

M.L. 2016 Projects

[MN Laws 2016, Chapter 186](#), Section 2 (beginning July 1, 2016)

Visit [the LCCMR website](#) for the most up-to-date project information and reports

Subd. 04 Water Resources

Subd. 04s Agricultural and Urban Runoff Water Quality Treatment Analysis - Phase II - \$110,000 TF

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Appropriation Language

\$110,000 the second year is from the trust fund to the Board of Water and Soil Resources for an agreement with the Blue Earth County Drainage Authority to continue monitoring a model demonstration for storage and treatment options in drainage systems designed to improve agricultural and urban water quality by reducing soil erosion, peak water flows, and nutrient loading. This appropriation is available until June 30, 2021, by which time the project must be completed and final products delivered.

SOUND BITE OF PROJECT OUTCOMES AND RESULTS

The results will be used to implement the most cost effective BMPs and guide future maintenance to maximize the benefits and lifespan of the associated BMPs implemented on public drainage systems. The data can use used to inform larger watershed plans to meet local and state water quality goals.

OVERALL PROJECT OUTCOME AND RESULTS

Phase I Agricultural and Urban Water Quality Treatment Analysis data shows how combining agricultural best management practices (BMPs) on a public drainage system can significantly improve water quality in an agricultural landscape. Upon the completion of the Phase I report and analysis, the need for continued, and more detailed, monitoring was identified as well as a gap in available information on maintenance recommendations for the BMPs and associated costs.

Phase II analysis refined methodology and findings from targeted site location including Klein Pond, the two-stage ditch, and rate control weir. Monitoring samples were collected during 2016-2017 by graduate students at Minnesota State University – Mankato (MSU) and added to previously collected data in Phase I to develop long-term trends.

A formal report compiled the findings from Phase II. The report outlined the long-term effectiveness of BMPs, maintenance recommendations to ensure functionality and effectiveness of BMPs, and review of

BMPs lifetime costs to determine the most cost-effective water quality practices for drainage systems.

The report was published on the ISG website [here](#). The findings were presented at multiple virtual conferences reaching of over 125 people. In addition, the report was sent in an email blast to 650+ individuals and was posted to social media to engage a larger audience and direct them to the website for more detailed information on findings.

The long-term study on CD 57 collected 10-years of monitoring data that provides decision makers and professionals with data to make informed decisions on having the greatest success with implementing and maintaining BMPs. Particularly in south-central Minnesota where drained agricultural lands dominate the landscape, a watershed approach to utilizing multi-purpose drainage management will play an integral role in meeting water quality goals. CD 57 can be used as a model for drainage systems and watersheds for implementing multiple BMPs with collaborative efforts from landowners, drainage authorities, county staff, and agencies. This project highlights the importance of long-term sustainable funding for water quality and resiliency programs targeting implementation of practices on agricultural lands.

PROJECT RESULTS USE AND DISSEMINATION

A formal report was developed supplementing the finding created in the Phase I report which summarized the monitoring data, long-term maintenance recommendation, and lifetime cost analysis. The report is posted to the ISG website [here](#). The findings were presented in workshops, conferences, virtual water storage tours, email blasts, posts to ISG's website, and social media threads for drainage staff, county commissioners, watershed district managers, watershed management organizations, landowners, agency staff, non-profit organizations, academics, water resources engineers, and others from Minnesota and Iowa.

Project Completed: 06/30/2021

FINAL REPORT

Subd. 06 Aquatic and Terrestrial Invasive Species

Sub-Project 01: Fungi in Ash Trees: Towards Protecting Trees from Emerald Ash - \$500,000 TF

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SOUND BITE OF PROJECT OUTCOMES AND RESULTS

Important new findings have been obtained about the fungi associated with the emerald ash borer (EAB). This knowledge helps better understand the biology and ecology of EAB invasion and provides new biological control agents that can be used to help manage this invasive pest.

OVERALL PROJECT OUTCOME AND RESULTS

The emerald ash borer (EAB) is an exotic beetle that has been introduced into the United States and is currently causing serious losses of ash trees in Minnesota. To effectively manage this pest, it is essential to understand the biology and ecology of the beetle and associated microorganisms. Our research has identified the diverse fungi that are associated with EAB. These include 1) canker causing fungi that work along with EAB to kill trees, 2) aggressive pioneer decay fungi that enter EAB wounds and cause hazardous conditions in ash trees attacked by the beetle and 3) fungi that can kill EAB with potential use as biological control agents. Laboratory and field studies have been done to test the pathogenicity of selected fungi on eggs, larvae and adult EAB. These studies have shown that fungi can kill EAB, and several species have been evaluated and are now available for field trials. This method of control for EAB provides an additional tool that natural resource managers will be able to use to control the pest. Methods of spraying and injecting trees have also been tested. Other fungi obtained from EAB galleries produce lesions and pathogenicity studies show that several of these canker causing fungi work in concert with EAB to kill trees. We also have a better understanding of the pioneer species of decay fungi that come into wounds made by EAB. These fungi cause extensive decay and strength losses early in the colonization process resulting in affected ash to become hazardous. These results, which are especially important in the urban landscape, indicate that timely tree removal is needed to avoid hazards produced by EAB associated wood decay fungi. Our research results provide important new findings for integrated pest management that will benefit Minnesotans long into the future.

PROJECT RESULTS USE AND DISSEMINATION

Results have been disseminated in scientific publications, presentations, and news releases. This includes journal articles on the diverse fungi associated with the emerald ash borer and fungi from EAB that produce cankers in ash trees, as well as presentations on the ovicidal effects of fungi on EAB and other aspects of biological control and management of EAB. Numerous news releases on fungi attacking EAB, protecting Minnesota's ash trees and others have taken place.

Subproject 01 Completed: 06/30/2022

FINAL ABSTRACT

Sub-Project 02: Understanding the Benefits and Limitations of using Goats for Invasive Plant Control - \$445,533 TF

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SOUND BITE OF PROJECT OUTCOMES AND RESULTS

Targeted grazing by goats demonstrates some benefits for the control of invasive *Rhamnus cathartica* and the enhancement of native plant communities. While *P. tenuis* transmission to goats remains a

concern during invasive plant management, co-grazing goats with waterfowl may mitigate this seasonal disease risk.

OVERALL PROJECT OUTCOME AND RESULTS

The use of goats for invasive plant control is increasing, yet few data exist on the effects of goat browsing on invasive species populations or native plant community composition. The cost of this management strategy is also elevated in some regions due to mortality caused by a parasite of white-tailed deer, *Parelaphostrongylus tenuis*, that goats may be exposed to when browsing in areas where infected deer defecate. To address these issues, we used *Rhamnus cathartica* as a target species to quantify the short- and long-term effects of goat browsing for invasive plant control and non-target impacts on associated native plant communities. We found that goats provide temporary suppression of *R. cathartica* abundance but this invasive shrub rebounds following grazing cessation. Native vegetation was similarly temporarily suppressed, but in some cases native plant diversity reached higher levels following grazing treatments. A broader synthesis and meta-analysis of the targeted grazing literature revealed similar patterns for the effects of goats and other livestock used for targeted grazing of invasive or undesired plant populations. Importantly, consumption by goats kills the seed of *R. cathartica*, and other invasive plants with larger seeds, indicating that goats are unlikely to exacerbate invasions by spreading them to new areas. Finally, in evaluating the *P. tenuis* risk to goats, we conducted a retrospective study of *P. tenuis*-associated mortalities of small ruminants in Minnesota over a 19-year period, as well as examined whether co-grazing goats with waterfowl could reduce transmission risk through waterfowl consumption of the gastropod intermediate hosts that harbor this parasite. Overall, we determined that the *P. tenuis*-associated mortality rate of goats is low (<1%), though it is unclear how browsing for invasive plant control might affect this level. Through our co-grazing experiments, we found more gastropods in habitats after goats had browsed alone; however, we did not observe these increases when goats were co-grazed with waterfowl. In addition, waterfowl did not negatively affect overall gastropod abundance or diversity. Thus, waterfowl could reduce *P. tenuis* risk to goats without harming gastropod communities.

PROJECT RESULTS USE AND DISSEMINATION

Research highlights were regularly disseminated throughout the duration of our project. Over the course of our research, our project was featured in eight popular press articles within the midwest region, one Minnesota radio station and PBS's Prairie Lawn and Garden show. Our project team leveraged our research in 11 education events targeting primary, secondary, higher education-level students, and community members, and seven presentations to university, local, regional, and national scientific, natural resource management, and public audiences. We've also had four manuscripts published in peer-reviewed scientific journals, with a fifth nearing submission. Project highlights have also been shared on [Twitter](#).

Subproject 02 Completed: 06/30/2022

FINAL ABSTRACT

Sub-Project 03: Genetic Control of Invasive Insect Species: Phase I - \$296,655 TF

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SOUND BITE OF PROJECT OUTCOMES AND RESULTS

We have demonstrated (in lab cages) a powerful new approach to combat invasive insect pests. Genetically engineered male insects would be released to mate with wild females, who would not have offspring. This can crash a wild population, and it is applicable to any sexually reproducing insect.

OVERALL PROJECT OUTCOME AND RESULTS

With the overall goal of demonstrating our innovative genetic biocontrol approach in the pest insect Spotted Wing Drosophila, we had three specific objectives on this project: (i) demonstrate a proof-of-concept in the model laboratory insect and close cousin to SWD, *Drosophila melanogaster*, (ii) translate what we learned from *D. melanogaster* into the SWD species, and (iii) study the genome sequence of wild SWD so we can precisely design our engineered biocontrol agents to effectively suppress wild SWD populations in Minnesota.

Our outcomes and results for the first objective exceeded project expectations. We succeeded in making the proof-of-concept in *D. melanogaster*, and the engineered insects were 100% incompatible with wild-type flies. We made over a dozen versions. We also added additional genetic control elements to automatically sort the males from females, making the technology more economical to deploy for pest control.

We did not meet our objective two milestones (completing the engineering of SWD), however, we made good progress in that direction. Near the end of the award, we succeeded in making our first transgenic SWD flies, so we should be able to move quickly now in finishing the engineering process.

Our results from the third objective exceeded expectations. While we initially planned to sequence the genome of 20 wild-caught flies, we instead invented a new approach that allowed us to sequence the relevant genes from over 10,000 wild flies. We are using this data in our current engineering efforts with SWD.

This was a high-risk/high-reward project. We were able to overcome a tremendous amount of technical risk on the project so far, and the approach is looking very promising. We plan to continue to make progress towards Objective 2 in our second Phase of this project.

PROJECT RESULTS USE AND DISSEMINATION

We have disseminated our results through the normal channels available to academic labs (regional, national, and international conferences and workshops; peer-reviewed publications; patents; etc.). We are most proud of two high-impact publications from this work. The first was published in [Nature Communications](#) in 2020, and the [second](#) is currently undergoing peer review at a top-ranked journal. We will have at least two additional papers submitted in the next year that stem from this project.

Subproject 03 Completed: 02/28/2021

FINAL ABSTRACT

Sub-Project 04: Dwarf Mistletoe Detection and Management in Minnesota - \$433,250 TF

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SOUND BITE OF PROJECT OUTCOMES AND RESULTS

We were able to identify key considerations for the early detection of the invasive American dwarf mistletoe on jack pine, including different detection methods and the need for field-level biology and identification education for foresters and loggers.

OVERALL PROJECT OUTCOME AND RESULTS

American dwarf mistletoe is an invasive species that infects and kills jack pine, a native tree species of Minnesota. American dwarf mistletoe is not currently present in Minnesota but has been detected in neighboring Canadian provinces. The goal of our project was to utilize Minnesota's native dwarf mistletoe, eastern spruce dwarf mistletoe (ESDM), to explore options for detection and management. Just like American dwarf mistletoe, ESDM results in mortality for its host tree, black spruce. We tested different types of detection methods. Google Earth was able to detect mortality, but we were unable to determine if mortality was caused by ESDM. Winter sampling resulted in higher potential false positives due to snow cover on tree. Summer sampling provided a clear view of the trees but movement within the stands were more difficult. Summer sampling was also used to explore impact of ESDM on forest ecosystems. ESDM is not a binary variable; lower levels of ESDM in black spruce stand resulted in higher tree species diversity and did not negatively impact regeneration.

With this new insight we explored different methods for predicting ESDM at the individual tree level and at the stand level using multiple different datasets. At the landscape level, we identified areas that have greater potential for impact from ESDM and linked those with stand and environmental variables which can provide foresters and natural resource management tools to prioritize management.

An additional part of our project was conducting focus groups and surveys with foresters and loggers within northern Minnesota. We found variable opinions regarding management and knowledge about ESDM and foresters and loggers identified the need for additional information about mistletoe and more data on results of management. We identified the need for training as a key component when considering early detection for the invasive American dwarf mistletoe.

PROJECT RESULTS USE AND DISSEMINATION

Results have been shared through talks at local, regional, and national meetings. We shared results through a special symposium: [Lake States Lowland, Wet, and Floodplain Forests](#). Published papers include:

- [Influence of eastern spruce dwarf mistletoe on stand structure and composition in northern](#)

Minnesota,

- The Difficulty of Predicting Eastern Spruce Dwarf Mistletoe in Lowland Black Spruce,
- Results of a Qualitative Assessment of Northern Minnesota Loggers' and Foresters' Perspectives and Experiences with Dwarf Mistletoe in Black Spruce Stands, and
- Results of a Survey of Minnesota Foresters Regarding Knowledge of and Treatment Practices for Dwarf Mistletoe in Black Spruce Stands in Northern Minnesota.

Subproject 04 Completed: 11/30/2021

FINAL ABSTRACT

Sub-Project 05: Developing Spatially Explicit Bio-economic Dispersal Model to Aid with the Management of Brown Marmorated Stink Bug - \$329,354 TF

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Subproject 05 Completed: 07/18/2021

Effects of Starvation, Age, and Mating Status on Flight Capacity of Laboratory-Reared Brown Marmorated Stink Bug (Hemiptera: Pentatomidae)

Sub-Project 07: Building Mechanistic and Process based Species Distribution Models for Common Tansy and Leafy Spurge: from Landscapes to Genomes - \$351,188 TF

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Subproject 07 Completed: 07/18/2021

FINAL ABSTRACT

Sub-Project 09: Genetic control of invasive insects, Phase 2 - \$60,000 TF

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Subproject 09 Completed: 12/31/2022

FINAL ABSTRACT

Subd. 06c Advancing Microbial Invasive Species Monitoring from Ballast Discharge - \$368,000 TF

Research Project

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Appropriation Language

\$368,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota to identify bacteria in ship ballast water and St. Louis River estuary sediments, assess the risks posed by invasive bacteria, and evaluate treatment techniques for effectiveness at removing the bacteria from ballast water. This appropriation is available until June 30, 2019, by which time the project must be completed and final products delivered.

SOUND BITE OF PROJECT OUTCOMES AND RESULTS

Bacterial communities and pathogen-containing bacterial genera were characterized in ship ballast water, throughout the St. Louis River estuary including commercial dock areas and muskellunge habitats to better understand the risk of discharging ballast water from commercial ships into this estuary.

OVERALL PROJECT OUTCOME AND RESULTS

While culture-based methods to detect indicator bacteria reduce the cost and complexity to monitor ballast and harbor waters, caution should be used when monitoring based on these indicators alone because their fates are not necessarily representative of bacterial cells in some pathogen-containing genera. Both UV-treatment and chlorination resulted in >99% removal of culturable indicator bacteria, however, each indicator responded differently with no regrowth of *Enterococcus*, moderate regrowth of *E. coli* for chlorine treated samples, and major regrowth of total bacteria after treatment. There were shifts in overall bacterial community composition after treatment including regrowth of cells from

genera that harbor pathogens (particularly Acinetobacter, Flavobacterium, and Pseudomonas). Initially, P. salmonis DNA appeared to be present in the surface water of the St. Louis River estuary, but this result proved to be incorrect. This finding was confirmed by sequencing bacterial DNA at various sites in 2017 and 2019, which did not detect the presence of Piscirickettsia DNA. Bacterial communities and the pathogen-containing bacterial genera (PCGs) subset in water and sediments at four commercial docks in the Duluth-Superior harbor were different from other sites in the St. Louis River estuary. Higher relative abundances of PCGs were found in commercial dock sediments compared to the rest of the estuary. While there were only minor differences in the relative abundance of PCGs in surface water throughout the estuary, DNA from the Flavobacterium genus was more abundant at docks than other areas. Discharge of ballast water may affect the prevalence of PCGs in the Duluth-Superior harbor. Treatment of ballast water prior to discharge may reduce any human and wildlife pathogen load. In addition, care should be taken when dredging dock areas because disturbing sediment may temporarily increase the chances of exposing recreational users to pathogenic bacterial strains.

PROJECT RESULTS USE AND DISSEMINATION

In total during this project, three graduate students were trained, two M.S. degrees will be completed, four poster and four oral presentations were made at regional and national scientific conferences and venues, and project results were disseminated to collaborators and colleagues at the U.S. EPA Mid-Continent Ecology Division and the Duluth Seaway Port Authority in Duluth, MN. One M.S. thesis will be appended to this project final report and the other will be forwarded when it is completed.

Project Completed: 06/30/2021

FINAL REPORT

Subd. 08 Methods to Protect, Restore, and Enhance Land, Water, and Habitat

Subd. 08a Bee Pollinator Habitat Enhancement - Phase II - \$387,000 TF

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Appropriation Language

\$387,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota to continue assessment of the potential to supplement traditional turf grass by providing critical floral plant resources to enhance bee pollinator habitat. Plant materials and seeds must follow the Board of Water and Soil Resources' native vegetation establishment and enhancement guidelines. This appropriation is available until June 30, 2019, by which time the project must be completed and final products delivered.

SOUND BITE OF PROJECT OUTCOMES AND RESULTS

Florally enhanced fine fescue lawns provide forage for diverse bee pollinators, maintain recreational and

aesthetic value, and reduce the need for irrigation, pesticides, fertilizers, and mowing. In response to demand, many local retailers now sell bee lawn seed mixes, a trend that will likely grow in Minnesota and nationally.

OVERALL PROJECT OUTCOME AND RESULTS

Our research demonstrates how small changes to a landscape can have meaningful conservation impacts on pollinators. Within Minneapolis parks, florally enhanced lawns (containing Dutch white clover, self-heal, and creeping thyme) had more diverse and distinct bee communities than lawns containing just Dutch white clover. Fifty-five species of wild bees were found foraging on Dutch white clover, and the vast majority were native species; however, *Apis mellifera*, the European honey bee, was the most common species. Seven bee species were found only on self-heal and not observed on Dutch white clover. The addition of flowers allows lawns to maintain their recreational and aesthetic value while still providing high-quality forage for pollinators. Park visitors supported bee lawns (95%) for their aesthetics and bee conservation, and city land managers emphasized need for education on the multiple benefits of bee lawns. Flowering lawns are highly sustainable, utilizing low-input fine fescues that reduce the need for irrigation, fertilizer applications, and mowing. Bee lawns encourage residents to view lawn flowers as food for bees rather than as a nuisance, reducing the perceived need to apply herbicides to the landscape. In addition, Bee lawns have become increasingly popular throughout the state of Minnesota as a result of this work; many local home and garden retailers in Minnesota now sell bee lawn mixes, which include both flower seeds and fine fescues. The Lawns to Legumes (L2L) program strives to make pollinator friendly lawns a trend nationwide. A newly funded grant will support bee lawn research integrated with other urban ecosystems questions: National Science Foundation: The Changing Nature of Cities: Ecological and Social Dynamics in the Minneapolis-St. Paul Urban Ecosystem. We see this as an excellent extension and expansion of the LCCMR project that will build future collaborations with Minnesota State agencies, Twin Cities municipalities, non-government organizations and businesses.

PROJECT RESULTS USE AND DISSEMINATION

There has been an amazing amount of interest by the general public about bee lawns. We have published four peer-reviewed research articles, have given dozens of talks, workshops, podcasts, field days, classroom lectures, and scientific conference presentations on bee lawns. Bee lawn materials are accessible on three different UMN websites geared toward different audiences (the general public on the UMN Extension site which gets hundreds of thousands of visits every year, turfgrass audiences on the Turfgrass Science website and entomology audiences on the Bee Lab website). Our continued outreach on bee lawns will reach many thousands of Minnesotans.

Project due to be completed: 06/30/2021

FINAL REPORT

[Flowering Lawns in Minneapolis Parks - 1 pg](#)

[Bee Lawns - Turf Grass with Flowering Plants - 2 pgs](#)

[Bee Lawns: Installing - 2 pgs](#)

[Testing the Establishment of Eight Forbs in Mowed Lawns of Hard Fescue \(*Festuca brevipila*\) for Use in Pollinator Conservation - 7 pgs](#)

[Turfgrass Species Affect the Establishment and Bloom of Kura Clover \(*Trifolium ambiguum*\) in Lawns - 6 pgs](#)

[FLOWERING BEE LAWNS - A TOOLKIT FOR LAND MANAGERS - 14 pgs](#)

[Exploring park visitor perceptions of 'flowering bee lawns' in neighborhood parks in Minneapolis, MN, US - 12 pgs](#)

Subd. 08b Measuring Pollen and Seed Dispersal for Prairie Fragment Connectivity – Research Project - \$556,000 TF

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Appropriation Language

\$556,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota to determine habitat connectivity between prairie fragments by measuring plant movement by dispersal of pollen and seeds to improve prairie restoration implementation. This appropriation is available until June 30, 2019, by which time the project must be completed and final products delivered.

SOUND BITE OF PROJECT OUTCOMES AND RESULTS

This project determined habitat connectivity between prairie fragments by measuring plant movement of 6 species by dispersal of pollen and seeds to improve prairie restoration implementation. New modeling approaches indicated that spillover from established/remnant prairies is a more complicated process than previous thought and requires different land management.

OVERALL PROJECT OUTCOME AND RESULTS

When restored prairies are adjacent to remnant prairies, rare species will move into and establish in these remnant prairies. This is a process we call spillover. Species that move into remnants tend to be dispersed by wind or animals. Over 1200 hectares of restored prairies benefit from spillover from remnant prairies in Minnesota.

We created an interactive map for managers in Minnesota to use to determine how landscape connectivity would change when they either 1) removed a remnant prairie, or 2) added a prairie to a location via restoration.

We learned that in Minnesota grasslands, if we model connectivity of our existing habitat fragments by incorporating an actual dispersal kernel, we get very different estimates of connectivity than when we use traditional approaches. This work demonstrates the importance of using dispersal kernels for measuring connectivity.

PROJECT RESULTS USE AND DISSEMINATION

This project has been presented at the Ecological Society of America conference in 2018 to an invited session on the role of space for coexistence as well as in 2019. Additionally, our team presented findings at the Botany Society meetings in 2019, 2020, and 2021 and various intuitional research talks in 2019 and 2020. The list of published papers associated with this project can be found in our Overall Project Outcomes.

One of the main outreach foci of this project was to provide conservation agencies and the MPCP with tools that they can use to determine the degree of habitat connectivity and the necessary size of corridors, to promote the spread of desirable species. To that end, we created and an app to the Nature Conservancy, and the MN DNR in March 2019. This app can be found at MN Connectivity.

Project Completed: 06/30/2020

FINAL REPORT

Apps can help bridge restoration science and restoration practice

Species diversity and dispersal traits alter biodiversity spillover in reconstructed grasslands

Consequences of ignoring dispersal variation in network models for landscape connectivity

Subd. 08d Evaluate Prescribed Burning Techniques to Improve Habitat Management for Brushland Species – Research Project - \$267,000 TF

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Appropriation Language

\$267,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota to compare the effects on brushland habitat of conducting prescribed burning in spring, summer, and fall to provide improved management guidelines for wildlife habitat. This appropriation is available until June 30, 2020, by which time the project must be completed and final products delivered.

SOUND BITE OF PROJECT OUTCOMES AND RESULTS

Lowland brush ecosystems provide critical habitat for a variety of wildlife. Lack of fire degrades habitat value. Our project suggests that prescribed burning in different seasons (e.g., spring, summer, fall) can be a tool to support a variety of outcomes, maintaining a diverse habitat that supports a diverse bird community.

OVERALL PROJECT OUTCOME AND RESULTS

Lowland brush ecosystems provide critical habitat for a variety of wildlife including over 80 Species of Greatest Conservation Need. These ecosystems depend on fire. Without fire, shrubs become dominant, reduce herbs, and reduce the quality of habitat for wildlife. Managers use prescribed burning as a tool in these ecosystems, conducting most burns in spring. We know that in other systems, summer and fall fires increase habitat value by creating patchiness in the vegetation. This patchiness supports greater plant and animal diversity. The objective of our project was to evaluate the effects of burn season on fire severity, woody and herbaceous plant communities, and breeding bird communities. Our goal was to understand whether burning in different seasons might improve brushland habitat to meet the needs of diverse wildlife and plants.

Four study sites were each broken into four 100-acre burn units including spring, summer, fall, and a control. At eight points per unit, we collected pre- and post-burn plant and breeding bird data. We

found similar levels of loss of aboveground shrub stems in all seasons in patches that burned. However, we found that spring burns burned more area than fall or summer. Overall, spring burns were the most successful at reducing woody stem density one year after burn. However, spring burns created a uniform layer of resprouting shrubs. This could reduce habitat quality. We found that when there was a greater variety of stem heights, we found more bird species. Thus, burning in just one season could homogenize brushlands reducing their value to wildlife. Overall, our project suggest that managers should view fire season as a tool to support a variety of outcomes and maintain a diverse habitat that supports a diverse bird community. Our data will be used to develop best management practices for brushland habitats.

PROJECT RESULTS USE AND DISSEMINATION

Our project results were presented at numerous regional meetings of natural resource managers, including several workshops focused specifically on the use of fire in management. In addition, two M.S. theses were completed ([Lori Knosalla](#) and [Annie Hawkinson](#)) with peer-reviewed publications in progress.

Project Completed: 06/30/2021

FINAL REPORT

Subd. 08f - Forest Management for Mississippi River Drinking Water Protection - \$300,000 TF

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Appropriation Language

\$300,000 the second year is from the trust fund to the commissioner of natural resources for an agreement with the Crow Wing Soil and Water Conservation District to pilot a water protection approach for the watershed through development of forest stewardship plans and targeted riparian forest restoration projects. Any expenditures from this appropriation spent on forest management plans or restoration must be for lands with a long-term contract commitment for forest conservation, and the restoration must follow the Board of Water and Soil Resources' native vegetation establishment and enhancement guidelines. This appropriation is available until June 30, 2019, by which time the project must be completed and final products delivered.

SOUND BITE OF PROJECT OUTCOMES AND RESULTS

Keeping forests alive and surrounding our communities is vital for water protection, provides safe drinking water to residents, and benefits wildlife populations into the future. Landowners within the Camp Ripley Sentinel Landscape completed 76 forest stewardship plans totaling 13,104 acres and 38 water quality practices in their woodlands.

OVERALL PROJECT OUTCOME AND RESULTS

Forests provide vital functions including water protection, providing critical habitat for wildlife, and contributing resources which communities rely on. The conversion of land within the Camp Ripley Sentinel landscape is happening at an alarming rate. Upland forest lands within LSP have declined by 28 percent (200,000 acres). These riparian forest areas are threatened by rapid urban and rural residential development within the City of Baxter, Crow Wing, Cass, Morrison, and Todd Counties (MN 2010 Census Data). This project aimed to work with private residents and certified forest plan writers to engage landowners into completing a forest stewardship plan and implement a best Management Practice on their woodlands. These plans provide important information about their forest resources and make it easier to enroll into forest protection programs like the Sustainable Forest Incentive Act or 2c. Parcels were targeted based on modeling, MPCA watershed Restoration and Protection Plan goals, and the county water plan. Landowners were reached through mailings or talking with their local foresters or certified plan writers in the region. In total, 76 forest stewardship plans (13,104 Acres) were written by SWCD technicians or certified forest plan writers. All landowners were then enrolled into some form of forest protection program like a conservation easement, SFIA, or 2c. In addition, 38 water quality projects were implemented on those properties to benefit drinking water as well as improve wildlife habitat and forest resiliency. Minnesotans will directly benefit from this work because 1.7 million people draw their drinking water from the Mississippi River. Forests are natural filters which traps pollutants and treat stormwater before it enters a water body.

PROJECT RESULTS USE AND DISSEMINATION

Mailers and in-person meetings were the two main modes of communication with landowners in the LCCMR boundary. The SWCD produced countless materials that were sent to prioritized landowners about forest plans and water quality BMP's. The best success with outreach came from in-person meetings with landowners and certified forest stewardship plan writers. The plan writers already had a great working relationship with the community and could disseminate materials quickly and have those 1 on 1 conversations. The Crow Wing SWCD is developing a story map to present the successes to landowners and constituents. It will be an interactive map with resources for landowners.

Project Completed: 06/30/2021

FINAL REPORT

Subd. 09 Land Acquisition, Habitat and Recreation

Subd. 09b Minnesota Point Pine Forest Scientific and Natural Area Acquisition - \$500,000 TF

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Appropriation Language

\$500,000 the second year is from the trust fund to the commissioner of natural resources in cooperation

with the Duluth Airport Authority to acquire approximately ten acres as an addition to the designated Minnesota Point Pine Forest Scientific and Natural Area located along the shores of Lake Superior in Duluth.

SOUND BITE OF PROJECT OUTCOMES AND RESULTS

The effort to acquire 10 acres of high-quality old growth forest and beach dune habitat from the Duluth Airport Authority as a new addition to Minnesota Point Pine Forest SNA was unfortunately unsuccessful during this appropriation's time-frame. However, opportunities to bring these parcels under protection may yet exist.

OVERALL PROJECT OUTCOME AND RESULTS

This appropriation came about due to a Duluth Airport Authority (DAA) ENRTF proposal in 2015 for funds to transfer about 10 acres of outstanding biodiversity significance to the DNR to create a new addition to (and contiguous ownership and management of) the existing Minnesota Point Pine Forest Scientific and Natural Area (SNA). The appropriation was awarded in ML16 (FY17) to DNR's SNA Program instead, to purchase the parcels from DAA / the City of Duluth following a more typical acquisition project model. DNR worked with DAA to write their application for a public waters permit to build out into the St. Louis Estuary to realign the Sky Harbor airport's runway, and thereby release the flight-path airspace into which the old-growth pines have been vertically growing. DAA/FAA (Federal Aviation Administration) release of that designated airspace once the runway realignment was complete, and subsequent sale of those acres to the SNA Program, was included in DAA's application for the public waters permit, since several rare features and critical habitat would be thereby placed under permanent SNA protections. However, after at least two appraisals and several appropriation extensions, the City/DAA did not respond to the DNR's February 2021 offer at certified Fair Market Value, which has led to DNR's inability to complete this project with the appropriated funds on time. The City of Duluth was not successful in an attempt to amend the original appropriation language to allow for the remainder of these funds to be granted to the Duluth Airport for the runway re-alignment instead of as compensation for a sale of the land. Rather than returning unused funds at the end of the award to the ENRTF corpus, funds were reallocated by the Legislature to other projects on June 30, 2021. This effort involved years of collaboration and negotiation between the DNR and the City of Duluth / DAA, among other stakeholders involved including the Minnesota Legislature, the Duluth City Council, the FAA and LCCMR. While ultimately unsuccessful on this appropriation, opportunities for protecting these acres may yet exist.

PROJECT RESULTS USE AND DISSEMINATION

This project has had no results to disseminate to date. Because of this project's inability to progress into the latter stages of acquisition and designation, none of the work completed thus far (largely professional services for acquisition e.g. appraisals, and staff hours devoted to the project) was deemed appropriate for public dissemination.

Project Completed: 06/30/2021

[FINAL REPORT](#)

Subd. 09g Otter Tail River Recreational Trail Acquisition - \$600,000 TF

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Appropriation Language

\$600,000 the second year is from the trust fund to the commissioner of natural resources for an agreement with the city of Fergus Falls to acquire approximately 16 acres along the Otter Tail River for a recreational trail and park. This appropriation is contingent on at least a \$400,000 match of nonstate money. Prior to the acquisition, a phase 1 environmental assessment must be completed and the city must not accept any liability for previous contamination of lands acquired with this appropriation.

SOUND BITE OF PROJECT OUTCOMES AND RESULTS

The City of Fergus Falls proposed, but was unable, to acquire 3,476 lineal feet of frontage on the Otter Tail River.

OVERALL PROJECT OUTCOME AND RESULTS

The City of Fergus Falls proposed to acquire 3,476 lineal feet of frontage on the Otter Tail River. The former Mid-American Dairy property, a 28.9 acre industrial site fronting on the Otter Tail River in downtown Fergus Falls, is currently owned by the Fergus Falls Port Authority. In preparation for the acquisition by the City of Fergus Falls and with the guidance of a work plan approved by the MPCA, the site has been carefully returned to a green field site from its former industrial use and subdivided into two parcels, with 11.57 acres identified as the location of a multi-use non-motorized trail.

By obtaining 11.57 acres from the Port Authority, the City would ensure in perpetuity the protection of 3,476 lineal feet of river frontage and foster recreational activities led by trail development. The acquisition would provide public access to river frontage that was previously inaccessible as well as create a trail link that would provide a major point of future connectivity between the Central Lakes Trail and north bound Pelican to Perham Trail, with eventual connection to the Heartland Trail. The Dairy trail segment factored into trail master plans initiated and approved by the City of Fergus Falls and Otter Tail County and recognized as regionally significant by the Greater Minnesota Parks and Trails Commission.

Unfortunately, the City of Fergus Falls was unable to secure the approval of the DNR's Appraisal Management Unit for acquisition of the property, rendering the aforementioned project outcomes incomplete. It is therefore not clear that Minnesotans will benefit from the protection of and recreational access to the Otter Tail River in this location. The failure of this project suggests a rigidity of policy by State agencies that counteracts the will of the Legislature.

DNR comment:

The DNR's Attachment E process, which requires the review that Fergus Falls mentions, is designed to ensure that the will of the legislature regarding acquisitions with ENRTF funds is followed. ENRTF session law requires that we pay no more than 100% of appraised value, and Office of Grants Management Policy 08-11 states that we have a duty to monitor pass-through grants to the same standards applied to other state grants.

Accordingly, we apply to ENRTF pass-through grants the same appraisal quality standards that we apply to our own land acquisitions and those of competitive grants the DNR awards. We are tasked with conducting valuations in a way that is independent and unbiased for the protection of the funding sources and taxpayers of the State of Minnesota. Technical reviews are designed to ensure that the appraiser complied with USPAP and DNR Supplemental Guidelines on completing appraisals.

Fergus Falls submitted two appraisal reports, reviewed under two different qualified reviewers. In both cases the reviewer determined the appraisal met neither USPAP standards nor DNR Supplemental Guidelines. To reimburse using an appraisal determined to be inadequate would not have been consistent with the expectations set in appropriation law or OGM policy for the administration of these grants.

PROJECT RESULTS USE AND DISSEMINATION

This project has been closely monitored by both the City of Fergus Falls' City Council and the Fergus Falls Port Authority by in-person updates from the project manager.

Project Completed: 06/30/2022

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