



# Environment and Natural Resources Trust Fund (ENRTF) M.L. 2014 Work Plan

**Date of Report:** January 14, 2014  
**Date of Next Status Update Report:** January 1, 2015  
**Date of Work Plan Approval:** Pending  
**Project Completion Date:** June 30, 2017  
**Does this submission include an amendment request?** no

**PROJECT TITLE:** Nutrient Capture Through Water Management and Biomass Harvesting

**Project Manager:** Jeff Lewis  
**Organization:** Red River Basin Commission  
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**Location:** May work on up to 3 sites within the Red River Basin if additional funding can be secured. This funding will be utilized at the North Ottawa Impoundment in Traverse and Grant Counties. See attached maps.

|                                    |                             |                  |
|------------------------------------|-----------------------------|------------------|
| <b>Total ENRTF Project Budget:</b> | <b>ENRTF Appropriation:</b> | <b>\$300,000</b> |
|                                    | <b>Amount Spent:</b>        | <b>\$0</b>       |
|                                    | <b>Balance:</b>             | <b>\$300,000</b> |

**Legal Citation:** M.L. 2014, Chp. 226, Sec. 2, Subd. 06h

**Appropriation Language:**

\$300,000 the second year is from the trust fund to the commissioner of natural resources for an agreement with the Red River Basin Commission to evaluate the potential capture of excess nutrients using cattails grown and harvested within shallow flood reservoirs for bioenergy use. This appropriation is available until June 30, 2017, by which time the project must be completed and final products delivered.

**I. PROJECT TITLE:** Nutrient Capture Through Water Management and Biomass Harvesting

**II. PROJECT STATEMENT:**

This project will evaluate the potential for capturing nutrient runoff from mostly nonpoint sources by utilizing cattails or other vegetation within existing shallow flood storage reservoirs. We plan to look at 3 pilot sites within the Red River Basin including the North Ottawa Project in the Bois de Sioux Watershed District. Over 80% of the phosphorus and nitrogen loads that are being discharged downstream are coming from nonpoint runoff mostly from agricultural fields. This project will develop and evaluate a new methodology for capturing and reducing the nutrient loads coming off agricultural dominated watersheds. This technique will provide a new and effective “tool” for addressing nutrient reductions.

Within the Red River Basin, a goal of reducing the flood water discharged by 20% has led to the planning and construction of distributed water storage sites throughout the basin. The North Ottawa Impoundment exterior diking was completed in 2011. These storage sites are often shallow, off-channel impoundments where high flows are stored and slowly released. Please see the attached photo and information brochure for further detail. We are planning on utilizing these storage areas by constructing treatment cells within the flood reservoir to grow vegetation for nutrient removal, harvest the vegetation and evaluate the potential utilization of cattails for various beneficial purposes including bioenergy. Attached is a detailed plan sheet of the North Ottawa Impoundment that shows the exterior and planned interior diking system. The RRBC is working with the Bois de Sioux Watershed District to complete the interior diking to construct between two to four 160 acre interior pools where we can manipulate water levels to grow and harvest cattails to capture and remove nutrients from the system. The system we are constructing will operate similar to a two-stage wastewater treatment pond where we will utilize the existing 640 acre Pool C area as a primary treatment pond. Water will be directed from Pool C to the constructed treatment cells that will as shown on the attachments as the Pool B area on the information brochure that is attached. The system will allow for water holding times to maximize the uptake of nutrients by the cattails in the Pool B area. Water levels within the Pool B areas will be drawn down to facilitate the cattail harvesting within the Pool B areas.

Detailed nutrient monitoring of the waters being discharged from the watershed above the North Ottawa flood reservoir, soils within the pool area, vegetation that will be harvested and removed, and the waters being discharged from the flood reservoir will be completed. This detailed monitoring will allow us to document the nutrient loads coming into the pool area and the effectiveness of the cattail treatment cells in capturing and reducing nutrients being discharged downstream. Monitoring work is proposed to be designed and coordinated by Dr. Joe Magner U of Mn-St. Paul as a research project with one or more graduate students.

This project will also evaluate potential utilization of the cattails harvested for several different purposes. We will evaluate the value of cattails harvested being applied back to cropland as a type of “green manure”. We will evaluate the nutrient content of the cattails as well as look at the benefits of adding additional organic material to enhance soil health. We will also work with Dr. Dan Svedarsky U of Mn-Crookston to look at potential utilization of cattail biomass for energy and other purposes. An economic evaluation of potential uses will be completed with Dr. David Ripplinger NDSU Fargo.

**III. PROJECT STATUS UPDATES:**

- Project Status as of *January 1, 2015*:**
- Project Status as of *July 1, 2015*:**
- Project Status as of *January 1, 2016*:**
- Project Status as of *July 1, 2016*:**
- Project Status as of *January 1, 2017*:**
- Overall Project Outcomes and Results:**

**Overall Project Outcomes and Results:** The overall project outcome is to capture and remove as much phosphorus and nitrogen as possible from the 75 square mile agricultural watershed above the North Ottawa flood impoundment. Based on work completed in Manitoba we can expect to remove between 10 – 20 pounds of phosphorus for each acre of cattails harvested. We plan to construct at least two and possibly up to four 160 acre treatment cells where we will divert all runoff from the watershed through these treatment cells. We will grow cattails in these cells that will be harvested and removed. These treatment cells have the potential to capture up to 100% of the average phosphorus load from the 75 square mile watershed above the North Ottawa Impoundment. The cattail biomass harvested will be used for various purposes. Some of the cattails will be reapplied to cropland thus recycling the phosphorus back within the watershed. The amount of phosphorus removed as well as the amount of nitrogen captured will be documented and a detailed nutrient budget will be prepared.

**IV. PROJECT ACTIVITIES AND OUTCOMES:**

**ACTIVITY 1:** Design, Redesign, Construct and Operate Treatment Cells

**Description:**

Design the treatment cells to maximize the capture of nutrients. Retrofit the existing 640 acre Pool C within the North Ottawa Impoundment to allow all streamflow to enter this cell of the impoundment and be evenly distributed to flow through the cattails that are currently growing within this cell. This Pool C will be used as a primary settling pool. Two to four 160 acre treatment cells will be constructed within the Pool B area using an interior diking system and water distribution system that will enable the expansion of cattail growth in the Pool B treatment pools. The number of cells constructed will depend on the construction costs. We will harvest individual cells at different times of the year to evaluate the optimum time to harvest for maximum nutrient capture. We will work with equipment suppliers to find harvesting techniques that work in wet soils. See the attached detailed plan sheet of the interior diking proposed.

**Summary Budget Information for Activity 1:**

**ENRTF Budget:** \$ 80,000  
**Amount Spent:** \$ 0  
**Balance:** \$ 80,000

**Activity Completion Date:**

| <b>Outcome</b>   | <b>Completion Date</b> | <b>Budget</b> |
|--|------------------------|---------------|
| <b>1. Design/Redesign North Ottawa Impoundment with additional cells</b> | August 2014            | \$ 20,000     |
| <b>2. Construct Cells within Pool B. Re- direct flow within Pool C</b>   | November 2014          | \$ 40,000     |
| <b>3. Drawdown and Harvest cattails within Existing Pool C</b>           | September 2014         | \$ \$20,000   |

**Activity Status as of January 1, 2015:**

**Activity Status as of July 1, 2015:**

**Activity Status as of January 1, 2016:**

**Activity Status as of July 1, 2016:**

**Activity Status as of January 1, 2017:**

**Final Report Summary:**

**ACTIVITY 2: Evaluate Potential Uses of Cattail Biomass**

**Description:**

Contract with Dr. Dan Svedarsky at U of Mn-Crookston who is working on cattail utilization for bio-energy. Dr. Svedarsky also is recommended to receive LCCMR funding for work on cattail harvesting mostly for wildlife enhancement. We will collaborate with Dr. Svedarsky to evaluate energy potential of cattail biomass, and evaluate the potential additional markets that could be developed utilizing this material. We will also contract with Dr. David Ripplinger NDSU Fargo to develop a market analysis of cattail utilization

**Summary Budget Information for Activity 2:**

**ENRTF Budget: \$ 40,000**

**Amount Spent: \$ 0**

**Balance: \$ 40,000**

**Activity Completion Date:**

| <b>Outcome</b>  | <b>Completion Date</b> | <b>Budget</b> |
|---|------------------------|---------------|
| 1. Evaluate energy potential and utilization of cattail biomass | July2015- July 2016    | \$ 25,000     |
| 2. Develop market analysis of cattail utilization               | September 2016         | \$ 15,000     |

**Activity Status as of January 1, 2015:**

**Activity Status as of July 1, 2015:**

**Activity Status as of January 1, 2016:**

**Activity Status as of July 1, 2016**

**Activity Status as of January 1, 2017:**

**Final Report Summary:**

**ACTIVITY 3: Harvest Cattails Pool B Cells**

**Description:**

Manipulate water levels to Pool B treatment cells to maximize cattail growth. Harvest cattails in Pool B Cells during differing parts of the growing season to evaluate nutrient content earlier in growing season vs later and to allow us to maximize our nutrient removal with harvesting.

**Summary Budget Information for Activity 3:**

**ENRTF Budget: \$ 35,000**

**Amount Spent: \$ 0**

**Balance: \$ 35,000**

**Activity Completion Date:**

| <b>Outcome</b>  | <b>Completion Date</b> | <b>Budget</b> |
|---|------------------------|---------------|
| 1. Harvest Cattails from Pool B Treatment Areas once annually | Dec. 2016              | \$ 32,000     |
| 2. Evaluate Nutrient content of harvested cattails            | Dec. 2016              | \$ 3,000      |

**Activity Status as of January 1, 2015:**

**Activity Status as of July 1, 2015:**

**Activity Status as of January 1, 2016:**

**Activity Status as of July 1, 2016:**

**Activity Status as of January 1, 2017:**

**Final Report Summary:**

#### ACTIVITY 4: Nutrient Monitoring

##### Description:

Develop detailed monitoring system to track nutrient inputs, outputs and nutrient storage within the impoundment. All water coming in from the upstream watershed will be sampled, soil samples will be collected within the impoundment area and all water leaving the impoundment will be sampled as well. A detailed nutrient budget will be developed and reported to clearly establish the total mass of nutrients removed from the system and to determine the capture rate of the North Ottawa Impoundment with the new treatment cells.

##### Summary Budget Information for Activity 4:

ENRTF Budget: \$ 135,000  
Amount Spent: \$ 0  
Balance: \$ 135,000

##### Activity Completion Date:

| Outcome   | Completion Date | Budget     |
|---|-----------------|------------|
| 1. Soil Sampling within the impoundment                                 | September 2014  | \$ 5,000   |
| 2. Water quality sampling for nutrients above and below the impoundment | June 2017       | \$ 130,000 |

Activity Status as of *January 1, 2015*:

Activity Status as of *July 1, 2015*:

Activity Status as of *January 1, 2016*:

Activity Status as of *July 1, 2016*:

Activity Status as of *January 1, 2017*:

Final Report Summary:

#### ACTIVITY 5: Outreach and publications

##### Description:

The results of this work will be published to inform Watershed District managers within the Red River Basin (RRB) and elsewhere about the success of this treatment technology. The results will be shared and if successful the technique will be used in multiple locations in the RRB to reduce nutrient loads to the waterways. Outreach will include numerous meetings within the RRB to discuss the progress and outcomes of this work.

##### Summary Budget Information for Activity 5:

ENRTF Budget: \$ 10,000  
Amount Spent: \$ 0  
Balance: \$ 10,000

##### Activity Completion Date:

| Outcome  | Completion Date | Budget   |
|--|-----------------|----------|
| 1. Host meeting to discuss interim and final results | June 2017       | \$ 8,000 |
| 2. Publish papers to summarize project findings      | June 2017       | \$ 2,000 |

Activity Status as of *January 1, 2015*:

Activity Status as of *July 1, 2015*:

Activity Status as of *January 1, 2016*:

Activity Status as of *July 1, 2016*:

Activity Status as of *January 1, 2017*:

**Final Report Summary:**

**V. DISSEMINATION:**

**Description:**

The results of this work will be published to inform managers within the RRB and elsewhere about the success of this treatment technology. The results will also be shared and the technique will be used in multiple locations in the RRB to reduce nutrient loads to the waterways. Currently MPCA, ND Dept. of Health and Manitoba Water Stewardship are all developing nutrient reduction strategies. These strategies will likely result in a goal of reducing nutrient loads within the RRB by up to 50%. This project will potentially provide a new strategy that will utilize the distributed storage locations being built to address the significant flood damages and expand the uses of these impoundments to capture and reduce nutrient loads as well. Results and information about the new strategy will be distributed through a series of informational meetings throughout the basin and by presentations at the RRBC Annual Conference that is attended by up to 500 individuals working in water management.

**Activity Status as of January 1, 2015:**

**Activity Status as of July 1, 2015:**

**Activity Status as of January 1, 2016:**

**Activity Status as of July 1, 2016:**

**Activity Status as of January 1, 2017:**

**Final Report Summary:**

**VI. PROJECT BUDGET SUMMARY:**

**A. ENRTF Budget Overview:**

| <b>Budget Category</b>                    | <b>\$ Amount</b> | <b>Explanation</b>  |
|---|------------------|---|
| Personnel:                                | \$ 89,500        | RRBC staff to operate treatment cells, work with partners on utilization, conduct monitoring  |
| Professional/Technical/Service Contracts: | \$ 203,000       | Contract with WSN for design and construction, contract with Svedarsky for energy utilization, contract with Ripplinger for market analysis, contract with Magner for monitoring work, contract for cattail harvesting, contract for lab analysis |
| Printing                                  | \$ 1500          | Project Reports to be used in outreach  |
| Travel Expenses in MN:                    | \$ 6000          | RRBC Staff for site work and outreach   |
| <b>TOTAL ENRTF BUDGET:</b>                | <b>\$300,000</b> |   |

Note: When original proposal was submitted we had not yet finalized how the monitoring work would be completed. We began discussions with Dr. Joe Magner, Research Professor, from the University of Minnesota Bioproducts and Biosystems Engineering who has had extensive experience in designing and operating monitoring systems in wetlands and agricultural areas including drainage ditch systems. Dr. Magner has since found a new graduate student who is very interested in working with us to develop this project into a research project that should result in research publications in refereed journals. A contract will be developed with Dr. Magner to develop the monitoring system, guide research on nutrient capture and publication of findings. We are requesting that Dr. Magner be added to our list of contractors for this project.

**Explanation of Use of Classified Staff:** N/A

**Explanation of Capital Expenditures Greater Than \$5,000:** N/A

**Number of Full-time Equivalent (FTE) Directly Funded with this ENRTF Appropriation:** 0.3 fte for three years

**Number of Full-time Equivalent (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation:** 1.0 fte for three years (estimate)

**B. Other Funds:**

Several funding sources are pending. University of Minnesota and RRBC have applied for funding from Minnesota Corn Growers Association to assist with the monitoring components of this project. RRBC will be applying for MPCA/EPA 319 funding later this spring. RRBC with the International Institute for Sustainable Development have applied for funding through the Lake Winnipeg Basin Stewardship Fund to fund work at additional sites within the RRB.

| Source of Funds(Pending)  | \$ Amount Proposed  | \$ Amount Spent | Use of Other Funds               |
|---------------------------|---------------------|-----------------|----------------------------------|
| <b>Non-state</b>          |                     |                 |                                  |
| Mn Corn Growers (Pending) | \$ 200,000          | \$              | Monitoring                       |
| LWBSF (Pending)           | \$ 450,000          |                 | Similar work at additional sites |
| <b>State</b>              |                     |                 |                                  |
| MPCA/EPA 319              | \$ 450,000          |                 | Similar work at additional sites |
| <b>TOTAL OTHER FUNDS:</b> | <b>\$ 1,100,000</b> | <b>\$</b>       |                                  |

**VII. PROJECT STRATEGY:**

**A. Project Partners:**

The project team will include Joe Courneya, RRBC as the project lead field staff, Jon Roschlein Administrator, Bois de Sioux Watershed District, in-kind, Jeff Lewis RRBC in-kind, Charlie Anderson, WSN Engineering contract to design, construct and operate treatment cells. The project Team will also include Dr. Dan Svedarsky U of Mn-Crookston under contract to work with us on energy utilization and Dr. David Ripplinger NDSU Fargo under contract to develop market analysis of cattail utilization and Dr. Joe Magner U of Mn-St. Paul under contract to guide the monitoring activities and analyze nutrient capture efficiencies and consult on treatment cell operation. Dr. Dan Svedarsky also has a separate LCCMR proposed funded project to work on cattail harvesting mainly for wildlife enhancement. RRBC and Dr. Svedarsky are also working with International Institute for Sustainable Development Winnipeg Manitoba who have completed earlier work on cattail harvesting and continue to work on cattail nutrient removal as well as utilization potential for energy.

**B. Project Impact and Long-term Strategy:**

This project will develop a new and additional tool to try and reduce the nutrient impairments common to the agricultural regions of our state. The RRB is currently in the process of developing a nutrient reduction strategy that will likely result in a goal of a significant nutrient reduction of somewhere around 50%. We need to develop new techniques if we ever want to be able to reach this potential goal. This tool could be used on many existing and proposed flood retention reservoirs that currently exist or are being built in the RRB. Based on

current nutrient load estimates and the number of retention sites planned for the RRB this tool could provide a significant amount of the nutrient reduction needed to reach the 50% goal.

**C. Spending History:**

| Funding Source | M.L. 2008<br>or<br>FY09 | M.L. 2009<br>or<br>FY10 | M.L. 2010<br>or<br>FY11 | M.L. 2011<br>or<br>FY12-13 | M.L. 2013<br>or<br>FY14 |
|----------------|-------------------------|-------------------------|-------------------------|----------------------------|-------------------------|
|                |                         |                         |                         |                            |                         |
|                |                         |                         |                         |                            |                         |
|                |                         |                         |                         |                            |                         |
|                |                         |                         |                         |                            |                         |

**VIII. ACQUISITION/RESTORATION LIST: N/A**

**IX. VISUAL ELEMENT or MAP(S):**

See the three attachments. These include an aerial photograph of the existing North Ottawa Impoundment, a locational map and information brochure and a detailed plan sheet of the proposed treatment cells to be constructed within the current impoundment area.

**X. ACQUISITION/RESTORATION REQUIREMENTS WORKSHEET: N/A**

**XI. RESEARCH ADDENDUM: N/A**

**XII. REPORTING REQUIREMENTS:**

Periodic work plan status update reports will be submitted no later than January 1, 2015, July 1, 2015, January 1, 2016, July 1, 2016 and January 1, 2017. A final report and associated products will be submitted between June 30 and August 15, 2017.



| Environment and Natural Resources Trust Fund   |  |              |                    |  |              |                    |                   |              |                    |                   |              |                    |                             |              |                    |                  |                  |
|--|--|--------------|--------------------|--|--------------|--------------------|-------------------|--------------|--------------------|-------------------|--------------|--------------------|-----------------------------|--------------|--------------------|------------------|------------------|
| M.L. 2014 Project Budget   |  |              |                    |  |              |                    |                   |              |                    |                   |              |                    |                             |              |                    |                  |                  |
| Project Title: Nutrient Capture Through Water Management and Biomass Harvesting  |  |              |                    |  |              |                    |                   |              |                    |                   |              |                    |                             |              |                    |                  |                  |
| Legal Citation: M.L. 2014, Chp. 226, Sec. 2, Subd. 06h   |  |              |                    |  |              |                    |                   |              |                    |                   |              |                    |                             |              |                    |                  |                  |
| Project Manager: Jeff Lewis  |  |              |                    |  |              |                    |                   |              |                    |                   |              |                    |                             |              |                    |                  |                  |
| Organization: Red River Basin Commission.  |  |              |                    |  |              |                    |                   |              |                    |                   |              |                    |                             |              |                    |                  |                  |
| M.L. 2014 ENRTF Appropriation: \$ 300,000  |  |              |                    |  |              |                    |                   |              |                    |                   |              |                    |                             |              |                    |                  |                  |
| Project Length and Completion Date: 3 Years, June 30, 2017   |  |              |                    |  |              |                    |                   |              |                    |                   |              |                    |                             |              |                    |                  |                  |
| Date of Report: January 15, 2014   |  |              |                    |  |              |                    |                   |              |                    |                   |              |                    |                             |              |                    |                  |                  |
| ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET  | Activity 1 Budget                                  | Amount Spent | Activity 1 Balance | Activity 2 Budget                          | Amount Spent | Activity 2 Balance | Activity 3 Budget | Amount Spent | Activity 3 Balance | Activity 4 Budget | Amount Spent | Activity 4 Balance | Activity 5 Budget           | Amount Spent | Activity 5 Balance | TOTAL BUDGET     | TOTAL BALANCE    |
| BUDGET ITEM  | Design/Redesign/Operate North Ottawa Impoundment . |              |                    | Evaluate Potential Uses of Cattail Biomass |              |                    | Harvest Cattails. |              |                    | Monitoring        |              |                    | Outreach Project Management |              |                    |                  |                  |
| <b>Personnel (Wages and Benefits):</b><br>Joe Courneya, Red River Basin Comm. : \$89,500 (66% salary, 34% benefits) 0.3 FTE for 3 years  | \$25,000   |              | \$25,000           | \$5,000                                    |              | \$5,000            | \$2,000           |              | \$2,000            | \$50,000          |              | \$50,000           | \$7,500                     | \$0          | \$7,500            | \$89,500         | \$89,500         |
| <b>Professional/Technical/Service Contracts:</b><br>WSN Engineering Charlie Anderson Design treatment cells within existing North Ottawa Impoundment. Operate interior cells to maximize capture of nutrients. | \$50,000   | \$0          | \$50,000           |  |              |                    |                   |              |                    |                   |              |                    |                             |              |                    | \$50,000         | \$50,000         |
| <b>Professional /Technical/Service Contracts:</b><br>Dr. Dan Svedarsky to evaluate energy potential of cattail biomass.  |  |              |                    | \$20,000                                   |              | \$20,000           |                   |              |                    |                   |              |                    |                             |              |                    | \$20,000         | \$20,000         |
| <b>Professional /Technical/Service Contracts:</b><br>Dr. David Ripplinger - Develop market analysis of cattail biomass utilization   |  |              |                    | \$15,000                                   |              | \$15,000           |                   |              |                    |                   |              |                    |                             |              |                    | \$15,000         | \$15,000         |
| <b>Professional /Technical/Service Contracts:</b><br>Dr. Joe Magner - Develop monitoring system, analysis of monitoring data, guide research and publication of findings                                       |  |              |                    |  |              |                    |                   |              |                    | \$50,000          |              | \$50,000           |                             |              |                    | \$50,000         | \$50,000         |
| <b>Service Contract:</b><br>(TBD) Competitive bid to harvest cattails from project site. Cut, remove and apply to adjoining cropland.  | \$5,000  |              | \$5,000            |  |              |                    | \$30,000          |              | \$30,000           |                   |              |                    |                             |              |                    | \$35,000         | \$35,000         |
| <b>Service Contract:</b><br>(TBD) Competitive bid for lab analysis, soil and water samples   |  |              |                    |  |              |                    | \$3,000           |              | \$3,000            | \$30,000          |              | \$30,000           |                             |              |                    | \$33,000         | \$33,000         |
| <b>Printing:</b><br>Interim reports and final report for distribution throughout the basin. Fulfill grant requirements.  |  |              |                    |  |              |                    |                   |              |                    |                   |              |                    | \$1,500                     |              | \$1,500            | \$1,500          | \$1,500          |
| <b>Travel expenses in Minnesota:</b><br>Mileage expenses to complete site work and related activities.   |  |              |                    |  |              |                    |                   |              |                    | \$5,000           |              | \$5,000            | \$1,000                     |              | \$1,000            | \$6,000          | \$6,000          |
| <b>COLUMN TOTAL</b>  | <b>\$80,000</b>                                    | <b>\$0</b>   | <b>\$80,000</b>    | <b>\$40,000</b>                            |              | <b>\$40,000</b>    | <b>\$35,000</b>   | <b>\$0</b>   | <b>\$35,000</b>    | <b>\$135,000</b>  | <b>\$0</b>   | <b>\$135,000</b>   | <b>\$10,000</b>             | <b>\$0</b>   | <b>\$10,000</b>    | <b>\$300,000</b> | <b>\$300,000</b> |



# North Ottawa Impoundment



**Location:** Bois de Sioux Watershed District, Minnesota

**Client:** Bois de Sioux Watershed District

Completed in the spring of 2010, this flood control and natural resource enhancement project for the Bois de Sioux Watershed District was funded by local, state, and federal dollars.

The primary purpose of the North Ottawa Impoundment Project is to provide flood relief on Judicial Ditch 2 (JD2), Judicial Ditch 12 (JD12), Rabbit River, Bois de Sioux River, and the Red River of the North. Secondary goals include wildlife management, stream flow augmentation, water quality enhancement, and public recreation.

Located on JD2 and JD12 drainage systems, the North Ottawa Impoundment project empties into the Rabbit River about five miles and 10 miles downstream, respectively.

The impoundment provides flood relief by controlling outflows so they do not contribute to flood damages downstream. In general, gates are closed during any downstream flood event and reopened after the flood at a rate that will not cause downstream damages. The downstream areas of concern include land and communities adjacent to the local ditch systems, the Rabbit River, the Bois de Sioux River, and the Red River.