background of the Basin Team and a description of its evolution since its inception in 1993. Work towards two of the goals overlap and are combined in Chapter 2. Chapters 2 through 4 are structured around the four goals of the Basin Team listed above and how the goals of the Basin Team have been implemented through the work of the Basin Team and its subcommittees. The chapters of the Planning Status Report 2005 are listed below:

Chapters of the Planning Status Report 2005 Based on Water Resources Goals

- Chapter 1: Introduction.
Chapter 2: Protect and improve the quality of the surface and groundwater resources of the St. Croix Basin (Basin Team Goal #1).
- Increase public participation and knowledge in water resource planning and management (Basin Team goal #3).
- Chapter 3: Provide a forum for water resources managers to integrate local, state, and federal policy (Basin Team goal #2)
- Chapter 4: Develop and implement water resources management projects (Basin Team goal #4).

Chapter 1.3: Background of the St. Croix Basin Water Resources Planning Team

In the early 1990s, local, state, and federal water resources managers were becoming increasingly concerned about the impacts of development and recreational use on water quality in the St. Croix River. Research provided evidence that nutrient loading from the St. Croix River mainstem and tributaries was increasing the rate of eutrophication in Lake St. Croix. The St. Croix River corridor is protected under the National Wild and Scenic Rivers Act (1968, 1972); however, the federal government has no control over the quality of the water flowing into the riverway. State and federal governments needed to work together to protect the St. Croix Basin from recreational and land use impacts. In 1993, a cooperative agreement was signed by the National Park Service, the Minnesota Department of Natural Resources, the Wisconsin Department of Natural Resources, Minnesota Pollution Control Agency, and coordinated by the Minnesota – Wisconsin Boundary Area Commission (no longer functioning).

From this Cooperative Agreement (Memorandum of Understanding) the St. Croix Basin Water Resources Planning Team was created to oversee the development of a basin plan and act as a forum for interagency interaction and local government and public involvement.

The original Basin Team has grown to include several cooperating member organizations with varying levels of participation.

<p style="text-align: center;">Organizations of the St. Croix Basin Water Resources Planning Team (Basin Team)</p> <p style="text-align: center;">Signatory Agencies in Memorandum of Understanding Minnesota Department of Natural Resources (MDNR) Minnesota Pollution Control Agency (MPCA) St. Croix National Scenic Riverway, National Park Service (SACN, NPS) Wisconsin Department of Natural Resources (WDNR) Minnesota-Wisconsin Boundary Area Commission (no longer functioning)</p> <p style="text-align: center;">Cooperating Members Chisago County Metropolitan Council Environmental Services (MCES) Minnesota Department of Agriculture (MDA) St. Croix Chippewa Indians of Wisconsin St. Croix County St. Croix Watershed Research Station (SCWRS, Science Museum of Minnesota) United States Geological Survey (USGS) University of Minnesota (UMN) University of Wisconsin Extension (UW)</p>

Chapter 1.4: Evolution of the St. Croix Basin Water Resources Planning Team

As the Basin Team has evolved, goal implementation has primarily occurred through the development of subcommittees. The Basin Team Core group meets on a quarterly basis to communicate on issues of mutual interest and direct the work of the subcommittees. The subcommittees address the issues identified in the Planning Status Report 2001 as posing the greatest concern to the water resources of the St. Croix Basin. In turn, these issues direct the research and activities of the Basin Team. The subcommittees are work groups. They offer an opportunity for public involvement and for other organizations to work on issues more pertinent to their specific interests.

Issue Statements (water resources issues) identified in 1993 by the St. Croix Basin Water Resources Planning Team and revised in 2001
1. Establish nutrient and sediment budgets for point and nonpoint sources
2. Address the impact of urban stormwater runoff
3. Address the need for long term monitoring
4. Increase public participation and knowledge in water quality management
5. Resolve differences in water quality standards between the two states
6. Forecast the future changes in land and water resources
7. Address the impact of rural nonpoint runoff (other than nutrients, sediment, and stormwater)
8. Evaluate sediment contamination

9. Assess the impact of impoundments
10. Assess the condition of the groundwater and suggest a protection strategy; list identified areas of higher sensitivity
11. Assess the impact from recreational use
12. Develop a common protection strategy for rare and endangered species and natural communities and their habitat
13. Assess the impact of water-dependent commercial agricultural operations

The Basin Team has been assisted through the work of a Basin Team Coordinator and a Conference Coordinator. The Basin Team funded a full time coordinator from 2000 – 2002, and part time funding has been secured through June 2005. The coordinator prepares the Planning Status Reports and facilitates the work of the Basin Team Core group and its subcommittees. The coordinator also handles administrative responsibilities of the Basin Team, such as mailing public notices in response to the reissuance of permits for waste water treatment facilities and other communication on behalf of the Basin Team. Public notices for the reissuance of permits are posted on each state's website:

- State of Wisconsin: <http://www.dnr.state.wi.us/org/water/wm/ww/drafts/pubnot.htm>
- State of Minnesota: <http://www.pca.state.mn.us/news/data/index.cfm>

Until funding is secured for a new Basin Team coordinator after June 2005, some of the current coordinator tasks will be administered by the following agencies:

- Basin Team meetings
 - Preparation of meeting notes: Wisconsin Department of Natural Resources, Kathy Bartilson and staff.
 - Communication regarding meetings: Wisconsin Department of Natural Resources, Kathy Bartilson and staff.
- Response to public notices in regards to waste water treatment facilities:
 - St. Croix National Scenic Riverway, Randy Ferrin.

In 2003 the Basin Team began funding a Conference Coordinator to coordinate their yearly conferences. Conference funding has been secured through 2005. The Conference Coordinator, with the assistance of the Conference Subcommittee, the St. Croix Basin Team, the University of Wisconsin Extension, the St. Croix Watershed Research Station, and the Minnesota Department of Agriculture, administered the 2004 and 2005 Nutrient and Sediment conferences.

Chapter 2

Protect and improve the quality of the surface and groundwater resources of the St. Croix Basin (Goal #1)

Increase public participation and knowledge in water resources planning and management (Goal #3)

Chapter 2.1: Water Resource Goals and Issue Statements

At its inception, the St. Croix Basin Water Resources Planning Team (Basin Team) developed four water resources goals which have directed the activities of the Basin Team. This chapter is a brief review of the work accomplished towards the first and third goals since these two goals overlap. The first goal states "*Protect and improve the quality of the surface and groundwater resources of the St. Croix Basin*". The third goal states "*Increase public participation and knowledge in water resources planning and management*". Work towards these two goals has been ordered around the Issue Statements (water resource issues) listed in Chapter 1 with a brief summary of the Basin Team's work following each Issue Statement. After each Issue Statement, a list is provided that documents the work. The documentation information describes the conferences, reports, presentations, posters, and other methods of communication produced by the Basin Team for agency and public use. A complete reference for the documentation follows Issue Statement 13. More in-depth details of Issue Statements 1 - 4, 6 and a Finance Task Force are covered in Chapter 4.

Chapter 2.2: Issue Statements and Activities

► **Issue Statement #1: Establish nutrient and sediment budgets for point and nonpoint sources (for more details see chapter 4)**

Activities

- Beginning in 2003, a series of monthly meetings were administered by the Nutrient Technical Subcommittee where research was analyzed to determine nutrient loading reduction goals for the St. Croix Basin.
- [make this the second bullet] Beginning in April 2005, regular meetings have been scheduled to coordinate the Basin Team's efforts towards implementation of the 20% reduction in phosphorus and sediment loading goal. The first meeting in April focused on developing site-specific water quality standards for Lake St. Croix, SWAT modeling, funding for expanding SWAT modeling and continuing the Basin Team coordinator position.
- The work of the Nutrient Technical Subcommittee was presented at the 4th, 5th and 6th Annual Conference titled *Protecting the St. Croix: Reducing and Management Nutrients and Sediment* and the 14th, 15th and 16th St. Croix Watershed Research Station Research Rendezvous.
- A report titled *The St. Croix Basin Phosphorus-Based Water-Quality Goals* was prepared based on the recommended goals of the Basin Team and the proceedings of the 5th Annual Conference *Protecting the St. Croix: Reducing and Management Nutrients and Sediment*.
- A Power Point presentation for the general public was prepared that explains why a 20% reduction in nutrient loading to the St. Croix Basin is necessary.
- A poster and handouts were created explaining the 20% nutrient loading reduction goal recommended by the Basin Team.
- Internal documents were prepared based on the Nutrient Subcommittee meetings.

*Documentation of Issue Statement 1

- Online (internet accessible)
 - *Environmental Indicators Online* article written for the MPCA website, prepared by Frank Kohlash: The article highlights the work of the Nutrient Subcommittee developing and implementing the 20% reduction in phosphorus and sediment loading goal. To review the complete article. See Appendix 7.
 - *Planning Status Reports 2001, 2003* www.pca.state.mn.us/water/basins/stcroix/.
 - *St. Croix Basin Phosphorus-Based Water Quality Goals*
 - www.pca.state.mn.us/water/basins/stcroix/.
 - www.smm.org/SCWRS/researchreports.php
- Journals
 - Special Issue of the *Journal of Paleolimnology*: The St. Croix Watershed Research Station is preparing articles for a special issue of the *Journal of Paleolimnology*. This issue will highlight how paleolimnology has contributed to decision making. The issue will include the research used to determine the goal of a 20% reduction in phosphorus and sediment loading recommended by the Basin Team. Paleolimnological research on Lake Peppin work will also be included. The special issue will be published the spring of 2006.
- Reports
 - *Planning Status Reports 2001, 2003, 2005*
 - *St. Croix Basin Phosphorus-Based Water Quality Goals*
- Posters / Kiosk
 - The Science Museum of Minnesota will have on display starting October or November 2005 a kiosk that will demonstrate the information from the *Environmental Indicators Online* article (www.pca.state.mn.us/water/basins/stcroix/). The article highlights the work of the Nutrient Subcommittee developing and implementing the 20% reduction in phosphorus and sediment loading goal.
 - *The St. Croix River Basin...* (8 1/2" x 11")
 - *20% Reduction in Phosphorus Loading* (MPCA, in process)
- Power Point presentation:
 - *A Degrading Scenic St. Croix*
- Conferences
 - On October 19th, 2005, the Water Resources Center at the University of Minnesota is hosting a conference. A session is being developed that provides a panel discussion on how science can turn into policy based on the Lake St. Croix and Lake Pepin nutrient studies.
 - Presentations and coordination: annual conferences titled *Protecting the St. Croix: Reducing and Managing Nutrients and Sediment*
 - *St. Croix Watershed Research Station Research Rendezvous*
- Approved meeting notes
 - Core Basin Team and Subcommittee meetings.

► **Issue Statement #2: Address the impact of urban stormwater runoff (for more details see chapter 4)**

Activities

- The Minnesota Pollution Control Agency (MPCA) and the Wisconsin Department of Natural Resources (WDNR) are developing rules to address the Phase II federal stormwater program requirements.

- Project NEMO (Non-point Education for Municipal Officials) presentations were made throughout the St. Croix Basin by the Minnesota Erosion Control Association (MECA). NEMO presentations were made by MECA to the following communities: Washington County kickoff, Bayport, Lake Elmo, Marine on St. Croix and the water management organizations in the area, Township officials from Scandia, May Township and Stillwater Township, Oakdale, Ramsey Washington Metro Watershed District Board, Hugo, Stillwater Township Planning Commission, Birchwood and Mahtomedi.

***Documentation of Issue Statement 2**

- Reports
 - Planning Status Reports 2001, 2003, 2005
- Approved meeting notes
 - Core Basin Team and Subcommittee meetings.

► **Issue Statement #3: Address the need for long term monitoring and accompanying financial needs (for more details see chapter 4)**

Activities

- A long-term monitoring plan is being developed by the Nutrient Subcommittee with accompanying financial needs based on the nutrient subcommittee's work and the other Issue Statements (see Appendix 2). Funding may be available for the Nutrient Subcommittee to hire someone to develop this plan
- The National Park Service's Inventory and Monitoring Program began work on protocols for monitoring large rivers including the St. Croix and Mississippi. The NPS Great Lakes Inventory and Monitoring Network (Large River park monitoring) is moving forward.
- A Great Lakes National Parks Network aquatic synthesis (a detailed literature review of existing aquatic research) is almost completed.
 - The aquatic synthesis can be found in draft form at: <http://www1.nature.nps.gov/im/units/glkn/reports.htm>. Due to high resolution maps, the file is very large and it is advised to wait to download the synthesis until it is finalized in summer 2005.

*** Documentation of Issue Statement 3**

- Online
 - The aquatic synthesis can be found in draft form at: <http://www1.nature.nps.gov/im/units/glkn/reports.htm>. Due to high resolution maps, the file is very large and it is advised to wait to download the synthesis until it is finalized in summer 2005.
- Reports
 - *Planning Status Reports 2001, 2003, 2005* (initially stated as Issue Statement #4 within Planning Status Report 2001)
- Approved meeting notes
 - The Core Basin Team and Subcommittee meetings.

► **Issue Statement #4: Increase public participation and knowledge in water quality management (see Issue Statement #1 above)**

Activities

- On October 19th, 2005 the Water Resources Center at the University of Minnesota is hosting a conference. A session is being developed that provides a panel discussion on how science can turn into policy based on the Lake St. Croix and Lake Pepin nutrient studies.
- An *Environmental Indicators Online* article was developed for the MPCA website (www.pca.state.mn.us/water/basins/stcroix/). The article highlights the work of the Nutrient Subcommittee developing and implementing the 20% reduction in phosphorus and sediment loading goal.
- The Science Museum of Minnesota will have on display starting October or November 2005 a kiosk that will demonstrate the information from the *Environmental Indicators Online* article.
- Power Point presentations were given to local organizations and workshops to explain the process of determining a 20% nutrient loading reduction goal by the Basin Team
- Annual conferences were held to provide information about the work of the Basin Team and other local organizations and provide an opportunity for feedback from the community.
- An 8 ½' x 11" poster was prepared for general distribution based on the work of the Nutrient Subcommittee (for a black and white copy of the poster see Appendix 7).
- Alternative radio station WMNN, 1330AM, interviewed the Basin Team coordinator. The interview provided a follow-up to an article written in the St. Paul Pioneer Press on March 7, 2004. The Pioneer Press article discussed the Nutrient Committee's work and the 2004 Nutrient and Sediment conference. Basin Team members were interviewed for the article.
- Basin Team members serve on various committees to develop local watershed water resources plans and to incorporate the 20% reduction goal.
- The work of the subcommittees provided a hands-on opportunity for community members to be engaged in Basin Team activities.

***Documentation of Issue Statement 4**

- Reports
 - *Environmental Indicators Online* article on the MPCA website www.pca.state.mn.us/water/basins/stcroix/.
 - Planning Status Reports 2001, 2003, 2005
 - *Guidance for Watershed Stewardship, Lower St. Croix River, A Stream Protection Strategy*, Appendix 3.
- Approved meeting notes
 - Core Basin Team and Subcommittee meetings.

► **Issue Statement #5: Resolve differences in water quality standards between the two states**

Activities

- Currently the Nutrient Subcommittee is developing a "Nutrient Agreement" between Minnesota and Wisconsin in support of the 20% reduction in phosphorus and sediment loading so that both states are adopting similar strategies on the same time line.
- This issue was addressed in detail in Planning Status Reports 2001 and 2003.

***Documentation of Issue Statement 5**

- Reports: *Planning Status Reports 2001, 2003, 2005*
- Approved meeting notes
 - Core Basin Team and Subcommittee meetings.

**► Issue Statement #6: Forecast the future changes in land and water resources
(for more details see chapter 4)**

Activities

- At the 6th Annual *Protecting the St. Croix: Reducing and Managing Nutrients and Sediments* conference (April 14, 2005) John Kari from Metropolitan Council detailed the population growth and accompanying land use changes in the St. Croix Basin. The presentation explored demographic, economic and development trends affecting the St. Croix Basin with a concentration on the influence of the Twin Cities region. A 39% population growth is projected to occur in the St. Croix Basin by the year 2020.
- Research prepared by the Nutrient Technical Subcommittee projected impacts from nutrient loading based on population growth and the accompanying land use changes; SWAT modeling by the TAPwaters program within the St. Croix Watershed Research Station has begun on the Willow River to determine sub-watershed nutrient loading.

***Documentation of Issue Statement 6**

- Presentations
 - Annual conferences titled *Protecting the St. Croix: Reducing and Managing Nutrients and Sediment*
 - Presentations and coordination: annual conferences titled *Protecting the St. Croix: Reducing and Managing Nutrients and Sediment*
- Reports
 - *Planning Status Reports 2001, 2005* (initially stated as #7 within Planning Status Report 2001)
- Approved meeting notes
 - Core Basin Team and Subcommittee meetings.

► Issue Statement #7: Address the impact of rural nonpoint runoff (other than nutrients, sediment, and stormwater)

Activities

- The USGS completed an analysis at two long term sites that were sampled for nutrients, suspended sediment, metals, bacteria, and pesticides (Lenz 2003).
- A regional mercury workshop was held at the St. Croix Watershed Research Station.

- A proposal for a River Defense Network on the St. Croix is being proposed that will determine time of travel for spills and thus will serve as the foundation for a spill plan.

***Documentation of Issue Statement 7**

- Reports
 - *Planning Status Reports 2001, 2005*
- Approved meeting notes
 - Core Basin Team and Subcommittee meetings.

► Issue Statement #8: Evaluate sediment contamination

Activities

- The USGS completed a trends analysis of data from two long-term sites that were sampled for flow, nutrients, suspended sediment, metals, bacteria, and pesticides (Lenz 2003).

***Documentation of Issue Statement 8**

- Reports
 - *Planning Status Reports 2001, 2005*
- Approved meeting notes
 - Core Basin Team and Subcommittee meetings.

► Issue Statement #9: Assess the impact of impoundments

Activities

- Some dams are being removed on the tributaries in Polk County (see the discussion by the WDNR in Chapter 3).
- Discussions are underway with the WDNR and Xcel to convert the St. Croix Falls Dam to a run-of-the-river operation.

***Documentation of Issue Statement 9**

- Reports
 - *Planning Status Reports 2001, 2005*
- Approved meeting notes
 - Core Basin Team and Subcommittee meetings

► Issue Statement #10: Assess the condition of the groundwater and suggest a protection strategy; list identified areas of higher sensitivity,

Activities

- Washington County is developing its own groundwater protection strategy outside the work of the Basin Team.
- The Lower St. Croix Valley Watershed Management Organization completed a Watershed Management Plan which identified and discussed groundwater quality and protection as a priority goal within its jurisdiction watershed boundaries.
- The NPS funded a proposal titled *Simulation of Ground-Water/Surface Water Interaction in the St. Croix River Basin, Wisconsin and Minnesota*. The USGS conducted the study and made a presentation at the Research Rendezvous in 2003 and 2004.

***Documentation of Issue Statement 10**

- Reports
 - *Planning Status Reports 2001, 2005*; 16th Annual Research Rendezvous 2004.
- Approved meeting notes
 - Core Basin Team and Subcommittee meetings.
- The USGS groundwater report for the St. Croix Basin will be issued in 2005.

► Issue Statement #11: Assess the impact from recreational use

Activities

- Issue Statement #11 is now addressed internally through the National Park Service. The island erosion study detailed in Planning Status Report 2001 was continued on the lower river. The islands exposed to boat waves and human trampling are eroding.
- The boat survey discussed in Planning Status Report 2001 was discontinued when the Boundary Area Commission was dismantled.

***Documentation of Issue Statement 11**

- Reports
 - *Planning Status Reports 2001, 2005*
- Approved meeting notes
 - Core Basin Team and subcommittee meetings.

► Issue Statement #12: Develop a common protection strategy for rare and endangered species and natural communities and their habitat.

Activities

- Issue Statement #12 is no longer part of the Basin Team's activities.
- The National Park Service, the Minnesota and Wisconsin Departments of Natural Resources are part of Recovery Teams that are not part of the Basin Team. The Recovery Team are fully engaged in their role of protecting the habitat and populations of rare and endangered mussel species.

- The National Park Service and the Wisconsin and Minnesota Departments of Natural Resources are part of a Zebra Mussel Task Force (now titled the Aquatic Invasive Species Task Force) that is not part of the Basin Team.

***Documentation of Issue Statement 12**

- Reports
 - *Planning Status Reports 2001, 2005;*
- Poster
 - *Aquatic Habitats Classification on the St. Croix River* (Wan et al. 2004)
- Approved meeting notes
 - Core Basin Team and subcommittee meetings.

► **Issue Statement #13: Assess the impact of water-dependent commercial agricultural operations**

Activities

- Research on Issue Statement #13 was discussed in Planning Status Report 2001. No further work is planned.

***Documentation of Issue Statement 13**

- Reports: *Planning Status Reports 2001, 2005*
- Meeting notes from the Core Basin Team and subcommittee meetings.

The following reference list provides information whereby the documents and information listed above can be found.

***References for the sections listed above**

Conferences

Protecting the St. Croix: Reducing and Managing Nutrients and Sediments. 6 Annual conferences beginning in 2000. Sponsored by the St. Croix Basin Water Resources Planning Team. Conference coordinator Jim Harrison. Conference administrator John Haack. For information about the conferences contact John Haack, UW-Extension, Ag. Research Station, W6646 Highway 70, Spooner, WI., 54801, email john.haack@ces.uwex.edu.

St. Croix River Research Rendezvous. 16 annual conferences beginning in 1987. Sponsored by the St. Croix Watershed Research Station and the Science Museum of Minnesota. For information contact St. Croix Watershed Research Station, 16910 152nd Street North, Marine on St. Croix, Minnesota, 55047. Phone 651-433-5953. See website for abstracts from the Rendezvous.

NEMO

NEMO presentations, "Non-point Education for Municipal Officials". Presentations made by Jay Michels, Minnesota Erosion Control Association, 5424 Lake Elmo Avenue, Lake Elmo, MN. 55042. Phone 651-351-0630, email jmichels@skypoint.com

Posters

The St. Croix River Basin... 2004. 8 ½" x 11" 2-sided handout. Prepared by the Wisconsin Department of Natural Resources and the University of Wisconsin, Extension. Printed by the Minnesota Department of Natural Resources. Contact Kathy Bartilson, WDNR, 810 Maple St., Spooner, WI. 54801. Phone 715-635-4053, email Kathy.Bartilson@dnr.state.wi.us.

20% Reduction in Phosphorus Loading (in process). 2005. Prepared by the Minnesota Pollution Control Agency. Contact Craig Affeldt, Minnesota Pollution Control Agency, phone 651-296-6062, email craig.affeldt@pca.state.mn.us.

Power Point Presentation

A Degrading Scenic St. Croix. 2004. Prepared by Pamela J. Davis, Basin Team coordinator. Contact Randy Ferrin, St. Croix National Scenic Riverway, National Park Service, phone 715-483-3284, email Randy_Ferrin@NPS.gov or Craig Affeldt, Minnesota Pollution Control Agency, phone 651-296-6062, email craig.affeldt@pca.state.mn.us.

Reports

St. Croix Basin Water Resources Planning Status Report, 2001, prepared Pamela J. Davis and the St. Croix Basin Water Resources Planning Team. Contact Randy Ferrin, St. Croix National Scenic Riverway, National Park Service, phone 715-483-3284, email Randy_Ferrin@NPS.gov, or Craig Affeldt, Minnesota Pollution Control Agency, phone 651-296-6062, email craig.affeldt@pca.state.mn.us. The report is posted on the MPCA website www.pca.state.mn.us/water/basins/stcroix/.

St. Croix Basin Water Resources Planning Status Report, 2003, prepared by Pamela J. Davis and the St. Croix Basin Water Resources Planning Team. Contact Randy Ferrin, St. Croix National Scenic Riverway, National Park Service, phone 715-483-3284, email Randy_Ferrin@NPS.gov, or Craig Affeldt, Minnesota Pollution Control Agency, phone 651-296-6062, email craig.affeldt@pca.state.mn.us. The report is posted on the MPCA website www.pca.state.mn.us/water/basins/stcroix/.

St. Croix Basin Phosphorus-Based Water Quality Goals. August 2004. Report on the Recommended Water-Quality Goals of the St. Croix Basin Water Resources Planning Team and the Proceedings of the 5th Annual Conference "*Protecting the St. Croix: Reducing and Managing Nutrients and Sediments*". Contact Craig Affeldt, Minnesota Pollution Control Agency, phone 651-296-6062, email craig.affeldt@pca.state.mn.us. The report is posted on the following websites:

- www.pca.state.mn.us/publications/reports/stcroixbasin-phosreport04.pdf
- www.smm.org/SCWRS/researchreports.php

Chapter 3

Provide a forum for water resources managers to integrate local, state, and federal policy

Chapter 3.1: Agency Activity Updates

At its inception, the St. Croix Basin Water Resources Planning Team (Basin Team) developed four water resources goals which have directed the activities of the Basin Team. This chapter documents progress on the second goal which states *"Provide a forum for water resources managers to integrate local, state, and federal policy."* The members of the St. Croix Basin Water Resources Planning Team (Basin Team) include the four Signatory Agencies formed from a Memorandum of Understanding and other cooperating agencies and organizations who have joined the Basin Team since its inception.

The core group of Basin Team members meets on a quarterly basis. The subcommittees, which are focused on specific water resource concerns (Issue Statements), meet as warranted. As a forum the meetings provide an opportunity for the members to discuss, analyze, and coordinate agency information. Chapter 3 provides an update of the Basin Team member agencies' activities that include St. Croix River and relate to the St. Croix Basin. The following information represents agency updates discussed at meetings since the 2003 Planning Status Report. Some of the following agencies have listed the updates in chronological order, starting with more recent events. Other agencies have summarized by topic the events of the last two years.

Chapter 3.2: Signatory Member Agency Updates

Minnesota Department of Natural Resources (MDNR)

- Watershed districts and organizations are updating their water resource plans providing an opportune time to incorporate the work of the Basin Team towards a goal of a 20% reduction in phosphorus and sediment loading into the St. Croix Basin.
- The Minnesota land use regulations are on hold.
- Steve Johnson, after 17 years of working on the St. Croix with the Minnesota Department of Natural Resources (MDNR) and 10 years working with the Minnesota Wisconsin Boundary Area Commission (MWBAC) is resigning to work with Mississippi National River and Recreation Area (NPS).
- During the summer of 2003 water levels were at/or below levels not reached since 1988. At Q90, water allocations are cut off. Q90 means that 90% of the flow data on record are above the current levels. The cut-off for withdrawing water from the river was implemented mainly in the Snake River area for agricultural purposes and golf courses. The Metro area was close to the Q90 level.
- According to climatologists, the current trend in precipitation is fewer events, but those events are higher intensity.
- A public forum for citizens interested in boating rules on the Lower St. Croix National Scenic Riverway was held September 17th, 2003, at Oakland Junior High School on Lake Elmo, Minnesota. Both Minnesota and Wisconsin Departments of Natural Resources have had special boating rules in effect on the Lower St. Croix since 1977. Following publication of the new Cooperative Management Plan (2002), the states are proposing several rule changes.
- The DNR has assumed the coordination of the Lower St. Croix Management Commission since the closing of the Minnesota Wisconsin Boundary Area Commission MWBAC. These meetings have not been held with any regularity recently and may be reviewed for format changes. The same applies to the Management Commission's Technical Committee

Minnesota Pollution Control Agency (MPCA)

- The Snake River Watershed Management Board was awarded \$250,000 in Section 319/Clean Water Partnership (CWP) grant funds to install a variety of BMPs in the watershed.
- An application submitted by the Valley Branch Watershed District directed towards trout stream habitat and bank protection has been recommended for awarding.
- A 16-member stakeholder group coordinated by the MPCA has developed legislation to address impaired waters that will be considered by the Minnesota Legislature. The "Clean Water Legacy" would support future work on TMDLs and proposes a funding mechanism based on a water use fee system. The governor has indicated he will sign the measure.
- Local Water Management plans are being reviewed and/or revised by the Lower St. Croix Valley Watershed Management Organization (WMO), the Middle St. Croix WMO, the Marine on St. Croix WMO and Chisago County. These processes provide the opportunity to raise awareness of the phosphorus reduction goal and integrate the goal into local water plans.
- Printing of the report "St. Croix Basin Phosphorus-Based Water Quality Goals" was completed in August 2004. The report was mailed to participants in the 2004 nutrients and sediments conference and other interested parties in early 2005.
- The MPCA just finished a further reorganization in the management of water-related programs. A Metro Watershed and Service Delivery Unit under the Watershed Section was created with John Hensel as the unit supervisor. Some new staff was added for this unit to coordinate Basin planning activities for the Metro area and the St. Croix Basin. Basin planning functions continue to be housed in a reconfigured Regional Division. A new Municipal Division and a new Industrial Division were also created.
- Chisago County was one of three counties to receive a matching grant for a pilot Individual Sewage Treatment Systems Program (ISTS) program. The grant provides \$240,000 over 4 years to update the county ISTS inventory, and identify and correct systems that pose immediate hazards.
- The mandatory thresholds for Environmental Assessment Worksheets (EAWs) are being reviewed by the Minnesota Environmental Quality Board to consider possible changes. The MPCA air quality and wastewater categories are included in this review. The Basin Team will have the opportunity to review and comment on any proposed changes.
- There are 20 streams and 26 lakes in the Minnesota portion of the St. Croix Basin that are on the MPCA's 2004 list of impaired waters. Most of the stream listings are for impaired fish or invertebrate communities, while the lakes are listed for excessive nutrients. These numbers do not include listings for mercury or other toxic pollutants related to fish consumption. Currently, TMDL projects are underway for the North Branch of the Sunrise River, Martin and Typo Lakes in the upper Sunrise watershed, and the Groundhouse River (tributary of the Snake River).
- The executive summary of the report authored by Barr Engineering and titled *Detailed Assessment of Phosphorus Sources to Minnesota Watersheds* (February 2004) was distributed. It includes phosphorus assessments on the ten major basins in Minnesota and statewide. There is information on the St. Croix for Minnesota only. The MPCA website has the full report. <http://www.pca.state.mn.us/hot/legislature/reports/index.html>
- The next round of water quality rule revisions will include new proposed water quality standards for lakes. Public meetings were conducted during 2004, and public hearings are expected to be held in mid-2005. The proposed phosphorus lake standards are eco-region based. Consideration has been given to how those lakes which are already below the standard will be managed to protect them from increasing phosphorus loads. The proposed rule changes also include requiring a 1 mg/L phosphorus effluent limit for new and expanding discharges with effluent loadings of greater than 1,800 lbs/year.
- A new wastewater treatment facility is planned for Sturgeon Lake.

- An upgrade is planned at Chisago Lakes Area Sanitary District which will expand the wastewater treatment facility and phase out facilities now serving the cities of Wyoming and Stacy. The Chisago Lakes Area facility will include the phosphorus effluent limit of 1 mg/L. This will be a significant reduction in current effluent loading. The Polaris company purchased the site of the wastewater treatment facility for the city of Wyoming to build a research and development facility.
- Color analysis has been added to the parameter list for all water quality monitoring stations within the St. Croix Basin. Two long-term "Milestone" sites are located on Lake St Croix, at river mile 17 (rail road bridge) and 23 (Stillwater). A suggestion was made to include dissolved organic carbon (DOC) in the analysis.
 - Note: MCES is currently monitoring at Stillwater and Prescott and has a long term data set.
- MPCA has a new water quality data access system called the Environmental Data Access web page. This product uses GIS to access Minnesota STORET water quality data at hundreds of locations across the state. Some data collected by organizations other than the MPCA is also available. <http://www.pca.state.mn.us/data/eda/index.html>
- USEPA conducted a 2-day workshop in Hinckley on the use of the stressor identification process in TMDL studies of waters with impaired biota. The Groundhouse River, an upper tributary of the Snake River, was used as the learning tool. Twenty river reaches in the St. Croix Basin on the Minnesota side were listed as impaired by fecal coliform contamination and/or with impaired biota.
- Leo Raudys has been appointed as the new manager of the MPCA Regional Division.
- The MPCA has created a new structure to get Phase II stormwater regulations up and running. This group includes stakeholders representing a range in interests related to stormwater to be better able to organize the demands of stormwater regulations such as rules, permitting, and inspection.
- MPCA approved 2 more years of funding for the Basin Team coordinator which will be effective from November, 2003 to June, 2005. This funding is in addition to the funding provided by the MCES through the NPS.
 - MPCA commissioner Sheryl Corrigan and deputy commissioner Kristin Applegate both have prior PCA experience and familiarity with key issues facing the state. Impaired waters, stormwater and basin planning are priorities. Some of the programs being reduced or eliminated due to budget cuts are closed landfills, leaking underground storage tanks, and clean-up of some super fund sites. With the federal money received from the TMDL program, the MPCA may be able to assist in local efforts.
- The Basin Coordinators have been reassessing basin planning in Minnesota. Basin Plans / Basin Information Documents have been completed on a five-year cycle and basins have had to report following a uniform format. A new format will be developed that will be more flexible and include information more specific to the each basin in addition to the representative water quality data. Some standardization of reporting is required to make comparisons among Basins.
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- The Bayport West project was withdrawn after the city of Bayport ordered the preparation of an EIS.

St. Croix National Scenic Riverway, National Park Service, (SACN, NPS)

- The NPS Great Lakes Inventory and Monitoring Network (Large River park monitoring) is moving forward. Dan Engstrom from the St. Croix Watershed Research Station is in charge of developing a monitoring protocol for large rivers. Sue Magdalene was hired to coordinate the development of the monitoring protocols and will work at the Research Station.

- Five proposals are being submitted for possible funding by the USGS/NPS water quality partnership program during this annual round of proposal writing. The proposals cover a variety of water resource issues.
- A Great Lakes National Parks Network aquatic synthesis (a detailed literature review of existing aquatic research) is almost completed, with Brenda Moraska Lafrancois and Jay Glase, both from the National Park Service, as lead authors. There are specific chapters addressing St. Croix National Scenic Riverway, Mississippi National River and Recreation Area, and the Upper Mississippi River Basin NAWQA unit.
 - The aquatic synthesis can be found in draft form at: <http://www1.nature.nps.gov/im/units/glkn/reports.htm>. Due to high resolution maps, the file is very large and it is advised to wait to download the synthesis until it is finalized in summer 2005.
- Along with Kent Johnson (MCES), Mark Tomasek and Craig Affeldt (MPCA), Brenda Moraska Lafrancois will be writing a manuscript on her trends analysis component of the nutrient goal setting work completed by the nutrient subcommittee.
- Randy Ferrin presented the nutrient goal setting work at the biennial NPS water resource specialists meeting in Fort Collins, CO. in November, 2004.
- The St. Croix is one of the focus areas of the watershed boundary delineation work (Hydrologic Unit Code or HUC) being done by an interagency task force which includes the WDNR, USGS, and US Forest Service. The NPS is involved with only the St. Croix Basin watershed delineations.
- At a USGS inter-regional conference held in May 2004, Randy Ferrin presented the information on the Basin Team's nutrient study to see how it could be incorporated in the USGS nutrient program.
- Randy Ferrin and Bernie Lenz (USGS) attended a groundwater meeting in Pierce County to develop groundwater protection.
- The NPS/USGS groundwater study was presented at the Research Rendezvous in October, 2004.
- The discussion on the new Stillwater Bridge is coming to a conclusion. The new bridge as proposed will have less visual impact than the bridge proposed in 1995. The existing lift bridge will remain and be kept as a pedestrian bridge.
- The St. Croix Watershed Research Station's SWAT modeling funding proposal will be funded for two years by the NPS, starting in 2006.
- The St. Croix Watershed Research Station hosted a NPS Inventory and Monitoring Program Vital Signs workshop. Vital Signs provides long term funding for various monitoring variables.
- A proposal for a River Defense Network on the St. Croix was proposed that will determine time of travel for spills and thus will serve as the foundation for a spill plan. The proposal was not selected for funding at this time.
- Wisconsin Basin Partners Team has received funding for Project NEMO in Osceola, WI.
- The channel and blue catfish have been determined as host fish for the endangered winged maple leaf mussel. 10,000 of the juvenile mussels were placed in cages in the St. Croix.
- A new WWTP is being proposed for Danbury. It will be a groundwater discharge.
- Proposals are being developed with the USGS on the impact of pharmaceuticals and other organic wastewater contaminants on water quality in the St. Croix. The proposal was selected for funding in FY 2007.
- Brenda Moraska Lafrancois worked with Jill Medland (NPS) and other mussel researchers on proposals to synthesize existing mussel research, analyze information gaps and make recommendations for future research. She also worked with a researcher at U Mass-Amherst on a proposal to investigate oxygen depletion in Lake St. Croix using fossil chironomids in sediments. The chironomid project will be funded by the NPS for one year starting in 2006.

- The island erosion study was continued on the lower river. The islands exposed to boat waves and human trampling are eroding.
- Purple loosestrife beetles were released and have been a success.
- The NPS Great Lakes and Northern Forest Cooperative Ecosystem Study Unit has been established and housed at the University of Minnesota. The focus of this program is to assist in getting federally funded research completed in a more cost effective method. Currently, the overhead for funding projects through the University can be substantial.

Wisconsin Department of Natural Resources (WDNR),

- The Wisconsin Basin Partner Team is planning several stormwater conferences based on EPA's Phase II rules and Wisconsin's new rule and Technical Standards.
 - January 27, 2005: Siren, Wisconsin
 - February 8, 2005: Rhinelander, Wisconsin
 - August 4, 2005: UW-River Falls, River Falls, Wisconsin Rain as a Resource: Stormwater and Community Building
- A handout was distributed on the WDPES Point Source Discharge Permits of the St. Croix Basin which includes the expiration date, type of discharge, receiving water, and its phosphorus removal status.
- The St. Croix Tribal Fisheries unit in Danbury is shut down while it changes from surface to groundwater discharge. EPA has jurisdiction on the facility now, as the site has been added to the tribal trust lands.
- The City of Grantsburg (on the Wood River) established a stormwater utility to implement and finance future stormwater controls and to help meet the 20% nutrient reduction goal for the St. Croix. This could provide a case study for a future report or a conference.
- A presentation on the nutrient work and 20% reduction goal was given at WDNR headquarters in Madison; further discussions are needed within the agency on the tools needed to advance the goal in the state. Agency Administration supports the goal.
- Environmental groups presented a petition to WDNR asking for more northern river and stream segments to be classified as Outstanding Resource Waters (ORW) and Exceptional Resources Waters (ERW). These classifications provide higher levels of protection under Wisconsin's antidegradation rules.
- There is local interest in getting additional protection for the headwaters of the St. Croix River between Solon Springs and Gordon, Wisconsin. This section of the river is not part of the National Scenic Riverway, and is not listed as an Outstanding or Exceptional Resource water under Wisconsin law.
- Washburn County is trying to get the Totogatic listed as a state Wild River, a tributary to the Namekagon.
- A survey is being done to determine the ordinary high water mark delineation for Lake St. Croix under NR118 Shoreline Protection regulations. Current water levels are too low. The survey will determine what the ordinary high water mark is. This delineation is important for zoning and shoreline protection regulation.
- The Wisconsin Legislature has provided funding for educational efforts to stop the spread of invasive species transmitted from boaters. The program calls for boat inspections at landings, presentations at fishing tournaments, and monitoring for invasives.
- A partnership protection organization purchased a farm on Squaw Lake. Wetlands were restored on the farm and are designed to remove P going into the lake. Agriculture is a primary source of the P loading and is part of the partnership organization. They want to continue this work in other areas.
- A phosphorus mass balance was done on Squaw Lake with a very positive result with an imbalance. More phosphorus was coming into the lake than going out.

- A groundwater bill was signed on Earth Day 2004 regulating the withdrawal of groundwater, and calling for review of potential impacts on the quantity and temperature of surface waters near proposed high capacity wells. This higher level of review is needed to protect special areas such as trout streams from loss of groundwater recharge base flow.
- University of Wisconsin Extension and Project NEMO sponsored a low impact stormwater tour on Friday, June 11, 2004. The tour was designed for municipal officials, consultants and interested citizens in the St. Croix Basin.
- John Paddock from the Lower Chippewa region retired.
- The St. Croix Basin Partner Team received a Wisconsin Lakes Grant to support Project NEMO in 4 communities, develop a Project NEMO conference at UW River Falls, and provide assistance for developing stormwater permits.
- A memorandum of understanding has been prepared with Xcel Energy for run-of-the-river status at the St. Croix Falls Dam. The MOU can be reviewed by contacting Terry Margenau, WDNR St. Croix Basin Fisheries Supervisor: Terry.Margenau@dnr.state.wi.us.
- The City of St. Croix Falls is planning an expansion of their wastewater treatment facility.
- Western Wisconsin Land Trust organization has been purchasing lake shoreline property. The Trust supports minimal development with strict building restrictions and protects natural space.
- The WDNR are revamping their county shore land (shore land zoning) rules. Public meetings have been well attended.
- The City of Shell Lake constructed a pipeline to divert water from the lake to the Yellow River. This creates a connection from the landlocked seepage lake to a tributary of the St. Croix. The diversion was needed to lower high lake levels and flooding of structures in 2003. The diversion was built to operate at 20 cfs, and first started running in November, 2003. As of April, 2005, the lake has been lowered 4 feet, and is now a foot below the administrative ordinary high water level. The diversion is still operating, but only at 1 cfs.
- The WDNR is doing baseline fisheries monitoring on the St. Croix and one section of the Namekagon. WDNR is assessing the fish population of the St. Croix and Namekagon Rivers using a non-wadeable stream survey protocol. In the reach below St. Croix Falls, they encountered many redbreast including one of the state listed species.
- Over a million *Galerucella* beetles were raised and released the past several summers in the St. Croix and Upper Chippewa River basins to combat invasive purple loosestrife. The beetles were raised by volunteers with assistance from DNR staff.
- 2005 was a good year for the sturgeon transfer project. Eggs are collected from Yellow River sturgeon in Burnett County, fertilized, and then taken to a WDNR hatchery. The young fish have been stocked above the dams on the Namekagon at Trego and Hayward. A mussel survey was completed on the Yellow River to provide baseline data prior to the diversion of water from Shell Lake.
- A new Secretary, Deputy Secretary, and Division Administrators were appointed accompanying the change in Governor in 2003.
- The WDNR is taking over from the USGS the seasonal monitoring of the Danbury and St. Croix Falls long-term trend sites. The data dates back to 1988.
- A new waste-water treatment facility for the Roberts – Hammond area was just approved and will have to maintain background conditions with no mass caps. This facility will discharge into the Willow River, which is classified as a trout stream and listed as a 303d water. Population growth is exploding in the area. Treatment facilities are being built based on 20 year growth plans that are often reached within 2 – 5 years.
- 2 dams on being removed that were blown out during storm events: the Polk County Woodley Dam and the Osceola Creek Dam. Environmental Assessments are being done on these sites.

- The WDNR are working with the Army Corps of Engineers to monitor 2 sites: a) wetland restoration on Squaw Lake to help with nutrient reduction b) Horse Creek Lake project on Cedar Lake for nutrient control; this site has an 18 year data base.
- After 2 years of negotiation the West Wisconsin Land Trust secured purchase of all the property around Straight Lake, east of Luck. The property is slated to be given to the state for use as a wildlife area.

Chapter 3.3: Cooperating Member Agency Update

Metropolitan Council Environmental Services (MCES)

- **Monitoring Programs:**
 - Due to a staffing reduction in 2004, adjustments in the MCES river monitoring program were implemented in March 2005. Rather than weekly monitoring of St. Croix River sites at Stillwater and Prescott during the March-October period, bi-weekly monitoring is being conducted, resulting in some loss of water quality data for dissolved oxygen, temperature, pH, ammonia-nitrogen, fecal coliform bacteria, and turbidity.
 - For four consecutive summers (1999-2002), MCES and the Minnesota-Wisconsin Boundary Area Commission (MWBAC) provided leadership and guidance for the Lake St. Croix Volunteer Monitoring Program. Due to MCES staffing limitations and the demise of the MWBAC in late 2001, the volunteer monitoring program was not conducted during the summers of 2003 and 2004. The program will resume under MCES leadership in 2005, on a more limited scale. Four volunteers will monitor five sites in the upper, middle, and lower segments of Lake St. Croix, including qualitative observations of water quality (physical condition and recreational suitability), measurement of Secchi Disk transparency, and collection of water samples for MCES analysis of total phosphorus and chlorophyll-a content.
 - In 2004, MCES purchased satellite imagery software that can be used to estimate water quality in the Metro Area lakes, including Lake St. Croix. Using this new software, MCES has prepared an annual "Census of Twin Cities Lake Water Clarity" for 2003 and 2004, available by contacting Randy Anhorn (651-602-8743).
 - MCES is also providing support for a MPCA project, funded by the LCMR, which is examining the capability of aerial imagery (remote sensing) to estimate water quality conditions in rivers and streams. Aerial hyperspectral imagery was acquired via airplane in August 2004 at the confluence areas of several key rivers, including the St. Croix River/Mississippi River confluence. Supporting field samples were obtained at 37 river sites by MPCA and MCES staff. The relationship of aerial imagery to TSS, turbidity, TP, and chlorophyll levels will next be examined. The river remote sensing project is scheduled for completion by June 30, 2005.
- **Reports:**
 - A 2004 MCES report ("Regional Progress in Water Quality: Analysis of Water Quality Data from 1976 to 2002 for the Major Rivers in the Twin Cities") evaluates 25-year water quality trends in the major rivers (Mississippi, Minnesota, and St. Croix) within the Metro Area, to determine if the water leaving the Twin Cities is in better condition than when it arrives. The report is available on the Metropolitan Council website at: <http://www.metrocouncil.org/planning/environment/RegionalProgressInWaterQu>

[ality.pdf](#) The St. Croix River at Stillwater showed decreasing trends for fecal coliform bacteria, 5-day biochemical oxygen demand (BOD5), total Kjeldahl nitrogen (TKN), ammonia nitrogen (NH3), total suspended solids (TSS), and turbidity, and increasing trends for dissolved oxygen (DO) and nitrate-nitrite nitrogen (NOX). No trends in total phosphorus (TP) and chlorophyll-a (Chl-a) concentrations were evident. With regard to the total mass pollutant loads entering the Metro Area via the Mississippi River (at Anoka, MN), Minnesota River (at Jordan, MN), and St. Croix River (at Stillwater, MN), the St. Croix River contributes 5% of the NOX load, 17% of the TKN load, 11% of the TP load, and 5% of the TSS load. The Minnesota River degrades Mississippi River water quality, but the St. Croix River improves it.

- The MCES 2001, 2002, and 2003 Stream Monitoring Reports are posted on the Metropolitan Council website (<http://www.metrocouncil.org/environment/RiversLakes>). Hard copies of these reports are also available by request (contact Kent Johnson at 651-602-8117). Each annual report includes flow, water quality, and biological monitoring data from 28 stream monitoring sites in the Twin Cities Metro Area and Minnesota River Basin, in the vicinity of Mankato. Streams monitored by MCES within the St. Croix River Basin include Browns Creek, Carnelian-Marine Outlet, Silver Creek, and Valley Creek.

- **Data Management:**

- The MCES Environmental Information Management System (EIMS) was launched in March 2005. EIMS provides direct availability, via the internet, of all environmental monitoring data generated by MCES, including regional water quality data for rivers, streams, and lakes. The EIMS web address is: www.es.metc.state.mn.us/eims.

Minnesota Department of Agriculture (MDA)

- **Phosphorus lawn fertilizer law**

- The 0% phosphorus lawn fertilizer law has been expanded statewide, effective January 2005. The educational process is ongoing with hardware stores, lake groups, etc. Available on the MDA web site are handouts and publications that are being distributed. Go to www.mda.state.mn.us, click on "Water and Land", then click on "Lawn Care and Water Quality", scroll down to the sections on Phosphorus.

- **2004 Metro Media Campaign**

- The metro media campaign, which focused on the phosphorus lawn fertilizer law, won the Minnesota Great Award.

- **Chisago Children's Water Festival**

- Chisago County held its annual children's water festival on October 8, 2004. Sufficient funding was obtained.

St. Croix Watershed Research Station (SCWRS, Science Museum of Minnesota)

- **Basin Team Nutrient Subcommittee goal-setting**

- SCWRS staff participated in the work of the Nutrient Subcommittee throughout all of 2003-04 during the process of determining goals for reductions of nutrient and sediment loads to the St. Croix. Data critical to this process included sediment core work by Triplett, Edlund, and Engstrom (see below); history of point-source discharges to the St. Croix by Edlund (see below); and a 25-year

history of water-quality data from the St. Croix, statistically analyzed by Moraska-Lafrancois of the NPS. The Nutrient Subcommittee met nearly monthly at the SCWRS through 2003 and into early 2004 in preparation of presenting the nutrient-reduction goals at the 2004 Sediment and Nutrient Conference held at the Trollhaugen Conference Center on 12 February 2004.

- **Lake St. Croix sediment core research**

- In late 2003, the report titled *A Whole-Basin Reconstruction of Sediment and Phosphorus Loading to Lake St. Croix* was completed by SCWRS scientists Triplett, Engstrom, and Edlund and submitted as the final project report to the funding agency, Metropolitan Council Environmental Services. This report provided critical data to the Nutrient Subcommittee in choosing goals for reducing nutrient and sediment loads to the St. Croix. The report is posted on the SCWRS web page (www.smm.org/SCWRS/).

Laura Triplett, a University of Minnesota (UMN) graduate student working at the SCWRS, received a prestigious Canon National Parks Science Scholarship to continue and expand this work as the basis for her PhD dissertation. Local newspapers reported the news of Laura's scholarship, as it was one of only eight awarded in the western hemisphere, and the first time that a researcher in a Midwestern park has won this award.

- **History of permitted point-source dischargers in the St. Croix Basin**

- Mark Edlund completed a project in July 2004 that was funded by the National Park Service to reconstruct the history of permitted point source dischargers in the St. Croix basin. Phosphorus loadings were estimated from the nearly 160 permitted dischargers that have operated in the St. Croix basin from 1900-2000 A.D. Peak discharges were in the 1960s and 1970s. Technology improvements to secondary and tertiary treatment and a shift in effluent discharge to land application or groundwater discharge significantly lowered surface water discharges in the 1980s and 1990s. By the 1990s, point source dischargers accounted for approximately 11% of the total phosphorus load (48 metric tons P/year). Population projections for the basin suggest that by the 2020s point source phosphorus loadings will increase to nearly 65 metric tons and represent 13% of the total phosphorus load. The historical estimates of point source loadings further allowed us to refine our estimates of nutrient loading to the St. Croix. First, the Research Station was able to partition the phosphorus loading into its component sources: the natural/background sources (nonpoint), the culturally-produced nonpoint burden, and the point source discharge. Second, the Research Station was able to normalize the historical and future estimates of nutrient loading to average flow conditions. The latter analyses suggest that under average flow conditions, point sources currently and in the future contribute nearly 20% of the controllable P load (the sum of point source and cultural nonpoint burden).

- **TAPwaters modeling center**

- Beginning in July 2003, the Technical Assistance Program for Watersheds (TAPwaters) was begun with \$160,000 in funding from the Minnesota legislature, under recommendation from the Legislative Commission on Minnesota Resources. The objectives of this program are (1) to establish equipment and expertise for computer modeling of watersheds at the SCWRS, (2) to apply a watershed model

to a selected sub-basin of the St. Croix for management purposes, and (3) to construct a whole-basin watershed model for the St. Croix to provide a regional framework for understanding non-point source pollutant loads to the St. Croix. Jim Almendinger of the SCWRS is the project leader, and a graduate student from the UMN, Marylee Murphy, has been hired to perform the sub-basin modeling.

The Willow River in western Wisconsin was selected for sub-basin modeling. The TAPwaters team has chosen to work with the Soil and Water Assessment Tool (SWAT) modeling program, which is a preferred model for handling agricultural landscapes. Currently the Willow sub-basin model is being calibrated for its hydrologic response. The reservoir at the mouth of the Willow, Lake Mallalieu, was cored in late 2004 to look at the record of fine-sediment deposition and phosphorus accumulation.

In early 2005, the Wisconsin DNR contributed another \$40,000 to this effort, especially to secure completion of the Willow River sub-basin modeling effort. Another \$30,000 from the WDNR, with a match from the USGS, will be used to add more data to the Willow River SWAT modeling.

Beginning in October 2005, the National Park Service will add another \$100,000 to the TAPwaters modeling efforts, which will expand to model the Sunrise River in eastern Minnesota, as well as to complete the first coarse-resolution whole-basin model for the St. Croix.

Another graduate student at the University of Minnesota, Mark Green, has begun SWAT modeling on the Lower Tamarack River, right along the Minnesota/Wisconsin border in the northern part of the St. Croix basin. This model is part of Green's PhD research looking at how climate changes may affect nutrient ratios in streams. Although this model is not directly funded by the TAPwaters office, Green works with the TAPwaters team and his work will contribute to the overall goal of eventually modeling all the sub-basins of the St. Croix.

- **River monitoring protocol development**
 - Suzanne Magdalene has been hired by the SCWRS to develop a river water quality protocol for the NPS Great Lakes Network, with a focus on the big river parks, the St. Croix and the Mississippi. The protocol, which incorporates historical data, includes a statistical design and QA/QC for field and laboratory methods. Protocol development will be completed December 2005, and sampling may begin in 2006.
- **St. Croix riparian wetland history project**
 - The National Park Service has funded another study slated to begin in April 2005, led by Mark Edlund of the SCWRS, to core several backwater riparian wetlands near Marine on St. Croix. The project will use analysis of biogeochemical signals to reconstruct the history of these wetlands especially in relation to hydromanagement and patterns of ecological change found in Lake St. Croix. The selected wetlands include two named Rice Lakes and Peasley Pond. Macalaster College (Kelly MacGregor) has expressed interest in collaborating on the study, as it relates to their studies of sediment movement in the channel (NPS funding pending).

- St. Croix River Research Rendezvous
 - The SCWRS hosted the 15th annual St. Croix River Research Rendezvous (SCRRR) on 21 October 2003, and the 16th SCRRR on 19 October 2004. In 2003, Basin Team members presented information on the nutrient management strategy (Davis), and water-quality trends in the St. Croix (Moraska-Lafrancois). In 2004, Basin Team members presented a history of point-source discharge to the St. Croix (Edlund), a state-of-the-basin summary (Sorge), and a poster showing progress in the Willow sub-basin modeling effort (Murphy and Almendinger).

United States Geological Survey (USGS)

- 2005: The USGS Rice Lake office in Wisconsin will be integrated into the Central Region which includes the Moundsview office in Minnesota.
 - **Minnesota:**
 - The second decade of studies for the NAWQA program began in 2001 with a focus on nutrient enrichment. This series of studies will focus on trends, factors that effect water quality and aquatic health, and national priority water issues such as development of nutrient criteria. Currently site selection has started in the St. Croix Basin as a forested and transitional zone. Sampling in the St. Croix Basin may begin next year.
 - **Wisconsin:**
 - A groundwater model is being developed for Pierce and St. Croix Counties. The model will determine recharge rates in areas of development.
 - More funding cuts have been made in the gauge sites.

University of Minnesota (UMN)

- Haibo Wan is studying habitat classification research on the St. Croix River. He is a PhD student of Water Resources Science with Professor Jim Perry at the University of Minnesota and is expanding the previous work of Eric Macbeth and others. This information will be put into a GIS data base. Sediment will be used as the primary parameter to classify the aquatic habitats on the St. Croix River. Field work was completed the summer of 2004 to collect the substrate data. A 1-minute video clip was taken every 400 meters at the river center, while also sampling the substrate using a dredger at an interval of four video sites. The two sources will be integrated and encoded to produce some synthetic measure, in turn combined with data of other physical, chemical or biological parameters. Both multivariate statistical techniques and ANN (Artificial Neural Network) will be employed on this integrated set for the sake of an optimal classification. ANN is used to implement complex regression/classification algorithms by simulating the pattern recognition process of a human brain.

University of Wisconsin Extension (UW)

- A Farmer Education Grant (EQUIP) for Burnett county was received. More requests for this grant will be coming in January.
- A small grant was obtained for Osceola in Polk County as a test for Project NEMO.
- Two education initiatives have been approved.
- In October of 2004, a 'fish friendly' culvert educational workshop will be offered that discusses creating culverts more conducive to fish movement and habitat.
- A farmer nutrient education workshop was funded for Washburn and Sawyer counties. It has already been done in Burnett County. This workshop discusses farming practices that

reduces the amount of nutrients on the soil. The farmers receive an incentive of \$150 to attend each workshop.

Basin Team Coordinator

- The current combined coordinator funding from NPS / MCES will end August 30th, 2005. The MPCA funding will end June 30 of 2005. Funding opportunities to continue the coordinator position are being explored. The WDNR has submitted a proposal to the EPA Watershed Initiative and / or may find funding from other sources. The MPCA is pursuing additional funding for a coordinator.
 - In the interim, Kathy Bartilson will have someone from her district prepare the meetings notes and send reminders about Basin Team meetings.
 - Randy Ferrin will temporarily respond to the public notices for NPDES permits.
- The new form letter was developed for reissuance of water treatment facilities to reflect the 20% nutrient loading reduction goal. The notice is mailed regularly in response to public notices prepared by the states of Minnesota and Wisconsin.
- The form letter was sent to the EPA when the St. Croix Chippewa Indians of Wisconsin were seeking a permit for the Big Sand Lake/West Hertel WWTP. Based on the letter, wording was added to the permit requiring P monitoring and other measures suggested by the letter.
- Information about the nutrient study and the Basin Team were sent upon request to *Lillie Suburban Newspapers* (Twin Cities), the Department of Natural Resources publication *Minnesota Conservation Volunteer*, and the Minnesota Pollution Control Agency's *Environmental Indicators Online* report.
- The coordinator prepared the 2003 and 2005 Planning Status Reports.
- The presentation about the 20% nutrient loading reduction goal and the history of the Basin Team was presented to the St. Croix River Association, Washington County Consortium, Minnesota Watershed Partners, annual Nutrient and Sediment Conferences, and St. Croix Watershed Research Station's Research Rendezvous.
- The coordinator assisted in the development of large and small posters explaining the 20% nutrient loading reduction goal.
- The coordinator prepared meeting minutes for all quarterly meetings of the Core Basin Team and subcommittee activities, such as a monitoring and the accompanying finances.
- The coordinator assisted in the preparation of the EPA Watershed Initiative proposal.
- Due to the closing of the MWBAC and limited coordinator funding, the Lake St. Croix Volunteer monitoring was postponed for the 2003 and 2004 seasons. The program was restarted for the summer of 2005, with the MCES providing training, supplies, and coordination with some assistance from the Basin Team coordinator.
- The coordinator assisted in the administrative work of the 2003 and 2004 annual Nutrient and Sediment conferences.
- The coordinator assisted in the preparation of the report *St. Croix Basin Phosphorus-Based Water-Quality Goals*.
- The coordinator administered the general communication of the Basin Team.
- The coordinator prepared a work plan and other contractual information for the coordinator funding for NPS and MPCA.

Basin Team Conference Coordinator

- In 2002, the Basin Team funded a part-time position to coordinate the yearly St. Croix Basin Nutrient and Sediment Conferences. Thus far the coordinator has coordinated the 2003, 2004 and 2005 conferences with the assistance of the Basin Team's Conference Planning Subcommittee, the Basin Team, the University of Wisconsin Extension, the Minnesota Department of Agriculture and the St. Croix Watershed Research Station. Working under annual contracts funded by grants from the Wisconsin Department of

Natural Resources, the conference coordinator facilitated development of the agendas, secured and instructed speakers, handled mailings, worked with conference facility managers, coordinated the Conference Planning Subcommittee, administered the finances of the conferences, prepared final reports, and handled other miscellaneous conference activities.

Chapter 4 Develop and Implement Water Resources Management Projects

Chapter 4.1 Basin Team Activities and Accomplishments

At its inception, the St. Croix Basin Water Resources Planning Team (St. Croix Basin Team) developed four water resources goals which have directed the activities of the Basin Team. Chapter 4 documents progress on the fourth goal, which states: "*Develop and implement water resources management projects*". In support of this goal, the Basin Team developed a number of water resources Issue Statements. Planning Status Report 2005 focuses on Issue Statements 1 – 4, and Issue Statement 6. During the past two years a financial task force was combined with the Monitoring Subcommittee and began work on the financial needs of the Nutrient Subcommittee.

- Issue Statement #1: Establish nutrient and sediment budgets for point and non-point sources
- Issue Statement #2: Address the impact of urban stormwater runoff
- Issue Statement #3: Address the need for long-term monitoring
 - Financial task force
- Issue Statement #4: Increase public participation and knowledge in water quality management
- Issue Statement #6: Forecast future changes in land and water resources

This chapter provides a progress report on the Basin Team's activities and accomplishments in support of these issue statements during the past two years.

Chapter 4.2 Issue Statement #1: Establish nutrient and sediment budgets for point and non-point sources

Through a scoping session of interested citizens and agency personnel, nutrient and sediment loading was determined as the top issue impacting water quality in the St. Croix River. With a 39% population growth predicted for the St. Croix Basin by the year 2020, water quality will continue to degrade under the current regulatory path. To address this issue, the St. Croix Basin Team formed a Nutrient Technical Subcommittee in 1997 (commonly referred to as the Nutrient Subcommittee). In 1998, the Nutrient Subcommittee secured funding and agency support to implement the *St. Croix River Basin Nutrient Monitoring, Modeling, and Management Project Plan* (posted on the MPCA website at: www.pca.state.mn.us/water/basins/stcroix/). The plan detailed the water quality monitoring and modeling work needed to establish nutrient and sediment reduction goals for the St. Croix River Basin. The plan also recommended that the general public and local governments be apprised of the monitoring, modeling, and goal-setting results through annual conferences, which provide a forum for public feedback.

In 2003, the Nutrient Subcommittee began a year-long series of meetings to assess the water quality monitoring data and modeling results from the nutrient and sediment studies. A lengthy goal-setting process revealed that a 20% reduction in phosphorus loading to Lake St. Croix will approximate the ecological condition of Lake St. Croix circa 1950, before major ecological changes related to eutrophication became evident. [note: by 1950, planktonic diatoms had become more dominant than benthic diatoms.] Results of the nutrient and sediment studies and details of the 2003 goal-setting process are presented in the report: *St. Croix Basin Phosphorus-Based Water Quality Goals* completed by the St. Croix Basin Team in August 2004. The report is posted on the MPCA website at: www.pca.state.mn.us/water/basins/stcroix/. At the annual 2004 St. Croix Nutrient and Sediment Conference sponsored by the Basin Team, the Basin Team announced its recommendation of a 20% reduction in phosphorus loading in the St. Croix Basin, to begin a reversal of the ecological degradation that has already occurred.

In 2005 the Nutrient Subcommittee commenced regular meetings to focus on implementation strategies for the recommended 20% reduction in phosphorus loading in the St. Croix Basin. At the first Implementation meeting in April 2005 the Nutrient Subcommittee addressed several issues.

- The Army Corps of Engineers met with Basin Team members to review their Watershed Reconnaissance Study. The COE is discussing this study with numerous watersheds covered by the study to develop local support and interest. There are three phases to the study: diagnostic, intense planning, and implementation, which may lead to BMPs. The Nutrient Committee discussed methods in which the Basin Team may be involved. The Nutrient Committee's work is at the end of the COE phase 2 and moving into implementation. The following are web links to the US-ACE Minnesota River Basin Recon Study.

Recon web page

<http://www.mvp.usace.army.mil/navigation/default.asp?pageid=93>

Recon Report - takes a while to download as much as a minute

<http://www.mvp.usace.army.mil/docs/projs/93MNRconRpt.pdf>

- A discussion suggested additional methods of communicating the need for a 20% reduction in phosphorus and sediment loading in the St. Croix Basin.
 - An *Environmental Indicators Online* article written for the MPCA website is in the draft stage. To review the full article see Appendix X.
 - The St. Croix Watershed Research Station distributed a list of articles that would appear in a special issue of the *Journal of Paleolimnology*. This issue will discuss how the use of paleolimnology has contributed to decision making. The issue will include the research used to determine the goal of a 20% reduction in phosphorus and sediment loading recommended by the Basin Team. Paleolimnological research on Lake Pepin work will also be included. The special issue will be published the spring of 2006.
 - Several upcoming conferences may provide opportunities to share the work of the Nutrient Subcommittee.
 - North American Lake Management Society in Madison: The NALMS conference committee wants to focus on regional issues.
 - University of Minnesota policy conference: The University sponsors a conference every year about getting science into policy.
- Developing site-specific water quality standards for Lake St. Croix as a method of implementing the 20% reduction goal was discussed. The MPCA is expecting to adopt numeric lake water quality standards by the end of 2005. Lake standard adoption is being undertaken as part of the MPCA's triennial review of state water quality standards. Lake standard adoption will be for four of the seven ecoregions in Minnesota (Northern Lakes and Forest, North Central Hardwood Forest, Western Corn Belt Plains and Northern Glaciated Plains ecoregions). Numeric standards will be established for total phosphorus, chlorophyll a and secchi disc transparency. Additionally it is anticipated that the rule will permit establishing site specific criteria for lakes, reservoirs and shallow lakes that lie on the border between two ecoregions, or are located in the Red River Valley, Northern Minnesota Wetlands or Driftless Area Ecoregions (remaining three of seven ecoregions in Minnesota). Site- specific criteria establishment is anticipated for Lake St. Croix. The year 2007 is the deadline for adopting lake water quality standards in Wisconsin.
- Discussion was begun on how to implement the goal of a 20% reduction in phosphorus and sediment loading so that both states are adopting similar strategies on the same time line. Work will begin on developing a *Nutrient Agreement* between the two states.

- SWAT modeling is an important component for the implementation of a 20% reduction in phosphorus and sediment loading. SWAT modeling can determine what is needed in BMPs to reach a certain mass cap for the St. Croix Basin. Current funding for SWAT modeling provides the following information:

- Willow River modeling to be completed by December 2006 [2005???
- Coarse whole St. Croix Basin modeling to be completed by June 2006
- Sunrise River modeling to be completed by 2007.

Some additional money has been secured from the WDNR with a possible match from USGS Moundsview to obtain more flow and water chemistry data from monitoring sites to add to the current Willow River SWAT modeling.

- The WDNR is drafting a funding proposal for the EPA Targeted Watershed Initiative that will provide implementation money for the 20% reduction in phosphorus and sediment loading goal

Strategies for implementation of the recommended 20% reduction in phosphorus loading

Point and non-point source phosphorus controls

In the 1998 *St. Croix River Basin Nutrient Monitoring, Modeling, and Management Project Plan* prepared by the Nutrient Subcommittee, four possible management options were suggested for reducing phosphorus loading in the St. Croix River Basin. These options were discussed prior to implementation of the project studies and goal-setting process, and are listed as follows:

- Implement basin-wide phosphorus reduction requirements in point source NPDES permits, including concentration limits and/or load caps for all wastewater treatment facilities.
- Evaluate possible trading options that offset an increased phosphorus discharge from one source by trading for an equal or greater decrease in discharge from another source.
- Expand special protection designations (e.g., expanding Outstanding Resources Value Water (Minnesota) or Outstanding Resources Water (Wisconsin)) to more tributaries in the St. Croix River Basin.
- Promote the increased use of best management practices (BMPs) already designed for reducing phosphorus contributions from various land use practices.

After completing the nutrient and sediment studies, the 2003 goal-setting process, and the 2004 *St. Croix Basin Phosphorus-Based Water Quality Goals* report, the Nutrient Subcommittee and St. Croix Basin Team revisited possible management options for implementing and achieving the recommended 20% phosphorus reduction goal.

Some possible phosphorus management options, as listed below, were based upon the question: "What does the Basin Team recommend for implementing the 20% phosphorus reduction goal?"

- Maintain point source phosphorus loads at 2000 levels (based upon actual flows and effluent phosphorus concentrations at that time), and establish these point source loads as mass caps (limits), with some language to account for existing and future variances. Phosphorus mass caps could be included in the next NPDES Permit re-issuance process for point sources, with accommodations made for certain facilities such as the Stillwater Wastewater Treatment Plant (a phosphorus mass cap is already in place), or for facilities that will need to convert from a groundwater to a surface water discharge. Since 1999, phosphorus loads from

Wisconsin point sources have been reduced by nearly 18 tons, representing a 60% decrease. Both short-term and long-term point source phosphorus management strategies merit further discussion by the Nutrient Subcommittee and Basin Team.

- Continue to promote non-point source phosphorus reductions, through implementation of best management practices and other non-point source control technologies. With better information, mass caps could also be established for non-point sources of phosphorus loading, such as urban stormwater and agricultural runoff. NPDES Phase II stormwater regulations will likely result in phosphorus load reductions in urban areas. Lake, stream, and wetland restoration opportunities may also arise through state and/or federal grants.
- Develop a long-term monitoring plan to inventory, monitor, and model phosphorus loading in the St. Croix Basin, thereby providing information that will better inform phosphorus management strategies. To this end, the St. Croix Watershed Research Station (Science Museum of Minnesota) is currently developing a watershed SWAT (Soil and Water Assessment Tool) model that will better identify sources of non-point source phosphorus loads throughout the basin and project phosphorus reductions associated with various non-point source best management practices.

Lake eutrophication standards

The adoption of eutrophication standards for lakes may also drive the 20% phosphorus reduction effort in the St. Croix River Basin. The Minnesota Pollution Control Agency (MPCA) is currently in the process of revising Minnesota Rules Chapters 7050 and 7052 (<http://www.pca.state.mn.us/water/standards/rulechange.html>). These rules contain water quality standards and other provisions that help protect surface and ground waters from pollution. One of the major rule changes under consideration is the proposed addition of eutrophication standards for lakes, including natural riverine lakes such as Lake St. Croix. The MPCA is proposing numeric standards for phosphorus, chlorophyll-a, and Secchi disk transparency. These lake standards will help protect the aquatic community and recreational uses such as swimming, boating, and aesthetic enjoyment. It is expected that the new MPCA lake eutrophication standards will be adopted by the end of the year 2005.

When applied to reservoirs and riverine lakes, the eutrophication standards for phosphorus, chlorophyll-a and Secchi disk may be modified on a site-specific basis to account for characteristics that can affect lake trophic status, such as variations in hydraulic residence time, watershed size, and the fact that reservoirs and riverine lakes may receive drainage from more than one ecoregion. Information supporting a site-specific standard can be provided to the MPCA Commissioner or by any person outside the agency. The Commissioner will evaluate all data in support of a modified standard and determine whether a change in the eutrophication standards is justified for a specific reservoir or riverine lake.

The Lake St. Croix eutrophication goals for total phosphorus (40 ug/l), chlorophyll-a (12 ug/l), and Secchi disk transparency (1.5 m) (St. Croix Basin Team, 2004) could serve as site-specific eutrophication standards, if approved by the MPCA. If these site-specific standards apply, current phosphorus, chlorophyll-a, and Secchi transparency levels in Lake St. Croix could lead to exceedances of one or more of the standards. If so, Lake St. Croix could be listed as impaired via the MPCA's Section 303(d) process. The impaired listing would require the development of a Total Maximum Daily Load (TMDL) plan to help ensure future compliance with the site-specific eutrophication standards for Lake St. Croix. This process would provide far greater weight and urgency for achieving phosphorus reduction in the St. Croix Basin. The 20% phosphorus reduction goal for the St. Croix River Basin will also be a component of the MPCA's Lake Pepin

(Mississippi River) TMDL, which is already underway. More information on the MPCA's TMDL process can be found on the MPCA website at: <http://www.pca.state.mn.us/water/tmdl/tmdl>.

Chapter 4.3 Issue Statement #2: Address the impact of urban storm water runoff

Minnesota became the first state to pass legislation restricting the use of phosphorus in lawn fertilizer. A fact sheet explaining this legislation has been prepared by the Minnesota Department of Agriculture (MDA), and is included as Appendix 5.

The states of Minnesota and Wisconsin are developing rules for implementation of federal (EPA) NPDES Phase II storm water requirements.

Several communities are already implementing programs to address storm water runoff. River Falls, Wisconsin serves as an excellent case study of storm water planning and management for river protection. The full case study appears in Appendix 3, with a synopsis below. The case study can also be viewed at: www.lambcom.net/kiaptuwish/stormwater.

River Falls, Wisconsin:

Managing Storm Water in Wisconsin: A Local Partnership Protects the Kinnickinnic River

The population of River Falls, Wisconsin, located in St. Croix County, has grown 20% over the past decade. Currently home to 12,000 people, continued rapid population growth is projected in River Falls because of its close proximity to the major metropolitan area of Minneapolis and St. Paul, Minnesota. The Kinnickinnic River, a state "outstanding resources water", flows through River Falls. The "Kinni" is a premiere trout stream. Concerned about the possible impacts of land use changes and storm water runoff on the Kinni as growth occurs, the City of River Falls developed a storm water management plan and innovative storm water management ordinance that requires infiltration of storm water runoff. The complete storm water ordinance can be viewed at: <http://www.rfcity.org/Eng/Storm%20Water%20Management.htm>. Storm water planning and management efforts in River Falls have been greatly informed by scientific data and information obtained on the Kinnickinnic River, through monitoring efforts by the City of River Falls, Wisconsin Department of Natural Resources, University of Wisconsin-River Falls, and Trout Unlimited (see appendix 6 for the full report).

Chapter 4.4 Issue Statement #3: Address the need for long-term monitoring

The establishment of a long-term monitoring program within the St. Croix River Basin has been a concern. The St. Croix River Basin has been included in several significant studies that provided event and short-term monitoring information. However, long-term monitoring has been limited to measurement of stream flow and water chemistry at a minimal number of sites. Funding has been secured for various short-term research projects, but the monitoring work typically does not continue upon completion of the project. Although limited in scope, several agencies have been conducting long-term monitoring. Currently the Nutrient Subcommittee is in the process of securing funding to develop a monitoring plan.

- The *United States Geological Survey* (USGS) has been monitoring stream flow at two sites on the St. Croix River, at Danbury and St. Croix Falls, Wisconsin, since 1914 and 1902 respectively. Monitoring of Kinnickinnic River flow was conducted in 1999, and has been continuously conducted since July 2002. The next phase of the USGS National Water Quality Assessment (NAWQA) Program has begun, including the St. Croix River Basin. See USGS website: <http://www.usgs.gov>.

- In 1953, the *Minnesota Pollution Control Agency* (MPCA) began collecting samples for limited chemical analysis of St. Croix River water quality at Taylors Falls and Stillwater, Minnesota and at Prescott, Wisconsin. Since that time, three to five St. Croix River stations have been monitored each year, with periodic adjustments in frequency and the number of analyses due to changes in funding levels. Currently, the MPCA routinely monitors “milestone” sites at Danbury (Wisconsin), Stillwater (Minnesota), and Hudson (Wisconsin). The MPCA operates an automated flow monitoring station on the Sunrise River near the town of Sunrise, Minnesota. Water quality monitoring is also conducted on other tributaries within the St. Croix Basin, either on a routine basis or short-term intensive surveys.
See MPCA website: <http://www.pca.state.mn.us>.
- Since 1976, the *Metropolitan Council Environmental Services* (MCES) has been monitoring St. Croix River water quality at Stillwater, Minnesota and Prescott, Wisconsin. MCES also operates automated stream monitoring stations on Browns Creek, Carnelian-Marine Outlet, Silver Creek, and Valley Creek, including continuous measurement of flow, analysis of water chemistry, and assessment of macroinvertebrate communities.
See MCES website: <http://www.metrocouncil.org/environment/RiversLakes>.
- The *Wisconsin Department of Natural Resources* (WDNR) has some long-term water quality data available for the St. Croix River at Danbury and St. Croix Falls, Wisconsin.
- The *St. Croix Chippewa Tribe of Wisconsin* has developed a monitoring program for their general geographical location.
- Several *local monitoring programs*, coordinated by cities, counties, and watershed districts, have been initiated on the St. Croix River and some of the key tributaries.
- The *Lake St. Croix Volunteer Monitoring Program* began in 1999 and continued through 2002, as a part of the St. Croix phosphorus study (St. Croix Basin Team, 2004). The St. Croix Basin Team coordinates this program. Volunteer monitoring will resume in 2005, after a two-year hiatus.
- The NPS Great Lakes Inventory and Monitoring Network (Large River park monitoring) is moving forward. Dan Engstrom from the St. Croix Watershed Research Station is in charge of developing a monitoring protocol for large rivers. Sue Magdalene was hired to coordinate the development of the monitoring protocols and will work at the Research Station. The goal of this monitoring program is to design and develop protocols for water quality in rivers and streams that will contribute to an understanding of the health of the ecosystems in park units of the Great Lakes network. Phase 3, which develops the protocol, will be finished December 2005. The sampling begins next year and will be completed every 2 – 3 years depending on funding.

Given the rapid rate of development in the St. Croix River Basin, long-term monitoring becomes even more imperative. The St Croix phosphorus study discussed in Chapter 4.2 emphasizes the need for long-term monitoring. For this reason, the St. Croix Basin Team commissioned a Monitoring Subcommittee in 2001. The 2001 and 2003 St. Croix Planning Status Reports detail the monitoring work conducted by the Basin Team. The 2005 St. Croix Planning Status Report reviews the progress of the Basin Team and Monitoring Subcommittee toward establishment of a long-term monitoring plan.

In 2004, on behalf of the Basin Team, WDNR submitted a proposal to the Environmental Protection Agency's Watershed Initiative for basin-wide monitoring. Although the proposal was

not funded, it highlights the need for long-term monitoring within the St. Croix River Basin. The Monitoring Subcommittee continues its work to secure funding and support for long-term monitoring. To enable continuation of the Nutrient Subcommittee's work, the USGS office in Rice Lake, Wisconsin has developed a draft tributary monitoring proposal that is currently under review. Funding is needed for continued monitoring of phosphorus and sediment impacts throughout the St. Croix Basin, and for evaluating progress toward achievement of the Basin Team's phosphorus reduction strategy through SWAT modeling. A suggested draft long-term monitoring plan is presented in Appendix 2.

Finance Task Force

In 2004, the St. Croix Basin Team integrated a Finance Task Force into the work of the Monitoring Subcommittee to develop a list of funding priorities and possible funding sources. The following is a list of items that need to be funded, in no particular order. Appendix 2 describes some of these items in greater detail.

Items in need of funding

1. Full time coordinator and grant administrator
2. Long-term monitoring at selected stations
3. Synoptic monitoring for specific issues
4. Implementation funds for local watershed initiatives
5. Pilot studies for agricultural and stormwater non-point pollution sources
6. SWAT modeling, sub-watershed by sub-watershed
7. Urban modeling using a SWAT counterpart
8. Outreach to promote the 20 percent phosphorus reduction goal, along with information and educational tools
9. Annual St. Croix Nutrient and Sediment Conference
10. Continuing operation of stream and river flow gauging stations
11. Response to emerging water quality issues
12. River Defense Network (spill planning and response)

Chapter 4.5 Issue Statement #4: Increase public participation and knowledge in water quality management

Various communication tools and reports were developed to accompany the work of the Nutrient Subcommittee and the recommended goal of a 20% reduction in phosphorus loading in the St. Croix River Basin (see Chapter 2). In addition to preparing reports, posters, and a PowerPoint presentation (available for general use) and making presentations to local organizations, the Basin Team has been focusing its efforts on an annual conference entitled: "*Protecting the St. Croix: Reducing and Management Nutrients and Sediment*". Beginning in 2000, these annual conferences have provided an opportunity for the general public, local organizations, and agencies to exchange information about the impacts of nutrient and sediment loading in the St. Croix River Basin. The Basin Team has consistently secured funding to administer the conference and to hire a conference coordinator. With the assistance of the Conference Subcommittee, the University of Wisconsin Extension Service, the St. Croix Watershed Research Station, the Minnesota Department of Agriculture, and several other organizations, the conference has engaged over a hundred participants annually for direct participation in water quality education and management activities.

Project NEMO (Non-Point Source Education for Municipal Officials) uses a strategy for protecting water quality based on providing a clear picture to planners and local officials of the importance of making the right land use decisions. The program emphasizes the importance of understanding natural resources protection within the context of growth and development. Land cover maps are used to highlight the connection between land use and water quality. Jay Michels and the Minnesota Erosion Control Association (MECA) have been working within the St. Croix River Basin to implement Project NEMO. NEMO presentations have been made to the following local governmental units: Washington County, the cities of Bayport, Birchwood, Hugo, Lake Elmo, Mahtomedi, Marine on St. Croix, and Oakdale, the townships of May, New Scandia, Scandia, and Stillwater, several water management organizations in the area, and the Ramsey-Washington-Metro Watershed District. In addition to the NEMO presentations, the University of Wisconsin Extension Service provided funding to NEMO for a bus tour of non-point source management practices that have been implemented on the Minnesota side of the St. Croix River Basin.

Chapter 4.6 Issue Statement #6: Forecast future changes in land and water resources

As a part of the nutrient goal-setting process discussed in Chapter 4.2 (Issue Statement #1), population growth and accompanying landscape changes were studied by the St. Croix Watershed Research Station (Edlund, 2004, St Croix Basin Team, 2004). Increases in nutrient loading have accompanied changes in agricultural practices and increased urbanization. Since the 1930s, acreage in agricultural production within the St. Croix River Basin has decreased, but changes in agricultural practices (including greater use of chemical fertilizers) have increased the availability of phosphorus on the landscape, thereby impacting water quality. Urbanization has increased both the number and volume of point source discharges (primarily wastewater treatment plants), increasing phosphorus loading to surface waters in the basin. The population of the St. Croix Valley has grown from about 150,000 residents in 1950 to nearly 400,000 residents in 2000. More than 500,000 residents are predicted by 2020. The southern counties of the St. Croix River Basin have some of the fastest growing populations in the region.

As mentioned in Chapter 4.2, SWAT modeling of the St. Croix River Basin has been initiated by the TAPwaters program (Technical Assistance Program for Watersheds) at the St. Croix Watershed Research Station. The basin model uses land cover, vegetation, topography, and other variables to provide support for basin-wide planning efforts.

References

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Murphy, Marylee, James E. Almendinger. 2004. *Compilation of Geographic Information System Data for Hydrologic Modeling by the Tapwaters Project*. Presentation and abstract. Sixteenth Annual St. Croix River Research Rendezvous sponsored by the St. Croix Watershed Research Station and the Science Museum of Minnesota, 16910 152nd Street North, Marine on St. Croix, Minnesota, 55047, phone 651-433-5953.

Protecting the St. Croix: Reducing and Managing Nutrients and Sediments. 6 Annual conferences beginning in 2000. Sponsored by the St. Croix Basin Water Resources Planning Team. Conference coordinator Jim Harrison. Conference administrator John Haack. For information about the conferences contact John Haack, UW-Extension, Ag. Research Station, W6646 Highway 70, Spooner, WI, 54801, email john.haack@ces.uwex.edu.

St. Croix Interagency Basin Team. 1998. *St Croix River Basin Nutrient Monitoring, Modeling, and Management, Project Plan*. Interagency document.

St. Croix River Research Rendezvous. 16 annual conferences beginning in 1987. Sponsored by the St. Croix Watershed Research Station and the Science Museum of Minnesota. For information

contact St. Croix Watershed Research Station, 16910 152nd Street North, Marine on St. Croix, Minnesota, 55047. Phone 651-433-5953. See website for abstracts from the Rendezvous.

St. Croix Basin Phosphorus-Based Water Quality Goals. August 2004. Report on the Recommended Water-Quality Goals of the St. Croix Basin Water Resources Planning Team and the Proceedings of the 5th Annual Conference "*Protecting the St. Croix: Reducing and Managing Nutrients and Sediments*". Contact Craig Affeldt, Minnesota Pollution Control Agency, phone 651-296-6062, email craig.affeldt@pca.state.mn.us. The report is posted on the following websites:

- www.pca.state.mn.us/publications/reports/stcroixbasin-phosreport04.pdf
- www.smm.org/SCWRS/researchreports.php

The St. Croix River Basin... 2004. 8 ½" x 11" 2-sided handout. Prepared by the Wisconsin Department of Natural Resources and the University of Wisconsin, Extension. Printed by the Minnesota Department of Natural Resources. Contact Kathy Bartilson, WDNR, 810 Maple St., Spooner, WI. 54801. Phone 715-635-4053, email Kathy.Bartilson@dnr.state.wi.us

Wan, Haibo, James Perry, Randy Ferrin, Brett Stadsvold, and Blayne Grave. 2004. *Aquatic Habitats Classification on the St. Croix River*. Poster presentation and abstract. Sixteenth Annual St. Croix River Research Rendezvous sponsored by the St. Croix Watershed Research Station and the Science Museum of Minnesota, 16910 152nd Street North, Marine on St. Croix, Minnesota, 55047, phone 651-433-5953.

List of Appendixes

- Appendix 1: MPCA Environmental Indicators Online article on the Basin Team nutrient work
- Appendix 2: Nutrient Subcommittee Monitoring Plan and Finance Task Force
- Appendix 3: *Guidance for Watershed Stewardship, Lower St. Croix River, A Stream Protection Strategy*
- Appendix 4: Minnesota Pollution Control Agency, *Lake Pepin Watershed Total Maximum Daily Load Eutrophication and Turbidity Impairments.*
- Appendix 5: Minnesota Department of Agriculture, Minnesota lawn phosphorus fertilizer law fact sheet
- Appendix 6: River Falls, Wisconsin: *Managing Storm Water in Wisconsin: A Local Partnership Protects the Kinnickinnic River*
- Appendix 7: *The St. Croix River Basin...* 2004. 8 ½" x 11" 2-sided poster

Finance Task Force
St. Croix Basin Water Resources Planning Team

Mission Statement: To be well poised for funding opportunities by having a list of tasks needed to further the work of the St. Croix Basin Water Resources Planning Team (St. Croix Basin Team), the costs of those tasks, a narrative of what the task will accomplish (deliverables), and to identify funding sources and partners. The following list of items in need of funding are not in any prioritized order.

Items in need of funding	
1.	Full time coordinator and grant administrator
2.	Long-term monitoring at selected stations
3.	Synoptic monitoring for specific issues
4.	Implementation funds for local watershed initiatives
5.	Pilot studies for agricultural and stormwater nonpoint pollution sources
6.	SWAT modeling sub-basin by sub-basin
7.	Urban modeling using a SWAT counterpart
8.	Outreach to promote the 20 percent reduction goal along with information and educational tools
9.	Annual Conference
10.	Keeping gaging stations operational
11.	Response to emerging water quality issues
12.	River Defense Network (spill planning and response)

The following information contains a funding pre-proposal for each of the above items in need of funding. The pre-proposals include: a) a brief description, b) deliverables, c) cost estimate for some projects, d) targeted funding source, and 4) potential partners and their role. The finance sub-committee developed an accompanying worksheet that provides the following information for most of the items:

- The agency / organization that provides the funds;
- A list of the source of the funds;
- The criteria needed to be applicable for the funds;
- The funding limit of the money available;
- A time line for the application process; and
- The ease or difficulty in obtaining the funds.

#1. Full time coordinator and grant administrator

Brief description: In 1999, the St. Croix Basin Team received funding for a part-time coordinator, which became fulltime from 2000 to 2002. In April of 2002, funding was secured to continue the position on a part-time basis, which continues to the present. Currently, the incumbent coordinator works from a home office, with a salary rate of \$40 / hour, at an average of 14 hours / week. The salary rate is inclusive of travel, postage, salary, benefits, office supplies, office equipment and all other needs.

Deliverables: The coordinator is responsible for the coordination of the activities of the St. Croix Basin Water Resources Planning Team; facilitation of meetings; provide draft agendas and minutes for meetings of the Basin Team and subcommittee; respond to public notices for wastewater treatment permits from each state and the EPA; attend meetings of groups which promote the advancement of water resource issues pertaining to the St. Croix watershed;

represent the Basin Team on an as needed basis; seek funding opportunities; provide updates to the Planning Status Report.

Cost estimate: For the present time, this is considered a part-time job out of the incumbent's home. The salary rate is all inclusive of travel, postage, salary, benefits, office supplies, office equipment, etc. The hourly rate is \$40 and the number of hours per week averages 20 hrs. Therefore, \$800 is needed per week, for a total of \$41,600 per year.

Targeted Funding Source: EPA watershed initiative grants, McKnight Foundation, individual agencies contributing equal shares or paying total annual costs on a rotating basis. Thus far, it has been difficult to obtain funding for the coordinator's position outside of the member agencies, irrespective of specific project funding. Most rejections stated they consider the position a responsibility of the member organizations.

Potential partners and their role: Member agencies of the Basin Team serve as a "board of directors" for oversight of the coordinator.

2. Long-term monitoring at selected stations

U.S. Geological Survey: Long-Term St Croix River Basin Tributary Monitoring Strategy

Problem Description:

The St Croix Basin Team is about to implement their strategy for reducing phosphorus loading in the St Croix Basin. This includes, among other things, developing management scenarios using SWAT modeling (performed by the St Croix Research Station). The basin team would like to develop a long-term tributary monitoring program that can track the effectiveness of their phosphorus reduction efforts as well as aid in the SWAT modeling. This will allow park managers to identify water-quality impacts and trends, make informed decisions on management objectives and policies, and provide scientific evidence to protect and preserve the Riverway through partnerships with federal, state and local regulatory agencies (Holmberg et al 1997). This evidence will need to be backed by solid, legally defensible scientific data.

Justification:

With the vast majority of the St. Croix watershed in private ownership, cooperative relationships between federal, state, tribal, and local governments, and land and resource managers are required to effectively protect the Riverway. Activities at any location in the watershed, both within the Park boundary and those outside it, have the potential to affect the water quality of the St. Croix River. In addition to its scenic qualities, the quality of its waters and the biodiversity it supports are among the reasons the Riverway was included in the National Wild and Scenic River System.

Several past studies (Graczyk, 1986; NPS, 1995b) have addressed water quality in the St. Croix Basin but a consistent water-quality sampling program was not established until 1994 when the Upper Mississippi (UMIS) NAWQA, in cooperation with National Park Service, began monitoring the St. Croix River at St. Croix Falls, the St. Croix River near Danbury, and the Namekagon River near Leonards. NAWQA sampled these sites from 1994 to 1998 (Stark and others, 1999; Kroening and Andrews, 1997; Kroening and others, 2000) and through a cooperative agreement between NPS and USGS, the USGS continued this monitoring effort in 1999 and 2000 as part of a tributary loading assessment (Lenz and others, 2001) and water-quality monitoring of Lake St Croix (Robertson and Lenz, 2002). The St Croix basin team used the results of those monitoring

efforts and intensive point source monitoring (Edlund, 2004) to determine current phosphorus loads in the St Croix. Sediment coring (Triplett and others, 2003) was used to recreate historical loading rates. This intensive cooperative multi-agency effort has resulted in the development of a phosphorus-loading goal for the St Croix Basin (St Croix Basin Team, 2004).

Resource managers in the St Croix Basin are currently developing and implementing ways to meet nutrient goals. The resource agencies now need ways to determine if their efforts are working and if the nutrient goals are being achieved. A need for a practical long-term monitoring strategy is apparent. Anthropogenic pressures and management challenges will only increase as the Twin Cities Metropolitan Area and the population of the entire basin expands and development continues. In future years, as additional resource pressures affect the St. Croix National Scenic Riverway, water quality data will be needed to reference baseline conditions and assess trends. A long-term monitoring program is needed to give resource managers solid scientific information to promote and influence management policies for the protection of the Riverway.

Objectives:

- Provide long-term monitoring for the St Croix tributaries
- Identify trends in phosphorus loading (and thus evaluate the effectiveness of the St Croix Basin Teams phosphorus reduction efforts)
- Support SWAT modeling efforts
- Support refinement to prediction of phosphorus loading in St Croix tributaries
- Get the most information for the least cost

Approach:

The proposed monitoring plan includes flow and water quality monitoring by the US Geological Survey at two fixed stations and two “roaming” stations each year. (Note: Actual site selection will be based on cooperator and St Croix Basin team input.) The fixed stations would remain at the initial sites for the perpetuity of the project, providing a long-term baseline dataset. The mobile sites would be moved from tributary to tributary within the St Croix basin every two years. These sites would provide snapshots of phosphorus loading within the St Croix Basin. This approach provides the spatial and temporal scales needed for long-term monitoring while reducing the overall cost of the monitoring program.

The roaming site will be chosen initially to aid SWAT modeling initially and can also be compared to historical data. As the “roaming” stations move and the period of record at the fixed stations becomes longer, regression analysis can be used to extend the spatial and temporal extent of the data. This will allow for the detection of trends and the refinement of predictions of loading across the basin. The ultimate goal will be to return to the “roaming” sites periodically through time and use both the roaming and fixed baseline data to continually monitor trends, analysis change in flow weighted concentrations, allowing use to evaluate the effectiveness of the St Croix Basin Teams phosphorus reduction efforts in the St Croix tributaries. Additionally, this data can be used in the larger context of assessing the Upper Mississippi River Basin’s impact on hypoxia in the Gulf of Mexico.

Sample Frequency:

A study by Robertson (2003) shows that for 1-year studies, fixed-period monthly sampling supplemented by storm chasing was most cost-effective for estimating annual loads, though loads can be overestimated by 25-50%. For 2 to 3-year studies, fixed-period, semi-monthly sampling provided not only the least biased but also the most precise loads. Based on this research, samples will be collected semi-monthly.

Sample Constituents: Sampling for the following constituents will be done at all sites.

*Field Measurements - water temperature, pH, dissolved oxygen, specific conductance, and temperature.

*Nitrogen - N, Nitrate, dissolved; N, Organic+ammonia,total

*Phosphorus: P, Phosphorus, total

*Sediment - suspended sediment concentration

Note: If we want to address anthropogenic sources of phosphorus inputs it might make sense to include all nutrient species. The additional cost is minimal, as the collection effort is paid for (just filling another bottle). It would just be a small additional lab cost.

FederalRole:

The USGS has an obligation to assist federal, state and local agencies with their water resource needs. The St Croix Basin Team is a multi-agency effort that has demonstrated real affect in improving water resources in the St Croix Basin. The USGS would like to continue to support that effort.

MeasurableResults

Annual reports, which will include water-quality data and comparisons to data in the USGS database will be prepared and sent to the cooperator. In addition, data will be stored in the USGS database, be released in the annual USGS data report, and be available on the World Wide Web.

Literature Cited:

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- Robertson, D. M. and Lenz, B. N. 2002. Response of the St. Croix River Pools, Wisconsin and Minnesota, to Various Phosphorus –Loading Strategies. U.S. Geological Survey Water-Resources Investigations Report 02-4181, Middleton, Wisconsin. 36 pp.
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- St. Croix Basin Water Resources Planning Team (as St. Croix Interagency Basin Team). 2004. St. Croix River Basin — Phosphorus-Based Water-Quality Goals, 28 p.
- Triplett, L. D., Edlund, M. B. and Engstrom, D. R. 2003. A Whole-Basin Reconstruction of Sediment and Phosphorus Loading to Lake St. Croix. Final Project Report to Metropolitan Council Environmental Services, 46 pp.

4. Implementation funds for local watershed initiatives

Deliverables: Explore working with local, watershed and county organizations interested in water quality in the St. Croix Basin to explore interest in a stakeholders group (either a new team or part of an existing organization) with the purpose of improving communication and coordination related to efforts to restore and protect water quality within the basin and collectively seek out implementation funds to further this work.

Cost estimates: Nominal direct cost to conduct the meetings. Initial staff time to conduct meetings provided by the St. Croix Basin Team members.

Targeted funding sources: Conducting meetings and exploring strategies and organizational options to support local water planning in the St. Croix River basin will require minimal cash beyond securing Basin Team staff. The group effort will be to identify all local, NGS, state and federal resources available to support the St. Croix water quality efforts.

Potential local partners and their roles: In addition to staff and organizations who have been active with the Basin Team, potential local partners for this work include: county staff (Minnesota and Wisconsin), cities and towns, relevant watershed districts and water planning organizations, soil and water conservation district, natural resource and conservation service (federal) resource conservation and development (nonprofit), state colleges and universities.

6. SWAT modeling sub-basin by sub-basin *(Jim Almendinger)*

Tributary watershed models

Need

Individual tributary watersheds of the St. Croix should be modeled to identify mechanisms of sediment and nutrient loading and to test management scenarios to abate these loadings.

Objective and Scope

A SWAT (Soil and Water Assessment Tool) model will be calibrated to each tributary watershed based on existing data, particularly the 1999 USGS data, where available. Selected management scenarios will be tested for their effectiveness in reducing sediment and nutrient outputs from the watershed.

Deliverables

- Calibrated SWAT model (input data sets and model project file)
- Model documentation report
- Interpretive report comparing effectiveness of selected management scenarios

Time Frame and Cost estimate

1-2 yr, for \$100,000, for each tributary watershed, for an estimated 25 watersheds. (We suspect modeling will become more efficient for each subsequent watershed.)

Targeted Funding Sources

LCMR, NPS, USDA, WDNR, MCES, MPCA, Counties

Potential Partners

SCWRS, Basin Team, MPCA, WDNR

Status

- Willow River (WI) currently funded by LCMR and WDNR. Targeted completion June 2005; likely completion November 2005.
- Lower Tamarack River (MN) currently being modeled by University of Minnesota graduate student (Mark Green), at no cost to the TAPwaters office.
- Apple River – a preliminary model may aid calibration of the Willow (unfunded)
- Sunrise River – targeted completion for June 2007, via NPS grant
- Snake River – targeted for near future because of extensive existing data set (unfunded)

7. Urban hydrology, storm-water management, and waste treatment plans (<i>Jim Almendinger</i>)

City water storm-water management plans

Need

Urbanization is proceeding rapidly in the lower St. Croix Basin and consequent storm water runoff is a threat to the St. Croix River. Cities need to develop storm-water management plans to avoid flooding issues as well as to provide for environmentally sound disposition of this runoff (rather than sending it directly to the St. Croix).

Objective and Scope

A municipal storm-water management plan will conduct a survey of existing infrastructure, perhaps conduct an inventory of existing natural resources, collect critical data for model calibration, construct an urban runoff model (most likely via XPSWMM), produce GIS mapping products, and produce an interpretive report.

Deliverables

- Calibrated XPSWMM model and data set
- Model documentation and interpretive report, including survey, inventory, and monitoring data

Targeted Funding Sources

Cities, Counties, Watershed Districts

Potential Partners

Consulting firms (perhaps minor role for SCWRS)

Status

Unfunded.

8. Outreach to promote the 20 percent reduction goal along with information and educational tools (see chapter 2 Planning Status Report 2005)

Deliverables: In 2003, the Basin Team set a goal of reducing nutrient loadings entering the watershed by 20% over the next two decades. There are many sources of nutrients entering the river and its tributaries: point sources; agricultural, construction, and urban non-point runoff. Likewise, there are many target audiences to reach in trying to get voluntary and legislative controls in place to meet this goal, such as community officials, farmers, legislators, water resource planners, consultants, schools, developers, landowners, etc. Good information and education materials need to be available for meetings with these groups, and for posting at visitor information centers and as links on websites.

PowerPoint presentation on the 20% goal: Pam Davis has prepared a lay version and a more scientific version on the background and need for the goal, including general water quality indicator information. This will probably need annual updates on the progress made toward the goal. It could be converted to DVD format as well.

Proceedings of the 2004 Conference and nutrient goal research: This document (explaining how the 20% goal was developed and the research presented at the 2004 nutrient conference) provides background information for team members to use in presentations to their agencies and to other resource managers.

Brochure: An eye catching color brochure would convey the need for protecting the river, including concise text on the problem, the worst-case situation if the goal is not accomplished, and ways all partners and river valley citizens can help. Good photos should be used to support the text and make a visually appealing document. A thousand or more copies would be needed for the first version. Copies would be made available at offices of the Basin Team members, and for distribution at meetings where members are making presentations on the 20% goal.

Display poster: A colorful display (such as a three-panel poster to be attached to a Velcro display board) would be used for poster sessions or on display tables at conferences. It would be used for a quick text and photo message conveying the 20% goal. The brochure above would be used as a hand-out at such a session. A more expensive version would be a window-shade type display that rolls up into a carrying case instead of posters that attach to a large Velcro board. This newer version display is free-standing and more convenient to transport and set up.

Kiosk: *Environmental Indicators Online* article written for the MPCA website, prepared by Frank Kohlsh: The article highlights the work of the Nutrient Subcommittee developing and implementing the 20% reduction in phosphorus and sediment loading goal. To review the complete article. www.pca.state.mn.us/water/basins/stcroix/.

Wall poster: A smaller, color wall poster to put up at visitor centers, etc., would also be helpful. It would be a smaller version of the display poster, also intended to catch the viewer's eye and quickly convey the message. Brochures would be placed near this wall poster for people wanting

more information. An "interim" version to use in the summer of 2004 is being developed as a PDF file for agencies to print as use as needed.

Website: The wall poster and brochure could be placed as PDF files on appropriate web sites, and/or converted to web pages.

Public service announcements: Another very costly communication tool would be professionally-produced television and radio public service announcements, with visuals highlighting: the history of the St. Croix, its long tradition as a valued and high quality river system, excellent place to live and recreate, threats coming in the next decade, and the need for protection. The announcement could conclude with ways to help and contact information. A cheaper alternative would be news releases developed by the nutrient committee or Basin Team coordinator.

Cost estimates:

Tool	Lead members	Target completion date	Approximate cost
PowerPoint presentation	Pam Davis	Completed and available on CD	
2004 Conference Proceedings and background information	Pam Davis and Craig Affeldt – MPCA	Completed and available at www.pca.state.mn.us/water/basins/stcroix/ . www.smm.org/SCWRS/researchreports.php	
Interim wall poster	Kathy Bartilson, WDNR	Available	Member agency's cost of printing on an ink jet
Brochure	Pam Davis and John Haack, UW-Extension	October, 2004	
Display poster / Wall poster	MPCA		
Website			
Public service announcements	See Planning Status report 2005 Chapter 2		

9. Annual Conference

Deliverables: Successful production of the annual conference; comfortable and adequate meeting room space; continental breakfast; coffee breaks, lunch, and afternoon break snacks and beverages; postcard and postage for pre-conference announcement; part-time conference coordinator; conference pamphlet and registration, postage for mailing; conference information packet and abstracts; post conference publication of proceedings; honorarium for featured speaker.

Cost estimates: Based on past costs and adjusted for inflation, this task can be achieved for a cost of \$8,000 yr.

Targeted funding sources: EPA watershed initiative grants; McKnight foundation, individual agencies contributing equal shares or paying total annual costs on a rotating basis; reimbursement from conference attendees.

Potential partners and their role: Member agencies of the Basin Team serve on the conference planning committee.

10. Keeping gaging stations operational (see #2)

Deliverables: Instantaneous discharge measurements along with stage and temperature; daily reporting on a USGS website; inclusion of data in USGS annual water resource data reports summarizing mean daily flow, monthly means, monthly low flows and high flows, etc.

Cost estimates: Each gaging station costs \$10,000 to operate. There are two stations on the St. Croix and one inactive gage on the Namekagon. Minnesota DNR operates gages on the Snake and Kettle to USGS standards. Other major tributaries to the St. Croix should be gaged as well. This would include about 10 additional gages. At a minimum the gages on the St. Croix must remain operational. Thus the cost estimate is based on this minimum requirement. This amounts to \$20,000 per year.

Targeted funding sources: Individual agencies contributing equal shares or paying total annual costs on a rotating basis; USGS; Xcel Energy; fishing interest groups; recreational interest groups; National Park Service non-recurring funding.

Potential partners and their role: Member agencies of the Basin Team, especially USGS, MDNR, WDNR tributary gaging sites.

12. River Defense Network (spill planning and response)

Deliverables: Spill response plan; potential spill sites on GIS layer; recommendations for containment equipment storage sites; time of travel predictions for various flow regimes and spill locations.

Cost estimates: Based on a proposal by the USGS, this project would cost approximately \$100,000.

Targeted funding sources: National Park Service non-recurring funding; EPA grants; McKnight Foundation; Basin Team partner agencies.

Potential partners and their role: Member agencies of the Basin Team would provide technical oversight.

**Managing Storm Water in Wisconsin:
A Local Partnership Protects the Kinnickinnic River**

**D. Kent Johnson and Andy Lamberson
Trout Unlimited, Kiap-TU-Wish Chapter**

Setting:

Some of the best trout fishing in the Midwest can be found in St. Croix County, one of the fastest-growing counties in Wisconsin. The City of River Falls, located on the southern edge of St. Croix County and in the heart of the Kinnickinnic River Watershed (Map 1), is home to 12,000 people. Because of its close proximity to the major metropolitan area of Minneapolis-St. Paul, MN, River Falls is a rapidly growing community, with a 20% population increase during the past decade. Growth estimates project a population of 16,500 by the year 2010. This estimate may be conservative, however, since it does not include growth in the surrounding townships, where agricultural lands are rapidly being converted to rural residential uses.

The Kinnickinnic River, a state "outstanding resource water", flows through River Falls in west-central Wisconsin. A premiere trout stream, the "Kinni" is renowned for its dense populations of wild brown trout. Approximately 2,000-8,000 trout per mile reside in the river, with no stocking needed to sustain this naturally reproducing fishery. According to fisheries biologists, a trout population of 1,000 fish per mile is considered excellent.

Scientific Assessment of Local Storm Water Impacts:

The Kinnickinnic River is a valuable cold-water resource representing a major natural amenity of the River Falls community. Although trout populations in the river are currently high, the effect of growth in the City of River Falls and surrounding townships has the potential to degrade the physical, chemical, and biological characteristics of the Kinnickinnic River and its tributaries. As growth occurs, the creation of impervious surfaces like roofs, sidewalks, driveways, streets, and parking lots generates a substantial amount of storm water runoff that can significantly affect a river. Storm water impacts include: higher stream flows, thermal pollution, chemical pollution, and sedimentation, all of which pose threats to aquatic habitat, trout, and other cold-water organisms.

Biological and Habitat Impacts

In the early 1990s, the local Kiap-TU-Wish Chapter of Trout Unlimited (Kiap-TU-Wish) and the Wisconsin Department of Natural Resources (WDNR) began noting differences in trout populations and habitat quality in the Kinnickinnic River, above and below the City of River Falls. Likely due to storm water runoff, trout populations were significantly lower and stream bank erosion was increasing downstream from River Falls. Thermal impacts were also suspected.

Thermal Impacts

In response to the concern about thermal pollution, Kiap-TU-Wish established a temperature monitoring network in 1992, at four locations on the Kinnickinnic River (Map 2) and two locations on major tributaries. With funding provided by Kiap-TU-Wish and the Wisconsin Council of Trout Unlimited, data-logging thermometers were purchased and installed at river locations upstream and downstream from City of River Falls storm water discharges and two local hydropower dams. The data-logging thermometers record river temperatures at 10-minute intervals during the April-September period, thereby documenting any thermal impacts associated with storm water runoff during summer rains. Significant thermal impacts have been apparent downstream from River Falls storm water discharges and hydropower dams. Rapid increases in river temperature (up to

10 degrees Fahrenheit) are frequently evident at locations downstream from storm water discharges during summer rainfalls (Figures 1 and 2), and storm water temperatures may exceed 78 degrees Fahrenheit (Figures 3 and 4), the upper lethal limit for brown trout. The thermal impact of the two city hydropower dams produces downstream temperatures that are at least 3-6 degrees Fahrenheit warmer than upstream temperatures during the summer months (Figure 5). Conversely, downstream temperatures are significantly cooler during the winter months, with possible impacts on incubating eggs in the trout redds. In 1995, Kiap-TU-Wish summarized the first three years of temperature monitoring results in a paper entitled: "Urban Storm Water Impacts on a Coldwater Resource". The paper was presented at an international conference of the Society of Environmental Toxicology and Chemistry in Vancouver, British Columbia, Canada. The paper is available for review in the Storm Water Section of the Kiap-TU-Wish website at: <http://www.lambcom.net/kiaptuwish/stormwater/stormwater.html>.

Sediment and Nutrient Impacts

To evaluate the possible impacts of sediment and other urban pollutants in River Falls storm water runoff, event-based composite sampling of residential, commercial, and industrial areas of River Falls was conducted in 1992 by Short Elliott Hendrickson (SEH), a local water resources management firm. A comparison of River Falls monitoring results to EPA (1983) NURP monitoring results (Table 1) indicates that sediment and nutrients are of particular concern in River Falls storm water runoff, with total suspended solids, total Kjeldahl nitrogen, and total phosphorus concentrations substantially higher than the NURP median concentrations.

Using Scientific Assessment Information to Initiate and Support Storm Water Planning and Management Efforts:

One of the goals of the Kiap-TU-Wish temperature monitoring project was to obtain sound scientific information on the local impacts of storm water runoff. Using this monitoring information, Kiap-TU-Wish initiated a discussion with River Falls planners and policy-makers about the need for storm water management tools that would enable the city to grow while protecting the Kinnickinnic River.

Leveraging the Ideas and Resources of Local Partners:

City of River Falls Storm Water Management Plan

In 1993, the City of River Falls applied for and received federal 205J funding to develop a storm water management plan. Short Elliott Hendrickson (SEH) was selected by the city to prepare the plan, in partnership with Kiap-TU-Wish, local townships, the WDNR, the Kinnickinnic River Land Trust, and the University of Wisconsin-River Falls. The "City of River Falls Water Management Plan for the Kinnickinnic River and Its Tributaries" (Figure 6) was completed in 1994, at a cost of \$115,000, with a portion of the funding provided by the city and Kiap-TU-Wish. The plan, adopted by the River Falls City Council in April 1994, provides a "blueprint" for the city's storm water management efforts to protect the Kinnickinnic River as the city grows.

Shortly after adoption of its storm water management plan, the City of River Falls established a storm water utility to generate funding for storm water management projects that protect and enhance the Kinnickinnic River. The storm water utility charges a fee to city residents and businesses according to the amount of storm water running off a property. As an incentive to residents and businesses that reduce the amount of storm water runoff from their properties, the City of River Falls reduces their annual storm water utility fee proportionately.

In 2002, River Falls adopted a storm water management ordinance (Figure 7). The ordinance, prepared with input from the partners, is another key element of the city's storm water

management plan. The ordinance, which applies to all new development and re-development projects within the city, requires all developers to use storm water management practices that entirely infiltrate all storm water runoff from rain events up to 1.5 inches. Among the storm water management options for developers is the low impact development approach, which employs biotechnology (rain gardens, vegetated swales, constructed wetlands, and buffers of native vegetation) to distribute and infiltrate storm water across the landscape, rather than concentrating and conveying it to the river with conventional storm water infrastructure (curb and gutter, storm sewers, and detention ponds). In 2004, the City of River Falls established a monitoring project to evaluate the effectiveness of the 2002 storm water management ordinance. The North Kinnickinnic River Monitoring Project will determine how well the ordinance protects the river as growth occurs in two new subdivisions adjacent to the river. The project monitoring components include measurement of the Kinnickinnic River baseflow regime and water temperature, water chemistry analysis, and surveys of the macroinvertebrate and fish communities. The project website, including the 2004 monitoring results, is available at: <http://www.rfcity.org/Eng/Stormwater/northkinnimonitoring/Default.htm>.

Kinnickinnic River Priority Watershed Project

In 1995, efforts to protect the Kinnickinnic River expanded watershed-wide when the WDNR selected the Kinnickinnic River as a part of the state's Priority Watershed Program. The Priority Watershed Program provides annual funding, over a ten-year period, for cost-shared projects in agricultural and urban areas of the watershed that protect and enhance the quality of the Kinnickinnic River. Prior to receiving state funding, however, a watershed plan had to be developed so that the state and local cost-share funding could be appropriately directed to areas of the watershed in greatest need. The WDNR worked in partnership with Kiap-TU-Wish, two counties, six townships, three cities (including River Falls), the University of Wisconsin-River Falls, the Kinnickinnic River Land Trust, and SEH to develop the "Nonpoint Source Control Plan for the Kinnickinnic River Priority Watershed Project" (Figure 8), which was approved by the Wisconsin Natural Resources Board in April 1999. The plan is unique in that it is the first priority watershed plan in the state to incorporate an urban storm water management component, applying the approach used in the City of River Falls storm water management plan to other cities and townships across the watershed. A list of eligible agricultural and urban best management practices (BMPs) and associated cost-share rates is presented in Table 2.

Local Environmental Education is Important:

In 1998, recognizing the need for an educational tool that can be used to protect cold-water resources in urbanizing areas, Kiap-TU-Wish, in partnership with Palisade Productions of Minneapolis, MN, produced a video entitled: "A Storm on the Horizon" (Figure 9). Using the Kinnickinnic River as the backdrop, this 15-minute video describes the value of a cold-water resource, discusses the potential threats posed to cold-water resources by urban growth, and also describes some tools available to communities for protecting these resources while accommodating growth. The video won a Silver Screen Award in the "Environmental Issues and Concerns" category at the Chicago International Film Festival in 1999. Chapter members have distributed nearly 3,000 copies of the video nationwide, to local planners and policy-makers, engineers, scientists, elementary, middle school, high school, and college educators and students, nonprofit organizations, and other Trout Unlimited members and chapters.

Translating a Storm Water Plan to Action in River Falls:

In 2000, the City of River Falls and the River Falls School District took advantage of an opportunity to implement some of the new storm water management techniques described in the city's storm water management plan. The school district was planning to build a new high school near the South Fork of the Kinnickinnic River, a tributary to the main river. After learning that a preliminary site plan had already been designed for the new high school, several Kiap-TU-Wish members showed "A Storm on the Horizon" to school officials and city planners, and stressed the need for good storm water management practices on the site. Kiap-TU-Wish members, the City of River Falls, SEH, and Kinnickinnic River Priority Watershed Project participants worked with the school district's landscape architect to redesign the site. A large, expansive parking lot in the original design was changed to smaller, separated lots buffered with native vegetation that will infiltrate storm water runoff from these impervious surfaces. Native buffers were also established between the athletic fields, to trap soil and nutrients. Three storm water detention ponds on the site will contain and infiltrate excess runoff, including the runoff from the building roof. With funding provided by the Priority Watershed Project, an innovative irrigation system was also installed to pump storm water from the detention ponds to the athletic fields. As originally designed, the new high school site would have cost the River Falls School District \$8,000 per year in storm water utility fees paid to the City of River Falls. With the redesign work, it is anticipated that no storm water will leave the site, saving the school district \$8,000 per year while protecting the South Fork and Kinnickinnic River. Kiap-TU-Wish members and Kinnickinnic River Priority Watershed Project participants plan to help the school district install interpretive signs that explain the various storm water management components of the site. It is hoped that these components can be incorporated into the educational curriculum at the high school. Funding for the signage will also be provided by the Priority Watershed Project.

The Benefits of Effective Storm Water Management:

Trout are an important indicator species of environmental quality, especially in an urbanizing area. As such, protection of the Kinnickinnic River is critical to help ensure the environmental, cultural, and economic future of River Falls and surrounding communities. With nearly 200 members, the Kiap-TU-Wish Chapter of Trout Unlimited and multiple partners have been instrumental in helping to protect the Kinnickinnic River during the past decade. Kiap-TU-Wish has raised the awareness of planners, policy-makers, and residents with regard to storm water issues, and has helped to change the way River Falls manages an outstanding cold-water resource in Wisconsin, thereby ensuring that the Kinnickinnic River will be available for the enjoyment of future generations.

For more information, please contact:

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This paper: "**Managing Storm Water in Wisconsin: A Local Partnership Protects the Kinnickinnic River**", with accompanying maps, figures, and tables, can be viewed in its entirety in the Storm Water Section of the Kiap-TU-Wish website at:

<http://www.lambcom.net/kiaptuwish/stormwater/stormwater.html>

Resources for You

Kiap-TU-Wish Chapter, Trout Unlimited:

Kiap-TU-Wish Website: <http://www.lambcom.net/kiaptuwish/>
In *Storm Water* <http://www.lambcom.net/kiaptuwish/stormwater/>:

"Urban Storm Water Impacts on a Coldwater Resource"
Author: Kent Johnson November, 1995

"Storm Water Management and the Kinni"
Author: Jeremy Cook December, 2000

"Guidance for Watershed Stewardship, Lower St. Croix River:
A Stream Protection Strategy"
Author: Kent Johnson December, 1998

Kiap-TU-Wish Video: "A Storm on the Horizon"
Available by contacting chapter member Kent Johnson

Publications:

"City of River Falls Water Management Plan for the Kinnickinnic River and Its Tributaries"
Available at:

River Falls Public Library
140 Union Street
River Falls, WI 54022
715-425-0905

River Falls City Hall
123 East Elm Street
River Falls, WI 54022
715-425-0900

Questions about the plan can be directed to Reid Wronski, City Engineer

"Nonpoint Source Control Plan for the Kinnickinnic River Priority Watershed Project"
A copy of the plan is available from:

Wisconsin Department of Natural Resources
Bureau of Water Resources Management
Nonpoint Source and Land Management Section
P.O. Box 7921
Madison, WI 53707
(Publication WT-522)

"Minnesota Urban Small Sites BMP Manual: Stormwater BMPs for Cold Climates". 2001. Metropolitan Council, St. Paul, MN.

<http://www.metrocouncil.org/environment/watershed/bmp/manual.htm>

"Protecting Water Quality in Urban Areas: BMPs for Dealing with Stormwater Runoff from Urban, Suburban and Developing Areas of Minnesota". 2000. Minnesota Pollution Control Agency, St. Paul, MN.

<http://www.pca.state.mn.us/water/pubs/sw-bmpmanual.html>

Non-Profit Organizations and Agencies:

Center for Watershed Protection

Website: <http://www.cwp.org>

An outstanding resource for information on storm water impacts and best practices for storm water management. After you visit the Kiap-TU-Wish website, go here before you go anywhere else!

Low Impact Development Center

Website: <http://www.lowimpactdevelopment.org>

Excellent information on best practices for storm water management.

U.S. Environmental Protection Agency

Urban Nonpoint Source Website: <http://www.epa.gov/owow/nps/urban.html>

Provides the national perspective and direction with regard to urban storm water management.

Quotations

"Like it or not, growth is necessary and inevitable. The goal of the Kiap-TU-Wish Chapter is to educate our communities about the value of cold-water resources, and then work with them to ensure that a sustainable blend of growth and resource protection is achieved."

- Kent Johnson

"The emerging generation of storm water management will embrace a distributed rather than centralized approach, where storm water is broadly dispersed and infiltrated on the landscape rather than funneled away to the nearest surface water via curbs, gutters, and storm sewers. The result can be a landscape that is less harsh and unforgiving, more natural and aesthetically appealing.....where water is regarded as a valuable commodity."

- Kent Johnson

"We shall never achieve harmony with the land, any more than we shall achieve absolute justice or liberty for people. In these higher aspirations the most important thing is not to achieve but to strive."

- Aldo Leopold

"I am trying to teach you that this alphabet of "natural objects" (soils and rivers, birds and beasts) spells out a story.... Once you learn how to read the land, I have no fear of what you will do to it, or with it. And I know many pleasant things it will do to you."

- Aldo Leopold

"Never doubt that a small group of thoughtful, committed citizens can change the world; indeed it's the only thing that ever has."

- Margaret Mead



To: Retailers of lawn and garden fertilizers

To: Registrants of lawn and garden fertilizers

To: Landscape associations, environmental organizations, trade groups

The Minnesota Legislature has recently passed a law that restricts the use of lawn fertilizers containing phosphorus. The law initially applied to the Twin Cities seven county metropolitan area, but was expanded by the legislature in the last session to cover all of Minnesota.

The purpose of this letter is to provide you with information on the new law, access to educational resources, and a contact person if you have any questions or need assistance regarding the law.

Key points on the Minnesota lawn phosphorus fertilizer law as we begin planning for the 2005 season:

- As of January 1, 2005, fertilizers containing phosphorus cannot be used on lawns in Minnesota. This is an expansion of the current law which restricts use of phosphorus in lawn fertilizer to 0% in the Twin Cities seven county metropolitan area and up to 3% in Greater Minnesota.
- IT IS NOT A BAN. Fertilizers containing phosphorus may be used on lawns if a soil test indicates that it is needed or if a new lawn is being established. These restrictions apply only to lawn fertilizer and do not apply to fertilizers used for agricultural crops, trees, flower and vegetable gardening, or by trained staff on golf courses.
- With a few exceptions, the new state law supersedes local community ordinances. However, a few communities passed ordinances restricting the SALE of phosphorus lawn fertilizer which remain in effect after January 1, 2005. A list of these communities and copies of the ordinances can be found at the MDA web site at the end of this letter.

Many of you who may be wondering what steps you need to take to ensure that both you and the people you work with are in compliance with the new law. With that in mind, the MDA, in partnership with the U of M Extension Service, Minnesota Office of Environmental Assistance, and the Minnesota Pollution Control Agency has developed the following educational resources. Samples of these resources can be downloaded from the MDA web site:

Phosphorus law posters

These posters – sample attached - are provided for posting (not required) where lawn and garden fertilizer is sold. Customers will be able to easily read about the basics of the law. Note that various sizes are available on the MDA web site.

Handout: New phosphorus lawn fertilizer law aims to protect Minnesota lakes and rivers

This handout – sample attached - is designed to be distributed to people who wish additional information on phosphorus fertilizer and the new law.

Booklet: Phosphorus in lawns, landscapes and lakes

This twenty page publication is designed to provide lawn care professionals, yard and garden shop staff, Master Gardeners, soil and water conservation specialists, and UM Extension Service educators with more detailed information on phosphorus in support of the new law.

These materials and additional information on phosphorus and lawn care are available on the MDA web site at www.mda.state.mn.us. Click on “Water and Land”, then click on “Lawn Care and Water Quality”, scroll down to the sections on phosphorus.

Thank you for partnering with us to help protect Minnesota’s water resources. Please don’t hesitate to contact me if you would like additional information or technical support.

Jerry Spetzman
Minnesota Department of Agriculture
651-297-7269
Jerome.spetzman@state.mn.us

**Guidance for Watershed Stewardship
Lower St. Croix River**

A Stream Protection Strategy*

**Kent Johnson
Environmental Monitoring and Assessment Section
Metropolitan Council Environmental Services**

December, 1998

***(From: Tom Schueler. 1995. *Site Planning for Urban Stream Protection*. Center for Watershed Protection, Ellicott City, Maryland.)**

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Acknowledgments

Credit for the Stream Protection Strategy* and much of the supporting information in this guidance document goes to Tom Schueler of the Center for Watershed Protection in Ellicott City, Maryland. More detail on the stream protection strategy and the watershed approach to site planning can be found in Tom's publication: "Site Planning for Urban Stream Protection" (1995). Tom's innovative ideas about planning for growth in the context of stream and watershed protection can serve as a model for those seeking a sustainable balance between environment, economy, and human needs.

A Thought on Conservation and Stewardship:

“There must be some force behind conservation more universal than profit, less awkward than government, less ephemeral than sport; something that reaches into all time and places where humans live on land; something that brackets everything, from rivers to raindrops, from whales to hummingbirds, from land estates to window boxes. I can see only one such force: a respect for land as an organism; a voluntary decency in land-use exercised by every citizen and every landowner out of a sense of love for and obligation to that biota we call America. This is the meaning of conservation, and this is the task of conservation education.”

- Aldo Leopold, from “*A Sand County Almanac*”

Foreword

The St. Croix National Scenic Riverway was one of the original eight components of the National Wild and Scenic River System. Its water quality, recreational and scenic values, and biological diversity were among the reasons for its inclusion in the system.

Unfortunately, those values are threatened by activities within its large watershed. The St. Croix River drains a land area of nearly 8,000 square miles, and pollution entering a tributary a hundred miles away may eventually find its way to the St. Croix. Realizing this threat, agencies with an interest in protecting the Riverway formed the St. Croix River Basin Water Resources Planning Team (St. Croix Basin Team) in 1994. The St. Croix Basin Team has developed a planning framework to gather information about a variety of water resource issues, to formulate strategies for resolving those issues, and to monitor water quality to see if our efforts are succeeding.

One of the most important elements of the planning process is public education and awareness. All watershed residents need to know that they have a great deal of influence in protecting water quality, both through their own activities and those of their communities. To that end, we requested that Mr. Kent Johnson of the Metropolitan Council Environmental Services develop this Guidance for Watershed Stewardship. We hope that you will read this guidance manual and will do your part to protect the water quality of your watershed and the St. Croix National Scenic Riverway.

Randy S. Ferrin
Chair, St. Croix Basin Team

**Guidance for Watershed Stewardship
Lower St. Croix River**

A Stream Protection Strategy*

Introduction

The Lower St. Croix River, a National Wild and Scenic Riverway, is significant for the following reasons:

- The riverway is an exceptional combination of high quality natural and historic resources, and scenic, aesthetic, and recreational values.
- These resources and values exist in a distinctive river valley setting with a strong regional identity and character.
- These resources and values exist within the expanding Twin Cities Metropolitan Area.

The management plan for the Lower St. Croix National Wild and Scenic Riverway is based on the following fundamental principles:

- The riverway must be managed cooperatively through federal, state, and local involvement.
- The river cannot be taken out of its watershed.

Water quality, one of the Lower St. Croix River's exceptional resources, is intimately linked to land use decisions within the entire St. Croix River watershed. At present, the Lower St. Croix River enjoys very good water quality, due largely to relatively undisturbed, natural conditions in the watershed.

Because of the St. Croix River's proximity to a rapidly-growing Twin Cities Metropolitan Area, however, river water quality is at risk. In 1997, the St. Croix River was named by American Rivers as one of the 20 most threatened rivers in America, because of concerns about the impacts of accelerated urban growth in the lower St. Croix watershed. Growth in the eastern Metropolitan Area and western Wisconsin promises large-scale land use changes in the watershed. Poor land use practices will result in deteriorating water quality in the Lower St. Croix River, while good land use practices will sustain water quality for generations to come.

Land use planning and water resource planning and management for the entire St. Croix River watershed (7,760 square miles) is a difficult and complex undertaking. Although federal and state agencies provide some direction, the magnitude of this task at a watershed scale is truly daunting.

Perhaps the best approach for protecting Lower St. Croix River water quality is to maintain stream water quality at a subwatershed level, through local involvement. A stream's scale, proximity, and vulnerability to land use changes make it an excellent choice for local water resources management. The preferred geographic units for local planning are the Lower St. Croix River subwatersheds, which drain individual streams. With authority for land use planning already vested in local entities, local governments and citizens have an excellent opportunity to promote stream protection at a subwatershed scale, provided stream protection is a community priority.

The Stream as the Primary Focus of Protection

A stream is a primary and important focus for protection because it integrates all aspects of the environment. When a watershed is transformed, the first impacts are often seen in the local stream. Beyond its intrinsic value as a sensitive environmental indicator, a stream is a very useful unit for local environmental management, for a number of reasons:

1. *Many communities have found that stream protection is a very clear, easily understood and well-supported local resource goal.*

The public intuitively understands the goal of stream protection. Quite simply, there is a stream in everyone's backyard. Once educated about their backyard streams, most residents place a high value on them. This can translate into the popular support needed to develop and maintain funding for stream protection.

2. *A stream exists on the same general scale as development.*

A stream is seldom located more than a quarter mile away from a development site. Consequently, it is possible to directly link the stream protection goal with the impacts generated by an individual development project. By contrast, it is much more difficult to relate impacts from individual development projects to broader regional water quality resources, such as the St. Croix River.

3. *Stream protection also provides reliable insurance that downstream water resource objectives can generally be achieved.*

Streams are the "narrowest door" in a watershed. If a community cannot protect the quality of its local stream, it cannot reasonably expect to maintain the quality of downstream lakes or the St. Croix River. Over time, the cumulative impact from hundreds of individual development sites will slowly degrade water quality at the regional scale. If streams are properly protected, a community can be more confident that downstream water quality will be maintained.

Advantages of a Stream Protection Strategy

Many communities have discovered that the stream protection strategy is a better alternative than conventional development regulations. Perhaps the greatest merit of this strategy is that it is resource-driven. The primary objective is very clear - the quality of a stream and its associated natural resource components is to be maintained or enhanced as the community develops and grows. The stream protection objective is tangible, measurable, and understandable to all the participants in the community development process.

The strategy is directly linked to the community development review process by making stream protection a priority during all stages of the development process, from the conception of how the landscape is to be altered, through the planning, design, and construction of individual projects, to the maintenance of the stream infrastructure after development is complete. Each step of the development process only proceeds when it can be reliably determined that the impacts of the development on the stream are minimal. As such, the strategy sets high performance criteria that explicitly recognize how difficult it is to maintain the quality of streams in the face of development pressure.

Another benefit of the stream protection strategy is that it typically requires an interdisciplinary approach during development review. Each development proposal must be assessed in terms of

all of its short- and long-term impacts on the stream. Thus, plan reviewers must be skilled in many disciplines to craft a development plan that meets community needs, yet produces minimal change to the hydrology, morphology, water quality, habitat, and biodiversity of the stream.

The last advantage of the stream protection strategy is that it presents a clear and practical management approach toward community development. When administered properly, the strategy can greatly streamline the local review process, reduce administrative burdens on local government, and be fully responsive to the needs of developers for clear direction, timely review, and cost reduction.

The Role of Community Planning in Stream Protection

At first glance, many communities may feel that implementation of the stream protection strategy is a rather daunting challenge. In an era of fiscal austerity and local economic restraints, communities may reasonably question whether they possess enough staff, financial, and political resources to effectively implement such a strategy. While the stream protection strategy does require a strong local commitment, it is primarily a management approach to better organize *existing* staff, resources, and programs around a common objective.

The stream protection strategy also recognizes that many existing local development regulations actually work against the goal of stream protection. Therefore, the strategy is not intended to produce more rules and regulations to govern development. Rather, it seeks to reform and simplify existing ones, and substitute flexible performance criteria in the place of rigid and uniform standards.

Thus, the first step in implementing the stream protection strategy usually involves a critical analysis of existing subdivision codes and related development criteria. Nearly every community in America has a subdivision code that regulates the density and geometry of development, specifies road widths, parking, and drainage requirements, and defines resource protection areas. The subdivision code contains a series of restrictive and uniform standards that govern all aspects of development, and trigger a complex site planning process. These requirements provide little flexibility for architects, landscape architects, and engineers involved in the design and site planning for new developments. While the exact standards often vary, most subdivision codes contain rigid standards within each zoning category that mandate:

- equal sized or shaped lots
- minimum lot sizes
- frontage requirements
- fixed setbacks for front, back, and side yards
- road widths and needed right-of-ways
- road turnarounds
- sidewalks and pedestrian access
- residential and commercial parking space requirements
- prohibition of common or shared facilities, such as driveways and septic systems
- curb/gutters and storm drains
- stormwater quantity and/or quality practices
- grading to promote positive drainage

Subdivision codes have evolved to their present level of complexity over the last few decades in response to an increasingly diverse list of community concerns. Primary among these has been

the need to accommodate the automobile, reduce liability, and provide emergency access. Other concerns include the need to respect privacy, reduce noise, allow for pedestrian movement, and prevent drainage problems. The underlying objective has been to standardize development practices so as to create more consistent subdivisions, to meet the goals of protecting public safety, enhancing community amenities, and preserving local property values.

It is not always clear, however, how well these complex codes are actually meeting these elusive community goals. However, it is abundantly clear that numerous aspects of subdivision code do not support better stream protection, insofar as they create needless impervious cover or fail to provide the right of way needed to adequately protect the stream. Relatively simple code modifications often make both economic and environmental sense.

To this end, a Site Planning Roundtable sponsored by the Center for Watershed Protection has recently established twenty-two model development principles that provide design guidance for economically viable, yet environmentally sensitive development (Center for Watershed Protection, 1998a). These model development principles can provide planners, developers, and local officials with benchmarks to investigate how existing ordinances may be modified to reduce impervious cover, conserve natural areas, and prevent stormwater pollution, for better stream protection.

Using the model development principles as a starting point, communities are encouraged to re-evaluate their existing development criteria in the 12 checklist areas summarized above. In addition, recommended elements of a stream protection strategy (detailed below) can be implemented through better community planning, within the context of existing codes and criteria.

Elements of a Stream Protection Strategy:

1. Watershed-based Planning and Zoning

The future quality of the Lower St. Croix River and tributaries (streams) is fundamentally determined by the broad land use decisions made by watershed communities. It is essential that the impact of future community growth and development on water quality be seriously assessed during the community zoning or master planning process. The most appropriate planning unit for this assessment is the subwatershed. On the basis of the forecasted level of impervious cover, it is possible to devise effective and achievable strategies for river and stream protection.

Watershed planning and zoning directs proposed development to the least sensitive area, and attempts to control the amount and location of impervious cover. Some areas are designated as growth areas, while others are partly or fully protected from future development. Many communities wonder about the effect of such broad-based planning on property values and the local tax base. Recent studies, however, suggest that the effect of watershed planning is largely positive (Schueler, 1997).

As one example, land use plans that retain open space, rural landscapes, and recreational opportunities contribute to the quality of a community and region. A survey of chief executive officers has ranked quality of life as the third most important factor in locating a new business. Citizens also rank protection of their water resources quite highly. As regional economies

become increasingly competitive, a high quality-of-life ranking can provide a critical edge in attracting new businesses and residents.

The Center for Watershed Protection has recently published a rapid watershed planning handbook that features elements for effective watershed planning, presents watershed analysis tools and management options, and provides case studies of actual watershed plans (Center for Watershed Protection, 1998b).

2. Protect Sensitive Areas From Development

Key natural areas, such as streams, wetlands, floodplains, steep slopes, mature forests, critical habitat areas, and shorelines, should be protected from development through the adoption and enforcement of local ordinances. An ordinance should describe how these sensitive areas will be delineated, and how they are to be protected during site planning, construction, and post-construction stages. Other protection methods include land trusts, conservation easements, and land purchases (both public and private).

Communities have repeatedly found that property adjacent to protected wetlands, floodplains, shorelines, forests, and other natural features constitutes an excellent location for development. A sense of place is instilled by the presence of water, forest, and natural areas, and this preference is expressed in a greater willingness to pay to live near these habitats (Schueler, 1997).

As one example, two regional economic surveys have documented that conserving forests on residential and commercial sites enhances property values by an average of 6 to 15%, and increases the rate at which units are sold or leased. Other studies show that the presence of forests and natural areas measurably increases the residential property tax base, boosts property values by reducing irritating noise and dust levels and screening adjacent land uses, saves 20-25% in energy bills for heating and cooling homes and businesses, and reduces the volume of stormwater runoff.

3. Establish a River and Stream Buffer Network

To fully protect the Lower St. Croix River and tributaries, it is very advantageous to establish a riparian buffer adjacent to river and stream channels (MWCOG, 1995a). The buffer network can be regarded as a river or stream right-of-way, and is an integral element of a watershed. A riparian buffer provides shade, woody debris, leaf litter, streambank protection, pollutant removal, wildlife habitat, recreational opportunities, and a multitude of other functions and services to the river or stream.

A shoreline or stream buffer can create many market and non-market benefits for a community, particularly if it is managed as a greenway (Schueler, 1997). Nationally, buffers were thought to have a positive or neutral impact on adjacent property values in 32 of 39 communities surveyed. Buffers also reduce pollution from stormwater runoff, provide a critical stream right-of-way during floods and storms, sharply reduce the number of drainage complaints received by local public works departments, protect valuable wildlife habitat, and expand recreational opportunities, when managed as a greenway.

4. Modify Local Ordinances to Reduce Creation of Impervious Cover

A key objective in any community or watershed plan should be the reduction of impervious cover created by development. Less impervious cover translates into less stormwater runoff and lower

pollutant loads (Schueler, 1994a). Planners and landscape architects can utilize a wide range of site planning tools to minimize impervious cover. In many cases, however, full utilization of these tools is limited by outdated local zoning regulations or inflexible subdivision codes. Indeed, existing subdivision codes often create needless impervious cover, in the form of wide streets, expansive parking lots, and large-lot subdivisions.

Reducing the amount of impervious cover created by subdivisions and parking lots at developments can lead to savings for municipalities and developers. Impervious cover can be minimized by modifying local subdivision codes to allow narrower or shorter roads, smaller parking lots, shorter driveways, and smaller turnarounds (Wells, 1994; Center for Watershed Protection, 1998a). These tools make both economic and environmental sense. Infrastructure—roads, sidewalks, storm sewers, utilities, etc.—normally constitutes over half the total cost of subdivision development (CH2M-Hill, 1993). Much of this infrastructure creates impervious surfaces. Thus, developers can realize significant cost savings by minimizing impervious cover. Some of the typical savings include:

- \$5,000-\$7,000 per space reduced in a commercial parking lot, considering lifetime costs for construction and maintenance;
- \$150 for each linear foot of road that is shortened (pavement, curb and gutter, storm sewer, and utilities) (MWCOG, 1998a);
- \$25-\$50 for each linear foot of roadway that is narrowed (MWCOG, 1998a); and
- \$10 for each linear foot of sidewalk that is eliminated.

In addition to these direct cost savings, developers will realize indirect savings. For example, costs for stormwater conveyance and treatment are a direct function of the amount of impervious cover. Thus, for each unit of impervious cover that is reduced, a developer can expect a proportionately smaller cost for stormwater conveyance and treatment.

Conservation Development

Conservation (or cluster) development provides an excellent opportunity to reduce impervious cover, while also protecting open space and natural resources, providing community recreational space, and substantially reducing development costs (Apfelbaum, et. al., 1997; MWCOG, 1998b; Schueler, 1994b). The concept underlying conservation development is to minimize lot sizes (but not necessarily reduce the total number of dwelling units) within a compact developed portion of a subdivision, while leaving the remaining portion prominently open. Housing can still consist of detached single family homes, as well as multi-family housing, or a mix of both. Conservation development creates protected open space that provides many market and non-market benefits. For example, some communities have found that conservation development:

- Can reduce subdivision impervious cover from 10-50% (depending on the original lot size and layout), thereby lowering the cost for both stormwater conveyance and treatment. This cost savings can be considerable, as the cost to treat stormwater from a single impervious acre can range from \$2,000-\$50,000. In addition, the ample open spaces within a conservation development provide a greater range of locations for more cost-effective stormwater management practices.
- Typically keeps from 40-80% of the total site area in permanent community open space. Much of the open area is managed as natural area, which often increases the future value of residential property in comparison to low-density subdivisions. This premium has ranged from 5-32% in communities in the Northeastern United States (Lacey and Arendt, 1990).

- Can reserve up to 15% of the site for active or passive recreation. When carefully designed, the recreation space can promote better pedestrian movement, a stronger sense of community space, and a park-like setting. Numerous studies have confirmed that homes situated near trails or parks sell for a higher price than more distant homes.
- Can reduce the capital cost of subdivision development by 10-33%, primarily by reducing the length of the infrastructure needed to serve the development (NAHB, 1986; Maryland Office of Planning, 1989, and Schueler, 1995).
- Can reduce the need to clear and grade 35-60% of the total subdivision area. Since the total cost to clear, grade, and install erosion control practices can range up to \$5,000 per acre, reducing clearing can be a significant cost savings to developers (Schueler, 1995; MWCOG, 1995b).
- Provides a developer some “compensation” for lots that would otherwise have been lost due to wetland, floodplain, or other requirements. This, in turn, reduces the pressure to encroach on stream buffers and natural areas.

An indication of the potential savings associated with conservation development is provided by the Remlik Hall Farm example in Maryland (Chesapeake Bay Foundation, 1996). Cost estimates were derived for two development scenarios that result in equivalent yield to the developer. In the conventional scenario, the 490-acre farm is subdivided into 84 large-lot units; whereas in the conservation scenario, 52 higher-end units are located on smaller lots in three clusters. In the conservation scenario, over 85% of the site is retained in open space, as farmland, forest, and wetland, compared to 41% in the conventional scenario.

In addition to a reduction in impervious cover, a net development savings of over \$600,000 was achieved for this conservation development. The total development cost for the conservation scenario is \$594,550, compared to \$1,229,030 for the conventional scenario. These large savings in development infrastructure (including engineering, sewer, and water) and road construction costs certainly contribute to a better bottom line. In addition, Arendt (1994) maintains that open space units sell both more rapidly and at a premium, thus increasing cash flow, which is always a prime concern for the developer.

5. Limit the Disturbance and Erosion of Soils

Perhaps the single most destructive stage during a development process occurs when vegetation is cleared and a site is graded to achieve a more buildable landscape. The potential impacts to a river or stream are particularly severe at this stage: vegetation and topsoil are removed, soils are exposed to erosion, steep slopes are cut, natural topography and drainage are altered, and sensitive areas are often disturbed (Paterson, 1994a; Schueler, 1994c). Reduction of the massive sediment pulse that inevitably occurs during construction can be achieved through a combination of clearing restrictions, erosion prevention, and sediment controls. Traditionally, many communities have focused on enforcing erosion and sediment control plans at construction sites (Paterson, 1994b), primarily through structural practices and temporary seeding. The value of non-structural practices for erosion control, such as clearing restrictions, construction sequencing, footprinting, and vegetation conservation, is increasingly being recognized (MWCOG, 1995b; Center for Watershed Protection, 1998a). Effective soil protection measures and practices should also be emphasized for agricultural and silvicultural activities in the watershed.

Current state and local requirements for erosion and sediment control (ESC) often do increase the cost of development. On a typical site, the cost to install and maintain erosion and sediment

control practices can average \$800-\$1,500 per cleared acre per year, depending on the duration of construction and site conditions (SMBIA, 1990; Paterson et. al., 1993).

Application of other watershed protection tools, however, can help reduce the total cost for erosion and sediment control practices at a construction site. Open space conservation, buffers, and clustering can all sharply reduce the amount of clearing and grading needed at a site, thereby reducing the area that must be controlled by ESC practices.

ESC practices also provide direct and indirect benefits to both the builder and the adjacent property owner. By keeping soil on the site, a developer needs to spend less time and labor re-grading the site to meet final plan elevations, and less effort stabilizing eroded slopes. Careful phasing of construction within a subdivision can also lead to economies over the entire construction process.

6. Treat the Quantity and Quality of Stormwater Runoff

An important component of any community or watershed plan involves the use of stormwater best management practices (BMPs) to treat the quantity and quality of runoff generated by impervious surfaces (Center for Watershed Protection, 1998a). Stormwater BMPs include ponds, wetlands, filters (riparian buffers), swales, and infiltration systems that are designed to replicate predevelopment river and stream hydrology and water quality. While many recent advances have been made in stormwater BMP design, most can only partially mitigate the impacts of development on rivers and streams. While reduction of impervious cover should be the primary objective of watershed planning, stormwater BMPs can provide important complementary benefits. Stormwater BMPs are a simple solution to a complex problem, however, and cannot be expected to compensate for a lack of watershed planning, poor site design, or the absence of a river and stream buffer network. Indeed, a poorly designed or located stormwater BMP can create as many environmental problems as it was intended to solve. Stormwater BMPs require an ongoing commitment to maintenance, to ensure performance and longevity. Many communities have failed to recognize the long-term cost burden of stormwater BMP maintenance.

Stormwater BMPs are designed to remove pollutants, promote groundwater recharge, prevent streambank erosion, and control downstream flooding. Special BMP design considerations are necessary to mitigate the thermal impacts of stormwater on sensitive cold-water resources such as trout streams (Galli, 1990; Galli and Dubose, 1990; Yetman, 1991; Claytor, 1997; Johnson, 1995). Although stormwater BMPs can be quite effective, they are also among the most expensive watershed protection tools to construct and maintain. The most recent study indicates that the cost of treating the quality and quantity of stormwater runoff ranges from \$2,000-\$50,000 per impervious acre (Brown, 1997), emphasizing the importance of reducing impervious cover to the extent practical before applying BMPs. These construction costs do not include the cost of land used for stormwater treatment. In addition, stormwater BMPs must be maintained, and that cost burden often falls on landowners and local governments. Over a 20-25 year period, the full cost to maintain a stormwater BMP is roughly equal to its initial construction cost (Wiegand et. al., 1986).

Despite their high construction and maintenance costs, stormwater BMPs can confer several tangible economic benefits:

- Since stormwater ponds and wetlands can create a waterfront effect, stormwater management can be beneficial for developers. In a recent analysis of twenty real estate studies across the

United States, the U.S. EPA (1995) found that developers could charge a per lot premium of \$10,000 for homes situated next to well-designed stormwater ponds and wetlands. In addition, EPA found that office parks and apartments next to well-designed stormwater BMPs could be leased or rented at a considerable premium, and often at a much faster rate.

- In a comparison of Minnesota home prices, sale prices were nearly one-third higher for homes that had a view of a stormwater wetland, compared to homes without any “waterfront” influence (Clean Water Partnership, 1997).
- Some stormwater BMPs, such as grassed swales and bioretention areas, actually are less expensive to construct than enclosed storm drain systems, and provide better environmental results. Liptan and Kinsella-Brown (1996) documented residential and commercial case studies where the use of swales and bioretention areas reduced the cost and size of conventional storm drains needed to meet local drainage and stormwater management requirements. The more natural drainage systems eliminated the need for costly pipes, trenches, catchbasins, and access holes, while removing pollutants at the same time. Total reported savings for these projects ranged from \$10,000 to \$200,000.

7. Maintain Stream Protection Measures

A concerted effort is needed to inspect, maintain, and restore the river and stream protection measures listed above (1-6). This effort can involve:

- Maintenance of stormwater BMPs,
- Enforcement and maintenance of buffers,
- Enforcement and revision of soil erosion ordinances, and inspection of soil erosion control measures,
- Creation and revision of local ordinances and community/watershed plans, and
- River and stream restoration.

This step is often the weakest element of a stream protection strategy. It is also the most important, since river and stream protection measures must continue to function properly over many decades to achieve the desired level of protection.

8. Treat Wastewater

In many rural watersheds, new development occurs outside of water and sewer service areas, which means that wastewater must be treated on the site, usually by a septic system. To treat wastewater, septic systems must have an appropriate drainage area and soil type to function properly. Costs associated with installing and maintaining septic systems and correcting system failures are as follows:

- The average cost of constructing a conventional septic system at a single family home situated on a large lot is about \$4,500 (U.S. EPA, 1993), approximately equal to the unit cost of municipal wastewater treatment. The cost of a more innovative septic system (with a higher nutrient removal rate, a lower failure rate, or with better performance in poor soil) is 25-75% greater than a conventional system (Ohrel, 1995).
- The cost to maintain a properly functioning septic system on an individual lot is not inconsequential. The cost to inspect a septic system ranges from \$50-\$150 per visit, while each pumpout costs about \$150-\$250. The recommended pumpout frequency ranges from two to five years for a standard household tank. Over a decade, the total maintenance cost for a septic system can range from \$1,000-\$3,000 (Ohrel, 1995).

- There are also major costs to landowners when septic systems fail. A failed or failing septic system can decrease property values, delay the issuance of building permits, or hold up a purchase settlement (NSFC, 1995). In the event a septic system fails, homeowners can expect to pay from \$3,000-\$10,000 for replacement.

In rural watersheds, innovative approaches to wastewater treatment should be considered when new development is planned outside of municipal wastewater treatment service areas. Common or community septic systems, or alternatives such as constructed wetland treatment systems, should be utilized whenever possible. Alternatives to conventional septic systems are particularly compatible with conservation development, where “clustering” of homes and availability of open space favor such options as community septic systems or wetland treatment. Local utilities can also be established to operate these alternative systems for homeowners, if desired.

As an example of alternative wastewater treatment, Jackson Meadow, a conservation development in Marine-on-St. Croix, Minnesota, is proposing to use 2 two-stage, two-cell wetland treatment systems to serve 64 homes generating an average wastewater flow of 11,000 gallons per day. Using this innovative design, no wastewater will be exposed to the surface at any time during the treatment process, and no wastewater will be discharged to local surface waters.

Common or community water supply sources should also be considered for new developments in rural areas, rather than individual wells.

9. Establish an Effective Public Outreach and Education Program

To succeed, a river and stream protection effort needs broad-based support throughout the watershed. To generate and maintain this support, public outreach programs must be developed for watershed residents, emphasizing the value of the St. Croix River watershed and its natural resources, educating residents and businesses about the daily role they play in protecting the quality of this watershed, and providing opportunities for the public to assist with protecting resource quality (appropriate lawn care practices, proper disposal of household hazardous wastes, storm drain stenciling, industrial and commercial pollution prevention programs, inspection of treatment systems, etc.).

10. Monitor River and Stream Quality

To provide feedback to watershed managers and residents on how well the stream protection strategy is achieving its objectives, ongoing water quality monitoring of the Lower St. Croix River and tributaries is needed. With a well-designed monitoring approach, spatial and temporal water quality trends can be documented, water quality issues can be identified and prioritized, water quality improvements can be measured as management programs are implemented, and the achievement of water quality goals can be demonstrated. A coordinated monitoring approach should be established, involving multiple partners (including citizens).

The Economics of Urban Sprawl vs. Stream and Watershed Protection

The Economics of Urban Sprawl

Low-density suburban development (popularly known as urban sprawl) has inexorably crept across the rural landscape, steadily transforming farms, forests, and fields into residential

subdivisions, strip shopping centers, and roads. In just a few decades, growing communities can find that dozens of square miles of rural land have been transformed into impervious cover and turf. At the same time, residents discover that roads are congested, schools are overcrowded, and the sense of place that originally attracted them has greatly diminished.

Urban sprawl is also increasingly recognized as a primary factor reducing the quality of streams, lakes, and wetlands in many watersheds. A growing body of research (Schueler, 1994a) clearly documents that the creation of impervious cover accompanying new growth causes a predictable and profound decline in critical elements of aquatic ecosystems. The most disturbing component of this research is that impacts start to occur at a relatively low level of impervious cover - about ten percent. This level is roughly equivalent to the amount of impervious cover produced by large-lot residential development (one house per acre). In a state-wide study of Wisconsin streams, impacts on biological integrity became severe when urbanized land use in the watershed surpassed a threshold of 10-20% (Wang et.al., 1997). In addition to the rapid and striking decline in stream quality that can occur in a single generation of sprawl development, sprawl also degrades the quality of the rural landscape by fragmenting fields, forests, and wetland habitats, and drastically altering viewsheds.

Just as the environmental effects of sprawl development can be felt throughout ecological systems, the economic effects of sprawl are felt throughout the economy (Pelley, 1997). While these detrimental effects may be temporarily masked in a "hot" real estate market, the economic impacts will eventually emerge. Because sprawl has adverse impacts on traditional local industries such as agriculture, tourism, recreation, fisheries, and forestry, it can weaken economic diversity in the overall regional economy and reduce the multiplier effects of money generated by these businesses.

One common assumption about sprawl is that by promoting residential development, local tax revenues are increased, which ultimately lowers everyone's property taxes. Although new development certainly increases the local tax base of the community, new homes and businesses also increase the cost of municipal services such as roads, schools, water supply, wastewater treatment, stormwater collection and treatment, fire and police services, libraries, and parks and recreation. A number of economic studies (Vance and Larson, 1988; American Farmland Trust, 1992 and 1994; Hulsey, 1996) have shown that taxes from residential development do not pay the full cost of servicing it. On the average, the cost of servicing traditional residential development is about 116% of the tax revenue received. In contrast, the cost of servicing commercial development is only 32% of the tax revenue received. However, while commercial development can be an initial tax positive, it tends to attract residential development as people move to homes closer to job locations. The cost of servicing farmland, forest, and open space averages 37% of the tax revenue received. In other words, changing rural land uses to traditional residential development costs the community more than is raised in tax revenues.

Finally, communities may need to spend significant sums to repair or restore natural resources degraded by sprawl. Reactive natural resource restoration is expensive and time-consuming, with no guarantee that restoration goals can be achieved.

After several decades of study, it is apparent that sprawl development imposes significant short-term and long-term costs on local government, business, property owners, developers, and the environment. Communities are beginning to recognize that public investments should be spent to contain sprawl rather than promote it. Educating the public and elected officials about the

economic and environmental consequences of sprawl is a first step toward better local choices about growth management.

The Economics of Stream and Watershed Protection

Watershed protection may be a fine idea, but how much does it cost? How does it change the bottom line for the region, the development community, landowners, and residents alike? This question is increasingly being posed to those advocating better watershed protection (Schueler, 1997).

Recognizing that people also need a place to call home, watershed protection cannot be anti-growth. Environmental sustainability must be supportive of a healthy economy and society. Conversely, watershed development does not have to be synonymous with the degradation of aquatic and other natural resources. When new growth is managed in a watershed context, homes and businesses can be located and designed to have the smallest possible impact on streams, lakes, wetlands, and other natural resources.

Planners have been proposing more compact growth patterns for many years. Regional plans for compact growth have been forged to respond to problems of sprawl by concentrating new growth around existing development centers or regions served by suburban transit. By strategically accommodating growth, compact development can preserve prime agricultural land and protect sensitive natural areas while also reducing costly construction of new infrastructure. Burchell and Listokin (1995) have defined planned growth as “an attempt to maximize development resources and limit costs by containing most growth within locations that are more efficient to service”.

While few people celebrate sprawl, consumers seem to prefer a suburban lifestyle. However, this does not necessarily imply that they are satisfied with conventional large-lot subdivisions. Developers have found that well-designed cluster and traditional urban-style neighborhoods are very attractive to new home buyers. In addition, surveys have shown that residents are willing to pay a premium to live next to natural areas or park-like settings. As environmental awareness has grown among consumers, the market for environmentally friendly compact developments has expanded. Recent market surveys have tracked the ascendance of this preference for “green” or “conservation” development.

A number of economic studies (Duncan et al., 1989; Frank, 1989; Burchell, 1992) have detailed the differences between sprawl and compact growth patterns. These studies have compared costs for suburban sprawl versus more dense, mixed-use growth. While both growth patterns typically result in the same number of people and jobs, compact growth protects a greater share of farmland, forests, and natural areas. The economic studies show that compact development consumes about 45% less land, and costs 25% less for roads, 15% less for utilities, 5% less for housing, and 2% less for other fiscal impacts (Burchell and Listokin, 1995).

Many players in the local economy perceive that watershed protection can be costly, burdensome, and potentially a threat to economic vitality. Others counter that watershed protection is inextricably linked to a healthy economy. The elements of a stream protection strategy, highlighted above, are designed to protect water quality while increasing the value of existing and developable land. Also, despite lingering concern about escalating cost, recent studies have shown that the economic effect of these watershed protection tools is largely positive. Examples of the positive environmental and economic benefits associated with some elements of a stream protection strategy are provided above. While economic research on many of the elements is

somewhat sparse, much of the evidence indicates that these tools can have a positive or at least neutral economic effect, when applied properly.

The Role of Local Governments

Many players in the local economy are justifiably concerned about the economic consequences created by stream and watershed protection programs. Despite long-term benefits, stream and watershed protection efforts are both fiscally and politically challenging for local governments. How, then, can communities craft stream and watershed protection programs that achieve the broad and deep acceptance needed to overcome these challenges? Successful communities have found it important to:

- Invest early in stream and watershed education and outreach;
- Designate a single agency to champion stream and watershed protection and play a role in the development process;
- Include all stakeholders in a public process to set stream and watershed protection goals and define the scope of protection tools;
- Develop simple and practical performance criteria;
- Employ a unified and streamlined development review process;
- Be responsive to the needs of the development community for fair and timely review and “common sense” requirements;
- Provide incentives and remedies that protect the economic interests of existing landowners;
- Continually tout the economic and environmental benefits expected from stream and watershed protection;
- Institute a dedicated funding source to support stream and watershed protection, such as a stormwater utility.

The central role of local government leadership in stream and watershed protection cannot be overstated, nor can the economic implications be discounted.

Summary

The premise that carefully-managed stream protection tools can have a balanced, positive effect on the local economy is generally supported by the economic research to date. At first glance, it seems futile to calculate the intrinsic economic value of a high quality stream, a clear lake, or a forested floodplain. Calculating the “true” value of a high quality Lower St. Croix River watershed seems an even more daunting task. What is interesting about urbanizing watersheds, however, is that society measures the value it places on these resources every day, in terms of property values, real estate premiums, rental rates, stormwater utility fees, construction costs, and volunteer hours donated. While the true value of a stream may never be known, it is clear that society does not value them lightly.

The timeless real estate adage “location, location, location” underscores the importance of how people value land. Many people prefer to locate next to forests, wetlands, streams, lakes, and other natural features. More importantly, even those members of the community who do not live next to these features still recognize the important role they play in the quality of the environment and in their lives. Harnessing this sense of place is perhaps the most important element of a stream protection strategy for the Lower St. Croix River watershed.

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