

**2020 MAWD Project & Program of the Year  
Detailed Award Information Form**

**1) Award Category (check one)**

Project ☒ Program ☐

**2) MAWD Region (check one):**

One ☒ Two ☐ Three ☐

**3) Watershed District:** *Pelican River Watershed District*

**4) Project/program name:**

*Flowering Rush – Coordinated Research & Adaptive Management*

**5) Nominator (if different from above watershed district)** *None*

**6) Project/Program Summary (Limit 150 words) to be read at the awards program during the annual meeting banquet:**

*In 1976, a Flowering rush (FR) infestation was documented in Curfman Lake in Becker County, and spread through the Pelican River chain into Detroit, Muskrat, Sallie, Melissa, Mill Pond, and Buck Lakes. By the mid-1980's, FR reached nuisance conditions in the near shore areas. The first FR management efforts included hand-digging, deflowering, limited chemical treatments and mechanical harvesting. However, by 2000, it was evident control efforts were failing, FR was spreading, and little was known about the biology, ecological impacts, or effective control methods.*

*In 2010, the District contacted various agencies and institutions to begin a coordinated applied science research effort to understand the biology and ecology of FR and build upon this knowledge base to eventually develop effective herbicide control measures. Research was costly, over \$425,000, but over 250 acres of near-shore FR and 60 acres of mixed stand bulrush/FR has been treated successfully due to the project.*

**7) Define need:**

*Since the introduction of FR in the Pelican River chain in 1976, various control efforts were tried and failed, and the plant was growing increasingly dense, inhibiting the recreational use of infested lakes. In 1990, PRWD was petitioned to establish a Harvesting Project to control FR on Detroit Lake using mechanical harvesters. Financing is by special assessment on shoreline properties on Detroit, Curfman, Sallie and Melissa Lakes. In 2002 on Detroit Lake alone 1820 tons of FR were removed out of the lake. However, even with the vast amounts of FR harvested, it was clear that mechanical harvesting was failing as a control measure and may be contributing to the spread of the invasive plant. By 2006, the MN DNR was limiting near-shore FR harvesting permits, which lead to preliminary herbicide testing. From 2008-2009 local citizen involvement increased and the Lake Detroiters Lake Association group generated support of the Watershed District from various government officials.*

**8) Goal/purpose of the project/program:**

*In January 2010, PRWD met with research scientists and agency representatives from both state and federal governments to further discuss the possible use of herbicide controls. Scientists from Montana State and Mississippi State University were also flown in to attend this meeting at District expense. Several concepts concerning FR emerged from discussions and it was determined that a better understanding of the biology and ecology of FR was needed to determine which MN approved herbicide may be the most effective in managing the plants above and below ground biomass (rhizome). The purpose of this research was to determine (1) how and when FR reproduces and (2) the optimal lake depth and type of sediment where FR grows and flourishes. This information is critical to determine the most effective treatment protocols including type of herbicide, application rates, needed concentration exposure time (contact time), and the number of herbicide applications (annual and subsequent years).*

*In addition to the phenology and ecology research studies, the District contracted with the Army Corps of Engineers and Aquatic Ecosystem Restoration Foundation to conduct in-tank FR herbicide application studies to identify which herbicides may be effective for treating subsurface FR populations.*

**9) Describe project/program:**

**Phenology and Ecology Research (2010-11).** *Towards developing greater effective management methods for FR populations, the District contracted with Dr. John Madsen, Mississippi State University/Geosystems Research Institute, and Dr. Michelle Marko, Concordia College, to study the plant life and growth cycle, ecology, and plant biomass in relation to water depth. Over the research period, hundreds of plant and sediment core samples were collected year-round and analyzed. The phenology study learned that FR biomass continues to accumulate until early autumn and the ecology study learned the plant biomass distribution is greatest nearshore to 12 feet of water with the highest densities between the shoreline and 4 feet of water depth. In addition, the ecology study results stated FR plant density is highest from the shoreline to 6 ft of water depth but can grow to depths of 12 feet. The phenology study results suggested that based upon rhizome division and timing, late June/early July followed by a second treatment 4 weeks later would be most effective for controlling FR.*

**Growth Chambers, Mesocosm and In-Tank herbicide Treatment Study (2010).** *The District contracted with the Army Corps of Engineers and Aquatic Ecosystem Restoration Foundation to conduct in-tank FR herbicide application studies to identify which herbicides may be effective for treating subsurface FR populations. Dr. Madsen targeted the submersed (below water surface) FR for the treatment research project. Two herbicides were identified as “promising” to control Flowering rush. The study also suggested that repeat herbicide applications may be required to achieve permanent control.*

**In-Lake test plot pilot study and Concentration Exposure Time (CET) study (2011).** *Using the phenology, ecology, and in-tank herbicide treatment study findings, small-scale pilot herbicide trials (5-acre test plots) and an in-lake dye dissipation study was conducted. Two herbicides were tested and a red dye was added to the chemical to track the dispersion of the chemical and the level of concentration over time within the two test plots. The dye dissipation study eliminated one of the two herbicides tested because the contact time was inadequate due to the lake morphology/mixing rate. This was an interesting finding, as the in-tank herbicide study found the eliminated herbicide to be more effective in the laboratory setting!*

**In-Lake Operational Scale Treatments (2012 – 14).** *In 2012, based upon the pilot test plot results, the first small scale near-shore in-lake treatments (June/August) of FR were conducted on Detroit, Curfman, Sallie, and Melissa Lakes. From 2013-14, the treatment areas were greatly expanded on all the lakes.*

**Pilot Study Mixed Stand Treatments of Flowering Rush and Bulrush (2015-17).** *A 2-year pilot study to treat mixed stands of FR and native hardstem Bulrush on Lake Sallie began in 2015 with a test plot of 5 acres. This study was so successful that in 2018 the entire mixed stand area of approximately 60 acres was treated at the request of the Minnesota DNR.*

**Developing an Adaptive Management Plan (2015-16).** *In 2015, the research goals shifted from determining how to reduce FR populations, to developing thresholds of where, when, and how often to treat the plant to effectively manage the plant population. To determine whether the treatment protocols are effective at maintaining a low population density, the District collected sediment core samples before and after each treatment to observe whether the root biomass is increasing, decreasing, or remaining the same. 2016 marked a major milestone in the District’s research on the control and management of FR. This was the final year of research on the development to establish long-term treatment protocols to maintain the plant at low population density. The research concluded no treatment may see an increase in FR density plant growth, one treatment/year would suppress/maintain plant density levels, and two-treatments/year would reduce plant densities. Annually each Spring, the District conducts a littoral point-intercept surveys of areas that are infested with FR. The presence or absence of FR is recorded at each survey point to determine the number of annual treatments for each area (no treatment, 1 treatment/yr, 2 treatments/yr). The goal of the treatment protocol is to minimize the amount of treatment and chemicals that are needed to keep the plant at a low population*

density. Over the past 10 years, the District has reduced treatment of FR from over 250 acres of near shore treatments to 23 acres in 2020.

**10) Describe public benefit:**

Area lakes have almost fully returned to their pre-Flowering Rush state, with native plant growth and hard sandy lake bottoms restored, and recreational activities are again enjoyed uninhibited by the invasive plant. The mile-long public beach on Detroit Lake, which draws thousands of visitors each summer and is an economic force in the area, has returned to its full glory with a hard, sandy bottom enjoyed by swimmers and boaters. Also, fishery conditions improved with increased spawning beds in areas that were treated.

**11) Watershed plan reference** (where is the problem/solution identified in the watershed plan, does it address stated problems, objectives and goals):

*The Project addresses the problems, goals, and objectives as noted in the District's Water Management Plans throughout the years as follows:*

***Pelican River Water Management Plan (2005-19)***

*Pages 12-13, Problem Identified – Excessive aquatic plant biomass in lake littoral zones. Undertake In-Lake Treatments, including whole lake chemical treatments and continuation of aquatic plant removal.*

*Page 53-55. Section 6.5 Aquatic Plants. Non-Native, Exotic Species. Flowering Rush and Curly-leaf Pondweed identified as problems, suggested harvesting is not been effective in managing plant density and may be contributing to the plant's spread.*

*Page 72. Section 8. Water Quality Issues, Concerns, Problems, and Causes-identifies FR growth as a problem which displaces native plants, alters shoreline sedimentation patterns, interferes with boating, swimming, and fishing, causes shoreline damage (alters it from hard bottom to swamp conditions), and is a hardship to shoreline residents.*

*Page 83, Section 10.5 Lake Management Planning – provide data and technical support for fulfilling additional data.*

*Pages 93 and 100. And Plans for Detroit/Rice and Sallie Melissa Lake Water Quality Management Areas-Both Sections Identify Flowering Rush as a problem and state: "Attempts to control exotic aquatic plants and other nuisance species will be further evaluated, and working with the MN DNR and citizen groups, and aquatic plant management plan will be developed. Herbicides and other measures will be considered as a full or partial replacement for mechanical harvesting.*

***Pelican River Water Management Plan (2020 – 2030)***

*Pg 4-26, 4.3 Ecological Integrity, 4.3.1 Aquatic Invasive Species. GOAL: Prevent establishment of new invasive species and manage invasive species that already exist. Objective A: Manage priority invasive species using the best available technology. 1. Update and implement the Flowering Rush Management Plan on infested waters to maintain less than 2% occurrence in the littoral zone. 7. Conduct research to identify alternative treatment practices for Flowering rush (to prevent resistance to existing chemical treatment products).*

**12) Was project goal achieved? If so, how was the success measured?**

*The project goal of decreasing the FR populations that was inhibiting recreational use and changing the ecosystem of area lakes was definitely achieved. In 2013, when in-lake treatments were beginning, approximately 250 acres of FR on Lakes Sallie, Melissa, Detroit and Curfman were treated. The most notable change has been in Detroit Lake where 170 acres were treated in 2013 and only 23 acres required treatment in 2020. Lake Melissa had 38 acres treated in 2013 and no treatments at all in 2020. The District achieved its goal of managing AIS that currently exists, using the best available technology based upon the research conducted, and maintains infested waters to less than 2% occurrence in the littoral zone of Detroit, Curfman, Sallie, and Melissa lakes.*

**13) Watershed or water body name to be protected or improved by project or program (if applicable)**

*Waterbodies improved by the Phenology and Ecology Research, In-Tank herbicide Study, In-Lake Pilot Studies, and Adaptive Management program include: Detroit, Curfman, Sallie, Melissa and Muskrat Lakes.*

- 14) **Watershed or water body information** (e.g., size, watershed area, classification, description):  
***Curfman Lake** is 121 acres with a Littoral area of 85 acres or 71%, and a maximum depth of 21 ft. It is a recreational lake with a sub-watershed area is 200 acres.*  
***Detroit Lake** is 3067 acres with a littoral area of 1895 acres or 61.78%, and a maximum depth of 89 ft. It is a general development lake with a sub-watershed area of 9769 acres.*  
***Melissa Lake** is 1846 acres with a littoral area of 934 acres or 50%, and a maximum depth of 37 ft. It is a general development lake with a sub-watershed area of 3509 acres.*  
***Lake Sallie** is 1273 acres with a littoral area of 577 acres or 45%, and a maximum depth of 50 ft. It is a general development lake with a sub-watershed area of 3159 acres.*

15) **Project partners** (financial or in-kind support)

<u>Agency or organization</u>	<u>% Participation</u>
Minnesota Department of Natural Resources	20 %
City of Detroit Lakes	10 %
Lake Detroiters Lake Association/Sallie-Melissa Lake Association	4 %
Mississippi State University	35 %
University of Montana	1 %
Concordia College in Moorhead	10 %
John Skogerbo, US Army Corps of Engineers	10 %
Aquatic Ecosystem Restoration Foundation	10 %

- 16) **Start date:**  
*Collaboration and research began in 2010.*

- 17) **Project status:**  
*All research and studies identified in Section 9 were completed and the District is successfully implementing the Adaptive Management Plan to maintain the FR plant at low population densities. Also, the District is currently treating the 60-acre mixed stand of flowering rush and bulrush on Lake Sallie, completing three years of treatment on 30 acres and two years of treatment on an adjacent 30-acre area at the request of the Minnesota DNR. The District continues to receive inquiries from other states as well as Canada regarding our treatment protocols.*

- 18) **Project cost**  
**Research.** *From 2010 to 2013 the coordinated research effort came with a price tag of \$425,000, with the Watershed District contributing \$321,000 and the balance being fund by the City of Detroit Lakes and the Minnesota Department of Natural Resources grant funding. To fund the needed research and management, a District-wide Lake Management Project; Project LMP-01 (2011-2025) was established. The District was petitioned, and an engineer's report was undertaken and recommended the implementation of the project. Public Hearings were held, and the Board of Managers established the 15- year project which is financed by an ad-valorem tax, in accordance with Minn. Stats. 103D.605 and 103D.905. Recognizing the urgency and importance of the project, the City of Detroit Lakes also implemented a 1% Sales tax increase to help finance FR research and control measures. Since 2011, the City assisted with funding the research and treatments contributing up to \$25,000 annually.*

**Treatment.** *Treatments are funded through special assessments on parcels on Detroit, Curfman, Sallie and Melissa. Annual treatment costs have ranged from a high of \$68,690 in 2013 to \$12,751 in 2020, or an 82% decrease.*

- 19) **Letters of support:**  
*See attachments: 1) Kelcey Klemm, Administrator, City of Detroit Lakes and 2) Richard Hecock, Ph.D., Vice-President, Lake Detroiters Association*

- 20) **Photos:**  
*See attachments*



**City of Detroit Lakes**

1025 Roosevelt Ave., P.O. Box 647 Detroit Lakes, MN 56502

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September 14, 2020

Ms. Karen Kill  
Minnesota Association of Watershed Districts  
595 Aldine Street  
Saint Paul, MN 55104

Dear Karen,

The Pelican River Watershed District is well-deserving of being recognized for the Project of the Year Award from the Minnesota Association of Watershed Districts. By undertaking a project to curb Flowering Rush infestations in the Pelican River Chain, the Pelican River Watershed District has had a tremendous positive impact on area lakes including Detroit Lakes.

Flowering Rush was first documented in the area in 1976 and the Pelican River Watershed District started working to curb the spread of this invasive plant in the mid-1980s with limited impact. There was a need to address the Flowering Rush problem and the Pelican River Watershed District did not give up. Instead, they reached out to a variety of agencies to study the problem and develop a treatment system based on applied science. The research effort included universities, the US Army Corps of Engineers, the Minnesota Department of Natural Resources, the Pelican River Watershed District, and the City of Detroit Lakes. The cost of the study and development of effective treatment methods was \$425,000.

The quality of the treatment project is evident from the results. At its peak 250 acres of Flowering Rush were treated in the District while in 2020 only 44 acres required treatment. For Detroit Lakes the number of acres treated has been reduced from 173 acres to 12 acres. It is difficult to argue with success.

I am very impressed with the results of this project and with the thoughtful and resourceful way the Pelican River Watershed District addressed the problem. The District created a collaboration among various entities to fund a study and develop a solution to the Flowering Rush problem. They then developed effective control measures which were used tenaciously over many years to successfully combat the Flowering Rush infestation. This program has tremendous public value and Detroit Lakes has benefited greatly from this project. The Pelican River Watershed District is, as I have tried to convey, very worthy of the project of the year honor.

Sincerely,

Kelcey Klemm  
City Administrator  
City of Detroit Lakes

Minnesota Association of Watershed Districts  
595 Aldine Street  
Saint Paul, MN 55104



Mission: "To promote the protection and enhancement of Detroit Lake."

September 30, 2020

Awards Committee:

Please accept this letter in support of the Pelican River Watershed District's (PRWD) project, "*Coordinated Research and Adaptive Management of Flowering Rush*".

In 1976 flowering rush (*butomus umbellatus*) was introduced into Curfman Lake, an embayment of Lake Detroit in Becker County. It is believed that the introduction was the result of a residential landscaping effort. By the mid-1980's the plant was found in dense stands in large parts of the littoral areas of Lake Detroit, and by 1990 it had made its way down the Pelican River to Lakes Sallie and Melissa.

In 1990, responding to a petition by Lake Detroit Association and other residents, a mechanical harvesting project (1-C) was implemented, with the DNR granting the necessary permits to cut and remove submerged and emerged aquatic plants. At that time it was thought that repeated cutting and removal of the plant would deplete flowering rush vigor, and control its spread.

In 1992, a joint effort by Lake Detroiters, the Melissa Sallie Association, Lake View Township, Becker County, the City of Detroit Lakes, and PRWD, led to Minnesota's designation of flowering rush as "a nuisance exotic plant" (later changed to an "invasive species" designation).

Financed by an assessment on shoreline property owners, PRWD's Detroit Harvesting Project using mechanical harvesters continued as the dominant flowering rush control measure for more than a decade and reached a peak removal of 1820 tons in 2002.

Nevertheless, by that time, it was becoming clear that mechanical harvesting was failing as a control measure – flowering rush stands continued to expand and grow more densely. There was some suspicion that harvesting activities were actually contributing to the problem by uprooting and moving small plants.

Also by this time there was overwhelming evidence of flowering rush's interference with water recreation activities such as swimming and boating, and growing understanding that the plant was negatively impacting game fisheries and altering the ecology of the lake by trapping sediment in near-shore areas.

In 2002 and 2003 some preliminary tests of herbicide control were implemented by PRWD, with the support of Lakes Detroit, Melissa, and Sallie shoreline landowners. At about the same time as the result of efforts by PRWD and Lake Detroiters Association, the DNR authorized hand-pulling by shoreline residents. In 2006, the DNR reversed course and restricted the use of the PRWD's mechanical harvesting activities to the public beach and the removal of floating mats of debris (especially curly-leafed pondweed).

2008 and 2009 were marked with intense local citizen involvement in an effort to generate additional support for more positive controls of flowering rush. There were several citizen actions instigated by Lake Detroiters, efforts that received widespread attention in local media, and generated renewed support of PRWD from local government officials.

In January 2010, PRWD staff and managers met with the research scientists from Mississippi State University, Montana State, Concordia College, and the US Corps of Engineers and agency representatives from both state and federal governments, in St. Paul and with concerned citizens from Detroit Lakes area to further discuss the possible use of herbicide controls. This conference led to a research project undertaken by the US Army Corps of Engineers in which



multiple herbicides were tested as to application rates and timing, efficacy, and impacts on other plant and animal organisms.

Also in 2010 the passage of a 1% increase in the City of Detroit Lakes' Food and Beverage Tax with the understanding that revenue from this source would be used to support flowering rush control, and similar lake protection measures. Considerable efforts to ensure passage were undertaken by Lake Detroiters, and money from this source was indeed made available for the support of subsequent aquatic plant management activities of the PRWD, and continues as a source of revenue in use for such efforts.

In 2011 PRWD established a district-wide Lake Management Project (LMP-01) to generate financial support to underwrite Flowering rush and other AIS management activities. Lake Detroiters supported this project which imposes a small ad valorem tax on all properties in the District.

In 2011 and 2012, PRWD, the Becker County Coalition of Lake Associations, the City of Detroit Lakes, Becker County and individual lake associations including Lake Detroiters, organized and held two statewide Aquatic Invasive Species summits in Detroit Lakes. In attendance at both events were many Minnesota legislators, and state agency managers and staff, as well as over 200 local citizens. Summit organizers are convinced that major 2012 revisions to the State's AIS statutes and regulations, were at least partially owing to the outcomes from these Summits.

In any case, the 2012 creation of the DNR's Statewide AIS Advisory Committee included the appointment of two local leaders, Tera Guetter to represent watershed districts, and Barb Halbakken-Fischburg to represent lake associations. Also, Guetter was soon appointed to Advisory Board of the Minnesota Aquatic Invasive Species Research Center. There is no doubt that involvement at this level was significant in gaining acceptance for local efforts to control flowering rush.

In 2013 large scale herbicide treatments of flowering rush were begun. At the same time research on the impacts of treatments was implemented by scientists from Mississippi State. Lake Detroiters continued its strong commitment and moral support for both efforts, and the City and County provided financial support and logistical resources. DNR staff were directly involved in identifying priority treatment areas, and in the permitting process in general.

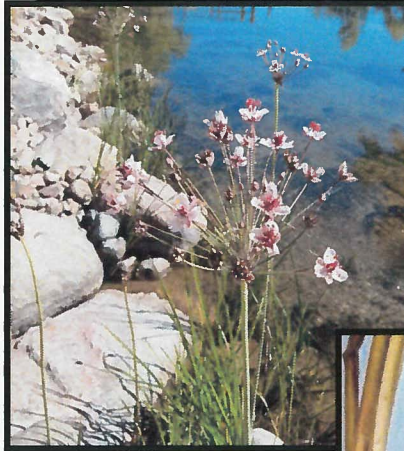
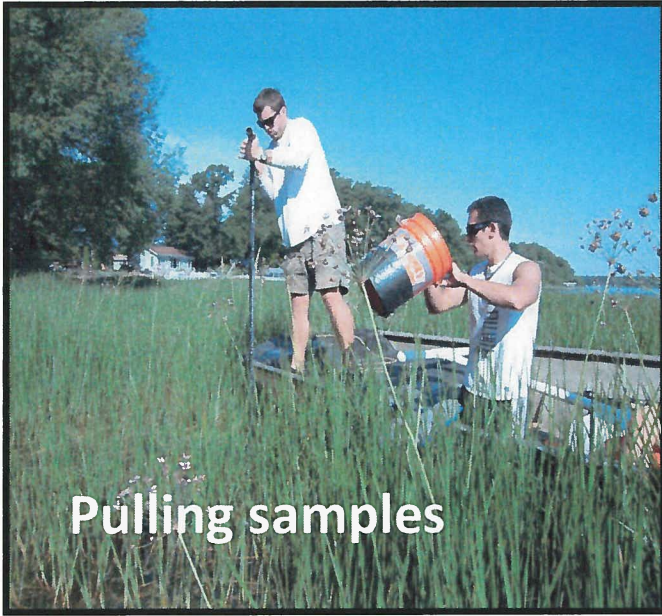
By 2015 it was certain that the herbicide control efforts were achieving success. No longer were there lake vistas dominated by dense stands of emergent plants. Lake use by swimmers and boaters was restored to pre-rush satisfaction levels. And the accompanying impact assessment research showed no deleterious effects on native species. A testament to the latter point was that the initially skeptical DNR eventually permitted the treatment of flowering rush that was mixed with American Bulrush, an extraordinarily important breeding habitat for gamefish. Moreover, property values and the general visual attractiveness of the area have been enhanced.

Control activities continue based upon an adaptive treatment protocol in which the overall goal is to prevent flowering rush populations from reaching the critical densities and extents which could lead to restoration of the plant as a major problem. Springtime vegetation surveys are utilized to make judgements about where, and how much treatment is needed. Treatment costs using this approach are a small fraction of what they were before.

So thirty years of working together on a common goal, learning what works and what doesn't, navigating an increasingly rigorous and sometimes skeptical regulatory context, defining and achieving realistic outcomes, acquiring multiple financing streams, generating widespread public and governmental support, and above all, restoring a natural resource to full utilization by both property owners and visitors, is a splendid example of persistence and accomplishment. – Lake Detroiters Association is proud to have had a role in these accomplishments.

Sincerely,

Richard D. Hecock, Ph.D  
Vice President, Lake Detroiters Association



*One Flowering Rush plant on the shoreline can be beautiful, but thousands in the lake are definitely not.*

*View of the rhizome that needs to be destroyed through in-lake treatments.*



*Flowering Rush Chemical Treatment Mesocosm Study was conducted by the Army Corps of Engineers.*



*Red dye was used to track the dispersion of chemicals to measure concentration over time.*

