

RED RIVER BASIN COMMISSION

Water Quality Strategic Plan

For the Red River Basin

Cattail biomass harvesting conducted in 2016 using conventional forage chopping equipment. Harvested biomass is then land applied as an agricultural soil amendment



PROGRESS REPORT TO THE MINNESOTA LEGISLATURE

MARCH 2017



Red River Basin Commission

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Red River Basin Water Quality Strategic Plan (WQSP)

Introduction

The 2015 Minnesota Legislature appropriated \$200,000 to the Minnesota Pollution Control Agency (MPCA) for the Red River Basin Commission (RRBC) to develop a strategic plan of action. This plan of action will address water quality issues in the Red River Basin that include consistency in water quality goals and objectives for the Red River of the North (RRN) and nutrient reduction allocations for both point and nonpoint sources on the Red River of the North and individual major watershed tributaries to the RRN and report progress and outcomes. The RRBC did not receive funding directly from either North Dakota or Manitoba but does have commitments for their participation in this initiative. The RRBC received a Community Innovations Grant from the Bush Foundation for nutrient reduction work that can be used in North Dakota.

There currently are numerous nutrient reduction activities occurring in each of the three jurisdictions. We are working with all of these activities to bring together a Basinwide vision on nutrient reduction approaches we want to use to move forward. We will summarize existing information on current sources of nutrients within the basin and develop nutrient reduction goals by subwatershed as well as by source type. All nutrient sources, point as well as nonpoint, will be included. A suite of nutrient reduction strategies and actions will be developed that can be utilized by the groups responsible for nutrient reduction implementation work. A progress report was prepared and previously submitted covering activities completed through February 2016. The next sections of this progress report will identify work completed since February 2016 and work anticipated to be completed as part of this effort. The update will include the Tasks identified in the original workplan.

Progress on Tasks

Objective 1. Organize Steering Committee/Summarize Existing Information

Task 1A. Steering Committee:

The Nutrient Reduction Steering Team was created to help guide the development of the overall Red River Basin Nutrient Reduction Strategy. The existing RRBC Water Quality Committee was expanded to form the Steering Team to lead this project. The Steering Team includes US and Canadian federal representation from USEPA-Denver, US Army COE- St. Paul, USGS, USDA-NRCS, Environment Canada and Agri-Food Canada. It includes State and Provincial representation from ND Department of Health, ND Department of Agriculture, MPCA, MN Department Agriculture, MN BWSR, Manitoba Water Conservation/Water Stewardship and Manitoba Department of Agriculture. The Steering Team includes the City Engineers or Waste Water Treatment Facilities Directors from the four major point source dischargers. These include the Cities of Winnipeg Manitoba, Grand Forks North Dakota, Fargo, North Dakota and Moorhead Minnesota. The Steering Team also includes Agricultural Sector representation from MN Farm Bureau and MN Ag Water Resource Center. American Crystal Sugar will be invited to participate as a representative of a major industrial point source discharger. Discussions with the Steering Team have taken place regarding what other sectors should be represented.

We are very interested in increasing the involvement of the Agricultural sector in this project. As part of Task 3C, we will be working directly with several Agricultural groups on the Ag Input Forums but will also consider additional agricultural groups participation on the Steering Team. Keystone Agriculture, a large agricultural producer organization in Canada, has been asked to join the Steering Team.

The Steering Team has meet approximately quarterly with meetings August 31, 2016 and November 2, 2016. In addition the smaller RRBC Water Quality Committee has met four times in 2016 plus January 2017. These meetings have a similar purpose and agenda but include a smaller group of members. The Steering Team is a large diverse group but the RRBC is built on broad representation and have found that while this does become cumbersome at times, it is critical to build the buy in that is required down the road during the implementation of the strategies we develop. A listing of the current Steering Team membership is attached in Appendix B.

Task 1B. Existing Nutrient Sources

There has been a large amount of data and information generated from multiple sources including international, federal, state/provincial and local initiatives. Some of this information is from monitoring data gathered for many different purposes and some is from water quality modeling work completed by many different entities. There are data generated from point source dischargers as well as ambient monitoring that has been completed, some with long periods of record.

As part of this project, we have gathered historic nutrient information from all the Steering Team members as well as other sources of information that the Steering Team knows about. We have assembled close to 100 refereed journal articles on the Red River basin. The US Geological Survey (USGS) and Environment Canada have produced much of the historic water quality data. There has been several water quality trends analysis papers that have been written by multiple organizations. All of these papers cover different time series or different locational data. All of these papers conclude that nutrient levels in the Red River are increasing. The amount of this increasing trend has depended on the time series evaluated as well as the specific location and nutrient evaluated. A proposal for an updated water quality trends has been put together and submitted to International Joint Commission January 2017 for possible funding. This work would provide a current trend analysis for nutrients in the Red River basin and would be completed under the direction of USGS but would include monitoring information from the U.S. as well as Canadian sides of the basin. The trend information is critical to documenting what changes in nutrient loads and concentration have occurred in the recent past. Having this current trend information is also critical to helping us identify which sources are causing the largest increasing trends. The last known paper on water quality trend information is over 10 years old.

Currently, USGS Grand Forks Office is leading the development and coordination of a water quantity and quality data base system including monitoring location and water quality data being collected within the Red River basin. This initiative is being led by Rochelle Nustad of the USGS Grand Forks Office. This effort gives us a good view of the extent of monitoring that is currently being completed and where we might have either excess sampling or too limited of sampling in any given location throughout the basin. The reporting network that Ms. Nustad put together has a mapping system that identifies known sampling locations where you can click on a location and call up detailed information on what sampling is occurring at that site by who and over what period of record. This new system was built with information being generated from all three jurisdictions and is intended to be all inclusive of sampling being completed in the Red River Basin. This data system went public in June 2016. The link to the data system is attached. The link is housed on the IJC webpage at <http://ijc.maps.arcgis.com/apps/MapSeries/index.html?appid=1e883514ace34b9bbd80596839a1fadc>. This is believed

to be the first time that water quality information from all three jurisdictions has been placed in a combined data system.

Several large water quality modeling efforts have been completed for the Red River basin as well as for subwatersheds that are tributaries to the Red River in 2016. The International Joint Commission (IJC) and USGS have just completed a very detailed SPARROW model for the basin. This was a three year effort utilizing sampling information to calibrate this Spatially Referenced Regression on Watershed Attributes model to give us a tool that can be used on a large scale to identify source contributions across the watershed. This report titled “Nutrient Delivery to Lake Winnipeg from the Red-Assiniboine River Basin-A Binational Application of the SPARROW Model” was published June 2016 by Glenn A. Benoy et al. It is included as Attachment C to this report. This study represents the first bi-nationally focused application of the SPARROW model to estimate loads and sources of Total Phosphorus (TP) and Total Nitrogen (TN) by jurisdiction and basin at multiple spatial scales. Sources of TP were lumped into four major categories including: Agricultural, Wastewater Treatment Plants, Forest and Wetlands and Stream Channel Erosion. TN sources were lumped into three major categories including: Agricultural, Wastewater Treatment Plants and Atmospheric Deposition. Agricultural was the single largest source of TP and TN across all subbasins. Stream Channel Erosion was the second largest source of TP. For the Red River approximately 65% of the TP came from agricultural inputs, 16% from stream channels 12% from WWTPs and 6% from forests and wetlands. For TN 75% came from Agriculture, 12% from atmospheric deposition and 12% from WWTPs. This SPARROW model is a potentially useful tool to address questions of where nutrients originate and their relative contributions to loads delivered to the subbasin outlets, the Red River and to Lake Winnipeg.

One component of the overall basin nutrient reduction strategy involves developing nitrogen and phosphorus concentration targets within the mainstem Red River. The IJC-IRRB has been discussing adopting nutrient objectives for the Red River at the Canadian border as part of their work administering the Boundary Waters Treaty of 1909. IJC-IRRB has finalizing work by RESPEC Consulting who developed a Stressor-Response model for the Red River that identifies under what nutrient levels we start seeing impacts on the aquatic ecosystem. The final report was published June 2016 titled “The Development of a Stressor-Response Model for the Red River of the North”. It is included as Attachment D to this report. The Stressor-response work focuses on collection of algae communities and water quality data up and down the Red River to identify at what nitrogen and phosphorus concentrations we begin to see an impact on the algae communities. This is the approach the MPCA uses for determining biological criteria for establishing nutrient limits for watercourses.

This report proposed potential nutrient guidelines for the Red River that would be needed to protect the aquatic resources. This study resulted in proposed nutrient targets of 0.15 milligrams per liter (mg/l) for TP and 1.15 mg/l for TN at the Canadian border. These targets fall right in line with the proposed TP and TN stream nutrient levels that have been discussed by MPCA for this ecoregion. This target concentrations will be matched with the targets load calculations being developed for Lake Winnipeg to come up with an overall basin nutrient reduction strategy. These proposed guidelines have not been adopted but are being discussed widely.

Task 1C. Existing Reduction Actions

This task is to identify and accumulate existing practices or actions being undertaken by the three jurisdictions (Minnesota, North Dakota and Manitoba) that contribute to nutrient reduction either in individual jurisdictions or basinwide. North Dakota Department of Health completed their draft Nutrient Reduction Strategy in December 2016. The statewide strategy includes an Implementation Framework that identifies the Red River Basin as the first of their 6 major river basins that they will begin this nutrient reduction effort. The first of the Public Meetings in the Red River basin are scheduled for February 28 Valley City, ND and March 1 Devils Lake, ND. There is a lot of effort that is currently going into identifying the “tools in the tool box” that can be used by

agricultural producers to limit the amount of nutrients they have leaving agricultural land. We continue to work closely with the Minnesota Department of Agriculture with their Water Quality Certification Program and on-farm monitoring work they are completing. We continue to utilize information gathered by Minnesota Agricultural Water Resources Center on work they are completing on their Discovery Farms and other water quality initiatives. We attended the MN Environmental Quality Board Water Summit this month and will find ways to help move forward the nutrient reduction goals that were proposed by Governor Dayton. We already have examples of implementation projects that are moving forward to help us position the Red River basin to be a leader in the nutrient reduction goals Governor Dayton has proposed including the 25% reduction by 2025.

Objective 2. Nutrient Reduction Load Allocation

Task 2A. Load Allocation

This task will develop and recommend adoption of nutrient load allocations and water quality targets for nutrients for the Red River at its discharge to Lake Winnipeg, at the International border and at the discharge of subwatersheds that are tributaries to the Red River. These subwatersheds will mostly be based on the Hydrologic Unit Code 8 (HUC 8) watersheds. The recommended nutrient load allocations and water quality targets should at a minimum, be protective of Lake Winnipeg but may be more restrictive at specific locations to protect local water quality issues of the individual jurisdictions. The Stressor-Response work has given us a first look at what reductions would be needed to be protective of the Red River ecosystem and we are being surprised that the reduction goals will not be driven by Lake Winnipeg but will also be driven in large part by the needs of the Red River and its tributary streams as well as uses within the watershed that are particular local interest.

This task will include the development of a nutrient reduction goal by use type also. Each subwatershed overall reduction target will be broken down to identify what reductions will be made by each use type to meet the overall goal. Discussions will include what reduction goals are possible for point sources such as wastewater treatment facilities as well as what reduction will be able to be generated by agricultural nutrient reduction activities that individual landowners can implement on their agricultural land. All significant sources of nutrients will be addressed in this process. By bringing together the four major point source dischargers we have already opened up the communications between these four important contributors of nutrients as well as had discussions on future nutrient reduction techniques currently being explored at a nationwide and International scale.

The City of Winnipeg is under a phosphorus reduction timetable that is part of their permit from the Province of Manitoba. The South WWTP is currently meeting the 1 mg/l discharge limit for phosphorus. The other two facilities are under a schedule to upgrade their facilities to meet the 1 mg/l discharge standard. The State of Minnesota is currently in negotiations with the City of Moorhead on upgrading their wastewater treatment plant to meet a 1 mg/l discharge limit. The State of North Dakota is currently in discussions with the Cities of Fargo and Grand Forks on phosphorus discharge limits. Both of these facilities currently are required to monitor phosphorus concentrations in their effluent. The City of Grand Forks, ND has recently entered into an agreement with the City of East Grand Forks, MN where Grand Forks will be treating all wastewater generated in East Grand Forks at the Grand Forks Treatment Plant. East Grand Forks had an aging pond system that they were under a directive from MPCA to upgrade their pond system. As an alternative the two cities are working cooperatively creating a more cost effective treatment system for their combined wastewater.

The current reduction goal being discussed for phosphorus on a Basinwide scale will include the need to be large enough to result in a 50% reduction in “in-lake” phosphorus concentrations in the South basin of Lake Winnipeg. A phosphorus reduction goal at the US/Canadian border has been proposed at 0.15 mg/l average monthly concentration. Phosphorus reduction goals at each subwatershed to the Red River will be developed as part of this process. The proposed goal for Lake Winnipeg would return the lake to the phosphorus levels that typically existed in the 1990’s. From the 1800’s to around 1900 the in-lake phosphorus concentration was 0.02 mg/l. From 1900 to 1990 the phosphorus concentration increased to 0.05 mg/l. From the early 1990’s till now, we have seen the in-lake phosphorus concentration in Lake Winnipeg double from 0.05 mg/l to 0.10 mg/l.

Objective 3. Implementation Strategy

Task 3A. New Reduction Actions

This task will develop new techniques that could be tested for addressing point and nonpoint source nutrient reduction. The new techniques will be reviewed by the Steering Team and from the information gathered at the Agricultural outreach meetings that will be discussed in greater detail below. We believe that the success of our nutrient reduction strategy will depend on us finding new creative ways to address all sources of this nutrient issue. Many current practices have struggled to address nutrient runoff especially from watersheds that are intensively farmed. By tying together soil health/soil conservation components with the flood damage reduction and distributed storage initiatives we will have a measurable reduction in nutrient runoff from the Red River basin.

Our approach that is promoting the use of distributed flood water storage structures to address flood damage reduction will also have a major impact on water quality. There are approximately 200 sites have been identified, that if built, would provide significant local flood damage reduction to roads, rural infrastructure and agricultural lands. A significant portion of our annual nutrient load comes during spring snowmelt flood events as well during large summer rainfall events. If we could construct these distributed storage sites where they would do the most good for reducing this overland flooding issue we will also significantly reduce our nutrient runoff from these agricultural watersheds. These distributed storage sites can also provide significant nutrient capture if designed and operated to do so. Most of the sites are being constructed with gated outlet structures that can allow for various operations that can also maximize water quality benefits. An additional benefit of distributed storage sites is to provide some relief to the altered hydrology that impacts almost all subwatersheds in the Red River basin. By storing excess runoff we can also reduce the existing streambank erosion issues that were identified as the second largest source of TP in the SPARROW modeling work discussed earlier.

The North Ottawa flood control impoundment constructed in the Bois de Sioux Watershed District is currently being used for multiple purposes including natural resource enhancement and water quality improvement. This site and work being completed with funding from the Minnesota Environment and Natural Resource Trust Fund through the LCCMR is discussed in greater detail later in this report. The “new” technique that we are testing is to utilize part of this impoundment as a nonpoint nutrient capture and treatment system for agricultural nonpoint runoff from the watershed above the impoundment. The North Ottawa impoundment has multiple pools within the overall impoundment. We are currently using two of the pools to provide a “two cell treatment system” where we use the first pool to hold water and settle out as much of the nutrients tied to sediment particles and

then discharge to the second pool where we are growing and harvesting cattail biomass to remove dissolved nutrients that get taken up in the cattail plants.

This work will provide valuable information on how we site, build and operate future impoundments to maximize their use for multiple purposes. We have learned already that if we construct these impoundments too far up in the watershed then they will not provide as much water quality benefit mostly because the water quality is typically better in the upper reaches and there is less nutrients and sediment being exported that could be captured by the impoundments. An update to the North Ottawa Nutrient Capture work completed in 2016 is attached in Appendix E.

Task 3B. Priority Areas

This task will develop techniques we can use to identify the high priority areas for implementing nutrient reduction within the basin. This task will focus mainly on nonpoint source reductions. One tool developed by the International Water Institute (IWI) is called PTMApp. This is a LIDAR based prioritization, target, and measure, application that helps identify down to an individual field scale where the highest nutrient exports are occurring within a watershed and also gives you the ability to monitor and estimate benefits that would occur on a watershed scale from practices that are placed on the ground. This tool is being used in many of the watersheds in both Minnesota and North Dakota's parts of the basin. The work needed to most effectively use this tool is to have a good hydrologically conditioned LIDAR system. This conditioning work is completed for some but not all of the subwatersheds. We will work with IWI to identify the highest priority watersheds based on nonpoint loads and then to develop PTMApp for those priority watersheds.

The original development of PTMApp was funded by the Minnesota Board of Soil and Water Resources using Clean Water Legacy funding. This application of this LIDAR tool has been utilized by Becker County SWCD through several grants they have received to do on the ground implementation practices with individual landowners. What this tool has provided and Becker County has perfected is to get away from "random acts of conservation" and now identify what tracts of land are the highest priority for conservation practices and to then go knock on doors to meet with landowners and work with them on developing conservation practices that will work for them. Peter Mead Administrator Becker SWCD has given many presentations on the use of PTMApp including a presentation at the RRBC Annual Conference Jan 2017.

Manitoba is currently developing the LIDAR work that is needed for this tool to be used on the Manitoba side of the basin. The RRBC is helping facilitate the first application of PTMApp on the Manitoba side of our basin within the Roseau River watershed. This watershed begins in Manitoba, flows south into Minnesota then flows east through Roseau County before turning and flowing back into Manitoba before it empties into the Red River. The Roseau River Watershed District is working on two distributed storage projects the Roseau WMA Outlet Reconstruction and secondly the Roseau Lakebed Restoration. Both of these projects will provide water quality benefits on their own. The Roseau River Watershed District working with the MnDNR and the International Water Institute has received a grant to provide the development of the PTMApp in the whole Roseau watershed that will identify the top 100 locations for conservation practices to be implemented to maximize the nutrient reduction of the distributed storage projects and overall watershed nutrient reduction. We are working with Provincial and Canadian Federal agencies to develop this LIDAR application throughout the complete watershed Manitoba side as well as Minnesota side. From this pilot application we will learn what needs to be done to provide PTMApp development in the rest of the Manitoba portion of the Red River basin.

Task 3C. Agricultural Forums

This task will include holding a series of public input meetings across the basin with agricultural sector interests. We have partnered with the State and Provincial Agriculture Departments from Minnesota, North Dakota and Manitoba in hosting these. We have also partnered with the Minnesota Ag Water Resource Center and Minnesota Farm Bureau on holding 3 of these meetings this summer on the Minnesota side of the basin. We have had some preliminary discussions with Keystone Agriculture a similar Ag commodity organization in Manitoba and will meet with North Dakota Ag Coalition as well. We are developing strategies to reach out to the agricultural sector to identify and implement voluntary nutrient reduction practices that will meet our nutrient reduction goals we develop. Agriculture is by far our biggest landuse in the Red River basin and is critical to the basin. Agriculture is a significant source of nutrients for our basin because of their percentage of the land use. We will partner with Agricultural landowners to develop voluntary practices that will work for them and will reduce the amount of nutrients being exported from our watershed. We feel Agriculture understands this and is interested in working towards water quality improvements.

In the past year we have attended and/or presented at over 20 Agriculture events. We participated in several County SWCD events, field days hosted by Mn Dept. of Ag. and others plus had a booth at the Prairie Grains Conference that draws up to 700 agricultural producers from Minnesota and North and South Dakota held in Grand Forks. We participated in the Mn Farm Bureau Summer Farm meetings, Nutrient Management Conferences hosted by Mn Ag Water Resources Center and have visited with Minnesota State Legislative leaders from the Red River basin discussing our work on nutrient reduction strategy. We have attended Governor Dayton's Water Summit Feb 2016 in St. Paul, his second water summit held Jan 2017 in Morris and Mn Environmental Quality Board Congress in Feb 2017 to hear Gov. Dayton lay out his nutrient reduction goals for Minnesota. We are learning from all these exchanges how to better listen and engage the Ag Sector on nutrient reduction issues.

We have completed two Ag Input Sessions on the North Dakota side of the basin. We will be scheduling additional meetings in Minnesota and North Dakota as well as hosting some in Manitoba. From these sessions, we will frame the current water quality issues in the basin and identify what land practices farmers are currently doing that are beneficial to nutrient reduction and to identify what else should be done to reduce our nonpoint nutrient runoff even further. The early work on these Ag Input Sessions was funded under a grant from the Bush Foundation Community Innovations Program that funds improvement projects in Minnesota and the Dakotas.

We intend to use PTMApp and what individual SWCD's have discovered on using this tool to engage farmers . We will use the Mn. Dept of Ag Water Quality Certification Program to help open the discussion with farmers where appropriate. We still have a lot of work to do to figure out how best to work with Ag Commodity groups, Ag input providers and others to better structure nutrient reduction strategies.

Objective 4. Indicators/Reporting

Task 4A. Develop Indicators and Reporting

A set of indicators of water quality improvement for Lake Winnipeg is currently being developed through an effort led by Environment Canada and Manitoba Water Conservation and Stewardship. Environment Canada maintains the International monitoring station at Emerson Manitoba that is used for measuring whether the Red

River is meeting the current water quality targets and goals of the Boundary Waters Treaty between Canada and US. The nutrient targets that will be part of the Boundary Waters Treaty have had much discussion through the State Departments of the two countries and the IJC on this issue. We will work with IJC-IRRB on the development of goals for nutrients at the border as part of this effort. We will continue to work with the USGS on the monitoring activities that they are leading including the compiling of all data from monitoring activities throughout the basin.

This task will develop a progress report framework, to prepare an annual “State of Water Quality in the Red River Basin”. This task will set short term and long term goals and targets throughout the basin. This annual summary will be used to track progress on meeting water quality goals. This task will be coordinated by the RRBC but much of the work will be completed by others in the basin as part of their ongoing water quality work. The RRBC must report progress on this initiative to the Minnesota House of Representatives and Senate Committees and Divisions with jurisdictions over environmental policy and finance in 2016 and 2017 and submit the completed plan by December 31, 2017. This report is the second update and is being submitted to meet the requirements of the 2015 legislation. This report has been slightly delayed in being submitted.

RRBC Vision and Mission

Vision: A Red River Basin where residents, organizations and governments work together to achieve basin-wide commitment to comprehensive integrated watershed stewardship and management.

Mission: To develop Red River Basin integrated natural resources framework plan; to achieve commitment to implement the framework plan; and to work toward a unified voice for the Red River Basin.

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Upon request, this material will be made available in an alternative format such as large print

APPENDIX A
RED RIVER BASIN COMMISSION FY16-18
Water Quality Strategic Plan Work Plan

Project Background

Minnesota Legislative General Fund funding (\$200,000) to the Red River Basin Commission to complete a water quality strategic plan for the Red River of the North. The legislation states that “the plan must include but is not limited to, consistency in water quality goals and objectives for the Red River of the North and pollution reduction allocations for both point source and nonpoint sources on the Red River and for major watersheds tributary to the Red River”. This project will develop a nutrient reduction strategy for the Red River basin that will include reduction goals by subwatersheds and actions to implement the strategy addressing all sources of nutrients in the basin. These reduction goals will be adopted to meet State/Province goals for specific reaches as well as the basinwide overall goal for nutrient reduction for the Red River at its outlet Lake Winnipeg, to meet the water quality improvement goals for Lake Winnipeg.

Project start date: May 2, 2016

Project end date: June 30, 2018

Proposed Work Summary

Excess nutrient levels in lakes and streams have been identified as a major water quality problem within the Red River basin. Each of the three water quality jurisdictions in the Red River basin, Minnesota, Manitoba and North Dakota either have or are in the process of completing nutrient reduction strategies within their jurisdictions. The Minnesota Nutrient Reduction Strategy was completed in September 2014. At that time the proposed nutrient standards for streams had not been completed and the Red River basin water quality goals had not been finalized. In 2011, Manitoba committed to a 50 per cent reduction in phosphorus concentrations in the South Basin of Lake Winnipeg. Work is underway to develop specific targets for the lake and its tributaries including the Red River. Manitoba also adopted its Surface Water Protection Strategy in September 2015. That document established new targets for point source nutrient reduction as well as specific actions for nonpoint source nutrient reduction work within the Province of Manitoba. North Dakota is currently completing their nutrient reduction strategy. The North Dakota plan will address point and nonpoint nutrient reduction goals. They are implementing this new strategy by major basins with the Red River basin proceeding first.

The Red River Basin Commission currently has a Water Quality committee that will be used to advance this basinwide nutrient reduction initiative. This committee is currently made up of representatives from Federal, and State/Provincial water organizations from both the US and Canada including: USEPA, US Army COE, USGS, USDA-NRCS, Environment Canada, Agri-Food Canada, ND Health, Manitoba Conservation and Water Stewardship, MPCA and MN Dept. Agriculture. The existing committee is chaired by Mike Ell ND, Nicole Armstrong MB, and Jim Ziegler MN. This existing water quality committee will be expanded to include additional interests including municipal and industrial point source dischargers and additional agricultural sector representation.

This project will be led by the RRBC Water Quality Committee and facilitated by RRBC staff. This initiative will incorporate current ongoing efforts on a number of different fronts including ongoing efforts of the International Joint Commission (IJC) – International Red River Board (IRRB). Much of the detailed water quality modeling work required to advance this basinwide nutrient reduction strategy is currently underway by projects advancing under the guidance of IRRB. There is also currently nutrient reduction work progressing in each of the three jurisdictions including the WRAPs progressing on the Minnesota subwatersheds. The RRBC will closely coordinate with all these efforts as we move forward with a basinwide strategy. The RRBC will develop consistent reduction strategies across all jurisdictions that will meet the basinwide goals. The RRBC will utilize a public input process to develop nonpoint source nutrient reduction actions that can be implemented by basin landowners. In September 2011 RRBC completed a Long Term Flood Solutions Plan (LTFS) for the basin that resulted in flood damage reduction strategies being adopted basinwide. We intend to use a similar process to develop our water quality plan. The LTFS allocated flood reduction targets by subwatersheds and set goals for the construction of distributed storage sites within each subwatershed. The current water quality initiative will result in targets by subwatershed for nutrient reduction to meet individual jurisdictions and our overall basin water quality goals.

RRBC staff who will be assigned to work on this grant include: Jeff Lewis Executive Director, Julie Goehring South Basin Manager, Aaron Ostlund Project Coordinator, Leah Thvedt Outreach Coordinator, and Jacque Radke Financial Administrative Assistant. At this time we do not anticipate utilizing any consultants or subcontractors.

Detailed Work Description

Objective 1 of 4. Organize Committee/Summarize Existing Info

Task 1A. Steering Committee

The existing RRBC Water Quality Committee will be utilized and expanded to lead this initiative. The existing committee includes representation from USEPA-Denver, US Army COE-St.Paul, USGS, USDA-NRCS, Environment Canada, Agri-Food Canada, ND Health, Manitoba Conservation and Water Stewardship, MPCA, MN Dept. of Agriculture. We will be adding ND Dept. of Agriculture, as well as point source representation from municipalities of Moorhead, Fargo, Grand Forks and Winnipeg and American Crystal Sugar, an industrial waste water discharger. We will also discuss adding MN BWSR because of their role in implementing water quality programs on the Minnesota side of the basin. The Steering Committee will meet monthly beginning in June 2016. The role of the Steering Committee is to lead the initiative. RRBC staff that will be involved in this task will mainly be Executive Director, US Basin Manager and Outreach Coordinator with some limited work by Project Coordinator, and Financial/Admin. Assistant.

Task 1B. Existing Sources

There has been a large amount of data and information generated from multiple sources including international, federal state/provincial and local initiatives. Some of this information is from monitoring data gathered within the basin and some is from water quality modeling work. There are data generated from point source dischargers as well as ambient monitoring work throughout the basin. There is watershed assessment work that has been completed by MPCA as part of the WRAPs process that may help. We will include historic trend data developed by USGS and Environment Canada and others within the basin that will help us identify trends and the need for nutrient reduction. This summary will help determine nutrient load reduction allocations by watersheds and source types. This task will result in a summary

document of water quality data between the three jurisdictions. RRBC staff who will principally be involved in this task is Project Coordinator, US Basin Manager and Outreach Coordinator with limited involvement from Executive Director and Financial/Admin Assistant. This task will be completed by October 2016.

Task 1C. Existing Nutrient Reduction Actions

This task is to identify existing actions or activities currently being undertaken by the three jurisdictions that contribute to nutrient reduction either in individual jurisdictions or basinwide. Some of this task was completed by IRRB in a document they produced April 2012. This task will update and expand that work. Examples of specific actions that will be included are nutrient reduction work at wastewater treatment facilities, individual onsite wastewater regulations, water quality standards, nonpoint regulations, livestock runoff regulations, drainage regulations, flood damage reduction/distributed storage work, and agricultural practices that reduce nutrient runoff. This task will result in a summary of existing tools currently being used within the basin. RRBC staff will principally be US Basin Manager and Outreach Coordinator with limited assistance from Project Coordinator and Executive Director. This task will be completed by December 2016.

Objective 2 of 4. Load Reduction Allocation

Task 2A. Load Reduction Allocation

This task will develop and recommend adoption of nutrient load allocations and water quality targets for nutrients for the Red River at its discharge to Lake Winnipeg, at the International border and at the discharge of subwatersheds of the Red River. It is recognized that Lake Winnipeg is the receiving surface water body for the Red River. The recommended nutrient load allocations and water quality targets should, at a minimum, be protective of Lake Winnipeg but may be more restrictive at specific locations to protect local water quality of the individual jurisdictions. The water quality nutrient objectives for Lake Winnipeg are being developed by the Province of Manitoba. IJC and USGS have recently completed a new updated water quality model for the Red River basin using the USGS SPARROW model. This model does provide estimates of loads by different sectors as well as by different reaches within the Red River basin. Nutrient targets for the Red River itself including at the International border are currently being developed by IRRB.

IJC through an International Watershed Initiative project has contracted with RESPEC Consulting Services to develop approaches to setting nutrient targets for the Red River. This report was completed March 2013. In the fall of 2014 RESPEC was retained on a second contract to develop a stressor-response model for the Red River. RESPEC is finalizing work based on algae sampling completed during July 2015. This work will be used to develop targets for nutrient levels along the whole length of the Red River from Breckenridge to Lake Winnipeg. With tools such as the SPARROW model, and through this project, RRBC will help jurisdictions to distribute load allocations by subwatersheds. Nutrient reduction goals for each subwatersheds will be developed similar to the storage goal allocations that were completed in the LTFS project.

This task will include discussions with point source dischargers, about their contribution to the overall Red River basin load of nutrients, a potential framework for consistent standards for the basin, reduction targets for major point source contributors and timetables for implementation of reduction targets. This discussion will result in a recommendation to the individual jurisdictions. Executive Director will lead this task for the RRBC with assistance from US Basin Manager, Outreach Coordinator, Project Coordinator and Financial/Admin. Assistant. This task will be completed by June 2017.

Objective 3 of 4. Implementation Strategy

Task 3A. New Reduction Actions

This task will develop new techniques that could be tested for addressing both point and nonpoint source nutrient reduction. This list of new and/or innovative techniques will be developed from the Steering Committee and from the Agricultural outreach meetings. One approach that is being promoted within the Red River basin is the use of constructed distributed flood water storage structures. The LTFS work has identified approximately 200 storage sites that could be constructed to meet the flood reduction goals of the basin. These same structures can be built to provide water quality benefits as well. RRBC and partners are documenting nutrient capture benefits at the North Ottawa flood storage impoundment in the Bois de Sioux Watershed District. This work will provide valuable information on how the basin can maximize water quality improvements with the proposed and current flood control structures that are being built to meet the flood damage reduction goals. This task will be completed by the Steering Committee with assistance from the RRBC Executive Director, US Basin Manager, Project Coordinator, and Outreach Coordinator. This task will be completed by October 2017.

Task 3B. Priority Areas

This task will develop techniques we can use to identify the high priority areas for implementing nutrient reduction within the basin. This task will focus mostly on nonpoint sources. A tool developed by the International Water Institute called PTMApp, that is LIDAR based, is starting to be used by both North Dakota and Minnesota to prioritize, target and measure areas within watersheds that generate higher nutrient export levels than elsewhere in the watershed. This tool can be used to help us generate which small scale areas to work on first within each subwatershed. Currently the work needed to use this tool has been completed for some of the subwatersheds. We will work with the International Water Institute to use already developed water quality modeling information to identify several subwatersheds that are contributing the largest loads of nutrients. We will then use the PTMApp to narrow down to the individual field level scale on where practices should be applied to provide the greatest nutrient load reductions. Manitoba is currently developing the LIDAR work that is needed for this tool to be used on the Manitoba side of the basin. This task will be completed by the Steering Committee with assistance from RRBC Executive Director, US Basin Manager and Project Coordinator. This task will be completed by October 2017.

Task 3C. Agricultural Forums

This task will include holding a series of input meetings across the basin with agricultural sector interests. We have partnered with the Departments of Agriculture in North Dakota and Minnesota as well as had discussions with Manitoba Agriculture, Food and Rural Development on this effort. We have also partnered with the Minnesota Ag Water Resource Center, North Dakota Ag Coalition and Keystone Ag Manitoba who are all agricultural grower group organizations, that are interested in working with us on identifying voluntary nutrient reduction activities that landowners can implement to continue the nutrient reduction work that will be required of the agricultural sector in the basin. Agriculture is by far the largest landuse and source of nutrients in the basin. We feel agriculture understands this and is interested in working towards water quality improvements.

We have completed two Ag Input sessions already on the North Dakota side. We have three scheduled in June with MN Farm Bureau and AG Water Resource Center on the Minnesota side of the basin. We will be scheduling sessions in Manitoba plus additional sessions in Minnesota and North Dakota for this summer and late fall. From these sessions we

will frame the current water quality issues in the basin and get input on voluntary nutrient reduction efforts landowners are currently doing or are willing to do. This early work on the Ag Input Sessions was funded under a grant from the Bush Foundation Community Innovations Program. This task will be completed by the Steering Committee with assistance from RRBC Executive Director, US Basin Manager, Project Coordinator, Outreach Coordinator with limited involvement from Financial/Admin Assistant. This task will be completed by April 2017.

Objective 4 of 4. Indicators/Reporting

Task 4A. Develop Indicators and Reporting

A set of indicators of water quality improvement for Lake Winnipeg is currently being developed through an effort led by Environment Canada and Manitoba Water Conservation and Stewardship. Environment Canada maintains the monitoring station at the Canadian border that is used for measuring whether the Red River is meeting the current water quality targets and goals of the Boundary Waters Treaty. The IRRB Water Quality Committee is working on a combined network of monitoring activities currently being done within the basin. This task will develop a progress report framework to prepare a “State of the Red River” annual report that can be used to document water quality within the basin on an annual basis. This task will also set short-term goals and targets as well as long term goals and targets for the basin and report on progress towards meeting those short and long term goals. This task will be coordinated by the RRBC Executive Director but much of the work will be completed by others as part of their ongoing water quality work in the basin. The RRBC must report progress on the plan to the House of Representatives and Senate committees and divisions with jurisdiction over environmental policy and finance by February 15 in 2016 and 2017 and must submit the completed plan by December 31, 2017.

APPENDIX B
RED RIVER BASIN COMMISSION
Water Quality Strategic Plan Steering Team

| First Name | Last Name | Title | City | State |
|------------|------------|---|---------------|-------|
| Nicole | Armstrong | Director Water Science & Mgt. Branch, MB Sustainable Development | Winnipeg | MB |
| Andy | Bradshaw | Wastewater Director | Moorhead | MN |
| Jim | Courneya | Sup. Nonpoint Programs, MPCA | Detroit Lakes | MN |
| Brian | Dwight | MN BWSR | Bemiji | MN |
| Mike | Ell | Water Quality Manager, ND. Dept. Health | Bismarck | ND |
| Warren | Formo | MN Dept. Ag, Water Resource Center | Eagen | MN |
| Chuck | Fritz | Exec. Dir. IWI | Fargo | ND |
| Al | Grasser | City Engineer | Grand Forks | ND |
| Duane | Griffin | Wastewater Operator | Winnipeg | MB |
| Iris | Griffin | Lake Winnipeg Program Director Enviro. Canada | Winnipeg | MB |
| XinHua | Jia | NDSU Soil Dept. | Fargo | ND |
| Riley | Maanum | Red River Policy Director, MN Farm Bureau | Moorhead | MN |
| Rocelle | Nustad | Hydrologist, USGS | Grand Forks | ND |
| Jessie | Pleff | Sr. Policy Analyst, ND Dept. Ag | Bismarck | ND |
| Sharon | Reedyk | Agri Canada | Winnipeg | MB |
| Marla | Riekman | Land Management Specialist, Manitoba Ag | Winnipeg | MB |
| Rob | Sip | Environmental Policy Specialist, MN Dept. Ag | St. Paul | MN |
| Eric | Steinham | Watershed Programs, EPA | Denver | CO |
| Don | Tucker | Wastewater Operator | Fargo | ND |
| Jason | Vanrobaeys | Water Quality, Agri Canada | Winnipeg | MB |
| Keith | Weston | NRCS | Fargo | ND |
| Jim | Ziegler | Section Manager, MPCA | Detroit Lakes | MN |
| Bob | Zimmerman | City Engineer | Moorhead | MN |



Red River Basin Commission

Vision: A Red River Basin where residents, organizations and governments work together to achieve basin-wide commitment to comprehensive integrated watershed stewardship and management.

Mission: To create a comprehensive integrated basin-wide vision, to build consensus and commitment to the vision, and to speak with a unified voice for the Red River Basin.

North Ottawa Nutrient Capture and Biomass Harvesting

Project Partners: Bois de Sioux Watershed District, International Institute for Sustainable Development (IISD), University of Minnesota, and North Dakota State University.

Current Project Funding:

- * \$300,000 ~ State of Minnesota LCCMR/Environment and Natural Resources Trust Fund for Nutrient capture and water quality monitoring within North Ottawa Impoundment.
Project Timeline: July 1, 2014 - June 30, 2017
- * \$290,000 ~ EPA 319 Funding through MPCA for Nutrient load reduction monitoring from the upstream North Ottawa drainage system.
Project Timeline: March 15, 2015 - August 31, 2018
- * \$180,000 ~ Bush Foundation for nutrient reduction outreach



Project Outcome

The project outcome is to maximize the capture and removal of phosphorus and nitrogen nutrients found in surface runoff from the 75 square mile agricultural watershed above the North Ottawa impoundment. The RRBC is working with project partners to develop a natural resource enhancement (NRE) management plan for the North Ottawa impoundment that incorporates water quality benefits into the project. The project utilizes a multiple cell treatment system with pre-treatment sedimentation followed by wetland vegetation treatment for nutrient uptake designed to maximize impoundment water quality benefits through:

- **Surface water management to capture suspended sediments in the impoundment**
- **Treatment for nutrient uptake by wetland vegetation**
- **Harvesting wetland vegetation (cattails) during optimal times of the growing season to maximize nutrient (phosphorus/nitrogen) removal**
- **Utilizing harvested biomass for nutrient cycling or value added products**
 - Early season harvest for ag soil amendment / Late season harvest for bio-based products

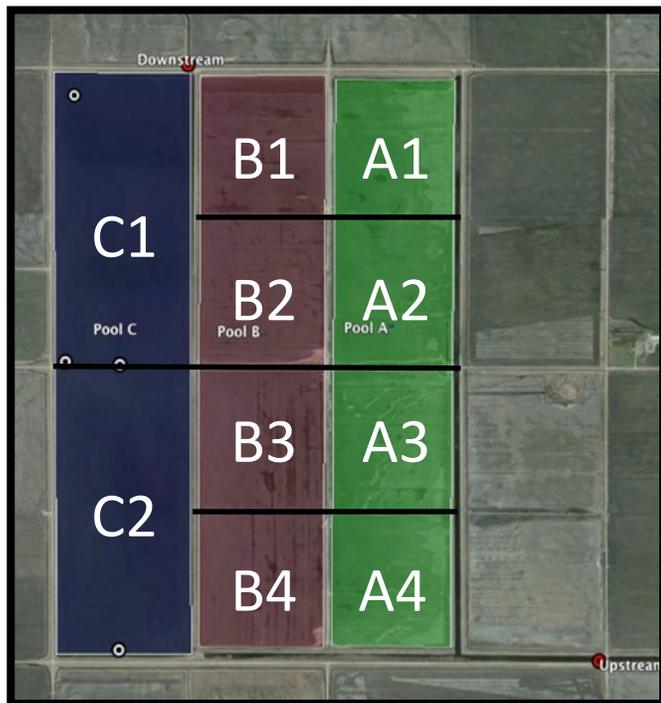


Photo: Cattail biomass harvesting conducted in 2016 using conventional forage chopping equipment. Harvested biomass is then land applied as an agricultural soil amendment

Project Publication YouTube Link <https://youtu.be/5X5E3APpsMQ>

PROJECT UPDATE

Monitoring: Detailed nutrient monitoring of the waters being discharged from the watershed above the North Ottawa impoundment, analyzing the soil water relationship within the pool area, testing of harvested vegetation and monitoring of water discharged from the impoundment are being completed. Preliminary sampling results showed a significant capture of phosphorus and nitrogen occurring within the impoundment. Summer 2016 results indicated a 47% reduction in Total Suspended Sediment, 68% reduction in Total Nitrogen and 54% reduction in Total Phosphorus loads from upstream of the impoundment to discharged nutrient loads, with adoption of the NRE management plan.



Management Plan: During the 2016 season the interior dike network was utilized for water level management. The NRE management plan was implemented that designates the “C” pool to be the primary storage pool, the “A” and “B” pools utilized for natural resource management through a moist soils management rotation, and two cells, A4 and B4 for water quality management and biomass harvesting.

Biomass Harvesting: Wetland vegetation within the “C” pool was targeted for harvesting in 2016 due to established stands of cattail species. Harvesting was successfully conducted on 10 acres of dense cattails for biomass removal and habitat management. Harvesting was accomplished using conventional forage chopping equipment and resulted in a 4.76 tons per acre biomass yield. Harvested biomass was then land applied as an agricultural soil amendment. Nutrient analysis of the harvested biomass equated to 48 lbs. Nitrogen and 6.6 lbs. Phosphorus captured per acre harvested.

Upper Right: Watershed sampling during runoff event to monitor nutrient loads from the North Ottawa drainage area

Left: North Ottawa impoundment layout with interior pools labeled. Inlet channel along eastern edge of the project site. Primary outlet to the north into J.D. 2

Lower Right: Harvested biomass being spread on adjacent agricultural land for incorporation as a green manure



NORTH OTTAWA IMPOUNDMENT PROJECT BENEFITS

Flood Damage Reduction: (*Primary objective*): Provides 16,000 acre feet of gate-controlled storage.

Water Quality: Improvement via sediment capture and nutrient uptake by wetland plants

Habitat Enhancement: Feeding and resting areas for migrating waterfowl and shorebirds and stream flow maintenance for downstream fish habitat

Downstream Flow Augmentation: Release of about 5 cfs flow during the ice free season in most years.

PROJECT BENEFITS TO THE RED RIVER BASIN

This project supports the current nutrient reduction strategies being developed by Minnesota, North Dakota and Manitoba. Over 80% phosphorus and 90% Nitrogen in the Red River is from non-point sources. We need new tools for addressing future goals of up to 50% reduction in phosphorus loading.

- **Nutrient removal:** Harvesting cattails captures nutrients, especially phosphorus that would normally flow downstream to the Red River and eventually to Lake Winnipeg. For each acre of cattails harvested there is a potential to remove approximately 10 –15 pounds of phosphorus from the system.
- **Nutrient recovery:** Application of harvested biomass to agricultural lands as green manure recycles nutrient content for enhancing soil health and fertility.
- **Habitat improvement:** Vegetation management leads to improved wildlife habitat. Waterfowl, shorebirds and marshland animal species benefit from stand management and access to more open water areas within marsh areas.
- **Biomass production:** Harvested cattails can be turned into compressed fuel products (e.g., pellets and cubes) or torrefied to create a charcoal based product .

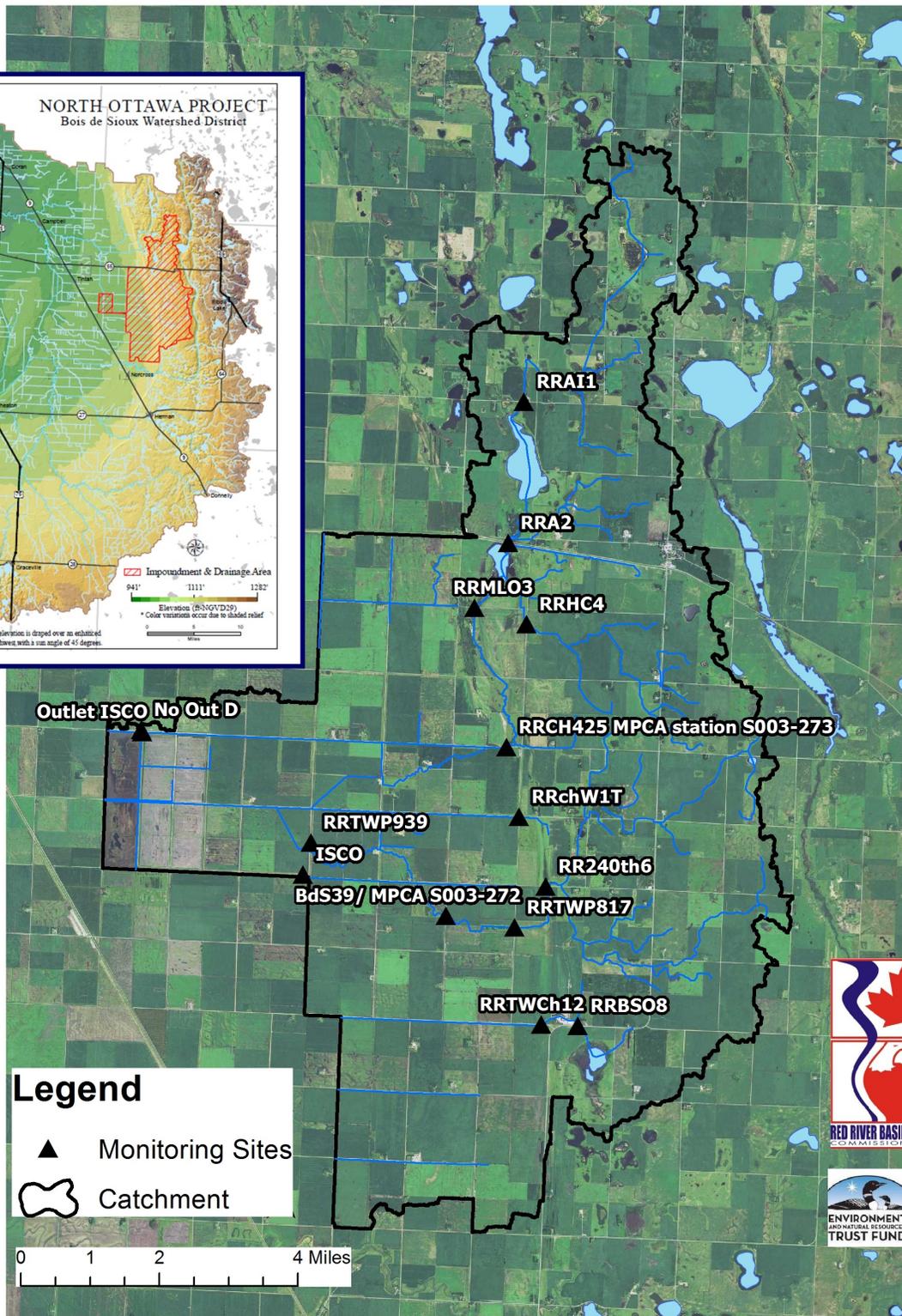
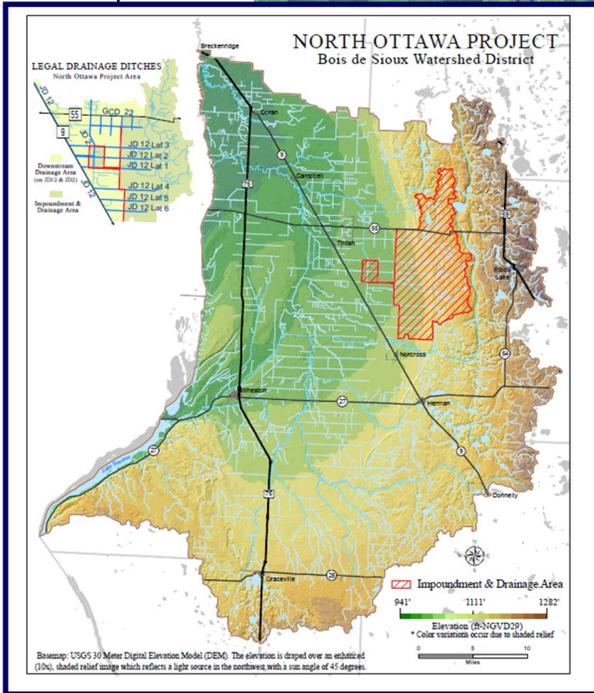


UPPER RIGHT: Wetland vegetation established within cell B4 for nutrient uptake

LEFT: Harvested cattails ready to be pelletized for bioenergy utilization

RIGHT: Pelletized cattails have burning quality similar to wood pellets and high absorption capacity creating a product suited well to hazardous spill absorption

North Ottawa Catchment



Legend

- ▲ Monitoring Sites
- ⬭ Catchment

0 1 2 4 Miles

January 2017

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