Lake Superior Headwaters Sustainability Partnership Landscape Stewardship Vision

FRAMEWORK AND APPLICATION TO THE LOWER ST. LOUIS RIVER /UPPER ST. LOUIS BAY AND ALLOUEZ BAY GEOGRAPHIC ZONES

Lake Superior Headwaters Sustainability Partnership

MARCH 2026

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Cover Image: *Spirit Lake*
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HEADWATERS PARTNERSHIP VISION STATEMENT AND GUIDING PRINCIPLES

The Lake Superior Headwaters Sustainability Partnership establishes an inclusive and intentional framework for how and where we work to achieve a thriving estuary landscape and community. The principles of sustainability, resiliency, and equity guide our approach to managing our natural resources by including economic development and community health and well-being considerations. In order to achieve this vision, we need to:

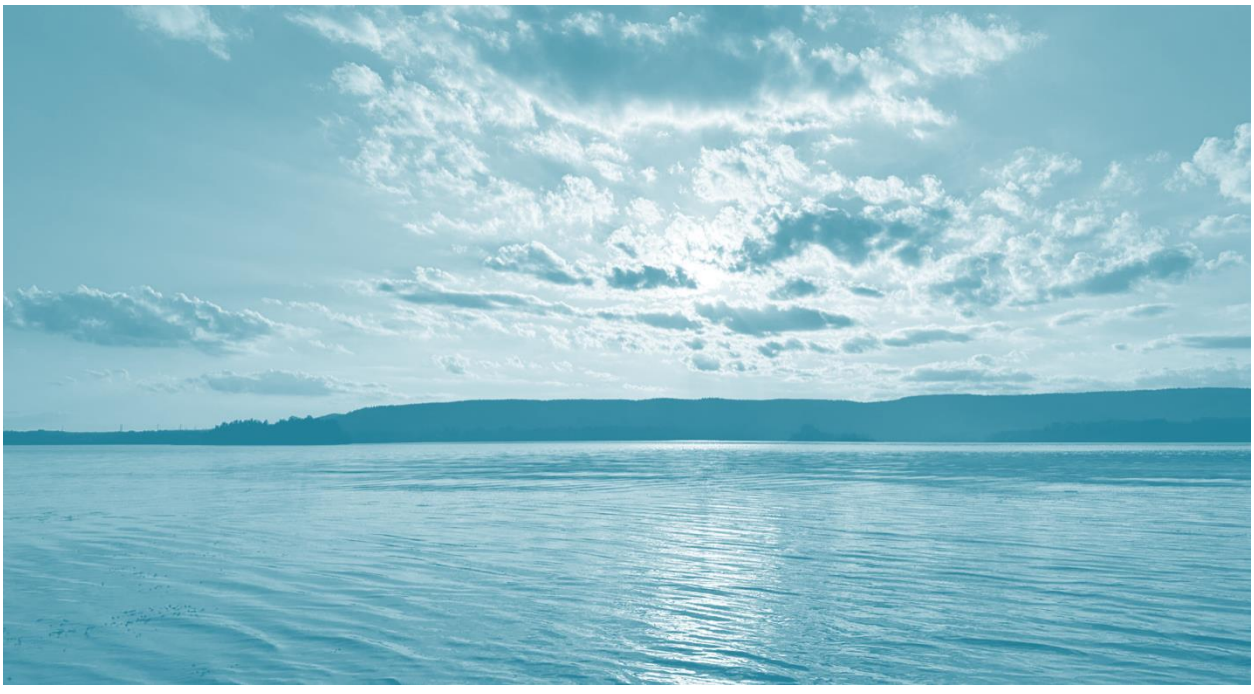
- *Take a holistic approach to protecting and restoring the natural resources of the St. Louis River Estuary and surrounding watersheds that can be scaled up geographically over time,*
- *Build and improve the existing capacity and processes that enable us to work collaboratively,*
- *Work to improve ecological integrity and resiliency while furthering a sustainable relationship between humans and the environment,*
- *Incorporate human community needs and provide access to ecosystem services in an equitable manner,*
- *Develop trust and legitimacy in our efforts through knowledge sharing and effective facilitation, and*
- *Proactively identify emerging issues that may negatively impact achieving a healthy and thriving landscape.*

EXECUTIVE SUMMARY

The Lake Superior Headwaters Sustainability Partnership (LSHSP, Headwaters Partnership, the Partnership) is a collaborative of agencies, organizations, municipalities, and tribal entities located in the western headwaters of Lake Superior. The Headwaters Partnership Vision Statement and Guiding Principles (previous page) provides a shared vision to guide our work to create a thriving St. Louis River Estuary. In addition, Goals and Objectives (Lake Superior Headwaters Sustainability Partnership, 2023) were developed for a specific set of natural resource and community priorities (Priority Concerns), which represent a systems-level approach to guide this work. The Headwaters Partnership's function is to assist partners in achieving these shared goals.

To that end, the Headwaters Partnership undertook a landscape level 'visioning' process, by Priority Concern, for three geographic locations in the St. Louis River estuary. This Landscape Stewardship Vision documents this process and its results, considering natural resources and community and cultural resources. The Headwaters Partnership covers a vast area with different ecological needs, partner capabilities and responsibilities, and communities. The complexity of the landscape level visioning process revealed the need for a bottom-up framework, where decisions are made locally using place-based stewardship.

A focus for this effort was developing tools to increase collaborative capacity and collective learning to support conservation efforts aligned with the Partnership's Vision Statement and Goals and Objectives. The Interactive Vision Map and associated Matrix with Stewardship Guidelines developed during this visioning process are built on information from this place-based and bottom-up point of view. These tools provide Priority Concern Teams with the context for collaboration to implement or prioritize projects starting from a local place within their expertise and expanding to other groups, interests, and considerations, while also providing guidance and information across teams to support the realization of multiple benefits in project work. This cooperative effort fulfills the desire to shepherd stewardship towards a thriving estuary landscape and community into an era beyond Area of Concern (AOC) delisting.



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GLOSSARY OF TERMS

Concept Plan/Restoration Vision – a smaller-scale plan involving multiple priority concerns leading to collaborative projects to advance a vision for a desired natural resource condition.

Feature – refers to a specific point, line, or polygon identified by Priority Concern Teams in the Interactive Vision Map.

Geographic Zones – meso-scale divisions of the Headwaters Partnership region based on the watersheds draining to the sediment assessment areas established for the Area of Concern. In this report, Geographic Zones general refers to the zones contained herein – Lower St. Louis River, Upper St. Louis Bay, and Allouez Bay.

Headwaters Partnership Estuary Landscape – the geographic region in which the Headwaters Partnership works. The boundary is the same as the St. Louis River Area of Concern (AOC) boundary.

Interactive Vision Map - a spatial, online resource containing feature data developed by Priority Concern Teams during the initial stages of the visioning process and able to be utilized in an interactive way to filter in a heatmap style.

Landscape Conservation Design (LCD) – defined by U.S. Fish and Wildlife Service as a partner-driven approach to achieve a sustainable, resilient socio-ecological landscape. It is an iterative, collaborative, and holistic process resulting in strategic and spatial products that provide information, analytical tools, maps, and strategies to achieve landscape goals collectively held among partners.

Landscape Stewardship Guidelines – a set of guidelines defining best practices, information gaps, priority actions, and considerations for partners for each Priority Concern. The guidelines link to the specific locations in the Interactive Vision Map and the matrix for each Priority Concern.

Landscape Stewardship Vision – a collective vision for future collaborative work to support goals and objectives of the Headwaters Partnership Priority Concerns in specific geographic zones.

Landscape Stewardship Vision Framework - describes the components and process for developing landscape stewardship visioning in geographic zones.

Lower St. Louis River Habitat Plan - a working plan containing conservation targets and strategies to facilitate protection of the ecological diversity and social benefits of the Lower St. Louis River.

Matrix – a series of tables developed by Priority Concern Teams containing habitat conditions, stressors, current work, future actions, and community and cultural information that refer to specific locations within the Geographic Zones. The matrices are linked to an Interactive Vision Map.

Priority Concern (PC) – one of 12 collective priorities established by the Headwaters Partnership region. Each priority concern has an overarching goal and set of objectives established by partners.

St. Louis River Area of Concern (AOC) - one of the 43 Areas of Concern across the Great Lakes (US and Canada) created under the 1987 Great Lakes Water Quality Agreement. The Area of Concern is a geographic area designated due to significant impairment of beneficial uses because of human activities.

1. BACKGROUND

The Lake Superior Headwaters Sustainability Partnership was created in 2021 and currently connects over 80 individuals from 30 different agencies, organizations, local governments, and tribal entities to protect, restore, and steward the Headwaters Partnership region, also referred to as the estuary landscape, with an overarching vision for a thriving estuary and community. The Headwaters Partnership region (Figure 1) is 1,020 square miles in Minnesota and Wisconsin and coincides with the EPA-designated Area of Concern (AOC) boundary for the St. Louis River. Nine geographic zones are defined within the region based loosely on HUC-12 Watersheds with minor modifications to group areas with similar natural resources or cultural features. The Landscape Stewardship Vision Framework presented in this report is applied to three geographic zones: the Upper St. Louis Bay, Lower St. Louis River, and Allouez Bay.

Figure 1. Headwaters Partnership Region, divided into nine (9) geographic zones.

Emmons & Olivier Resources, Inc. (EOR), Minnesota Land Trust (MLT), and the Headwaters Partnership are supporting a Landscape Stewardship Vision process for these three geographic zones with a focus on fostering collaboration within the Headwaters Partnership region. The Partnership facilitates and builds on collaboration started decades ago during efforts to restore the St. Louis River AOC. Sustainability, resilience, equity, community health, and opportunities for economic development are guiding principles of the Partnership. The Partnership supports partners on diverse projects that improve the ecological integrity and resilience of the estuary landscape and recognizes that community health and ecological health are intrinsically linked. The inclusion of community values, needs, and concerns differentiates the Partnership from other regional planning efforts.

The Headwaters Partnership has adopted the U.S. Fish and Wildlife Service's Landscape Conservation Design approach to developing spatial tools and strategies to support collective conservation. In the initial scoping phase of the partnership, partners developed a planning framework with three levels based on scale (Minnesota Land Trust, 2021). Level 1 planning was conducted for the estuary landscape between 2019 and 2021. As a result, a set of twelve Priority Concerns (Table 1) was identified across the Headwaters Partnership region from partner input during large group meetings and a series of online workshops. Note, two of the Priority Concerns (Environmental Justice and Community Engagement) were later combined to form one "Community Engagement" Priority Concern. The Priority Concerns represent the important resources of the Partnership Region and include individual species or groups of species, natural communities, landscape processes, or socio-economic issues. The selected Priority Concerns are diverse, representing key elements of the estuary landscape. Priority Concerns are not equally distributed across the different geographic zones.

Following the selection of the Priority Concerns, teams associated with each were tasked with creating a set of Goals and Objectives to help direct work in the Headwaters Partnership region (Minnesota Land Trust, 2023). The Goals and Objectives have been adaptive and updated as additional information has become available through the process. These Goals and Objectives have been instrumental in informing the Landscape Stewardship Vision. A Level 2 analysis was conducted for Allouez Bay in 2021 and 2022, prior to establishment of the Priority Concerns, as a prototype for the process and resulted in the Allouez Bay Restoration Vision (Lake Superior Headwaters Sustainability Partnership, 2022). The Headwaters Partnership Forum (the partnership steering committee) revised the partnership's terminology from restoration vision to landscape stewardship vision in 2023 to begin this visioning process

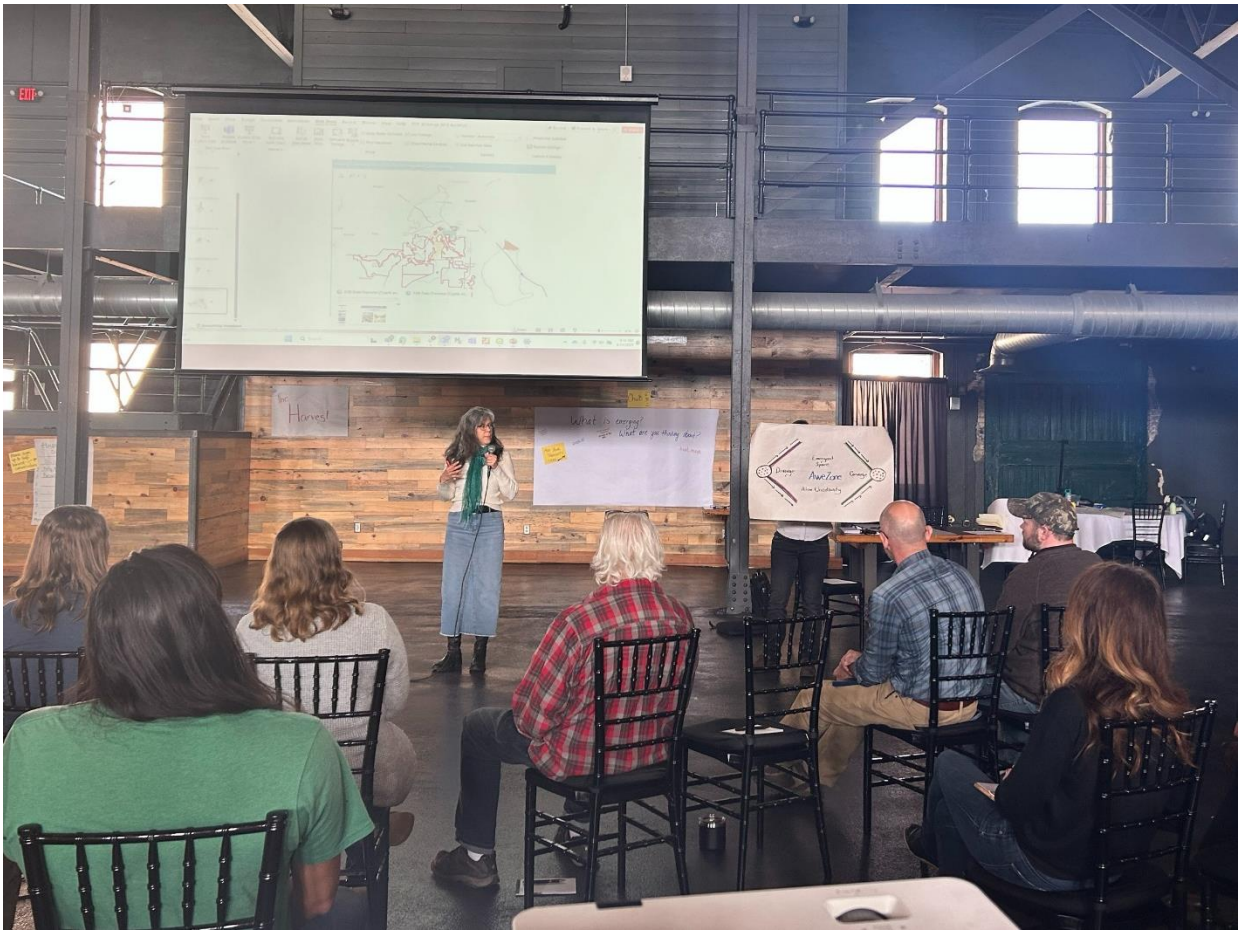
Development of the Landscape Stewardship Vision Framework involved preliminary meetings and coordination between MLT and EOR and consultation with the Headwaters Partnership Forum, followed by re-engagement of the Priority Concern Teams in Spring 2024. At this stage, the Teams provided datasets and references, pertinent to each Priority Concern, which were then used to set up online mapping spaces. Beginning in Fall 2024, Priority Concern Teams then participated in a mapping exercise to identify needed projects within the geographic zones, which included high quality resources to protect, actions to take in the future to improve the health of the resource, areas in need of restoration or management, opportunities for collaboration, and focus areas for future work.

Once the team mapping was complete, EOR and MLT processed and visualized the data, presenting their findings at a workshop with Priority Concern Teams in April 2025. The outcomes of this meeting involved collective insight into the complexity of creating a Landscape Stewardship Vision at the size and scale of

these geographic zones (Figure 2) and an understanding of the many ways partners prioritize future work. The initial restoration visioning process for Allouez Bay resulted in a concept plan graphic and accompanying report as a final product. The graphic vision has been used extensively to drive future collaborative work in Allouez Bay. It was initially thought that this level of vision could be created for the Lower St. Louis River and Upper St. Louis Bay geographic zones; however, due to the scale of these areas and the amount of information collected in the mapping exercise, a pivot was made. Instead, a bottom-up approach was taken to use the detailed on-the-ground feature information that the Priority Concern Teams provided to derive broad-level, action-driven guidelines as a framework accompanied by an interactive map of the site-level data.

Ideas for a revised planning framework for the partnership were solidified in meetings with the Headwaters Partnership Forum and Priority Concern Teams in May and August 2025. Finally, draft components of the framework were developed by EOR in the winter 2025-2026, including a set of Landscape Stewardship Guidelines developed from mapped features and an interactive map of site-level information. The guidelines and interactive map enable partners to collaborate on projects and prioritize future work.

The following Landscape Stewardship Vision Framework ties guidelines important to the geographic zones and the Headwaters Partnership region as a whole, with detailed site-level information. Further restoration visions, large site concept plans, or tributary watershed plans can then be developed in important areas within the geographic zones (Figure 2).



Community Workshop Session

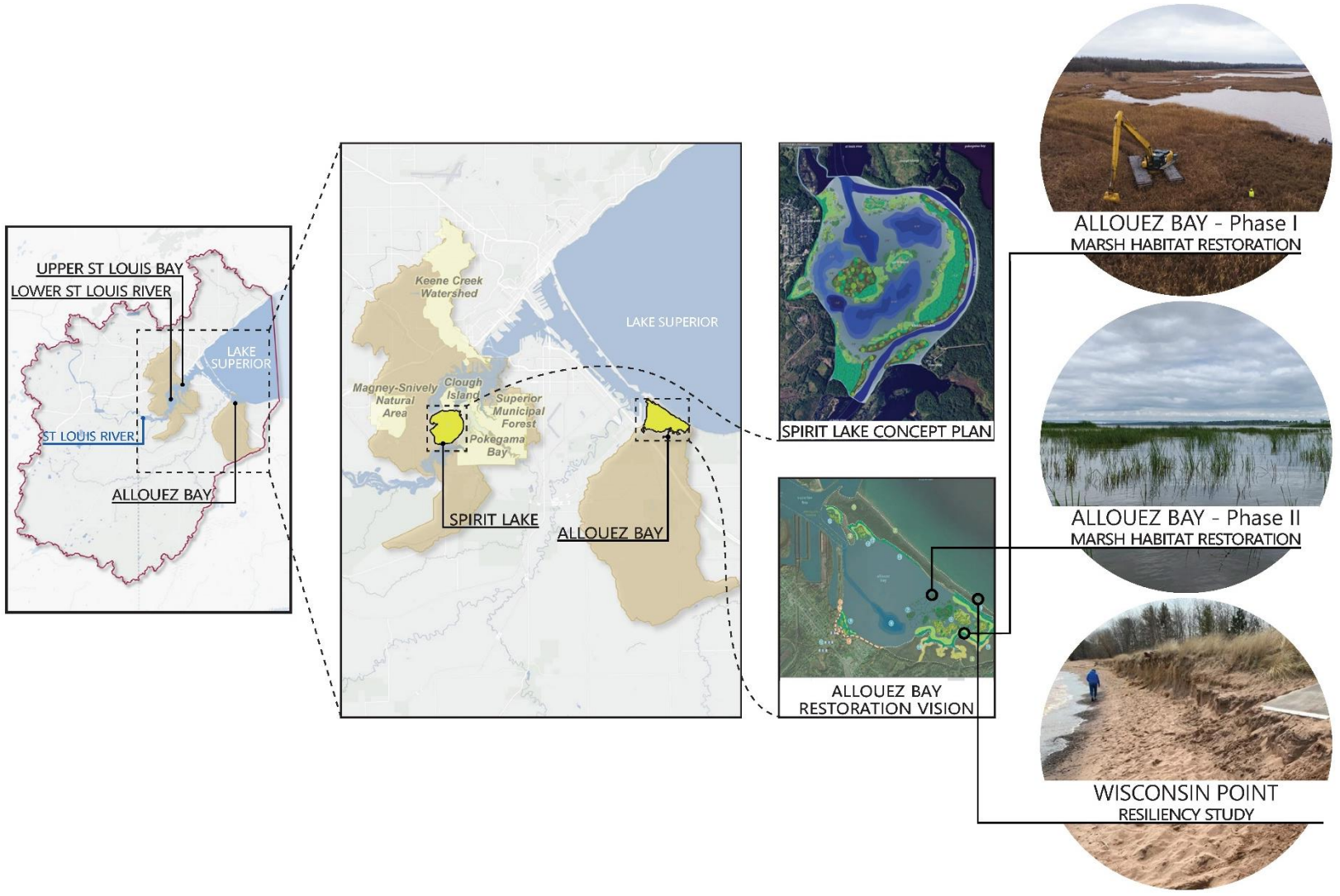


Figure 2. Landscape Stewardship Visioning Framework

Table 1. Priority Concerns

Birds	Hydrologic Integrity
Brook Trout Streams	Invasive Species
Coastal Wetlands	Lake Sturgeon
Community Engagement	Terrestrial Habitat Connectivity
Dredge Material Management	Water Quality
Environmental Justice	Wild Rice (Manoomin)

1.1. How to Use This Document

This Headwaters Partnership Landscape Stewardship Vision (Vision) is intended for partners and engaged community members. Technical information and terminology have been minimized. Background resources can be found in Appendix B. All components of the Vision can be found at the Headwaters Partnership website http://headwaterspartnership.org/. The components of the Landscape Stewardship Vision include this framework document, a set of Landscape Stewardship Guidelines in the form of two-page illustrations for each Priority Concern, an Interactive Vision Map, and matrices, which are printed tables containing project level information about features in the Interactive Vision Map.

Table 2 below shows potential uses and audiences for components of the Vision, providing a guide on where to find information in the document based on interests.

Table 2. Location and Description of Information Based on Interests

Area of Interest	Potential Audience	Section
Stewardship Guidelines to help during planning and design	Priority Concern Teams and those working at the project level	**Part II** – Landscape Stewardship Vision Framework
The amount of future work needed in three geographic zones	Project funders and decision makers	**Part III** – Opportunities and Needs in the Upper St. Louis Bay, Lower St. Louis River, and Allouez Bay Geographic Zones
	Community members	
How the Landscape Stewardship Vision can be applied to other geographic zones	Priority Concern Teams and others working at the project level	**Part III** – Application of the Framework to Concept and Site-Level projects
Planning level costs for select projects	Priority Concern Teams and those working at the project level	**Part IV** – Project Level Planning Costs for Representative Projects
	Project funders and decision makers	
Identifying projects or project collaborators within Lower St. Louis River, Upper St. Louis Bay, and Allouez Bay geographic zones	Priority Concern Teams and those working at the project level	**Interactive Vision Map and Appendix C** – Matrices for Each Priority Concern

1.2. Operational Uses of the Landscape Stewardship Vision Framework

The Landscape Stewardship Vision and Framework have multiple operational uses that are described in this section.

1.2.1. Provide a Framework and Align Other Planning Efforts within the Headwaters Partnership Region

The Headwaters Partnership is a voluntary, collaborative partnership independent of mandated plans specific to the partnership that direct the future of natural resource management. The Landscape Stewardship Vision Framework recognizes that other planning efforts will continue and be completed concurrently within the Headwaters Partnership region. The focus of those planning efforts varies based on mandates, funding sources, planning objectives, and partner involvement. At a broad-based level, the Headwaters Partnership provides a framework that other planning efforts can use to align with common concepts, practices, and priorities within the estuary landscape. The framework is meant to be flexible, allowing partners to make connections based on their point of reference, whether at the detailed project level or broader planning level. For a detailed look at commonalities, differences, and embeddedness of previous planning documents in relation to the Landscape Stewardship Vision Framework, see Figure 2.

1.2.2. Guide Natural Resource Stewardship Planning and Implementation

The Landscape Stewardship Vision Framework can be used to guide planning and implementation within the estuary landscape. This framework groups on-the-ground mapped features into Landscape Stewardship Guidelines with categories and themes. For instance, a reference wetland might have an opportunity for wild rice (manoomin) restoration adjacent to it. Therefore, the guideline category is Best Practice and the theme is Plan, with a guideline to evaluate positive and negative impacts to manoomin and manoomin habitat during project development, including potential for invasive species treatment. The framework can be referenced by teams and project partners to direct work based on emergent priorities and practices. During site-level planning, the framework for other Priority Concerns can be referenced to identify opportunities to collaborate or determine where potential adverse impacts may exist. For instance, in our reference wetland example above, a project using beneficial re-use of dredge material might need to avoid impacting this particular wetland.

1.2.3. Understand the Need for Continued Work

The delisting of the St. Louis River AOC has required a long-term, coordinated, and focused effort that has improved the conditions of the St. Louis River estuary for fish and wildlife, recreation, and the general community. The Headwaters Partnership was formed because partners recognized that the work will not finish after AOC delisting, which is currently slated for 2029. The estuary landscape continues to face existing and emerging threats to the wide range of Priority Concerns. Part III of this document provides an example of how the Landscape Stewardship Vision is applied to three geographic zones within the estuary boundary and the level of work that is needed in the future. At the estuary landscape scale, the level of work will continue to grow as additional planning efforts commence.

1.2.4. Communicate Stewardship Priorities and Activities to a Broad Audience

The Landscape Stewardship Vision uniquely recognizes the value of economic development and community health as vitally important to a thriving estuary landscape. The Landscape Stewardship Vision can be a tool to communicate to project funders, decision makers, and community members about the desired future conditions, activities, and priorities within the estuary landscape.

1.2.5. Understand Headwaters Partnership Priorities

Through the development of the Headwaters Partnership Landscape Stewardship Vision, it was a collective recognition among partners that developing a single way to prioritize projects, actions, or areas was not feasible at this large of a geographic scale and level of complexity. Several factors, including differences in the amount of information available, characteristics of each Geographic Zone, and scales of impact complicate prioritization. Instead, the development of the Vision revealed that partners can choose a myriad of ways to identify priorities based on their own plans, directives, funding, community desires, or momentum. At a Priority Concern Team Leader and Headwaters Partnership Forum meeting, discussion centered around factors to prioritize projects and future planning. In addition, a Headwaters partner provided a non-exhaustive list of ways to prioritize projects (Table 3 and Figure 3; Wick; 2025, *personal communication*).

Table 3. Possible Ways to Prioritize Projects

- Synergies with other projects or Priority Concerns
  (e.g. a project that addresses Birds, Invasive Species, and Water Quality)
- Cost of the project
- Funding source, matching funds availability
- State of knowledge, project needs, and clear objectives
  (e.g. a fully developed concept vs. a potential idea)
- Partners for project identified
- Critical mass of multiple factors such as funding, partners, concept plan, and synergies
- Location within the watershed (downstream impacts – positive and negative)
- Addressing the source of the problem (vs. fixing the outcomes)
- Needs identified by the community
- Specific sites (e.g. high-quality site preservation vs. restoring low-quality sites)
- Balancing site protection, restoration, assessment, and conservation
- Assessing risk based on impacts to threatened/endangered species, cascading impacts

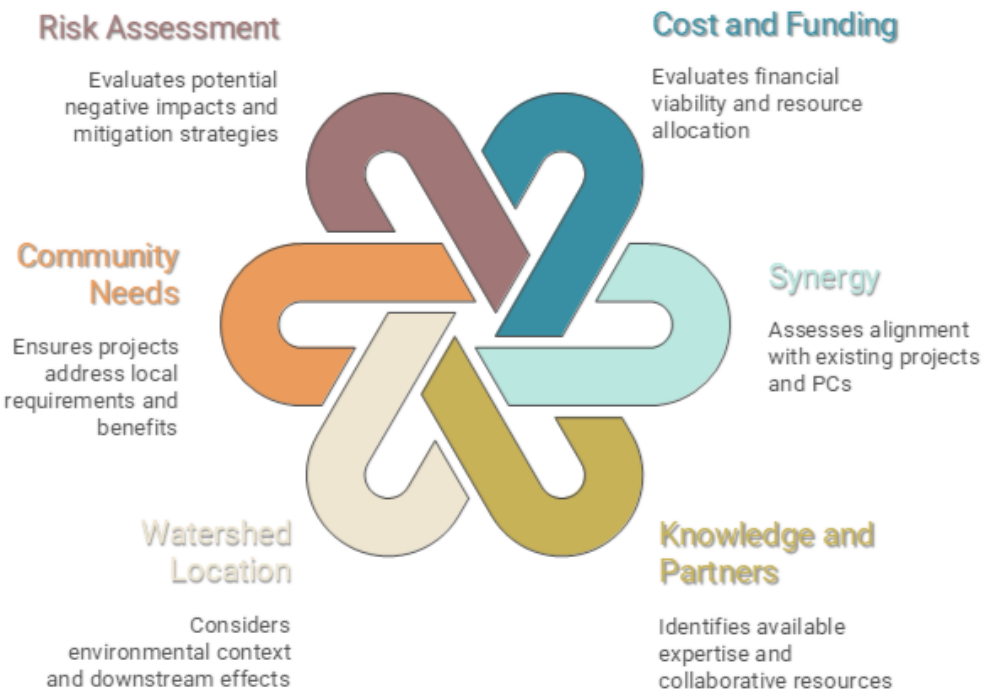


Figure 3. Project Selection Considerations

2. LANDSCAPE STEWARDSHIP VISION FRAMEWORK COMPONENTS

The Headwaters Partnership Landscape Stewardship Vision Framework is a hierarchy to aid decision making. The framework starts on the ground, with mapped features that are then assigned Categories, Themes, and Landscape Stewardship Guidelines that correspond to a Priority Concern. The set of Landscape Stewardship Guidelines link to actions (Themes) to achieve Goals and Objectives developed in 2023 by members of the Headwaters Partnership for each Priority Concern (Lake Superior Headwaters Sustainability Partnership, 2023). The guidelines are not unique to each geographic zone and Priority Concern because they represent common ideas to conservation and restoration of the estuary. However, the application of guidelines is specific to a particular geographic zone based on the Priority Concern. For example, guidelines for brook trout are not relevant in geographic zones that historically lack brook trout streams.

2.1. Development of the Landscape Stewardship Guidelines

Landscape Stewardship Guidelines (guidelines) were developed after an iterative process with Priority Concern Teams during the Landscape Stewardship Vision process. Key resources, outcomes, and activities resulting in the development of the guidelines include:

- Preliminary mapping and designation of locations of importance based on habitat quality, stressors, current project information, partnership opportunities, and information gaps was conducted by Priority Concern teams in 2024 and 2025 for the Lower St. Louis River, Upper St. Louis Bay, and Allouez Bay geographic zones. The mapping exercise created a dataset of spatially located protection, restoration, stewardship, and information needs.
- Meetings and group discussions with Priority Concern Teams leaders, and Headwaters Partnership Forum members about the mapping exercise identified the need for a Vision with a framework that could be extended beyond the initial three geographic zones.
- Development of Stewardship Guidelines, categories, and themes based on mapping data.
- Working together with the Priority Concern Team Leads to align Stewardship Guidelines with the Goals and Objectives (Lake Superior Headwaters Sustainability Partnership, 2023).

The Landscape Stewardship Guidelines represent a common toolbox of actions that support the desired Goals and Objectives for each Priority Concern. The guidelines also recognize the diversity of the Priority Concerns with an understanding that the Priority Concern teams may play different roles throughout the implementation of the Vision. For example, the Brook Trout and Wild Rice Priority Concern teams may drive project design and implementation while the Invasive Species team may have the important role of providing key considerations and best practices for project implementation.

2.2. Organization of the Landscape Stewardship Guidelines

The data compiled from the mapping exercise is a working example of the diversity of responses and scales of information arising from a large, complex organization such as the partnership (see Appendix C: Matrices). The mapping exercise highlighted what is understood about each Priority Concern; specifically, where to focus efforts toward ecological intervention, with whom collaboration could occur, and what more information might be needed. To simplify the complexity and diversity of information received in the

mapping exercise, data was organized into Categories (Table 4) and further subdivided into Themes. Themes were determined based on the type of action that could address the issue identified in the mapping feature comments.

Table 4. Category and Theme Definitions

Guideline Category	Themes
Best Practices – Recommended management and stewardship practices	**Maintain** – Management actions (direct or indirect) to keep the current ecological conditions.
	Steward – Management actions to restore, enhance, and improve the current ecological conditions.
	Plan – Practices and principles that should be incorporated during the planning or design phase completed by the Priority Concerns team and/or collaborators.
Information Gaps – Areas where additional information, study, or monitoring is needed	**Study** – Address a question that may advance future planning and design.
	Assess – Understanding a status or establishing a baseline.
	Connect – Reflects a need to connect with partners or the broader community.
Priority Actions – Specific action items for implementation	**Collaborate** – Reflects a need to connect with partners or the broader community to drive future action.
	Preserve – Maintain specific ecological functions or features that are difficult to restore once lost.
	Educate – Outreach to the broader community that improve outcomes.
	Restore – Actions that direct restoration, enhancement, or improvement.
	Design – Guidance on areas needing restoration, enhancement, or improvement.
Considerations – Important factors that other planning teams should know	**Collaborate** – Reflects a need to connect with partners or the broader community.
	Preserve – Important features, habitat, etc. that have high quality elements that should be protected or preserved, either directly or indirectly (i.e. prevent or minimize unintended impacts).

Based on these themes, a set of guidelines was developed for each Priority Concern to illustrate the known issues and feasible actions that could occur to help allocate funding and support project development. These may also be important due to a high feature density, where multiple Priority Concern Teams may collaborate on a single project.

The guidelines are organized into Categories described in Table 4Table 4. Category and Theme Definitions based on the action or next steps they describe and can be applied across geographic zones to direct and inform landscape stewardship planning and design. The process of synthesizing the data into the guidelines can be seen in the matrices in Appendix C.

2.3. Variations for Each Priority Concern during Guideline Development

Components of the Landscape Stewardship Vision reflect the variability between Priority Concerns and showcase their importance to the stewardship of a functional landscape. The Priority Concern Landscape Stewardship Vision Framework and Guidelines were created independently for each Priority Concern. For those Priority Concern Teams with mappable information (Birds, Brook Trout Streams, Coastal Wetlands, Hydrologic Integrity, Invasive Species, Terrestrial Habitat Connectivity, and Wild Rice), the guidelines were created based on the themes developed from attributes of each Priority Concern's mapped locations, integrated with the Goals and Objectives created by the Priority Concern Teams in 2023. For teams who did not add features to mapping spaces (Dredge Material Management, Lake Sturgeon, and Water Quality), the guidelines were created based on the Goals and Objectives and any updates needed, as well as information that the teams deemed important for continued work in the estuary.

The process for developing Guidelines for Community Priority Concerns involved evaluating data from a series of community events held in 2024-2026 and working with the Headwaters Partnership community council to develop a set of Stewardship Practices. Information from these two processes informed development of the Community Engagement Stewardship Guidelines. The community data is described in the document 2024-2026 Community Events Summary (Lake Superior Headwaters Sustainability Partnership, 2026d), and the Stewardship Practices are contained in the Headwaters Partnership Community Engagement Framework (Lake Superior Headwaters Sustainability Partnership, 2026b). Priority Concerns Teams also integrated their knowledge of community uses and needs in specific locations as they were mapping. This information can be found in the community and cultural information column of the Matrices and in the Interactive Map.

In addition to the Community Engagement Guidelines, the Headwaters Partnership has developed several resources to support engagement between partners and with the public, including the Community Engagement Framework, the Community Atlas, and the Community Engagement Toolkit (Lake Superior Headwaters Sustainability Partnership, 2026c). The Community Atlas is a mapping tool for identifying community characteristics and assets. The Community Engagement Toolkit is a step-by-step guide on how to engage community members in project planning. These resources were developed during a parallel process to this visioning process and will be integral guides in the future for the Landscape Stewardship Vision Framework and the partnership as a whole. The Community Engagement resources can be found at the Headwaters Partnership website, see: https://headwaterspartnership.org/

2.3.1. Stewardship Guidelines for Each Priority Concern

The Stewardship Guidelines for each priority concern are presented in the following graphic illustrations on the following 13 pages.

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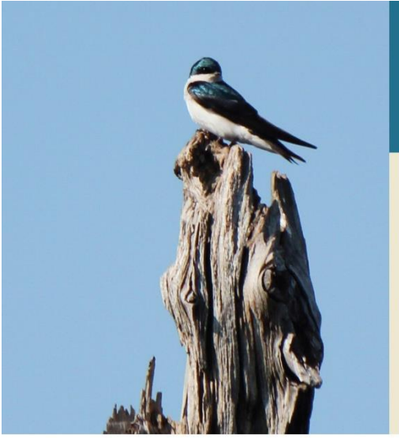

PRIORITY CONCERN:
WETLAND BIRDS

To ensure the resilience of wetland bird populations, we must restore the structural diversity and connectivity of wetland complexes within the St. Louis River Estuary. By securing these critical habitat mosaics, we support stable breeding grounds and high-energy migratory corridors.

BEST PRACTICES

PLAN

- Restore a hemi-marsh mosaic designed to support breeding marsh-obligate species—such as rails, bitterns, and wrens—while providing critical stopover habitat for migratory waterfowl.
- Implement an adaptive management framework to refine conservation strategies in response to shifting wetland dynamics and population trends of target species.

MAINTAIN

- Maintain an optimal mosaic of emergent vegetation and open water to maximize wetland edge complexity.

INFORMATION GAPS

STUDY

- Implement standardized monitoring protocols to establish ecological baselines, quantifying the value of wetland sites for breeding birds and migratory stopover occupancy.
- Quantify the conservation value of wetland sites by utilizing multi-metric assessments of bird productivity, habitat quality, and focal indicator species to serve as metrics for ecosystem health.

PRIORITY ACTIONS

DESIGN

- Optimize wetland projects for priority birds by aligning project hydrology and vegetation structure with species-specific habitat recommendations during the initial design phase.

RESTORE

- Prioritize restoration of hemi-marsh wetlands to support diverse wetland bird communities.
- Restore critical, limited-extent wetland habitats in the St. Louis River Estuary by aligning site hydrology and structure with the specific requirements of priority bird species.
- Create complex habitat by establishing and maintaining hemi-marsh conditions, including shallow water, exposed mudflats, and gradual vegetation transitions to provide essential roosting and foraging habitat.

CONSIDERATIONS

COLLABORATE

- Collaborate with partners to maximize benefits to wetland ecosystem function and resilience by coordinating hydrologic restoration, vegetation management, and bird habitat objectives across projects.
- Engage private landowners to protect and restore critical wetland functions, ensuring a connected mosaic of diverse vegetation and hydrologic regimes for priority bird populations.

PLAN

- Integrate climate-resilient design into wetland projects, using long-term monitoring to track species range shifts and adaptive management to ensure habitat connectivity remains functional despite changing environmental regimes.
- Promote landscape resilience by integrating successional modeling into wetland design and employing adaptive management to ensure habitats remain productive for wetland-dependent birds over time.

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PRIORITY CONCERN:
SHORELINE BIRDS

Identify essential shoreline and island habitats necessary for promoting waterbird productivity and shorebird migration. Conservation efforts must emphasize habitat connectivity and disturbance-free zones that remain viable under projected sea-level rise and climatic transitions.

BEST PRACTICES

PLAN

- Preserve and optimize beach and nearshore mosaics—including islands and mudflats—to provide critical nesting and migratory stopover sites for diverse bird populations.

MAINTAIN

- Systematically update shoreline management plans to mitigate erosion, manage shifting vegetation, and balance recreational demands with ecological needs of local bird species.

INFORMATION GAPS

STUDY

- Establish ecological baselines by conducting standardized avian surveys during peak migration and breeding seasons. This data will quantify how shorebirds and waterbirds utilize specific beaches, mudflats, and nearshore habitats.
- Assess the significance of shoreline and island sites by monitoring nesting productivity, evaluating habitat integrity, and documenting species composition. This includes identifying indicator species to serve as benchmarks for habitat quality.

PRIORITY ACTIONS

RESTORE

- Prioritize creation, enhancement, and restoration of natural shoreline and nearshore habitats within the St. Louis River Estuary in areas with the highest potential to recover rare or absent habitats—such as mudflats, sandy beaches, and essential vegetation gradients—to support diverse shorebird and waterbird populations.

DESIGN

- Integrate bird conservation into the design phase of shoreline projects by providing site-specific guidance on infrastructure, vegetation, and disturbance management to better support shorebird and waterbird species.

CONSIDERATIONS

COLLABORATE

- Partner with stakeholders to optimize shoreline resilience by integrating stabilization and recreation management with the specific ecological requirements of shorebird and waterbird species.
- Cultivate partnerships with private landowners to promote shoreline stewardship that balances effective erosion control and recreation with the protection of vital bird habitats.

PLAN

- Design climate-ready shorelines that mitigate erosion and storm impacts while facilitating habitat transitions. Incorporating adaptive management strategies will ensure continued connectivity and support for species as they respond to shifting environmental conditions.

Photo Credits:

- *Natural Resources Research Institute*
- *Emmons & Olivier Resources, Inc.*

PRIORITY CONCERN: FOREST BIRDS

Support diverse, self-sustaining populations of forest-dependent birds by enhancing forest structure and understory density. Identifying native plant communities that foster biodiversity while remaining resilient to climate change will be critical. Maintaining high-quality riparian and upland corridors is essential to facilitate movement and provide high-energy stopover habitat.

BEST PRACTICES

PLAN

- Promote a diverse mosaic of forest age classes and structural complexity to provide high-quality habitat for riparian and forest-dwelling birds throughout their breeding and migratory cycles.
- Systematically update forest management plans every ten years to ensure that forest succession, disturbance impacts, and wildlife goals remain aligned with a changing climate.

MAINTAIN

- Prioritize the retention of structural features—including snags, coarse woody debris, and multi-layered canopies—alongside patches of mature forest to maintain complex habitat architecture.

INFORMATION GAPS

STUDY

- Establish ecological baselines to quantify the conservation value of forested sites for breeding and migratory bird populations. By integrating standardized point counts with autonomous acoustic monitoring, we can utilize long-term monitoring data to evaluate restoration efficacy and inform adaptive management.

PRIORITY ACTIONS

DESIGN

- Integrate bird conservation into the design phase of forest projects by providing site-specific guidance on silvicultural treatments, structural complexity, and landscape connectivity to support priority species throughout their life cycles.

RESTORE

- Prioritize the restoration of structurally complex forests—incorporating varied age classes and canopy gaps—to sustain high-priority bird communities throughout their breeding and migratory cycles.
- Prioritize restoration within the St. Louis River Estuary for sites with the highest potential to recover scarce forest types. Efforts will focus on re-establishing structural diversity and landscape connectivity to meet the specialized needs of priority avian species.
- Enhance habitat heterogeneity within forested wetlands by maintaining a mosaic of open water and early-successional gaps which provide essential foraging and roosting opportunities.

CONSIDERATIONS

COLLABORATE

- Partner across agencies to build resilient forest landscapes where sustainable management and recreation coexist with thriving habitats for breeding and migratory birds.
- Cultivate long-term partnerships with private landowners to promote forest stewardship that preserves structural complexity and habitat connectivity for forest-dependent bird species.

PLAN

- Incorporate climate resilience into forest planning by addressing shifts in species composition, shifting disturbance regimes and habitat transitions. Use adaptive management to maintain resilient ecosystems that support the life-cycle needs of forest bird communities.

Photo Credits:

- *Natural Resources Research Institute*
- *Emmons & Olivier Resources, Inc.*

PRIORITY CONCERN:
BROOK TROUT STREAMS

Maintain, enhance, and rehabilitate self-sustaining, Brook Trout populations within resilient watersheds.

BEST PRACTICES

PLAN

- Develop stormwater management plans and implement projects that reduce the negative impacts of stormwater discharged to Brook Trout watersheds.

EDUCATE

- Develop outreach materials that highlight the importance of headwater wetlands and stormwater management for the long-term health of Brook Trout watersheds.
- Develop concept plans for specific high-priority watersheds to promote advancement of actions that preserve, enhance and restore their ecological functions.

PRESERVE

- Mitigate the negative impacts of development to the greatest degree possible.

MONITOR

- Assess and characterize high quality wetland complexes within priority Brook Trout watersheds.

STEWARD

- Ensure existing regulations are being implemented to protect habitat.
- Improve recreational access to brook trout watersheds to enhance public support for their restoration and preservation.

MAINTAIN

- Maintain the quality of areas that have already undergone restoration efforts.
- Advance currently funded projects to completion.

INFORMATION GAPS

STUDY

- Understand what factors could be addressed to make difficult projects more feasible.
- Identify connectivity barriers to critical habitat areas.

ASSESS

- Gather baseline data such as water temperature, sediment loading, habitat quality, and hydrology to determine the feasibility of future projects and to aid in the prioritization of projects for Brook Trout watersheds.

PLAN

- Work through how to restore a challenging site with available resources.

PRIORITY ACTIONS

RESTORE

- Prioritize and sequence future stream restoration efforts in a way that will enhance previously completed projects to maximize the ecological uplift of the entire system.
- Manage erosion from heavily incised tributaries.
- Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.

PLAN

- Develop roadmaps to resilience for quality Minnesota Brook Trout watersheds with sources of stress that are considered high.

STEWARD

- Improve recreational access to brook trout watersheds to enhance public support for their restoration and preservation.
- Identify and establish government units responsible for long term maintenance of past, present and future projects.

PRESERVE

- Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands.
- Preserve coldwater tributaries that offer thermal refugia and spawning habitat.

CONSIDERATIONS

COLLABORATE

- Work with appropriate natural resource management agencies to prioritize restoration and monitoring needs.
- Work to acquire easements to preserve or restore high quality habitat and maintain connectivity.
- Work with the City of Duluth on city managed land and projects.
- Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.
- Work with municipal authorities to develop processes and protocols for preserving priority habitats.

Photo Credits:
- *South St. Louis SWCD*
- *Emmons & Olivier Resources, Inc.*

PRIORITY CONCERN:
COASTAL WETLANDS

Restore and protect resilient coastal wetland habitats, so that water quality and substrate conditions support healthy native fish and wildlife populations, healthy native plant communities, ecosystem services, recreational uses, and commercial activities in the St. Louis River and Estuary.

BEST PRACTICES

PLAN

- Continue to control invasive species (e.g. cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.
- Implement Early Detection Rapid Response (EDRR) principles to identify the establishment of new invasive species that have a high probability of negatively impacting native plant communities or the spread of existing invasive species populations to new areas.
- Pro-actively plant trees and shrubs in forested wetlands where they are at risk of forest conversion due to emerald ash borer (EAB), browse pressure, or climate change disturbance.
- Manage dredge spoils to prevent the spread of aquatic invasive species (AIS,) especially to new or high quality areas.
- Use high quality reference sites within the St Louis River estuary or a similar functioning Great Lakes coastal wetlands to inform future restoration designs and derive species planting lists.
- Plant native species in restored coastal wetlands selecting suitable species derived from an ecologically functioning reference community within the SLRE or a similar system, like Wisconsin's South Shore coastal wetlands. Emphasize culturally significant species such as wild rice and northern white cedar when appropriate.
- Conduct baseline surveys before restoration and follow-up monitoring focusing on vegetation and other potentially impacted fauna species. and Set realistic reference goals to determine success.

INFORMATION GAPS

STUDY & ASSESS

- Identify and learn more about wetlands not included in the Great Lakes Coast Wetland Monitoring Program.
- Identify areas where shorelines can be softened, the emergent plant zone can be expanded, or islands can be created to slow wave intensity, buffer high quality areas, and re-connect or expand existing wetlands.
- Conducting monitoring to prevent the spread of invasive species into existing high quality habitats.
- Understand the importance of high quality wetlands to other priority concerns such as birds.
- Identify areas where large scale factors (shoreline change, fetch) impact the existing or potential plant community.

PRIORITY ACTIONS

PRESERVE:

- Preserve and protect high quality reference wetlands, and use these locations as references for restoration design.
- Protect and improve small and limited wetlands that are creating a habitat corridor between larger wetlands for birds, fish and other wildlife.

EDUCATE

- Develop public demonstration areas for public education on the control and restoration of an area impacted by invasive species.
- Improve recreation and education infrastructure such as boat launches and wildlife viewing area.

RESTORE:

- Promote dynamic native plant communities that are able to respond to fluctuating estuary water levels by reducing monocultures of cattail and other invasive species.
- Restore specific wetland types or habitat conditions such as hemi-marsh, sheltered floating mat, and incorporate wild rice where conditions are appropriate.
- Develop wetland restoration goals that stress ecological function rather than goals focused on quantities of habitat created.
- Address shoreline erosion due to fetch through barrier island creation and shoreline softening.

CONSIDERATIONS

PRESERVE

- Control invasive species in high quality reference native plant community locations.
- Prevent invasive species from becoming re-established in newly restored areas or where previous worked has occurred to prevent loss of potential ecological gains.
- Prioritize shoreline softening and new coastal wetland creation in areas that might connect existing wetlands or create a habitat corridor.
- Identify overlapping objectives with other priority concern teams to enhance benefits of projects.
- Confirm that proposed restoration will enhance existing wetland habitat, and, for example, that the location is not already a high-quality area.

Photo Credits: *Kelly Beaster / Emmons & Olivier Resources, Inc.*

PRIORITY CONCERN:
COMMUNITY ENGAGEMENT

Prioritized and valued as essential to support a thriving landscape and community in the lower St. Louis River. Communities generate, inform, co-develop, contribute to, and evaluate the actions of the Headwaters Partnership, with reciprocal responsiveness, resources, and support from the Partnership.

BEST PRACTICES

PLAN

- Plan for equitable community engagement before, during, and after project development. Seek adequate funding to implement your plan.
- Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.
- Seek to learn about the history and culture of a place, including communities that have been excluded or harmed.

Headwaters Partnership Community Council 2025/2026

- Recognize the importance of building relationships for lasting community engagement using the Headwaters Partnership Community Engagement Framework as a guide for learning. Plan for the time, funding, and capacity that this takes.
- Use a step by step approach for engaging with communities at any point in project development using the Headwaters Partnership Community Engagement Toolkit.
- Approach engagement with genuine curiosity, humility, openness, and flexibility rather than predetermined goals or agendas.

- Use simple, clear language in communications with the public. Avoid technical words or acronyms and explain things in ways that anyone can understand.
- Honor traditions and cultural practices in your engagement. Strive to understand and follow cultural protocols as appropriate. Work alongside Indigenous and local community leaders.
- Build-in evaluation and feedback loops to assess and learn from engagement efforts. Share learning gained from evaluation with the broader Headwaters partners.

PRIORITY ACTIONS

DESIGN

- Meet people at community events, parks, libraries, and community centers, where people have easy access and feel comfortable, rather than asking them to come to you. Build authentic connections through consistency, rather than single events.
- Design informal, unstructured activities such as simple, shared meals and intergenerational activities in outdoor spaces to create an environment where people are comfortable and feel they belong. Engage with community members in these spaces to understand concerns, input, and priority areas.

COLLABORATE

- Collaborate with partners to create opportunities for stewardship in action - citizen science, event hosting, volunteer activities, and youth leadership. Honor and celebrate the commitment of volunteers.
- Create a cross-departmental team to help with engagement in your organization. Utilize internal resources and staff, such as volunteer programs, outreach, and education.
- Support local community groups, to help build capacity for partnership and engagement, through funding; and stipends to community members for their time and expertise.
- Collaborate with community organizations, schools, tribal, and partner networks already creating programming for community members where interest align.

- Create opportunities to share stories of disconnection and reconnection to land, water, and place. Recognize that reconnection is emotional, political, and cultural, as well as informational. Consider inviting Ojibwe story tellers to share aadizookaan or other important stories in the winter months.
- Use open-ended questions that invite community-defined visions and values such as "What do you want out of the resources in your backyard?" or "How do you like to connect with this place?" Share how their experiences and input connects with your efforts. Share back how it shapes project outcomes.
- Offer engagement in multiple forms - interactive, digital, visual, oral, artistic. Partner with other community organizations that have skills to lead in non-traditional ways.
- Design intergenerational engagement opportunities to reach youth, families, and elders and to hear their stories, concerns, and interests.
- Capture feedback and learn from conversations during informal, unstructured activities to connect future engagement efforts to what people already care about.
- Share information learned and communicate next steps in a timely manner to build trust and transparency within project teams, across the partnership for collective learning, and back with participants for accountability.

Photo Credits:
- *St. Louis River Alliance*
- *Minnesota Land Trust*

PRIORITY CONCERN:
DREDGE MATERIAL MGMT.

Increase public awareness of the dredging process for maintaining the Great Lakes navigation system and identify opportunities to more effectively manage material that benefits both the environment and economic interests.

BEST PRACTICES

PLAN

- Align proposed dredging operations with environmental exclusions to limit impacts on habitat and the aquatic community.
- Consider seasonal timing and placement locations to avoid negatively impacting the St. Louis River fishery.
- Use the EPA dredge material decision support tool to help prioritize beneficial use opportunities.
- Examine current regulatory standards to determine fit with Clean Water Act requirements as they relate to dredging and material management (e.g. Section 401, Section 404, NPDES permit conditions.)

MAINTAIN

- Protect the areas identified in the Harbor Study that have high quality vegetation, macro-invertebrates and sediment chemistry from negative impacts to due dredge materials management.

INFORMATION GAPS

STUDY

- Examine nutrient loading and bio-accumulative compounds in sediment horizons to determine potential inputs from wastewater and runoff sources. Reference or establish specific cutoff values for which constituents are likely to manifest in sheltered bays, interacting with warming water temperatures, that increase exposure risks to human health and the environment.
- Assess the performance or results where dredge material is beneficially used.

ASSESS

- Characterize sediment adequately based on proposed use.
- Document concerns or negative impacts due to dredge material management.
- Document turbidity baseline values and determine what rates result in detrimental biochemical impacts and/or increase nutrient availability.

PRIORITY ACTIONS

DESIGN

- Provide general guidance on preferred material characterization used for beneficial use based on intended use.
- Seek and maintain a list of opportunities for beneficial use for both in-water and land-based opportunities.
- Determine natural resource management priorities that align with the City's of Duluth and Superior comprehensive plans and Duluth Seaway Port Authority land use plans.

EDUCATE

- Promote and facilitate the use of dredged material for beneficial uses, both in-water and land-based applications.
- Use results from the public perception survey on dredge material management to target future outreach efforts to improve public awareness and understanding.
- Promote the importance of accessing a federal navigation system on the regional economy.

CONSIDERATIONS

CONNECT

- Connect with Dredged Material Management Team members during initial restoration planning stages.

COLLABORATE

- Collaborate with other Priority Concern teams on shared goals and objectives.

Photo Credits:

- *Duluth Seaway Port Authority*
- *Emmons & Olivier Resources, Inc.*

PRIORITY CONCERN:
HYDROLOGIC INTEGRITY

For the streams, lakes, and wetlands within the estuary landscape to be resilient and function as close as possible to their range of natural variation, which includes a natural flow regime and healthy water quality.

BEST PRACTICES

PLAN

- Develop and adopt a climate resilient stormwater management focused development code.
- Combine sub-watershed and stormwater management planning with regional transportation planning to maximize efficiency of funding resources and align schedules.

STEWARD

- Prioritize green infrastructure opportunities and areas to be restored/protected.
- Implement an infrastructure upgrade plan for climate resiliency.

MAINTAIN

- Develop priorities for protection – forests, wetlands, streams, riparian areas, shoreline setbacks, and watershed storage.

INFORMATION GAPS

STUDY

- Conduct baseline monitoring as we move post-Area of Concern.
- Inventory natural storage and retention opportunities (wetlands, glacial till deposits, native plant community retention).
- Improve the understanding of groundwater inputs, flows, recharge rates (efforts are currently underway in MN & WI).
- Understand how climate change impacts, including storms, droughts, rising temperatures, and reduced ice cover, affect estuarine processes.
- Understand patterns and drivers of change in lake levels, seiche impacts, and implications for Lake Superior near shore areas and the estuary.

ASSESS

- Conduct baseline inventories to inform sub-watershed planning, which may include an inventory of water storage opportunities, wetlands, cold water inputs, biological community health, storm sewer system mapping, road-stream crossings, habitat, or stream health.
- Enhance monitoring of streams and wetlands (e.g., flows, temperature, and water quality). Also included as Water Quality Objective 3.
- Implement an urban stormwater management strategy (see Brook Trout Objective 2).
- Create and maintain an inventory of green/grey infrastructure.
- Evaluate if stream crossings are limiting stream functions such as passage barrier and wetland connections. A focus on railroad crossings or causeways and culverts; including the railroad causeway along the St. Louis River.

LAKE SUPERIOR headwaters Sustainability Partnership

PRIORITY ACTIONS

RESTORE

- Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.
- Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.
- Remove water bodies from the Clean Water Act 303(d) impaired waters list.

PRESERVE

- Preserve coldwater tributaries, wetlands, springs, forested greenspaces, and designated natural areas to maintain baseflow conditions, and coldwater refugia for aquatic organisms and reduce sediment input.
- Prioritize lands to be sold or developed that should be protected in headwaters, wetlands, and other vulnerable areas.

DESIGN

- Develop implementation focused sub-watershed management plans at HUC 10-12 scale that comprehensively identify and address ecological and physical stressors.

MAINTAIN

- Pursue funding to support ongoing monitoring to help identify stressors and track improvements.

COLLABORATE

- Facilitate communication via a contact list of practitioners focused on watershed health (or other more specific topic).
- Support the local natural resource groups that provide technical knowledge and collaboration as well as public engagement.

EDUCATE

- Support citizen science opportunities and participatory science (e.g. school and community engagement, updated Lake Superior Streams website, public service announcements, one on one contact with landowners, site stewardship by recreation and community groups).

CONSIDERATIONS

COLLABORATE

- Increase availability of monitoring data to the public and partners.
- Emphasize green infrastructure solutions, especially to capture excess sediment before it reaches downstream water bodies.
- Restore, protect, and enhance watershed functionality in relation to stormwater management goals.
- Incorporate updated design standards for infrastructure that include climate change considerations.
- Coordinate stormwater management planning with other jurisdictions, state, county and municipal, township.

PRESERVE

- Protect and restore the resiliency of water bodies against physical and ecological changes throughout time.

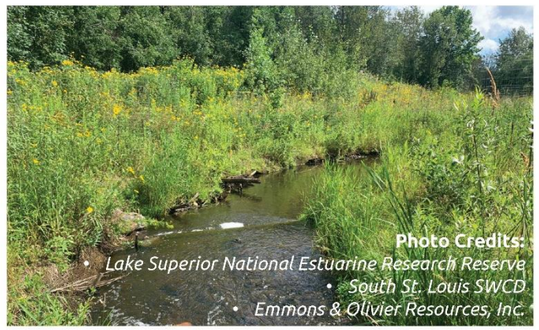


Photo Credits:
- *Lake Superior National Estuarine Research Reserve*
- *South St. Louis SWCD*
- *Emmons & Olivier Resources, Inc.*

PRIORITY CONCERN:
INVASIVE SPECIES

Protect and maintain diverse native plant communities and resilient habitats within the Headwaters Partnership region so resilient ecosystem services are provided for plants, animals, and people with minimal impact from invasive species. Conduct invasive species prevention, education, and population management activities in a biologically sound and culturally appropriate manner.

BEST PRACTICES

PLAN

- Consider prioritization criteria from partners managing invasive species within and outside of the St. Louis River estuary, such as the Great Lakes Indian Fish and Wildlife Commission.
- Identify target invasive species on a site-specific basis based on management goals, public health risk, habitat quality, potential for spread or range expansion, state-listed noxious weeds, and risk to culturally significant and sensitive species.

MAINTAIN

- Conduct regular Early Detection Rapid Response monitoring and notify agencies of new species finds and response plan.

STEWARD

- Prioritize areas where previous restoration work or invasive treatments have occurred to help ensure previous achievements are not degraded and investments are not wasted.

INFORMATION GAPS

STUDY

- Monitor public access areas (e.g. boat launch, trail head) or other locations where invasive species may likely be spread or establish.
- Meet with partners to design and implement invasive species population management strategies (Integrated Pest Management) and include a strategy with guidance for carefully targeted herbicide use.

CONNECT

- Reach out to technical and local knowledge stakeholders on invasive species presence and management efforts, especially in areas that appear to lack information, before prioritizing actions to better identify and address local management objectives.
- Acknowledge the indigenous traditional ecological knowledge perspective when developing management actions and seek opportunities for appropriate engagement to help inform actions.

LAKE SUPERIOR headwaters Sustainability Partnership

PRIORITY ACTIONS

COLLABORATE

- Engage with decision makers, stakeholders, citizens, resource managers and partners to communicate threats posed by invasive species and encourage participation in prevention and management activities.

EDUCATE

- Develop consistent messaging for invasive species outreach & education utilizing well established campaigns such has Stop Aquatic Hitchhikers and Play Clean Go.

RESTORE

- Prioritize areas for invasive species control where critical habitat or species are present, such as native plant communities, manoomin, or walleye and sturgeon spawning habitat.
- Continue to control invasive species (cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.

CONSIDERATIONS

COLLABORATE

- Recommend inclusion of invasive species management as a component of projects completed by others when/ where appropriate.

Photo Credits:

- *St. Louis River Alliance and Community Action Duluth*
- *St. Louis River Alliance/Old Saw Media*
- *Wisconsin DNR*

PRIORITY CONCERN:
LAKE STURGEON

Maintain, enhance, & rehabilitate self-sustaining Lake Sturgeon populations by providing a resilient watershed through the protection and rehabilitation of habitat and migration corridors important for all life stages.

BEST PRACTICES

MAINTAIN

- Continue to control sea lamprey and other invasive species to minimize negative impact on Lake Sturgeon.

PLAN

- At the project-level scale, consult with state Department of Natural Resources (DNR) and Tribal natural resource staff on potential benefits and impacts to sturgeon habitat for potential projects.

INFORMATION GAPS

ASSESS

- The results of long-term spawning and larval/ juvenile surveys will enable the evaluation of species restoration and inform adaptive management into the future.
- Continue annual spawning surveys with goals of estimating sturgeon population size while also evaluating growth, survival, and spawning periodicities.
- Continue to index natural reproduction through annual larval drift netting and juvenile netting surveys.

PRIORITY ACTIONS

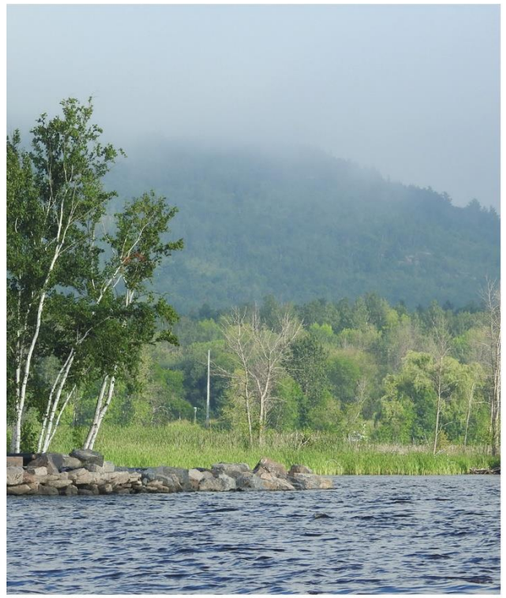
RESTORE

- Remove or mitigate both upstream and downstream migration barriers to Lake Sturgeon.
- Improve Lake Sturgeon juvenile rearing habitat and restore off channel deep hole habitat.

EDUCATE

- Increase public awareness and education on the ecological and cultural importance of Lake Sturgeon.

CONSIDERATIONS



COLLABORATE

- Remove barriers such as undersized culverts and disconnected floodplains that limit the natural transport of sediment and natural hydrologic processes.

PRESERVE

- Protect important habitat for all uses (rearing, overwintering, feeding, migrating) by various life stages of Lake Sturgeon.

Photo Credits:

- *Dan Wilford*
- *Brian Rucker*
- *Minnesota Land Trust*
- *Emmons & Olivier Resources, Inc.*

PRIORITY CONCERN:
TERRESTRIAL HABITAT CONNECTIVITY

Terrestrial habitats in the Headwaters Partnership region are resilient to the impacts of climate change and development, ecologically connected, and support thriving ecological communities that include humans and culturally significant plant and animal species.

BEST PRACTICES

PLAN

- Support and guide the protection and restoration of wetlands and forested habitat within the St. Louis River watershed to enhance terrestrial connectivity and climate resiliency.
- Develop an index of fragmentation and track over time to measure change and aid in prioritization of restoration and protection actions.

INFORMATION GAPS

ASSESS

- Compile wildlife movement and road mortality data to better understand existing barriers, identify connectivity opportunities, and collect additional data to fill data gaps that hinder our ability to identify safe road crossing locations and critical linkages between core habitat patches.

PRIORITY ACTIONS

RESTORE

- Restore or enhance habitat to create landscape corridors for increased connectivity.

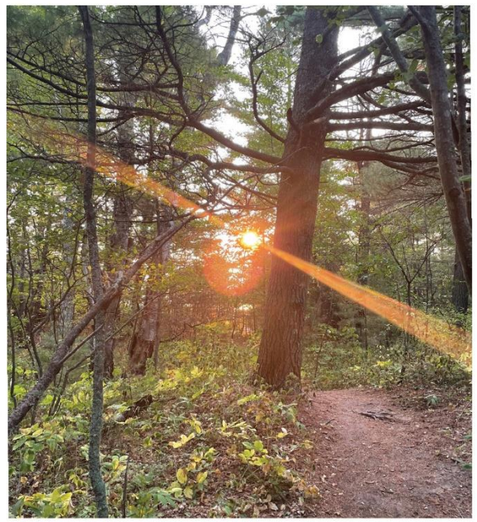
COLLABORATE

- Develop comprehensive forest management plans to protect core forest areas. Collaborate with partners and the community.

PRESERVE

- Protect and enhance existing or newly restored landscape corridors, including aquatic organism passage and riparian/stream connectivity.

CONSIDERATIONS



COLLABORATE

- Support the implementation of priority management actions identified in existing plans - such as the Wisconsin and Minnesota State Wildlife Action Plans - that contribute to increased terrestrial connectivity within the St. Louis River watershed.

PRESERVE

- Continue to protect and enhance current core areas of large intact terrestrial habitat.

PRIORITY CONCERN:
WATER QUALITY

Maintain water quality in waterbodies within the Headwaters Partnership region that falls within current state and federal regulations, taking into account natural variation inherent in unique ecosystems within the estuary; supports healthy aquatic communities; and enhances cultural and environmental ecosystem services.

BEST PRACTICES

PLAN

- Assess phytoplankton community composition to assess ecosystem health.
- Communicate water quality issues identified via water quality monitoring programs for agencies and partners to address.
- Assess the site-specific potential for water quality contamination from nearby contaminated sites.
- Review land use plans, zoning, and development codes to determine adequacy for water quality protection now and in the future with consideration for climate change.

INFORMATION GAPS

ASSESS

- Identify gaps in existing monitoring programs to determine what information still needs to be collected, such as new and emerging contaminants.
- Characterize baseline phosphorus and turbidity conditions in Bear and Bluff Creeks and Allouez Bay to define natural variability and watershed influences on water quality.

STUDY

- Characterize spatial and temporal patterns in water quality through all seasons.
- Determine acceptable water quality standards for shallow bays in the estuary that consider natural variation in water quality.
- Study how climate change impacts affect estuarine process and subsequent effects on water quality.
- Study patterns and drivers of lake level changes and implications for water quality in the St. Louis River estuary.
- Develop understanding of how limited hydrologic connection impacts. water quality in wetlands.
- Identify opportunities for restoring historic land alterations and the negative water quality effects within the Estuary watershed.

LAKE SUPERIOR headwaters Sustainability Partnership

PRIORITY ACTIONS

RESTORE

- Address pollutants and stressors from point and non-point sources that are causing water quality impairments (303-d listed waters).

DESIGN

- Maintain and expand water quality monitoring programs in the estuary, streams, and wetlands.

EDUCATE

- Increase availability of water quality monitoring data and interpretations of the data to the public.

COLLABORATE

- Develop efficient collaborative monitoring strategies among partners.
- Improve collective understanding of hydrodynamcis in the St. Louis River Estuary and near shore areas of Lake Superior.

Photo Credits:

- *MPCA*
- *WDNR*
- *Lake Superior National Estuarine Research Reserve*

CONSIDERATIONS

RESTORE

- Implement Invasive Species objectives for aquatic invasive species control.

COLLABORATE

- Evaluate linkages between ambient water quality and completed restoration projects to determine whether observed water quality improvements can be attributed to project actions.
- Support restoration and protection projects in streams tributary to the St. Louis River Estuary.
- Improve hydrologic connectivity to sheltered bays and disconnected wetlands to address water quality issues.

PRIORITY CONCERN:
WILD RICE (MANOOMIN)

Increase the abundance and distribution of self-sustaining wild rice within the St. Louis River Estuary to increase opportunities for culturally important harvest, improve fish and wildlife habitat, and enhance Manoomin's resiliency for long-term persistence.

BEST PRACTICES

PLAN

- Identify hydrologic and geomorphic restoration and/or enhancement opportunities to benefit the creation of suitable manoomin habitat, where possible.
- Evaluate positive/negative impacts to manoomin and manoomin habitat during project development and implementation.

MAINTAIN

- Implement the Manoomin Restoration Model at Core Restoration Sites as directed by the 2024 St. Louis River Estuary Manoomin Restoration and Stewardship Plan.
- Manage the impact of Canada goose herbivory as recommended in the 2024 St. Louis River Estuary Manoomin Restoration and Stewardship Plan.

INFORMATION GAPS

STUDY

- Develop research and monitoring programs to address Research Priorities identified in the Goals and Objectives for wild rice. For example:
- Quantify seed viability in St. Louis River Estuary sediments and define what it means to achieve a resilient manoomin seed bank.
- Investigate the prevalence of toxic metals in St. Louis River Estuary wild rice and potential human health impacts from dietary exposure.
- Determine the density at which wild rice is resilient to herbivory pressure from Canada geese in the St. Louis River Estuary.
- Define the spatial dynamics of Canada geese relative to wild rice distribution and quantify the impact of goose removals on annual wild rice seed production.
- Develop and implement an estuary-wide study to identify the relationship between muskrat activity and factors influencing wild rice persistence (e.g., density, acreage, presence of competing vegetation) at restoration and control sites in the St. Louis River Estuary.
- Develop a strategy for implementing regular remote sensing data collection to define the extent of wild rice across the St. Louis River Estuary.
- Identify and evaluate methods for sustaining and enhancing community relationships with wild rice (e.g., recruiting harvesters, stewards, etc.).

Photo Credits:

- *WDNR*
- *Minnesota Land Trust*
- *Emmons & Olivier Resources, Inc.*

PRIORITY ACTIONS

RESTORE

- Implement aquatic invasive species management strategies where conflicts with manoomin restoration objectives arise.

EDUCATE

- Develop local education and outreach programs (e.g., signage, seminars, workshops, rice camps, etc.) to recruit future stewards and build community consensus for long-term stewardship.

CONSIDERATIONS

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3. APPLYING THE LANDSCAPE STEWARDSHIP VISION FRAMEWORK TO THE LOWER ST. LOUIS RIVER, UPPER ST. LOUIS BAY, AND ALLOUEZ BAY GEOGRAPHIC ZONES

The Landscape Stewardship Vision Framework presented in Section 2 was developed based on application to three of the nine geographic zones in the Headwaters Partnership estuary landscape: Lower St. Louis River, Upper St. Louis Bay, and Allouez Bay (Figure 4). These geographic zones were selected to pilot the development of landscape stewardship visions because they represent a diversity of current and emerging issues facing the estuary landscape. In the case of the Allouez Bay geographic zone, it represented an opportunity to update a 2022 visioning effort that inspired the current process. The Landscape Stewardship Vision developed for these three geographic zones will not only drive local, site-specific work in the future, but will also provide a template for how the Landscape Stewardship Vision Framework can be applied to the remaining six geographic zones in an efficient, repeatable manner.

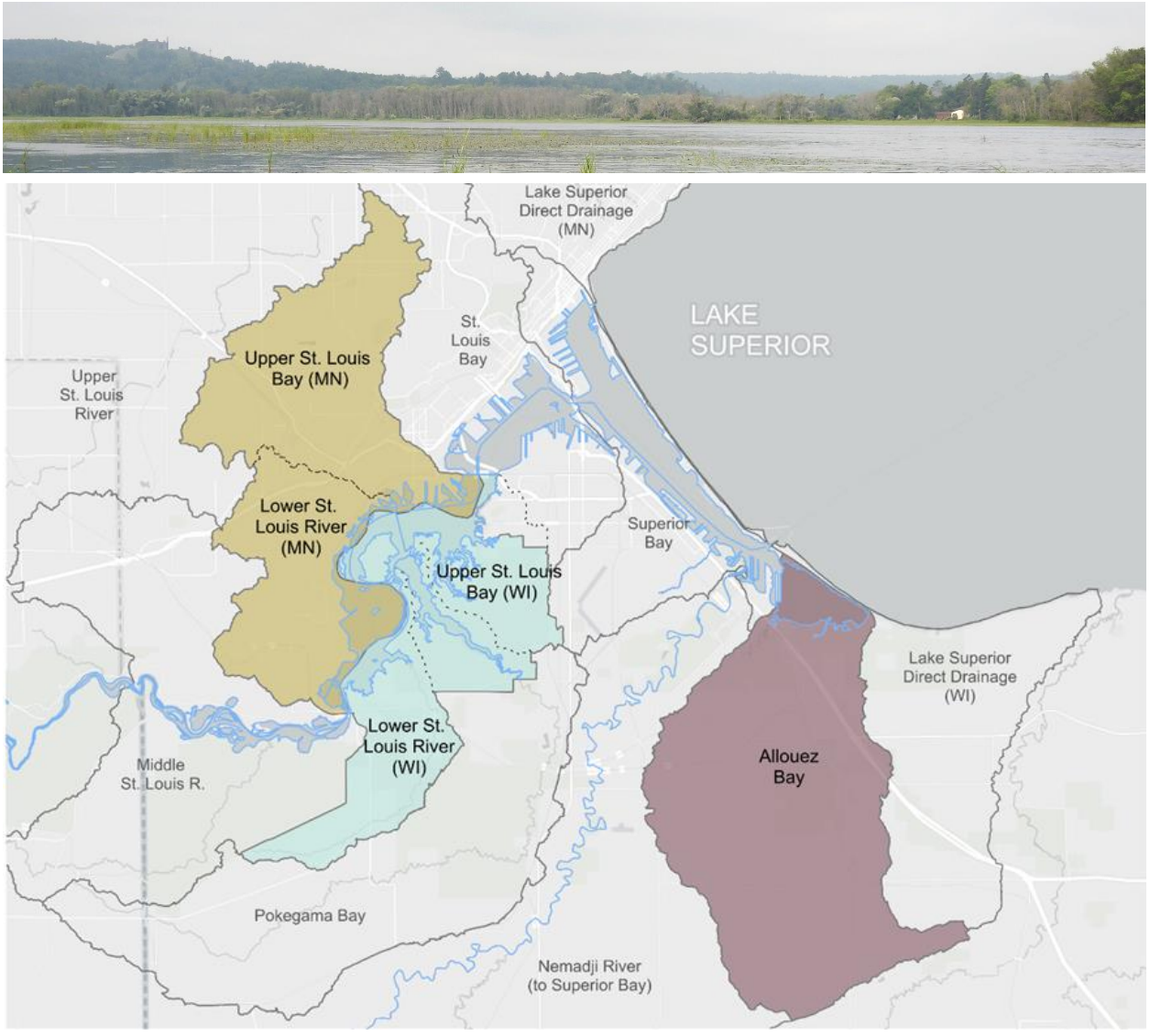

Figure 4. Map of the Three Geographic Zones Used to Develop and Apply the Headwaters Partnership Landscape Stewardship Vision Framework and Process

During the development of the vision, the Lower St. Louis River and Upper St. Louis Bay were combined into one geographic zone for planning purposes because they are immediately adjacent to each other. Priority Concern Teams did not distinguish between the two geographies when mapping potential projects. A more natural delineation occurred when the Priority Concern teams considered the state, Minnesota or Wisconsin, because although a shared vision exists for landscape conservation among the partners, each state has its own unique opportunities, constraints, data availability, and standards of practice that need to be considered when planning and implementing projects.

3.1. A Look at Each Geographic Zone

Each of the three geographic zones considered in the landscape stewardship visioning process are briefly described in this section.

3.1.1. Lower St. Louis River and Upper St. Louis Bay – Minnesota

The Lower St. Louis River and Upper St. Louis Bay geographic zones in Minnesota are bounded by the Northern Pacific Railroad near Grassy Point on the downstream end of the estuary and the Oliver Bridge (Highway 105) on the upstream end. The estuary portion of the geographic zones on the Minnesota side is an area of approximately 2,000 acres. These geographic zone boundaries follow natural watershed boundaries and encompass approximately 20,000 acres across all watersheds. Important streams include Keene Creek, Kingsbury Creek, Knowlton Creek, Stewart Creek, US Steel Creek, and several unnamed direct drainages.

The combined geographic zones include three municipalities, Duluth, Proctor, and Hermantown. Dominant land cover is a mix of residential, forested, and wetland in the upper portion of the watersheds, with housing and industrial density increasing towards the estuary. In the Upper St. Louis Bay geographic zone, there are several existing shipping slips that are currently operational, while the Lower St. Louis River geographic zone has no current shipping industry features. Duluth neighborhoods within the combined geographic zones include Irving, Norton Park, Smithville, Riverside, Fairmont, Morgan Park, and a portion of Gary-New Duluth.

Terrestrial resources within the combined geographic zones include several properties in the Duluth Natural Area Program. The Magney-Snively Natural Area is an 1,800-acre property containing two trout streams, Sargeant Creek and Stewart Creek, and high-quality native plant communities including the region's largest Sugar Maple-Basswood forest. Five of the nine places that make up the St. Louis River Natural Area (Grassy Point, Kingsbury Bay, Tallas Island, Munger Landing, and Mud Lake) are located within the combined geographic zone. Additional terrestrial resources include city parks, Spirit Mountain Recreation Area, the Lake Superior Zoo, Indian Point Campground, Bayview Forest Park, and Grassy Point.

According to the 1863 Hearding map, the estuary was a combination of open water river conditions with extensive floating and shallow emergent vegetation. Today, many areas of floating and shallow emergent vegetation have transitioned to primarily open water habitat. Important estuary features within the combined geographic zones on the Minnesota side include Grassy Point, Kingsbury Bay, Spirit Lake, and Mud Lake. Previous restoration work completed over the last 20 years through the 2002 Lower St. Louis River Habitat Plan are vital to progress made to de-list the St. Louis River AOC.

3.1.2. Lower St. Louis River and Upper St. Louis Bay – Wisconsin

The Lower St. Louis River and Upper St. Louis Bay geographic zones on the Wisconsin side share similar estuary boundaries as the Minnesota side. The total estuary acreage of the combined geographic zones on the Wisconsin side is approximately 1,750 acres. The land-based boundaries are a combination of natural watershed boundaries and artificial boundaries set to include and exclude areas to align management direction. For the purposes of this Landscape Stewardship Vision process, the boundary for the Lower St. Louis River geographic zone in Wisconsin was modified to include all the Superior Municipal Forest and exclude an urban portion of the City of Superior located northeast of the Superior Municipal Forest. In total, land-based area for the combined geographic zones includes approximately 12,900 acres. Important streams include the Pokegama River, Little Pokegama River and several first order, unnamed drainages.

The City of Superior is the main municipality within the combined geographic zones with Oliver being the only other municipality within the boundary. Dominant land cover is a mix of residential, forest, and wetland in the upper portion of the watersheds with housing and industrial density in the northern quarter of the geographic zone, primarily in the Billings Park neighborhood. Unlike on the Minnesota side, the shoreline has not been altered for industrial shipping purposes.

The 4,400-acre Superior Municipal Forest is the dominant terrestrial resource within the combined geographic zones. Additional terrestrial resources include Clough Island and two other small islands.

Historically, the estuary on the Wisconsin and Minnesota sides were similar according to the 1863 Hearding map. The Wisconsin side was also a combination of open water river conditions with extensive floating and shallow emergent vegetation. Today many areas of floating and shallow emergent vegetation have transitioned to primarily open water habitats. Bays on the Wisconsin side tend to be narrower and more finger-like when compared to the Minnesota side due to geologic history. Important estuary features within the combined geographic zones on the Wisconsin side include Pokegama Bay, Little Pokegama Bay, Kimballs Bay, Dwight's Point, Kilner Bay, and Woodstock Bay. Due to limited impacts from previous industrial land uses, the Wisconsin side of the combined geographic zones were not a focus of previous restoration work to de-list the St. Louis River AOC. However, Pokegama Bay has been identified during the Headwaters Partnership Landscape Stewardship Vision process as an important area where focused work should occur in the future.

3.1.3. Allouez Bay – Wisconsin

The Allouez Bay geographic zone is located solely in Wisconsin on the eastern edge of the Headwaters Partnership estuary Landscape. The only geographic zone further east is Lake Superior Direct Drainage (WI). Allouez Bay is an approximately 1,300-acre shallow bay separate from Lake Superior by the coastal barrier spit, Wisconsin Point. Water depths in Allouez Bay are generally less than 14 feet. A deeper hole with water depths ranging from 14 to 20 feet is located in the south-central portion of the bay. Based on the 1863 Hearding map, historically, Allouez Bay was a mixture of extensive floating vegetation, islands, and land spits, which reduced the size of the mouth entering the bay. Today, the extent of wetlands has decreased significantly, and the bay is primarily open water with a cattail-dominated wetland fringe along the southern and eastern boundaries, bordering a high-quality coastal fen. The western boundary also contains one slip, historically used as an industrial dock and now owned by the City of Superior.

The Allouez Bay watershed is approximately 20,000 acres with a mix of forests and low-density residences with scattered light industrial businesses. Major tributaries of the watershed include Bear Creek, Bluff Creek and several unnamed tributaries and direct drainages. Located on the eastern edge of Superior, Wisconsin, the adjacent small neighborhoods of Allouez and Itasca represent the highest density residential dwellings.

In 2022, a draft restoration vision for Allouez Bay (Lake Superior Headwaters Sustainability Partnership, 2022) was developed as a pilot project to demonstrate the nested planning framework developed using the Landscape Conservation Design approach detailed in the Headwaters Partnership Scoping Report (Minnesota Land Trust, 2021). A draft restoration vision was developed based on a combination of conservation targets for fish and wildlife resources, ecological design criteria and goals, historical information (Hearding map), and community values. Many of the same principles used to develop the Allouez Bay restoration vision have been incorporated into the development of Headwaters Partnership Landscape Stewardship Vision.

The Allouez Bay Restoration Vision also played an important role in the development of Headwaters Partnership Landscape Stewardship Vision framework because it highlighted the importance of scale and how that impacts planning. The Allouez Bay geographic zone is relatively simple because it involves one state, one county, one main municipality with smaller town municipalities, one watershed with a limited number of tributaries. Scaling up to a larger geographic zone, such as the Lower St. Louis River geographic zone, demonstrated the need identified in the Headwaters Partnership scoping document for an additional level of planning as issues, resources, and information gaps became more complex making larger scale concept plan development difficult.

Since 2022, partners have used the draft concept plan to inform current and future restoration work in Allouez Bay. Select past and current projects include those depicted in Figure 2. More information about current projects in Allouez Bay and Wisconsin Point can be found at the St. Louis River Alliance website https://www.stlouisriver.org/.

3.2. Learning from the Community in the Geographic Zones

From 2024-2026, the Headwaters Partnership placed a large focus on community engagement through training in skills development and the establishment of a Community Council. To expand the breadth and depth of direct engagement with communities, the partnership worked with the St. Louis River Alliance and Duluth Area Outdoor Alliance to host and collaborate on community events. The following information is summarized from community events, discussion opportunities, and community survey responses from 14 events and represents information shared by approximately 500 people. More information on these findings can be found in the 2024-2026 Community Engagement Event Findings document (Minnesota Land Trust, 2026a).

The St. Louis River, its tributaries, the estuary, and Lake Superior, as well as the surrounding landscape are vital to the health and well-being of the community, who connect with these places in deep and meaningful ways. People primarily engage with the area in informal, low-barrier, and year-round ways, through walking and biking, winter activities, and quiet social activities such as wildlife observation. Paddling, fishing, and swimming are frequently mentioned activities as well. Safety concerns, both personal and environmental health, are routinely shared. Due to persistent historical pollution, concerns about fish health, contamination, and water quality continue to factor strongly in community comments and conversations, even while many Area of Concern (AOC) beneficial use impairments (BUIs) have been lifted. Respondents expressed a strong desire to learn more, to safely connect with the river, and to be involved in its care. An opportunity to improve public perception and understanding can be made through education and engagement.

Community members express deep emotional and cultural connections to specific places in the estuary, with stories connected to childhood, family time, or time spent taking care of the river and resources. Continued opportunities to deepen connection with nature in a hands-on way, will provide meaning and foster long-term stewardship. Community members are excited to learn more, especially about river ecology, flora and fauna, history, and restoration concepts. They have a desire to balance conservation with recreation and development. Improving access and equity, creating small scale, intergenerational events, with hands-on opportunities, such as restoration days, cleanups, community monitoring programs, and adopt-a-site efforts, will all address interests and barriers expressed in the findings and will bring further personal connections between people and the St. Louis River estuary.

An analogous Community Engagement process took place in Wisconsin and has helped build on community data previously received through the Allouez Bay Restoration Vision process. Between September 2025 and January 2026, the St. Louis River Alliance, on behalf of Minnesota Land Trust and Wisconsin Department of Natural Resources, collected community input through a mailed survey, interviews with residents, and events connected to the area around Allouez Bay and Wisconsin Point. A more detailed summary of this information can be found in the document, 2025-2026 River Activities Questionnaire Findings (St. Louis River Alliance, 2026). Similar findings stood out in these discussions and survey responses, including a strong cultural and emotional connection to the area.

Barriers to participation included limited access, inadequate amenities, safety concerns, and lack of equipment or companions. There was strong interest in low-impact, river-based activities such as paddling, bird watching, guided walks and talks, and swimming. Community members also consistently expressed a

desire for ecological restoration, expanded trail systems, interpretive signage, and greater acknowledgement of Indigenous history and presence in the river landscape. A Visitor Use Assessment of Wisconsin Point also took place during this time period, with only preliminary results available at the time of finalizing this document. See https://www.stlouisriver.org/news/wdnr-monthly-update-wisconsin-point-visitor-use-assessment for more information.

3.3. Connecting the Components of the Landscape Stewardship Vision with an Interactive Vision Map

To offer a spatial and interactive resource to help drive future work in the estuary landscape, an Interactive Vision Map was created. The Interactive Vision Map provides a hierarchical view of data accumulated during the Priority Concern Teams mapping process and connects to categories, themes, and guidelines for each location (point, line, or polygon) that was identified. In this way, a user can filter data and view results at several different scales from different Priority Concerns.

These varying spatial scales summarize the count of features and are offered as a one-kilometer grid, division by HUC-12 Watersheds, by neighborhoods (based on voting districts), or by estuary landscape Geographic Zones: Lower St. Louis River (SLR)/Upper St. Louis Bay (SLB) (split along the Minnesota-Wisconsin border) and Allouez Bay.

Upon accessing the application, users can view an introduction to the map with tabs detailing the project background outlining the history, purpose, and organization of the project. A second tab provides information on how to use the Interactive Vision Map. With this background in place, users may select the "Map" tab to view the map.

3.3.1. Understanding the Interactive Map View Levels

The Interactive Map is organized into three map view levels that provide progressively more detailed information and filtering capabilities. Instructions for using each view level are given in this section. To move between Levels, adjust the "View Level" "In" (to access higher levels) or "Out" (to access lower levels).

Level 1 – *Overview*

The overview level aggregates features across all Priority Concerns and only allows filtering by "Category". Within the Level 1 view, it is assumed that partnership-wide themes and categories can be assessed using a heat map. This view also offers the best assessment of overall data availability. To explore the map, exit out of the information pop-up, which can be brought back by clicking the "Show Info" bar near the top of the map. Hovering over any of the Heat Map features will show a pop-up with a count of the number of features in that cell. Users may also adjust the opacity of the Heat Map layers with the Opacity slider on the toolbar.

Level 2 – *Filtering View*

The "Filter" view provides filtering by Category, Priority Concern, or Theme. "Select All" or "Clear All" allows users to add all or none of each group to a filter. Selecting a narrower filter—for instance, only selecting the "Assess" Theme—will restrict the view to simply those features. Any Theme, Priority Concern, or Category can be clicked on and deleted, which will then remove those features from the map. To bring that item back, click the white box and select the item back from the dropdown menu.

Level 3 - *Explorer View*

The explorer view dives into the full featured breadth of the project, with the ability to view all points, lines, and polygons mapped as a part of this project. Users can turn on and off the points, lines, and polygons, and select any of them to view a pop-up with detailed information about the feature

Two toolbar items become useful in this view, the Search feature and the Study Area upload. To use the Search feature, simply type a term into the search bar. A list of features containing that search term is provided. If clicked, the map will highlight, zoom, and open a pop-up of detailed information for the feature. Click the "X" to the right of the search bar to clear the search.

The Study Area upload allows users to upload a study area to view on the map. Once uploaded, metrics including feature counts, percentage breakdown by category and top five themes are provided which give context for the study area's relationship to the mapped features.

Users may still apply the same filters shown at Level 2, however there is no heat map feature at this level. For that, users must return to the Level 2 view.

Selecting the blue "Reset View" bar will return users to the Level 1 view.

3.3.2. Case Studies Using Three Map View Levels

Case studies describing potential uses for each of the three map view levels are presented in this section.

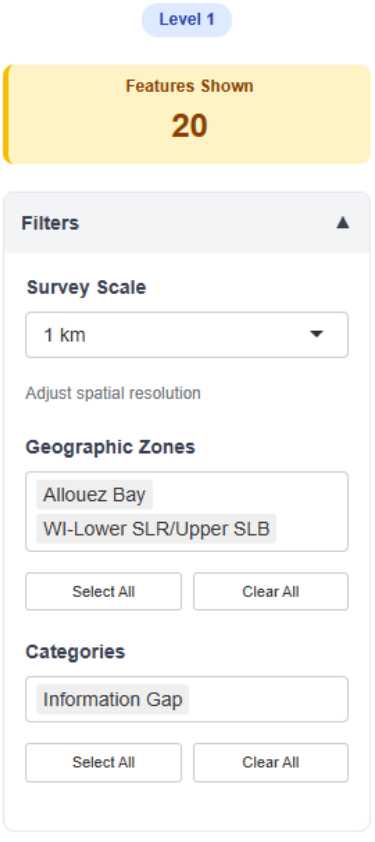

Figure 5. Level 1 Case Study. Filter options in toolbar.

Level 1 – *Potential Purposes*

The Level 1 view provides a heat map of all Priority Concerns. Filters here include the survey scale, Geographic Zones, and Categories. In general, this is a zoomed-out view to focus on the Categories and offer a high-level assessment of resources.

Level 1 – *Example*

University of Wisconsin-Superior students are looking for master's projects to complete on the estuary landscape in their home state. In this scenario, they might start at Level 1 and select the Information Gaps category to identify a starting point for investigation.

To view only Wisconsin results, they can apply the Geographic Zones filter to Allouez Bay and the WI-Lower St. Louis River/Upper St. Louis Bay (Figure 5). Based on the map results (Figure 6), it looks like Allouez Bay or Clough Island might be good starting points for research due to their higher density of points, and thus darker colors on the 1km grid.

To investigate specific opportunities, the students might zoom to Level 3.

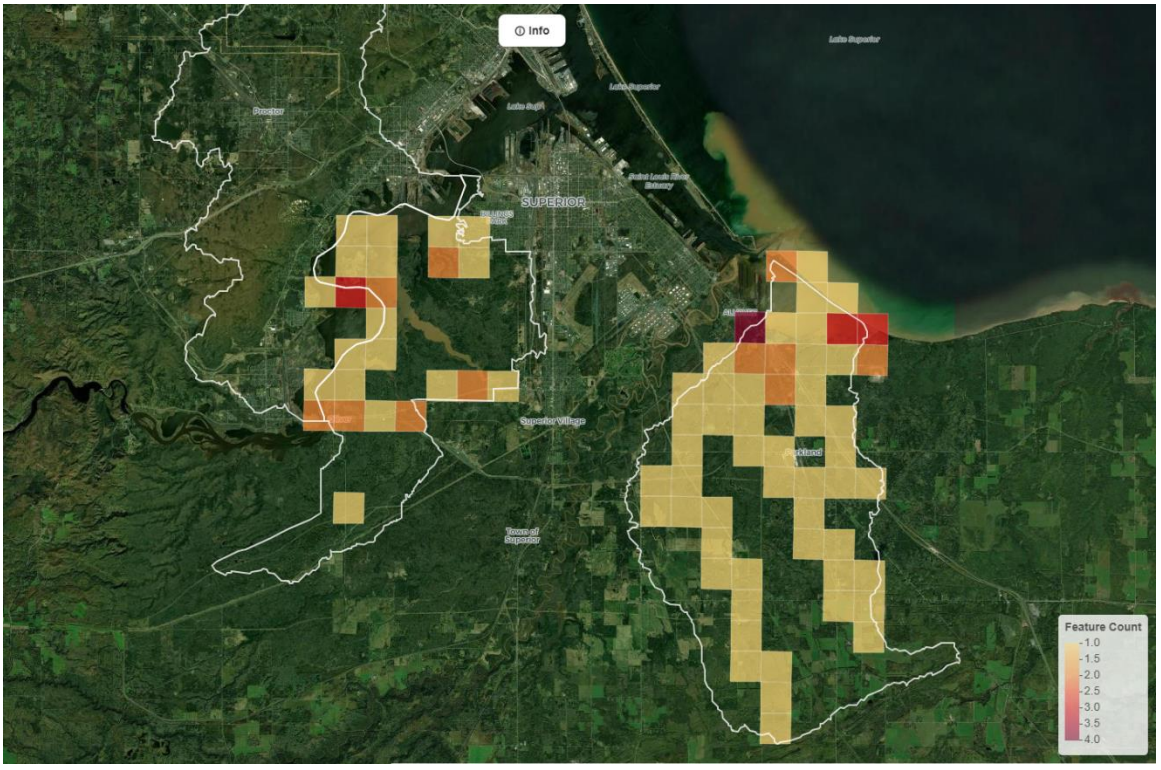

Figure 6. Level 1 Case Study. Level 1 filter for 'Information Gaps' in the geographies of Allouez Bay and WI Lower St. Louis River/Upper St. Louis Bay

Level 2 – *Potential Purposes*

Level 2 offers the opportunity to filter the dataset and produce unique views that can provide insights into the patterning and trends of the data. Added filters include Themes and Priority Concern Teams. Here, there are 34 different selections that could be made, and the different combinations of filters offer millions of possible map views. Each view presents the same heat map view at the selected scale, so users are encouraged to experiment with combinations that interest them.

Level 2 – *Case Study*

A wild rice partner team wants to consider more than just wild rice—what other Priority Concern Teams can they partner with to extend the impact of their projects? They can select different Priority Concerns one by one and see where there might overlap with wild rice. It appears that features are clustered along the estuary, which makes sense for wild rice. Birds and Coastal Wetlands appear to be good project partners, since they are also clustered along the estuary.

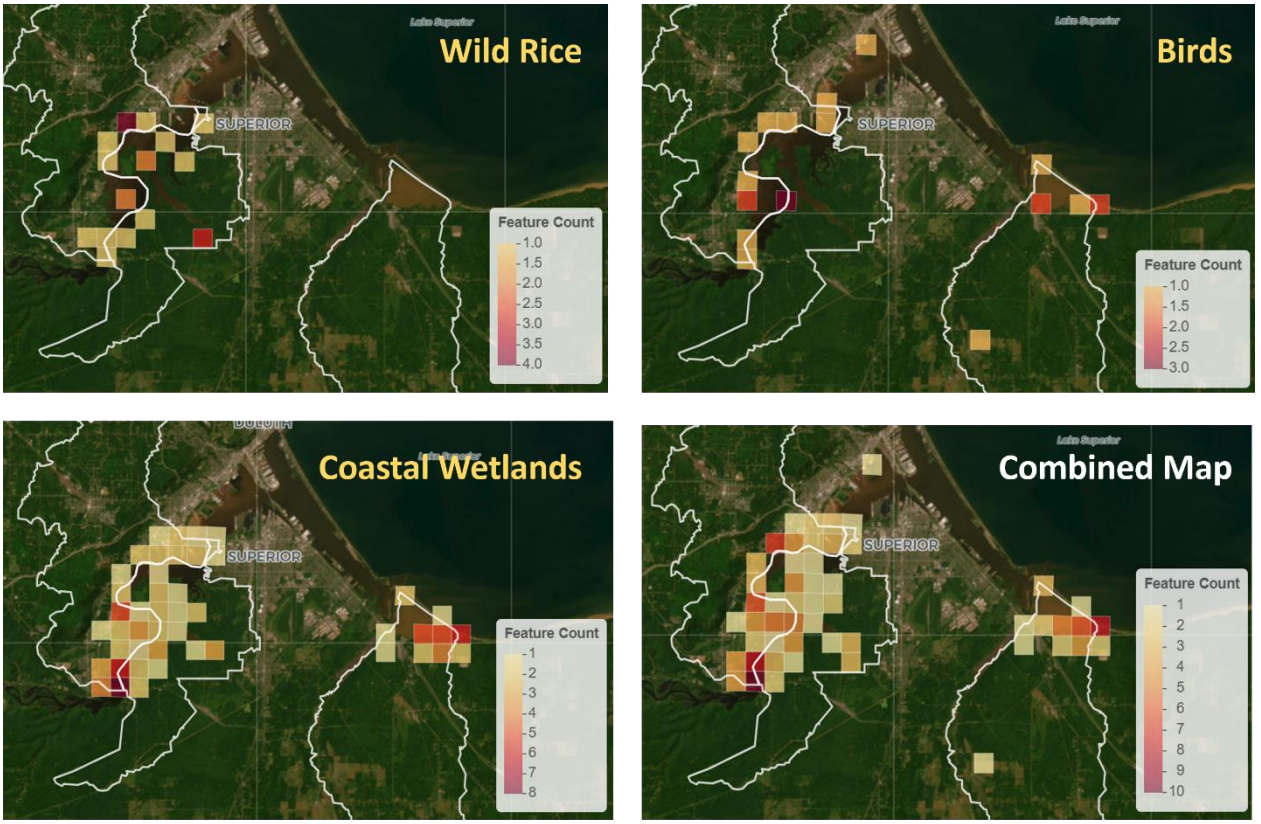

Figure 7. Level 2 Case Study. Level 2 filter for 'Wild Rice' Compared with 'Birds' and 'Coastal Wetlands'

Level 3 – *Potential Purposes*

Level 3 shows all features and filters and depicts all points, lines, and polygons. The most useful tool at this level is to click on specific features and read about their information in a pop-up. Additional features include the ability to change the color legend based on Priority Concern Team, Theme, or Category and the ability to upload a GeoPackage or GeoJSON file of a "Study Area" to view on the

map. A pop-up populates with relevant metrics from the study area. Metrics will adjust based on the filters selected. So, if the only Geographic Zone selected is Allouez Bay, the metrics will show percentiles within that Geographic Zone. Another useful feature is the search tool, where users can enter search terms that can then be filtered onto the map. Users may also search for Matrix ID and match it to the accompanying ID in Appendix C.

Level 3 – *Case Study*

A project organizer involved with Brook Trout wants to know how many culvert-replacement projects might be in the Lower St. Louis River/Upper St. Louis Bay Geographic Zone. To view this on the map, they filter the geographic zones to the Wisconsin and Minnesota Lower SLR/Upper SL Bay, filter Category to Priority Actions, then search "culvert" and select "Filter to # Results". There are 70 results. To view a pop-up of more details on potential projects, click on the feature in the list to zoom to the corresponding location on the map or click on the points, lines, or polygons visible within the map.

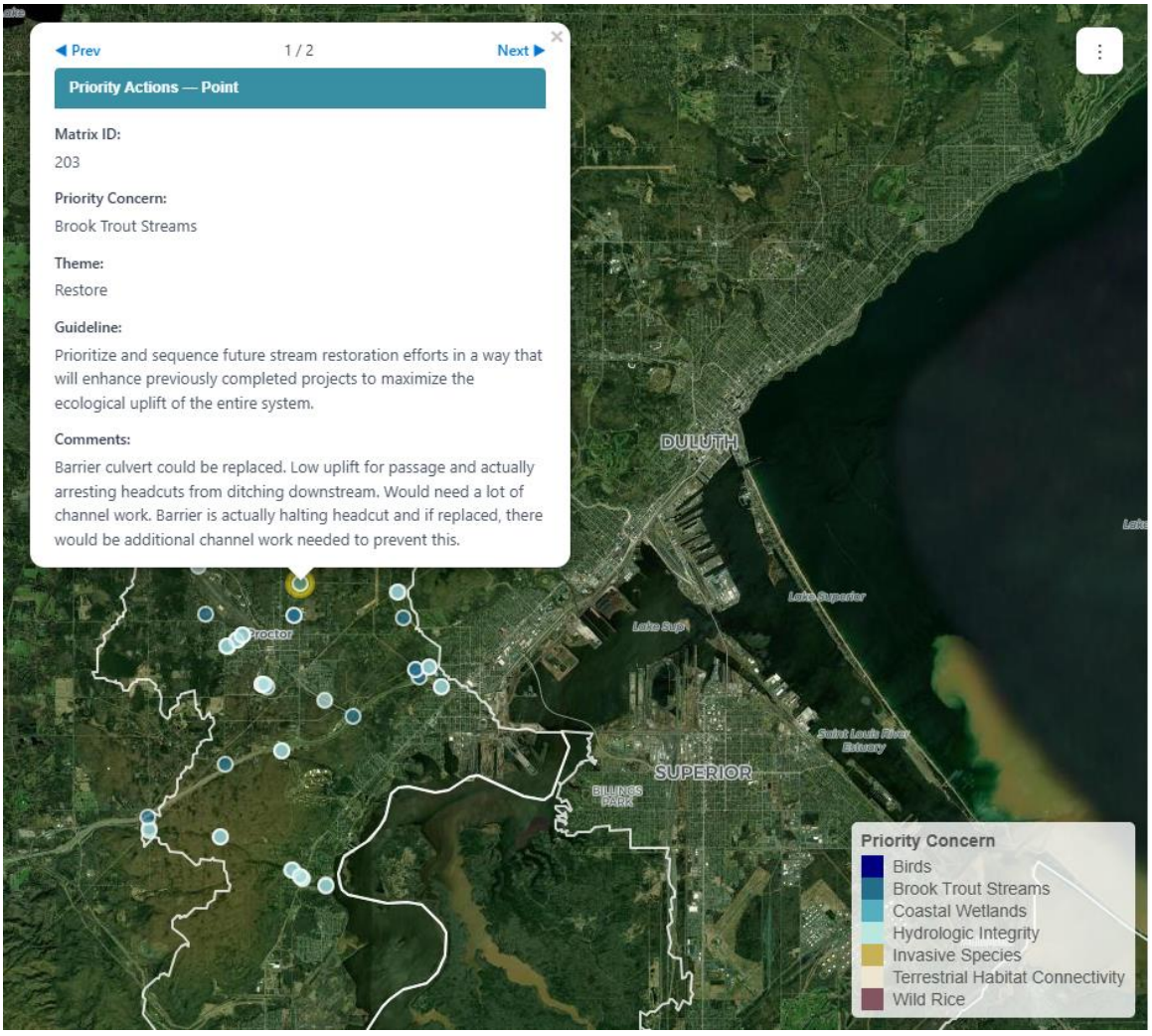

Figure 8. Level 3 Case Study—potential culvert replacement projects for brook trout.

3.4. Opportunities and Needs for Landscape Stewardship

Priority Concern Teams mapped 480 features within the three geographic zones. Across all guidelines and categories, 448 potential projects were identified (Figure 9). These were defined as areas where resources could potentially be committed in the near-term to address needs identified from the feature. Through consideration of ways to prioritize (Table 3), partners can use the Interactive Map to drive future collaborative work. Based on the Headwaters Partnership Landscape Stewardship Vision Framework, 266 projects were classified as Priority Actions that represent projects that should be considered first steps towards achieving Priority Concern goals and objectives. Within the 266 Priority Actions projects, 162 involved projects to restore, and 6 projects involved design. Appendix C shows all mapped features and their hierarchy.

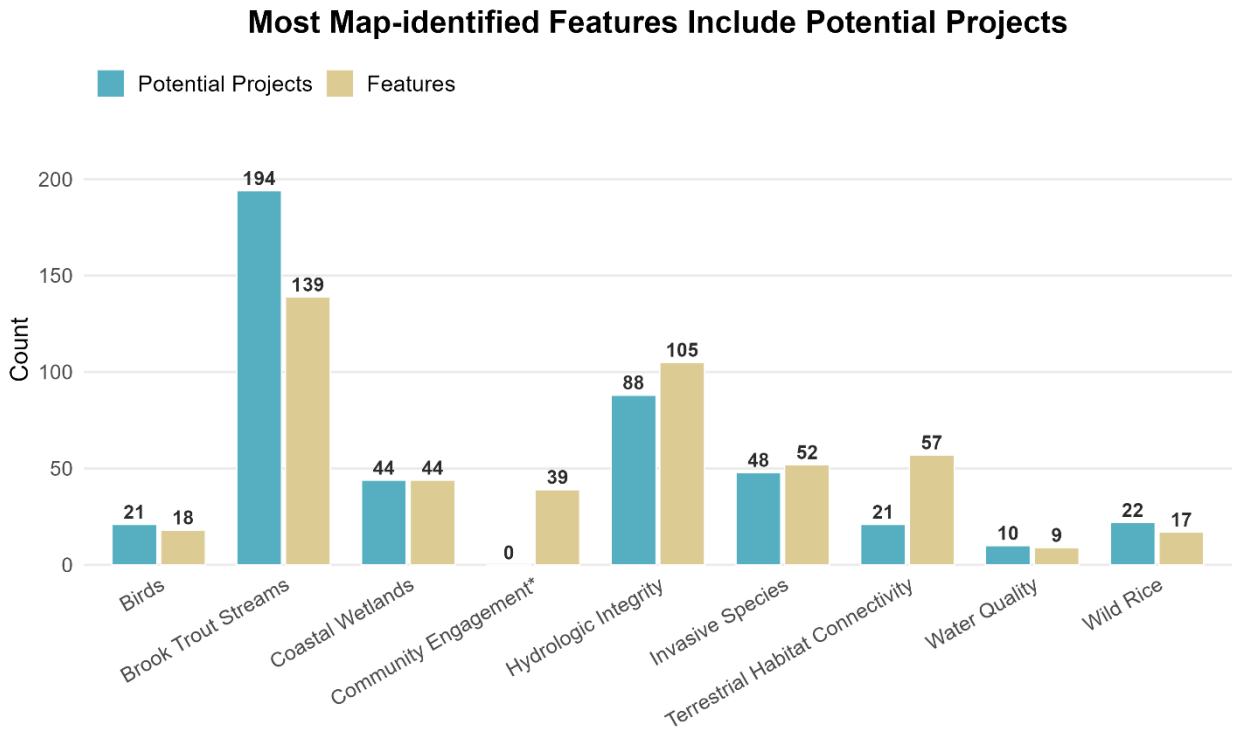

Figure 9. Number of potential projects compared to each Priority Concern's total mapped features.
** Not evaluated for potential projects*

Some features have the potential for multiple projects, and thus the potential projects can outnumber the features. There is likely spatial overlap in projects beyond duplicated features. It is hoped that the mapping features provided on the web application and within this document helps to organize and integrate potential partnerships for project development.

4. PROJECT LEVEL PLANNING COSTS FOR REPRESENTATIVE PROJECTS

Planning level cost estimates were developed for five projects selected by the Priority Concern teams. The estimates will be used for project planning, funding requests, and bid solicitation, depending on the project. The selected projects demonstrate the diversity of the type of work that may occur in the future within the Lower St. Louis River, Upper St. Louis Bay, and Allouez Bay geographic zones. Additionally, the selected projects also demonstrate the diversity of project information currently available for planning purposes. One project (the Superior Municipal Forest Invasive Species Management Plan) has a detailed project scope and defined goals. Others have a range of project specifications with general project boundaries. Generic cost estimates for shoreline softening were developed based on the general characteristics of sites but would be further refined once sites are selected.

4.1. Keene Creek – BNSF Railroad Causeway Removal and Floodplain Restoration

Project Description

The proposed project removes a failing railroad embankment and culvert crossing Keene Creek downstream of Grand Avenue to restore the stream channel and floodplain while reducing risk to downstream residences and businesses, if the embankment were to fail during a storm event.

Assumed Project Elements

- Project Size – 300 feet of stream channel from the downstream invert of the culvert on Grand Avenue to the first Minnesota Power transmission structure downstream of the railroad crossing.
- Three different amounts of proposed embankment removal were estimated to provide a range of potential costs and ranged from providing a minimal floodplain three times the size of the existing culvert to matching either the upstream or downstream valley widths.
- The channel through the project area is re-constructed and stream habitat features are added along with appropriate channel bed material.
- Project access occurs from 60th Ave W, 61st Ave W, and/or 59th Ave W along the existing railroad embankment.
- Due to the Minnesota Power transmission line no trees and shrubs were included in the re-vegetation estimate.
- Design and permitting were estimated based on a percentage of the mid-range construction cost estimate.

Table 5. Estimated planning level cost for the removal of the BNSF causeway crossing Keene Creek to restore the floodplain and improve stream habitat.

Item	Quantity	Unit	Unit Cost	Total	Notes
Construction					
Mobilization	1	LS	$90,000	$90,000	
Demolition of Culvert	1	LS	$12,000	$12,000	
Construction Services	1	LS	$75,500	$75,500	Includes water control, traffic control, project staking, construction permitting, project management
Clearing and Grubbing	1	LS	$30,000	$30,000	
Causeway Excavation					
Low	2,700	CY	$20	$54,000	60 ft wide causeway opening
Mid	9,400	CY	$20	$188,000	200 ft wide causeway opening
High	16,500	CY	$20	$330,000	350 ft wide causeway opening
Channel Excavation and Embankment	1,600	CY	$20	$32,000	300 ft long channel
Channel Bed Materials	400	CY	$50	$20,000	Composite mix of select filter, gravel, cobble
Boulders	30	EA	$100	$3,000	
In-Stream Habitat Features	1	EA	$10,000	$10,000	
Bank Stabilization (Erosion Control Blanket)	1,000	SY	$5	$5,000	
Slope Stabilization – Causeway (Erosion Control Blanket)	2,600	SY	$5	$13,000	
Native Seeding – Floodplain	1	AC	$3,500	$3,500	
Site Restoration	1	LS	$20,000	$20,000	
Establishment and Maintenance – 3 yr	1	LS	$10,000	$10,000	
Construction Cost Total					
			Low	$378,000	
			Mid	$493,000	
			High	$635,000	
			Design and Permitting (25% of Mid Construction Cost	***$123,250***	
Construction Contingency (20%)					
			Low	$75,600	
			Mid	$98,600	
			High	$127,000	
Total Planning – Level Project Costs					
			Low	$576,850	
			Mid	$714,850	
			High	$885,250	

4.2. Magney-Snively Natural Area – Conifer Tree Planting

Project Description

The proposed project plants White Pine and Northern White Cedar within the Magney-Snively Natural Area to protect the long-term hydrology and water temperatures at two headwater spring locations. The City of Duluth and Minnesota Land Trust are partnering on the project.

Assumed Project Elements

- 100 trees per acre will be planted in two locations across a total of 50 acres.
- Tree species will be White Pine and Northern White Cedar. Bare root trees approximately 15-18 inches tall (3-5 years old) will be used.
- Each tree will be protected from deer browse using a woven wire fence at least 6 feet in height.
- A 2-year Establishment and Maintenance period will occur after planting to hand pull vegetation and maintain deer browse protection.
- No permits will be required.
- There will be pre-planting field fit design to identify suitable areas for planting and each planting location will be recorded with a GPS.

Table 6. Estimated planning level cost for conifer planting in the Magney-Snively Natural Area to protect headwater springs.

Item	Quantity	Unit	Unit Cost	Total	Notes
Materials					
Trees (3-5 years old bare root stock)	5,000	EA	$5	$25,000	
Deer Fencing	5,000	EA	$50	$250,000	6 ft steel woven wire fence with 2 8 ft steel posts per cage (Actual design may vary)
Labor					
Tree Planting	5,000	EA	$2.75	$13,750	
Fence Installation	5,000	EA	$11	$55,000	
2-year Establishment and Maintenance	2	EA	$35,800	$71,600	200 crew hours per year with 5% material cost/year
Project Management (5%)	1	EA	$20,800	$20,800	Pre-planting design, GPS planting locations, and general project management
			Total Planning Level Cost	$436,150	

4.3. Superior Municipal Forest Invasive Species Management Plan

Project Description

The 2023 Superior Municipal Forest Master Plan identified the need to develop an invasive species management plan to protect the ecological function and public use and enjoyment of the approximate 4,400-acre Superior Municipal Forest. The City of Superior is sponsoring a project that would seek to develop a framework for decision on when and where management actions are needed to control invasive species and provide information for city budgeting and monitoring. The Invasive Species Management Plan would involve a field reconnaissance phase to map invasive species locations and the development of the plan.

Assumed Project Elements

- The City of Superior has a detailed draft RFP that was used to develop the planning level cost.
- A total buffer of 50 ft wide along trails in the forest are surveyed. Additionally, transects no more than 2,000 ft apart are surveyed throughout the forest.
- Only invasive species infestations 100 square feet or greater are delineated and mapped.
- The plan includes the development of goals and objectives for invasive species management along with proposed actions, cost estimates, and recommended monitoring.
- A series of meetings are required; from regular project check-ins to working with an advisory group.

Table 7. Estimated planning level cost to develop an invasive species management plan for the Superior Municipal Forest.

Item	Cost
Field reconnaissance, mapping and reporting	$18,500
Developing the Invasive Species Management Plan	$21,600
Project Meetings	$11,500
Total Planning-Level Cost	**$51,600**

4.4. Clough Island – Ecological Assessment, Planning, Design, and Restoration

Project Description

Many potential projects in the estuary have a combination of needs that vary from gathering of baseline data, to developing a concept level plan, to restoring and maintaining native plant communities. The proposed project at Clough Island represents an example of a multi-tiered approach. The proposed project has three phases: Studies and Assessments, Design, and Restoration.

Assumed Project Elements

Studies and Assessments

- An ecological assessment will establish baseline data for how species such as birds, bats, and other species of concern are using Clough Island and the surrounding islands.
- A habitat management plan for Clough Island and the surrounding islands would be developed based on the findings of the ecological assessment. The goal of the habitat management plan is to develop a document that can guide annual management on Clough Island and surrounding islands to address issues related to bluff erosion, visitor usage, invasive species, and habitat for species of concern.

Design

- Building on the findings of the habitat management plan, a feasibility study and conceptual design to improve shoreline habitat will be completed. Potential project elements may include manoomin restoration, fish habitat improvement, and shoreline plant community restoration.

Restoration

- Proposed restoration projects include improving Clough Island trail infrastructure to improve the ability and efficiency for crews to move through the island, continuing to treat invasive species, and planting trees to improve the forested communities on the island.
- Clough Island Trail Infrastructure
  – Five miles of natural surface trails are developed within the island using the existing trail network and improving trail locations based on topography and existing/future plant communities.
- Invasive Species Control
  – Buckthorn species, non-native honeysuckle, and barberry are controlled in approximately 147 acres. Aspen trees within 111 acres where trees are planted are girdled to reduce shading and competition.
- Re-forestation
  – Trees are planted at 200 trees per acre in 111 acres throughout the island. A combination of 1–2-year-old trees and 3–5-year-old trees are planted with approximately 50% being caged using tree tubes to reduce herbivory. A 2-year establishment and maintenance period is completed to help promote project success.

Table 8. Estimated planning level costs for the assessment, design, and restoration work at Clough Island and the surrounding islands.

Item	Quantity	Unit	Unit Price	Total	Notes
Studies and Assessments					
Clough Islands Habitat Management Plan	1	EA	$50,000	$50,000	Survey bats, birds, other special concern species, map native plant communities
Clough Islands Biological Assessment	1	EA	$50,000	$50,000	
			Total	$100,000	
Design					
Shoreline Habitat Improvement Design	1	EA	$75,000	$75,000	
			Total	$75,000	
Restoration					
Infrastructure					
Natural surface trail	5	Miles	$48,000	$240,000	$2.27/sqft 4 ft wide trail
			Total	$240,000	
Invasive Species Control					
Buckthorn, honeysuckle and barberry	147.1	AC	$1,000	$147,100	
Aspen girdling	111	AC	$110	$12,210	Girdling within select areas where conifers have previously been planted.
			Total	$159,310	
Re-Forestation					
Materials					
Trees (1-2 year old bare root stock) transplants)	44,400	EA	N/A	N/A	111 acres @ 400 trees/acre Trees acquired from state nursery at no cost.
Deer fencing	22,200	EA	$4.00	$88,800	HDPE 15" tall mesh tube with two wood stakes. Protect 50% of trees planted.
Labor					
Tree installation	44,400	EA	$4.25	$188,645	
Fence installation	22,200	EA	$8.80	$195,360	
2-year maintenance	2	EA	$38,000	$76,000	300 hours/year (60 hrs x 5 crew) + replacement fence materials (5% of material costs/yr)
Project Management (5%)	1	EA	$35,210	$35,210	Pre-planting recon, GPS planting locations, general project management
			Total	$584,015	
			Grant Total	**$1,158,325**	

4.5. St. Louis River Estuary – Shoreline Softening

Project Description

General cost estimates to improve shoreline habitat through native plantings and removal of existing riprap were developed for use as a project planning tool. Currently, there isn't an identified project; however, a general cost estimate provides a baseline unit cost that can be scaled and modified as actual site conditions and other factors that determine cost are considered. Three different shoreline softening scenarios were developed to represent a range of potential sites currently within the estuary. The focus of two of the scenarios was removal of the existing riprap. For all three scenarios, the project area is 500 ft long by 50 wide or 25,000 sq ft as means to represent a typical project size. For small projects, the unit cost is typically higher than larger projects because larger projects have greater efficiency, resulting in a lower unit cost.

Assumed Project Elements

Scenario 1 – Shoreline conversion to native vegetation

- In Scenario 1, no in-water work occurs. 500 feet of shoreline with a 50-ft wide buffer that contains poor vegetation including potentially invasive species is converted to native vegetation.
- An initial site preparation includes an herbicide treatment and minor vegetation removal.
- Native plant plugs planted on 3-ft on-center spacing and native seeding is used to re-vegetate the site.
- There is a 3-year establishment and maintenance period where vegetation is managed to improve planting success.
- Fencing to prevent goose browse is included due to the density of geese in the St. Louis River estuary.
- There is a minimal amount of project design and permitting required primarily due to modifying the shoreline.

Scenario 2 – Remove existing riprap, re-grade the bank, and plant native vegetation.

- Same as Scenario 1 and includes:
- A 6-ft wide strip of rip rap is removed and disposed of off-site.
- To re-grade the banks, additional topsoil is required.
- The toe of the slope is stabilized with a coir log that is planted.
- Design and permitting costs increase due to greater complexity and permitting.

Scenario 3 – Remove existing riprap, install a stone wave attenuator, re-grade the bank, plant native vegetation in the buffer and an emergent wetland planting zone.

- Same as Scenario 2 and includes:
- The site is located in an area where wave energy requires an attenuator such as field stone sill to reduce erosion potential.
- An emergent wetland planting zone is established between the attenuator and the shoreline.
- Design and permitting costs increase due to greater complexity and permitting.

Table 9. Planning level costs for shoreline softening under Scenario 1.

Item	Quantity	Unit	Unit Price	Total	Notes
Materials					
Native plants - Plugs	3200	EA	$3	$9,600	
Native seed mix	0.6	AC	$1,500	$900	
Goose protection (Materials + Installation)	1	LS	$6,000	$6,000	
Services					
Site preparation	0.6	AC	$1,000	$600	
Plant installation - Plugs	3200	EA	$6	$19,200	
Seed Installation	0.6	AC	$3,200	$1,920	
Establishment and Maintenance - 3-year	1	EA	$26,400	$26,400	
			Construction Subtotal	*$64,620*	
			Construction Contingency (20%)	*$12,924*	
			Design and Permitting (10% of Construction Cost)	*$6,462*	
			Total Planning Level Cost	**$84,006**	
			Cost/Linear Ft	**$168.01**	
			Cost/Square Ft	**$3.36**	

Table 10. Planning Level Costs for shoreline softening under Scenario 2.

Item	Quantity	Unit	Unit Price	Total	Notes
Materials					
Native plants - Plugs	3200	EA	$3	$9,600	
Native plants - Plugs for coir logs	250	EA	$3	$750	
Native seed mix	0.6	AC	$1,500	$900	
Goose protection (Materials + Installation)	1	LS	$6,000	$6,000	
Erosion control blanket	350	SY	$3	$1,050	
Coir log and stakes	500	LF	$12	$6,000	
Topsoil	175	CY	$20	$3,500	
Services					
Mobilization	1	LS	$10,000	$10,000	
Excavation and embankment - Riprap removal	350	CY	$20	$7,000	
Excavation and embankment - Topsoil and Grading	175	CY	$20	$3,500	
Coir log installation	500	LF	$24	$12,000	
Plant Installation - Plugs	3200		$6	$19,200	
Plant Installation - Plugs - Coir Log	250		$9	$2,250	
Seed Installation	0.6	AC	$3,200	$1,920	
Establishment and Maintenance - 3-year	1	EA	$26,400	$26,400	
			Construction Subtotal	$110,070	
			Construction Contingency (20%)	$22,014	
			Design and Permitting (15% of Construction Cost)	$16,511	
			Total Planning Level Cost	$148,595	
			Cost/LF	$297.19	
			Cost/SF	$5.94	

Table 11. Planning level costs for shoreline softening under Scenario 3.

Item	Quantity	Unit	Unit Price	Total	Notes
Materials					
Native plants - Plugs	3200	EA	$3	$9,600	
Native plants - Plugs - coir logs	250	EA	$3	$750	
Native plants - Plugs - Emergent planting	1500	EA	$3	$4,500	
Native seed mix	0.6	AC	$1,500	$900	
Goose protection (Materials + Installation)	1	LS	$9,000	$9,000	
Erosion control blanket	350	SY	$3	$1,050	
Coir log and stakes	500	LF	$12	$6,000	
Topsoil	175	CY	$20	$3,500	
Field Stone	175	CY	$50	$8,750	
Services					
Mobilization	1	LS	$20,000	$20,000	
Excavation and embankment - Riprap removal	350	CY	$20	$7,000	
Excavation and embankment - Topsoil and Grading	175	CY	$20	$3,500	
Excavation and embankment - Field Stone Sill	175	CY	$30	$5,250	
Coir log installation	500	LF	$24	$12,000	
Plant Installation - Plugs	3200	EA	$6	$19,200	
Plant Installation - Plugs - Coir Log	250	EA	$9	$2,250	
Plant Installation - Plugs - Emergent planting	1500	EA	$6	$9,000	
Seed Installation	0.6	AC	$3,200	$1,920	
Establishment and Maintenance - 3-year	1	EA	$26,400	$26,400	
			Construction Subtotal	*$150,570*	
			Construction Contingency (20%)	*$30,114*	
			Design and Permitting (20% of Construction Cost)	*$30,114*	
			Total Planning Level Cost	$210,798	
			Cost/LF	$421.60	
			Cost/SF	$7.03	

5. REFERENCES

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Wisconsin Department of Natural Resources. (2024). *St. Louis River Estuary Manoomin Restoration and Stewardship Plan.* Wisconsin Department of Natural Resources, Office of Great Waters. Superior, WI. https://dnr.wisconsin.gov/sites/default/files/topic/GreatLakes/St.LouisRiverEstuaryManoominRestorationStewardshipPlan.pdf

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Appendix A. HEADWATERS PARTNERSHIP FORUM AND PRIORITY CONCERN TEAM MEMBERS

Headwaters Partnership Forum Members

- Dan Breneman, *Minnesota Pollution Control Agency*
- Kris Eilers, *St. Louis River Alliance*
- Deanna Erickson, Lake Superior National Estuarine Research Reserve
- Tom Estabrooks, *Minnesota Pollution Control Agency*
- Cherie Hagen, *Wisconsin Department of Natural Resources*
- Anna Hess, *US Environmental Protection Agency Office of Applied Science and Environmental Solutions*
- Joel Hoffman, *University of Minnesota - Natural Resources Research Institute*
- Kate Kubiak, *City of Duluth, Minnesota*
- John Lindgren, *Minnesota Department of Natural Resources*
- Jeremy Pinkerton, *Minnesota Department of Natural Resources*
- Kirsten Rhude, *Lake Superior National Estuarine Research Reserve*
- Nancy Schuldt, *Fond du Lac Band of Lake Superior Chippewa (retired)*
- Matt Steiger, *Wisconsin Department of Natural Resources*

The following individuals served as members of the Headwaters Partnership Priority Concern Teams:

Priority Concern	Group Member	Affiliation
Dredge Material Management	**Dan Breneman**	**Minnesota Pollution Control Agency**
	Jeff Udd	Duluth Seaway Port Authority
	Jim Luke	US Army Corps of Engineers
	Jason Serck	City of Superior, Wisconsin
	Jeramy Pinkerton	Minnesota Department of Natural Resources
	Mike Wenholz	Arrowhead Regional Development Commission
	Ellen Coffman	Wisconsin Department of Natural Resources
	Kelsey Prihoda	Minnesota Sea Grant
Birds	**Annie Bracey**	**University of Minnesota - Natural Resources Research Institute**
	Alexis Grinde	University of Minnesota - Natural Resources Research Institute
	Emilia Kenow	Minnesota Land Trust
	Martha Minchak	Minnesota Department of Natural Resources (retired)
	Sumner Matteson	Wisconsin Department of Natural Resources
	Steve Kolbe	University of Minnesota - Natural Resources Research Institute
	Tom Prestby	Audubon Great Lakes
Brook Trout Streams	**John Lindgren**	**Minnesota Department of Natural Resources**
	Paul Piszczek	Wisconsin Department of Natural Resources
	Steve Shier	1854 Treaty Authority
	Jeff Jasperson	Minnesota Pollution Control Agency
	Allen Brandt	Minnesota Department of Natural Resources
	Ann Thompson	Minnesota Department of Natural Resources
	Andy Kasun	South St. Louis Soil & Water Conservation District
	Tim Beaster	South St. Louis Soil & Water Conservation District
Coastal Wetlands	**Kelly Beaster**	**Tsuga Ecological Consulting**
	Carol Reschke	University of Minnesota Natural Resources Research Institute (retired)
	Cherie Hagen	Wisconsin Department of Natural Resources
	Jeramy Pinkerton	Minnesota Department of Natural Resources
	Kirsten Rhude	Lake Superior Reserve
	Martha Minchak	Minnesota Department of Natural Resources (retired)
Community	**Deanna Erickson/ Molly Wick**	**Lake Superior National Estuarine Research Reserve/ Wisconsin Department of Natural Resources**
	Matt Steiger	Wisconsin Department of Natural Resources
	Cherie Hagen	Wisconsin Department of Natural Resources
	Dave Grandmaison	Minnesota Department of Natural Resources
	Katie Williams	US Environmental Protection Agency
	Steven Robertson	City of Duluth, Minnesota
	Tom Hollenhorst	US Environmental Protection Agency
	Kris Eilers	St. Louis River Alliance

Priority Concern	Group Member	Affiliation
	Cherie Hagen	Wisconsin Department of Natural Resources
	Jodi Slick	Ecolibrium3
	Katie Williams	US Environmental Protection Agency
	Steven Robertson	City of Duluth, Minnesota
	Meghan Klasic	US Environmental Protection Agency
	Tom Hollenhorst	US Environmental Protection Agency
	Jules Witts	US Environmental Protection Agency
	Madison Rodman	Minnesota Sea Grant
	Andrea Crouse	Zeitgeist Arts
	Tiffany Sprague	University of Minnesota - Natural Resources Research Institute
Lake Sturgeon	**Dan Wilfond**	**Minnesota Department of Natural Resources**
	Nick Boygo	1854 Treaty Authority
	Paul Piszczek	Wisconsin Department of Natural Resources
	Tom Howes	Fond du Lac Band of Lake Superior Chippewa
Hydrologic Integrity	**Ben Nicklay**	**Minnesota Department of Natural Resources**
	Ann Thompson	Minnesota Department of Natural Resources
	Matt Steiger	Wisconsin Department of Natural Resources
	Tom Estabrooks	Minnesota Pollution Control Agency
	Tom Hollenhorst	US Environmental Protection Agency Great Lakes Toxicology and Ecology Division
	Tom Johnson	City of Superior, Wisconsin
Invasive Species	**Tyler Kaspar**	**Minnesota Department of Natural Resources**
	Alexander Selle	Wisconsin Department of Natural Resources
	Amanda Weberg	Cook County Soil & Water Conservation District
	Dara Fillmore	Wisconsin Department of Natural Resources
	Martha Minchak	Minnesota Department of Natural Resources (retired)
	Eben Phillips	Community Action Duluth Stream Corps
	Zach Stewart	Douglas County Land Conservation
	Matt Santo	1854 Treaty Authority
	Doug Jensen	Minnesota Department of Natural Resources
	Travis Bartnick	Great Lakes Indian Fish and Wildlife Commission
Terrestrial Habitat Connectivity & Integrity	**Martha Minchak**	**Minnesota Department of Natural Resources (retired)**
	Carol Reschke	University of Minnesota - Natural Resources Research Institute (retired)
	Dave Grandmaison	Minnesota Department of Natural Resources
	Kate Kubiak	City of Duluth, Minnesota
	Tom Hollenhorst	US Environmental Protection Agency Great Lakes Toxicology and Ecology Division
	Kirsten Rhude	Lake Superior Reserve
	Kelly Beaster	Tsuga Ecological Consulting

Priority Concern	Group Member	Affiliation
Water Quality	**Ellen Coffman**	**Wisconsin Department of Natural Resources**
	Kaitlin Reinl	Lake Superior Reserve
	Rich Axler	University of Minnesota - Natural Resources Research Institute (retired)
	Euan Reavie	University of Minnesota - Natural Resources Research Institute
	Joel Hoffman	University of Minnesota - Natural Resources Research Institute
	Kelsy A Federico	Fond du Lac Band of Lake Superior Chippewa
	Josh Schrope	Fond du Lac Band of Lake Superior Chippewa
	Tom Estabrooks	Minnesota Pollution Control Agency
Wild Rice	**Dave Grandmaison**	**Minnesota Department of Natural Resources**
	Carol Reschke	University of Minnesota - Natural Resources Research Institute (retired)
	Darren Vogt	1854 Treaty Authority
	Kelly Beaster	Tsuga Ecological Consulting
	Martha Minchak	Minnesota Department of Natural Resources (retired)

APPENDIX B. RESOURCES BY PRIORITY CONCERN

BIRDS

- 21st Avenue West Remediation-to-Restoration Project: Biological Survey and Hydrodynamic Modeling Results https://conservancy.umn.edu/handle/11299/187327
- 40th Avenue West Remediation-to-Restoration Project: Biological Survey https://conservancy.umn.edu/handle/11299/201339
- An Ecological Design for the 40th Ave West Remediation-to-Restoration Project https://conservancy.umn.edu/handle/11299/187341
- An Ecological Design of the 21st Avenue West Remediation-to-Restoration Project https://conservancy.umn.edu/handle/11299/187332
- Avian Surveys for the St. Louis River Natural Areas Project https://conservancy.umn.edu/bitstream/handle/11299/204494/NRRI-TSR-2019-09.pdf?sequence=1&isAllowed=y
- Coastal Wetland Monitoring Survey Report: Clough Island 2014 https://conservancy.umn.edu/handle/11299/201346
- eBird https://ebird.org/home
- Evidence of a Four-Year Population Cycle for the Rusty Blackbird https://rustyblackbird.org/wp-content/uploads/0945_Savard_Rusty-Blackbirds_BD-2.pdf
- Foraging Ecology Differentiates Life Stages and Mercury Exposure in Common Terns https://setac.onlinelibrary.wiley.com/doi/full/10.1002/ieam.4341
- Interstate Island Habitat Restoration: Phase III – Long-Term Monitoring and Maintenance Plan Common Tern Monitoring & Migratory Shorebird Assessment 2023 Final Report https://conservancy.umn.edu/handle/11299/260334
- Lake Superior NERR, Black Ash Habitat and Breeding Bird Survey, St. Louis River Estuary, WI, 2021 https://portal.edirepository.org/nis/mapbrowse?packageid=edi.2112.1
- Mapping Avian Movements in Minnesota https://conservancy.umn.edu/handle/11299/224855
- Midwest Conservation Blueprint https://mcap-fws.hub.arcgis.com/pages/midwest-conservation-blueprint
- Migratory Routes and Wintering Locations of Declining Inland North American Common Terns https://academic.oup.com/auk/article/135/3/385/5148826
- Minnesota CliMAT (Climate Mapping and Analysis Tool) https://climate.umn.edu/MN-CliMAT
- MN Breeding Bird Atlas https://mnbirdatlas.org/
- MN Land Trust Final Report: Let the Birds Guide You: https://conservancy.umn.edu/bitstream/handle/11299/226552/NRRI-TR-2019-70.pdf?sequence=1&isAllowed=y
- Seabird Restoration Database https://www.seabirddatabase.org/
- St. Louis River AOC Remediation-to-Restoration Support Projects: Ecological Monitoring and Assessment https://conservancy.umn.edu/items/66d9500b-69f2-4feb-8a12-127504d6bf84
- St. Louis River Estuary Avian Visualization Tool. Allouez Bay and WI SLRE 2020-2022 Bird Surveys: Breeding and stopover data in targeted areas of the estuary. https://experience.arcgis.com/experience/3b9fc4b32a8e4ab6a74f7f28c6737c05/page/Home
- State Wildlife Action Plans https://www.dnr.state.mn.us/mnwap/index.html
- WI Breeding Bird Atlas II ebird.org/atlaswi

BROOK TROUT STREAMS

The following files are saved on the Headwaters Partnership Google Drive and accessible via this link https://drive.google.com/drive/folders/175j6-FRLo_-J0yrbUeDJjyPQzdJCMnKa?usp=drive_link

Datasets:

- Mean_Temperatures
- Trout_Abundance
- MNDNR Shapefile Attributes Notes

Reports:

- Keene Creek
  2000 Fish Survey MNDNR
- Keene Creek
  2002 Fish Survey MNDNR
- Keene Creek
  2010 Fish Survey MNDNR
- Keene Creek
  Habitat Assessment 2011 MNDNR
- Keene Creek
  MNTU Report – Appendix 1
- Keene Creek
  MNTU Report – Appendix 2
- Keene Creek
  MNTU Report – Appendix 3
- Keene Creek
  MNTU Report – Watershed Plan
- Keene Creek
  Stocking History MNDNR
- Keene Creek
  Stream Management Plan 2011 MNDNR
- Keene Creek Stream Management Plan
  2023 Amendment MNDNR
- Keene Creek
  Temperature Report 2001 MNDNR
- Keene Creek
  Temperature Report 2013 MNDNR
- Keene Creek
  Tributaries Sampling 2021 MNDNR
- Keene Creek
  WRAPS Report
- Kingsbury Creek
  2017 Fish Survey MNDNR
- Kingsbury Creek
  Stocking History MNDNR
- Kingsbury Creek
  Stream Management Plan 2011 MNDNR
- Kingsbury Creek
  Temperature Report MNDNR
- Kingsbury Creek
  Watershed Feasibility Study
- Knowlton Creek
  2014 Fish Survey MNDNR
- Knowlton Creek
  2018 Fish Survey MNDNR
- Knowlton Creek
  Stream Management Plan 2021 MNDNR
- MNDNR Trout Movement Study 2017
- Steelton Creek S-2-5
  1968 Stream Survey MNDNR
- Stewart Creek Stream Report
  1998 MNDNR
- Stewart Creek
  Temperature Report 2001 MNDNR
- Stewart Creek
  WRAPS Report

COASTAL WETLANDS

Any files not containing a link are saved on the Headwaters Partnership Google Drive and accessible via this link https://drive.google.com/drive/folders/175j6-FRLo_-J0yrbUeDJjyPQzdJCMnKa?usp=drive_link

Datasets and Maps:

- Aquatic Habitat Mapping in the St. Louis River Estuary (Reschke & Hill 2020) https://conservancy.umn.edu/bitstream/handle/11299/226674/NRRI-TR-2020-19.pdf
- EDRR_Allouez Bay Management Plan 2019
- EDRR_Pokegama Bay Management Plan 2019
- EDRR_Red River Breaks Management Plan 2019
- Plant Community Shapefiles (2002 Habitat Plan) https://drive.google.com/drive/folders/1n0RDfE2BXT8NQSspRAkmaK7MvkMZTHWU
- Estuarine habitats in the St. Louis Estuary, Lake Superior, Wisconsin: past, present, and future (Endris et al. 2023) https://www.nerra.org/wp-content/uploads/2024/01/LSNERR-Habitat-Mapping-Reserve-Report-1.pdf

Reports:

- Are chemicals of emerging concern correlated with growth of aquatic plants in the St Louis River Estuary? (Reschke and Host 2014)
- Coastal wetland plant community responses to record-high Lake Superior water levels: An Allouez Bay case study (Hartsock et al. 2022) https://www.sciencedirect.com/science/article/abs/pii/S0380133022000399
- Duluth Natural Areas Program and Plans https://duluthmn.gov/parks/natural-resources/dnap/
- Great Lakes Coastal Resiliency Study https://www.lrd.usace.army.mil/glcrs/Category/24864/
- Measuring Aquatic Vegetation Quality: a guide to using vegetation metrics for evaluating the St. Louis River Estuary (Reschke 2018)
- Munger Wetlands Invertebrate and Aquatic Vegetation Sampling St. Louis River Estuary (Reschke et al. 2017)
- Natural communities, aquatic features, and selected habitats of Wisconsin. Chapter 7 in The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management. Wisconsin Department of Natural Resources, (Epstein 2017)
- St. Louis River Area of Concern Aquatic Plant Restoration Experiment (Reschke 2016)
- Superior Coastal Plain Ecological Landscape. The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management. Chapter 21, PUB-SS-1131W 2015, (Wisconsin Department of Natural Resources 2015)
- The importance of natural disturbance processes in a wild rice dominated natural area. (Meeker and Rose 1989)
- Tracking vegetation transitions due to invasion of cattail in Lake Superior coastal peatlands. (Meeker et al 2023)
- Wild-rice and sedimentation process in a Lake Superior coastal wetland. (Meeker 1996)

COMMUNITY ENGAGEMENT

Headwaters Partnership Community Engagement Framework, Community Atlas, and Community Engagement Toolkit https://headwaterspartnership.org/resources

DREDGE MATERIAL MANAGEMENT

The following files are saved on the Headwaters Partnership Google Drive and accessible via this link https://drive.google.com/drive/folders/175j6-FRLo_-J0yrbUeDJjyPQzdJCMnKa?usp=drive_link

Reports:

- A Process for Setting, Managing, and Monitoring Environmental Windows for Dredging Projects (Committee for Environmental Windows for Dredging Projects 2001)
- ASBPA/USACE/CSO-Sediment Regulations Project One Pager 2022
- Erie Pier Management Plan (Duluth Seaway Port Authority & Duluth-Superior Metropolitan Interstate Council 2021)
- Exploring science-based strategies for environmental dredging in Lake Michigan: A virtual symposium and workshop (Great Lakes Commission 2021)
- White Paper: Sediment Placement Regulations Of U.S. Coastal States And Territories Towards Regional Sediment Management Implementation: A Focus On The Great Lakes Region (American Shore and Beach Preservation Association & Coastal States Organization 2022)

HYDROLOGIC INTEGRITY

Any files not containing a link are saved on the Headwaters Partnership Google Drive and accessible via this link https://drive.google.com/drive/folders/175j6-FRLo_-J0yrbUeDJjyPQzdJCMnKa?usp=drive_link

Datasets and Maps:

- *Note, several of these are also included in the Mapping Tool on the Headwaters Partnership website https://headwaterspartnership.org/*
- Culvert inventory/road stream crossings
  https://gisdata.mn.gov/dataset/struc-culvert-inventory-pub
  https://arcgis.dnr.state.mn.us/ewr/whaf2/
- Ditched/altered waterbodies
  https://gisdata.mn.gov/dataset/water-altered-watercourse
- Environmental Quality Information System (EQIS)
  https://www.pca.state.mn.us/about-mpca/environmental-quality-information-system-equis
- Impervious Surface
  https://www.mrlc.gov/data?f%5B0%5D=year%3A2021
- Lake Superior water levels
  https://www.glerl.noaa.gov/data/wlevels/dashboard/#mastergauge

- Land Cover
  https://www.mrlc.gov/data?f%5B0%5D=year%3A2021
  https://gisdata.mn.gov/dataset/biota-landcover-nlcd-mn-2019
- Minnesota Cooperative Stream Gaging
  https://www.dnr.state.mn.us/waters/csg/index.html
- Minnesota Impaired waters (303d list), Assessed waters (305b list), water quality monitoring stations, MPCA remediation sites, Statewide altered watercourse project, Environmental benefits index top five percent areas
  https://www.pca.state.mn.us/about-mpca/mpca-spatial-data
  https://gisdata.mn.gov/dataset/env-impaired-water-2024-draft
- MPCA Surface Water Quality, St. Louis River Area of Concern, MPCA Map Data, MPCA Remediation, MPCA Watershed GIS Team
  https://mpca.maps.arcgis.com/home/groups.html?sortField=title&sortOrder=asc#featured
- MPCA spatial data on Minnesota Geospatial Commons: What's in My Neighborhood Sites, MPCA Remediation Sites, Permanent List of Priorities (PLP), Surface Water Stations – MPCA Environmental Data Access, Impaired Waterbodies, Minnesota, 2024; Assessed Waters, Minnesota, 2024; River Nutrient Standards, Current Stream Water Units in Minnesota, River TSS Standards, National Hydrography Dataset (NHD) – Minnesota, TMDL and WRAPS Project Boundaries, MPCA Environmental Justice, Outstanding Resource Value Waters, MPCA Volunteer Water Monitoring Stations, St. Louis River Area of Concern Sediment Assessment Units.
  https://gisdata.mn.gov/organization/us-mn-state-pca
- MPCA Watershed Pollutant Load Monitoring Network –Tableau:
  https://public.tableau.com/app/profile/mpca.data.services/viz/WatershedPollutantLoadMonitoringNetworkWPLMNDataViewer/ProgramOverview
- Minnesota Stream layer
  https://gisdata.mn.gov/dataset/water-strahler-stream-order
- Pokegama River monitoring
  https://cdmo.baruch.sc.edu/PWA/index.html
- LKSPOMET https://cdmo.baruch.sc.edu/
- St. Louis River Gage
  https://waterdata.usgs.gov/monitoring-location/04024000/#parameterCode=00065&period=P7D&showMedian=false
- Steep slopes adjacent to streams
  https://www.dnr.state.mn.us/whaf/about/gis_data_sources.html#S
  https://arcgis.dnr.state.mn.us/ewr/whaf2/
- Surface water data viewers
  https://webapp.pca.state.mn.us/surface-water/search
  https://webapp.pca.state.mn.us/wqd/surface-water
  https://dnrmaps.wi.gov/H5/?Viewer=SWDV
- Watershed Health Assessment Framework
  https://whaf-explorer.dnr.state.mn.us/

Reports:

- Duluth Streams Bacterial Source Identification Study Final Report 2020
- Duluth Urban Watershed WRAPS
  https://www.pca.state.mn.us/watershed-information/duluth-urban-area-watershed
- Duluth Urban Watershed TMDL
  https://www.pca.state.mn.us/watershed-information/duluth-urban-area-watershed
- Estuarine habitats in the St. Louis Estuary, Lake Superior, Wisconsin: past, present, and future StoryMap https://storymaps.arcgis.com/stories/57104f88e35c4fdb920f4d50f0d3a35b
- Estuarine habitats in the St. Louis Estuary, Lake Superior, Wisconsin: past, present, and future Report (Endris et al 2023)
- Fish Passage Culvert Assessment in the St. Louis River Area of Concern in Wisconsin (Steiger, WDNR 2017)
- Keene Creek Stream Assessment 2016
- Kingsbury Creek Sediment Reduction Feasibility Study 2020
- Pokegama River Targeted Watershed Assessment: A Water Quality Report to Protect Wisconsin Watersheds 2020
- St. Louis River TMDL
  https://www.pca.state.mn.us/business-with-us/st-louis-river-watershed-mercury-tmdl
- Stewart Creek Stream Assessment 2018
- WRAPS, TMDLs, Stressor Identification, Monitoring and Assessment, Watershed Assessment and Trends Updates - containing information on water quality conditions, vulnerabilities, restoration and protection priorities, and recommended actions
  - St. Louis River Watershed
    https://www.pca.state.mn.us/watershed-information/st-louis-river
  - Lake Superior South Watershed
    https://www.pca.state.mn.us/watershed-information/lake-superior-south
  - Duluth Urban Area Watershed
    https://www.pca.state.mn.us/watershed-information/duluth-urban-area-watershed
    ** Note Appendix B of the Duluth WRAPS report has a study of six Duluth area streams by South St. Louis SWCD*

INVASIVE SPECIES

Any files not containing a link are saved on the Headwaters Partnership Google Drive and accessible via this link https://drive.google.com/drive/folders/175j6-FRLo_-J0yrbUeDJjyPQzdJCMnKa?usp=drive_link

Datasets and Maps:

- EDDmapS - central Database for CISMA Partners and public to report verified Terrestrial Invasive Plants Eddmaps.org
- Invasive Survey Maps
- SLRNA_NPCs.kmz
- WI DNR SWIMS AIS Viewer - central database for verified AIS populations https://dnrmaps.wi.gov/H5/?viewer=Lakes_AIS_Viewer

Reports:

- A Minnesota Management Plan for Invasive Species (Minnesota Invasive Species Advisory Council (MISAC) 2022) https://www.mninvasives.org/stateplan
- Clough Island Aquatic Macrophyte Survey (Roesler, Wisconsin DNR 2013)
- Clough Island, Wisconsin: Invasive Plant Survey (Hlina et al. 2013)
- Duluth Natural Areas Program and Plans https://duluthmn.gov/parks/natural-resources/dnap/
- Aquatic Invasive Species Prevention Plan St. Louis County, Minnesota (2015) https://www.stlouiscountymn.gov/Portals/0/Library/Dept/Planning%20%26%20Development/Community-Development/Aquatic-Invasive-Species/SLC-AIS-Prevention-Plan-Final.pdf
- Biodiversity Conservation Assessment Background Chapter and Conservation Strategy Regional Plan: 12-St. Louis and Cloquet BCA Regional Unit (2015) Lake Superior Partnership Work Group https://npshistory.com/publications/water/bca-v2.pdf
- Douglas County AIS Strategic Plan (2021) https://www.douglascountywi.org/DocumentCenter/View/12115/2021-Douglas-County-AIS-Strategic-Plan
- Lake Superior Binational Program. Lake Superior Aquatic Invasive Species Complete Prevention Plan. January 2014. http://www.epa.gov/glnpo/lakesuperior/index.html
- St. Louis River Bottom Trawling Survey Summary Reports (years 2011-2023) https://www.1854treatyauthority.org/management/biological-resources/reports
- Wisconsin Aquatic Invasive Species Management Plan. July 2018. Wisconsin Aquatic Invasive Species Management Plan

LAKE STURGEON

Any files not containing a link are saved on the Headwaters Partnership Google Drive and accessible via this link https://drive.google.com/drive/folders/175j6-FRLo_-J0yrbUeDJjyPQzdJCMnKa?usp=drive_link

Reports:

- A lake sturgeon rehabilitation plan for Lake Superior (Great Lakes Fishery Commission Auer,N.A. [ED.] 2003)
- Fish-community objectives for Lake Superior. Great Lakes Fish. Comm. Spec. Pub. 03-01. 78 p. http://www.glfc.org/pubs/SpecialPubs/Sp03_1.pdf
- Lake Superior Fisheries Management Plan 2020-2029. Admin. Rep. No. 93. Wisconsin DNR https://widnr.widen.net/s/wtwwsnnqqr
- Lake Superior Lake Sturgeon Index Survey: 2011 Status Report (Lake Superior Lake Sturgeon Work Group (2014)
- Larval Sturgeon Drift Netting Summary Report. (1854 Treaty Authority Resource Management Division 2024) https://www.1854treatyauthority.org/management/biological-resources/reports/fisheries
- Minnesota Department of Natural Resources Lake Sturgeon Management Plan for the St. Louis River Estuary (2019)
- Minnesota Department of Natural Resources. Spawning Assessment (2022)
- St. Louis River Estuary Lake Sturgeon Management Plan (2019)

TERRESTRIAL HABITAT CONNECTIVITY

Any files not containing a link are saved on the Headwaters Partnership Google Drive and accessible via this link https://drive.google.com/drive/folders/175j6-FRLo_-J0yrbUeDJjyPQzdJCMnKa?usp=drive_link

Datasets and Maps:

- Great Lakes Restoration Initiative's Terrestrial Habitats & Connectivity Work Group's Pilot Area's Post-Fiscal Year 2022 Forest Habitat Connectivity https://www.usgs.gov/data/great-lakes-restoration-initiatives-terrestrial-habitats-connectivity-work-groups-pilot-3

  https://data.usgs.gov/datacatalog/data/USGS:64efac9ad34e4b6d8ab731f3

Reports:

- Habitat Restoration and Protection: St. Louis River Area of Concern, Minnesota 2020 https://www.researchgate.net/publication/344952458_Habitat_Restoration_and_Protection_St_Louis_River_Area_of_Concern_Minnesota
- Important Habitat in the Lake Superior Basin Storymap https://www.arcgis.com/apps/Cascade/index.html?appid=054672405cdf4c989905819e75ad1602
- Natural communities, aquatic features, and selected habitats of Wisconsin. Chapter 7 in The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management. Wisconsin Department of Natural Resources, (Epstein 2017)
- Superior Coastal Plain Ecological Landscape. The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management. Chapter 21, PUB-SS-1131W 2015, (Wisconsin Department of Natural Resources 2015)

WATER QUALITY

Any files not containing a link are saved on the Headwaters Partnership Google Drive and accessible via this link https://drive.google.com/drive/folders/175j6-FRLo_-J0yrbUeDJjyPQzdJCMnKa?usp=drive_link

Datasets and Maps:

- Lake Superior NERR System-Wide Monitoring Data (SWMP) -10 years of water quality data collected every 15 min, nutrient, and chl-a data monthly, and annual veg surveys at Pokegama Bay https://cdmo.baruch.sc.edu/
- Wisconsin DNR Monitoring Data SWIMS - a variety of water quality monitoring parameters throughout the Estuary https://apps.dnr.wi.gov/securitygateway/login?r=/swims

Reports:

- Lake Superior Basin Plan (Minnesota Pollution Control Agency 2004)
- St. Louis River Area of Concern Beneficial Use Impairment Removal Recommendation for Excessive Loading of Sediment and Nutrients (2020) https://www.epa.gov/system/files/documents/2021-07/eutrophicationbui-removal-package_0.pdf
- St. Louis River Area of Concern Beneficial Use Impairment Restoration Report (2023) https://dnr.wisconsin.gov/sites/default/files/topic/GreatLakes/2023_SLR_BUIRestorationReport.pdf
- Water Quality in the St. Louis River Area of Concern, Lake Superior: Historical and Current Conditions and Delisting Implications. Journal of Great Lakes Research 42, no. 1 (Bellinger et al. 2016): 28–38. https://doi.org/10.1016/j.jglr.2015.11.008

WILD RICE

Any files not containing a link are saved on the Headwaters Partnership Google Drive and accessible via this link https://drive.google.com/drive/folders/175j6-FRLo_-J0yrbUeDJjyPQzdJCMnKa?usp=drive_link

Datasets and Maps:

- Lower St. Louis River Habitat Plan 2002-general maps index

Reports:

- Aquatic Habitat Mapping in the St. Louis River Estuary (Reschke & Hill 2020) https://conservancy.umn.edu/bitstream/handle/11299/226674/NRRI-TR-2020-19.pdf
- St. Louis River Estuary Wild Rice Restoration Monitoring (2015-2025) (Vogt, 1854 Treaty Authority 2025) https://www.1854treatyauthority.org/management/biological-resources/reports/wild-rice
- St. Louis River Estuary Manoomin Restoration and Stewardship Plan (Wisconsin Department of Natural Resources 2024) https://dnr.wisconsin.gov/sites/default/files/topic/GreatLakes/St.LouisRiverEstuaryManoominRestorationStewardshipPlan.pdf
- The importance of natural disturbance processes in a wild rice dominated natural area. (Meeker and Rose 1989)

- Tracking vegetation transitions due to invasion of cattail in Lake Superior coastal peatlands. (Meeker et al 2023)
- Wild Rice Restoration Implementation Plan for the St. Louis River Estuary (Minnesota Department of Natural Resources 2014) https://www.1854treatyauthority.org/images/WildRiceImplementationPlan_2014_Final.pdf
- Wild Rice Monitoring and Abundance in the 1854 Ceded Territory (1998-2024) (Vogt, 1854 Treaty Authority 2024) https://www.1854treatyauthority.org/management/biological-resources/reports/wild-rice
- Wild-rice and sedimentation process in a Lake Superior coastal wetland. (Meeker 1996)

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APPENDIX C. MATRICIES FOR EACH PRIORITY CONCERN

BIRDS					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
1	**Information Gap**	**Study**	Implement standardized monitoring protocols to establish ecological baselines or determine post restoration response, quantifying the value of wetland sites for breeding birds and migratory stopover occupancy.	Some management is currently happening, so we should monitor post-restoration response of birds to management actions. Especially because this is one of the best sites in the SLRE for migrating and breeding birds.	Access is dangerous but this site would be used extensively by birders and people fishing. Should be made safer. Currently difficult to determine if it is accessible or not.
2	**Information Gap**	**Study**	Implement standardized monitoring protocols to establish ecological baselines or determine post restoration response, quantifying the value of wetland sites for breeding birds and migratory stopover occupancy.	As newly created habitat, we need to establish a baseline of which species are using it, when, and how. Lower urgency due to habitat being new. However, it is important to determine the benefit of restoration actions for bird use.	
3	**Information Gap**	**Study**	Establish ecological baselines by conducting standardized avian surveys during peak migration and breeding seasons. This data will quantify how shorebirds and waterbirds utilize specific beaches, mudflats, and nearshore habitats.	As newly created habitat, we need to establish a baseline of which species are using it, when, and how. Lower urgency due to habitat being new. However, it is important to determine the benefit of restoration actions for bird use.	
4	**Information Gap**	**Study**	Establish ecological baselines by conducting standardized avian surveys during peak migration and breeding seasons. This data will quantify how shorebirds and waterbirds utilize specific beaches, mudflats, and nearshore habitats.	As newly created habitat, should collect baseline data on bird use of the island. Newly created, use by birds currently unknown. Would help inform future restoration actions.	
5	**Information Gap**	**Study**	Implement standardized monitoring protocols to establish ecological baselines or determine post restoration response, quantifying the value of wetland sites for breeding birds and migratory stopover occupancy.	Need to conduct post-restoration monitoring to determine effectiveness of restoration actions. Newly restored. Determining how birds respond to bird-specific restoration actions will be very important for informing future restoration actions.	
6	**Priority Actions**	**Restore**	Prioritize restoration of hemi-marsh wetlands to support diverse wetland bird communities.	Reestablish Kilchlis Meadows which had been important for many different guild of birds. Useful place to use dredge materials to reestablish the habitat that used to be present. Lacking adequate habitat for shorebirds in the St Louis River estuary. This site has previously been highly valuable for many guilds of birds including shorebirds.	
7	**Priority Actions**	**Restore**	Prioritize creation, enhancement, and restoration of natural shoreline and nearshore habitats within the St. Louis River estuary in areas with the highest potential to recover rare or absent habitats—such as mudflats, sandy beaches, and essential vegetation gradients—to support diverse shorebird and waterbird populations.	Reestablish Kilchlis Meadows which had been important for many different guild of birds. Useful place to use dredge materials to reestablish the habitat that use to be present. Lacking adequate habitat for shorebirds in the St Louis River estuary. This site has previously been highly valuable for many guilds of birds including shorebirds.	
8	**Priority Actions**	**Restore**	Prioritize creation, enhancement, and restoration of natural shoreline and nearshore habitats within the St. Louis River estuary in areas with the highest potential to recover rare or absent habitats—such as mudflats, sandy beaches, and essential vegetation gradients—to support diverse shorebird and waterbird populations.	Seems to be good potential location to create shorebird habitat and also enhance quality of habitat on parts of the island. Would be potentially good location for creating much needed shorebird habitat in the St Louis River estuary, but priority may be lower since protection/restoration does not require immediate action.	
9	**Information Gap**	**Study**	Implement standardized monitoring protocols to establish ecological baselines or determine post restoration response, quantifying the value of wetland sites for breeding birds and migratory stopover occupancy.	Restoration actions currently happening at this site to enhance habitat features for marsh nesting birds. Post-restoration monitoring is necessary to determine effectiveness of restoration actions.	
10	**Information Gap**	**Study**	Establish ecological baselines by conducting standardized avian surveys during peak migration and breeding seasons. This data will quantify how shorebirds and waterbirds utilize specific beaches, mudflats, and nearshore habitats.	Has been restored. Requires data on habitat use by different species. Currently very limited survey data at this site. Should be a priority to determine species use by season. Habitat created and being used by birds. However, quantifying use would be valuable to determine its value and identify which groups of species are using and when to inform future restoration actions in the SLRE.	

BIRDS					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
11	**Information Gap**	**Study**	Implement standardized monitoring protocols to establish ecological baselines or determine post restoration response, quantifying the value of wetland sites for breeding birds and migratory stopover occupancy.	Site has been recently restored. Should conduct surveys to determine impact of restoration on breeding marsh birds. Should assess how recent restoration actions impacted breeding marsh birds at this site.	
12	**Information Gap**	**Study**	Quantify the conservation value of wetland sites by utilizing multi-metric assessments of bird productivity, habitat quality, and focal indicator species to serve as metrics for ecosystem health.	Area of unknown value, however potential habitat restoration or enhancement possible for marsh birds. Not much known about this site in terms of bird use or habitat quality but may be valuable to explore.	
13	**Information Gap**	**Study**	Assess the significance of shoreline and island sites by monitoring nesting productivity, evaluating habitat integrity, and documenting species composition. This includes identifying indicator species to serve as benchmarks for habitat quality.	This sandbar provides important habitat for shorebirds, waterbirds, and waterfowl. Should have a plan for continued management/enhancement to ensure it persists in this location. Habitat fairly recently created and highly used by multiple guilds of birds. Maintaining this habitat and monitoring to determine use by taxa is important.	
14	**Information Gap**	**Study**	Implement standardized monitoring protocols to establish ecological baselines or determine post restoration response, quantifying the value of wetland sites for breeding birds and migratory stopover occupancy.	Need to establish baseline data to determine significance of location to marsh nesting birds and to birds during migration (stopover habitat). Need to determine conservation value. Multiple owners of land, including private.	
15	**Consideration**	**Collaborate**	Collaborate with partners to maximize benefits to wetland ecosystem function and resilience by coordinating hydrologic restoration, vegetation management, and bird habitat objectives across projects.	Site Identified by Coastal Wetlands team. Identified potential to restore baymouth bars that have been sediment starved and eroded. Potential to be repaired/restored for coastal wetland purposes & bird objectives	
16	**Consideration**	**Collaborate**	Collaborate with partners to maximize benefits to wetland ecosystem function and resilience by coordinating hydrologic restoration, vegetation management, and bird habitat objectives across projects.	Site Identified by Coastal Wetlands team. Identified potential to restore baymouth bars that have been sediment starved and eroded. Potential to be repaired/restored for coastal wetland purposes & bird objectives.	
17	**Information Gap**	**Study**	Establish ecological baselines by conducting standardized avian surveys during peak migration and breeding seasons. This data will quantify how shorebirds and waterbirds utilize specific beaches, mudflats, and nearshore habitats.	Beach nourishment will be occurring in 2025. Project is occurring to increase the size and health of his beach that has experienced significant erosion and degradation. Shorebird monitoring of the nourished area vs other areas of the beach would be a very informative project. Compare use after nourishment to previous eBird data.	Community uses the site heavily
18	**Consideration**	**Collaborate**	Engage private landowners to protect and restore critical wetland functions, ensuring a connected mosaic of diverse vegetation and hydrologic regimes for priority bird populations.	Largely unknown. Audubon has evaluated it as medium priority This is an area of primarily wet hay with hydric soils that would lend itself well to restored wetland. Some species like Sedge Wren and Swamp Sparrow are present and restoring some marshbird habitat here could establish habitat for these species and waterfowl/shorebirds. Any possible restoration here would depend on interest and cooperation from landowner. Owned by "Bluff Creek Wetlands LLC".	
19	**Consideration**	**Collaborate**	Engage private landowners to protect and restore critical wetland functions, ensuring a connected mosaic of diverse vegetation and hydrologic regimes for priority bird populations.	Any work here would likely need a partnership with the Duluth Power Squadron/America's Boating Club Area has high potential to develop/restore emergent/hemi-marsh habitat where there currently is none in this creek mouth. Could use dredge material and plant native species. Further exploring and planning to do.	High possibility of cultural resources High potential to increase community use and benefit
20	**Priority Actions**	**Restore**	Prioritize restoration of hemi-marsh wetlands to support diverse wetland bird communities.	Any work here would likely need a partnership with the Duluth Power Squadron/America's Boating Club Area has high potential to develop/restore emergent/hemi-marsh habitat where there currently is none Potential for restoration of emergent/hemi marsh in this creek mouth. Could use dredge material and plant native species. Further exploring and planning to do.	High possibility of cultural resources High potential to increase community use and benefit
21	**Priority Actions**	**Design**	Optimize wetland projects for priority birds by aligning project hydrology and vegetation structure with species-specific habitat recommendations during the initial design phase.	MN DNR is considering the site for restoration and is the lead on this possible project. Restoration would improve vegetation community, and connection with the river on the other side of the railroad grade.	

BROOK TROUT STREAMS					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
22	Best Practices	Plan	Develop stormwater management plans and implement projects that reduce the negative impacts of stormwater discharged to Brook Trout watersheds	City owned property potentially utilized for stormwater management.	
23	Priority Actions	Steward	Identify and establish government units responsible for long term maintenance of past, present and future projects.	Private stormwater basin associated with mobile home development. Requires long-term maintenance. Not maintained by the City of Duluth.	
24	Priority Actions	Steward	Identify and establish government units responsible for long term maintenance of past, present and future projects.	Stormwater BMP established as part of housing development. Need to identify in this document who is responsible for long-term maintenance. Need to identify who is responsible for long-term maintenance. Need to maintain these BMPs.	
25	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Installation of curb and gutter to Westgate Boulevard to convey stormwater flows to underutilized vegetated area on east bank of Keene Creek. installation of drainage basin with biofiltration features and native perennial/pollinator plantings. Existing sanitary sewer infrastructures in this area would need to be carefully referenced prior to being crossed by proposed alterations to the stormwater conveyance systems needed for green infrastructure improvements at this site. MNDOT right of way. Project has not been fully scoped to determine feasibility. Ownership issues with MNDOT. More specific information about this project is contained in the City of Duluth Draft Resiliency Report for Keene Creek watershed.	
26	Priority Actions	Steward	Identify and establish government units responsible for long term maintenance of past, present and future projects.	Installation of curb and gutter to Westgate Boulevard to convey stormwater flows to underutilized vegetated area on east bank of Keene Creek. installation of drainage basin with biofiltration features and native perennial/pollinator plantings. Existing sanitary sewer infrastructures in this area would need to be carefully referenced prior to being crossed by proposed alterations to the stormwater conveyance systems needed for green infrastructure improvements at this site. MNDOT right of way. Project has not been fully scoped to determine feasibility. Ownership issues with MNDOT. More specific information about this project is contained in the City of Duluth Draft Resiliency Report for Keene Creek watershed.	
27	Information Gaps	Assess	Gather baseline data such as water temperature, sediment loading, habitat quality, and hydrology to determine the feasibility of future projects and to aid in the prioritization of projects for Brook Trout watersheds.	There is a 36-inch outfall that discharges into a tributary to Kingsbury Creek. However, the area of the stormshed is currently unknown. Although it is known that erosion within the tributary is an issue, the stormsheds that convey runoff have not been evaluated. Would need to develop a relationship with the City of Proctor to determine opportunities for stormwater management in this area Although there is minimal baseline information, the benefit of advancing stormwater management at this site should be pursued.	
28	Best Practices	Plan	Develop stormwater management plans and implement projects that reduce the negative impacts of stormwater discharged to Brook Trout watersheds	There is a 36-inch outfall that discharges into a tributary to Kingsbury Creek. However, the area of the stormshed is currently unknown. Although it is known that erosion within the tributary is an issue, the stormsheds that convey runoff have not been evaluated. Would need to develop a relationship with the City of Proctor to determine opportunities for stormwater management in this area Although there is minimal baseline information, the benefit of advancing stormwater management at this site should be pursued.	
29	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	There is a 36-inch outfall that discharges into a tributary to Kingsbury Creek. However, the area of the stormshed is currently unknown. Although it is known that erosion within the tributary is an issue, the stormsheds that convey runoff have not been evaluated. Would need to develop a relationship with the City of Proctor to determine opportunities for stormwater management in this area Although there is minimal baseline information, the benefit of advancing stormwater management at this site should be pursued.	
30	Information Gaps	Assess	Gather baseline data such as water temperature, sediment loading, habitat quality, and hydrology to determine the feasibility of future projects and to aid in the prioritization of projects for Brook Trout watersheds.	Detailed and accurate streamline data layer is needed for the St. Louis River watershed.	
31	Priority Actions	Steward	Identify and establish government units responsible for long term maintenance of past, present and future projects	Existing BMP to take backflow from the Spirit Mountain snow-making system. Requires long-term maintenance performed by Spirit Mountain Recreation Authority and the City of Duluth. Need for positive identification of long-term maintenance plan. Long-term maintenance required.	

BROOK TROUT STREAMS					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
32	**Priority Actions**	**Preserve**	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	This area contains features that have been associated with coldwater springs and good headwaters habitat for Brook Trout. Headwaters wetlands and springs are critical for sustaining baseflows and cold water inputs. No existing data, however looks like potential is there.	
33	**Information Gaps**	**Assess**	Gather baseline data such as water temperature, sediment loading, habitat quality, and hydrology to determine the feasibility of future projects and to aid in the prioritization of projects for Brook Trout watersheds.	This area contains features that have been associated with coldwater springs and good headwaters habitat for Brook Trout. Headwaters wetlands and springs are critical for sustaining baseflows and cold water inputs. No existing data, however looks like potential is there.	
34	**Best Practices**	**Plan**	Develop stormwater management plans and implement projects that reduce the negative impacts of stormwater discharged to Brook Trout watersheds	City owned property potentially utilized for stormwater management.	
35	**Priority Actions**	**Steward**	Identify and establish government units responsible for long term maintenance of past, present and future projects.	A sediment collection basin was constructed at the mouth of Knowlton Creek behind Tallas Island prior to the restoration of Knowlton Creek. The basin filled as a result of rain events. Iit will be dredged through the USX Superfund process. Although sediment transport has been greatly reduced as a result of implementing watershed projects upstream, long-term maintenance will be required. Responsible party not identified. US Steel as mitigation for Superfund remediation process. Not responsible for long-term maintenance. Although long-term maintenance of the sediment basin will be necessary, it is anticipated to be less of an issue after since completion of the sediment control structures below Spirit Mountain and continued effort to control sediment from the ski hill. Identifying an entity to fund the maintenance of the basin will be challenging.	
36	**Priority Actions**	**Preserve**	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	Large area of elevated woody wetlands with numerous spring fed headwaters tributaries. Water temps are cold in the tributary that collects most of the water emerging from this elevated wetland complex.	
37	**Priority Actions**	**Preserve**	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	Woody wetlands with springs. These areas have been shown to contribute to and/or form coldwater headwaters tributaries. There is a small tributary emerging from this area. This is a smaller area than others in the watershed, but headwaters wetlands and springs are critical for sustaining baseflows and cold water inputs.	
38	**Priority Actions**	**Preserve**	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	Headwaters wetlands and springs are critical for sustaining baseflows and cold water inputs. Several cold tributaries emerge from this area of woody wetlands and springs. These areas have been shown to contribute to and/or form coldwater headwaters tributaries.	
39	**Best Practices**	**Preserve**	Mitigate the negative impacts of development to the greatest degree possible	High preservation need - City of Hermantown intends to develop this area further and make Maple Grove the downtown of Hermantown. Development is making its way to interior parcels by extending stub road like Oak Drive and Lober Rd using sewer easements. Headwaters of Keene Creek are currently in excellent condition but at risk.	Preservation of interior high-quality parcels would benefit Keene Creek Trail users recreation experience and make them better connected to a healthy stream ecosystem.
40	**Priority Actions**	**Preserve**	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	High preservation need - City of Hermantown intends to develop this area further and make Maple Grove the downtown of Hermantown. Development is making its way to interior parcels by extending stub road like Oak Drive and Lober Rd using sewer easements. Headwaters of Keene Creek are currently in excellent condition but at risk.	Preservation of interior high-quality parcels would benefit Keene Creek Trail users recreation experience and make them better connected to a healthy stream ecosystem.
41	**Priority Actions**	**Steward**	Improve recreational access to brook trout watersheds to enhance public support for their restoration and preservation.	High preservation need - City of Hermantown intends to develop this area further and make Maple Grove the downtown of Hermantown. Development is making its way to interior parcels by extending stub road like Oak Drive and Lober Rd using sewer easements. Headwaters of Keene Creek are currently in excellent condition but at risk.	Preservation of interior high-quality parcels would benefit Keene Creek Trail users recreation experience and make them better connected to a healthy stream ecosystem.

BROOK TROUT STREAMS					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
42	**Considerations**	**Collaborate**	Work with municipal authorities to develop processes and protocols for preserving priority habitats	High preservation need - City of Hermantown intends to develop this area further and make Maple Grove the downtown of Hermantown. Development is making its way to interior parcels by extending stub road like Oak Drive and Lober Rd using sewer easements. Headwaters of Keene Creek are currently in excellent condition but at risk.	Preservation of interior high quality parcels would benefit Keene Creek Trail users recreation experience and make them better connected to a healthy stream ecosystem.
43	**Priority Actions**	**Preserve**	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	Woody wetlands with springs. These areas have been shown to contribute to and/or form coldwater headwaters tributaries. Headwaters wetlands and springs are critical for sustaining baseflows and cold water inputs Two years of temperature data at tributary outlet of this wetland/spring area - very cold temps and Brook Trout observed in this tributary.	
44	**Priority Actions**	**Preserve**	Preserve coldwater tributaries that offer thermal refugia and spawning habitat	Woody wetlands with springs. These areas have been shown to contribute to and/or form coldwater headwaters tributaries. Headwaters wetlands and springs are critical for sustaining baseflows and cold water inputs Two years of temperature data at tributary outlet of this wetland/spring area - very cold temps and Brook Trout observed in this tributary.	
45	**Best Practices**	**Plan**	Develop stormwater management plans and implement projects that reduce the negative impacts of stormwater discharged to Brook Trout watersheds	Zenith Terrace development has little stormwater management at this time. Would be desirable to work together with the City of Proctor to determine the feasibility of developing a stormwater plan for this area. No baseline information and lack of a foundational relationship with the City of Proctor to address stormwater issues on this site. Although there is minimal baseline information, the benefit of advancing stormwater management at this site should be pursued.	
46	**Considerations**	**Collaborate**	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Zenith Terrace development has little stormwater management at this time. Would be desirable to work together with the City of Proctor to determine the feasibility of developing a stormwater plan for this area. No baseline information and lack of a foundational relationship with the City of Proctor to address stormwater issues on this site. Although there is minimal baseline information, the benefit of advancing stormwater management at this site should be pursued.	
47	**Best Practices**	**Educate**	Develop outreach materials that highlight the importance of headwater wetlands and stormwater management for the long-term health of Brook Trout watersheds	Curb cut with rain garden pre-treatment; drainage basin with biofiltration features and native perennial/pollinator plantings; public educational signage; optional extensive green roof addition to Duluth-owned buildings. A 10-inch vitreous clay sanitary sewer pipe exits the public library and runs parallel to the 4-inch polyvinyl chloride stormwater conveyance system at this location. The proposed biofiltration basin must consider these systems in site design parameters. The site is owned by the City of Duluth, there is an adequate footprint for the objective and the completed effort would provide opportunity for development of educational outreach. More specific information about this project is contained in the City of Duluth Draft Resiliency Report for Keene Creek watershed.	Potential for community education signage.
48	**Considerations**	**Collaborate**	Work with the City of Duluth on city managed land and projects	Curb cut with rain garden pre-treatment; drainage basin with biofiltration features and native perennial/pollinator plantings; public educational signage; optional extensive green roof addition to Duluth-owned buildings. A 10-inch vitreous clay sanitary sewer pipe exits the public library and runs parallel to the 4-inch polyvinyl chloride stormwater conveyance system at this location. The proposed biofiltration basin must consider these systems in site design parameters. The site is owned by the City of Duluth, there is an adequate footprint for the objective and the completed effort would provide opportunity for development of educational outreach. More specific information about this project is contained in the City of Duluth Draft Resiliency Report for Keene Creek watershed.	Potential for community education signage.
49	**Best Practices**	**Maintain**	Advance currently funded projects to completion	Curb cut with rain garden pre-treatment; drainage basin with biofiltration features and native perennial/pollinator plantings; public educational signage; optional extensive green roof addition to Duluth-owned buildings. A 10-inch vitreous clay sanitary sewer pipe exits the public library and runs parallel to the 4-inch polyvinyl chloride stormwater conveyance system at this location. The proposed biofiltration basin must consider these systems in site design parameters. The site is owned by the City of Duluth, there is an adequate footprint for the objective and the completed effort would provide opportunity for development of educational outreach. More specific information about this project is contained in the City of Duluth Draft Resiliency Report for Keene Creek watershed.	Potential for community education signage.
50	**Information Gaps**	**Study**	Understand what factors could be addressed to make difficult projects more feasible.	Mogie Lake, at the headwaters of Kingsbury Creek, was said to have supported a Brook Trout fishery prior to initial logging and sedimentation after the fires. Dredge sediment deposits to restore Brook Trout fishery. There are multiple factors that cause this proposed action to be difficult to advance. However, the potential to create a natural Brook Trout lake is appealing. Need to evaluate the feasibility of pursuing the project. This project does not fit well into any of the 10 objectives	
51	**Priority Actions**	**Preserve**	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	Woody wetlands with springs. These areas have been shown to contribute to and/or form coldwater headwaters tributaries.	

BROOK TROUT STREAMS					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
52	Priority Actions	Preserve	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	Elevated woody wetlands with springs. These areas have been shown to contribute to and/or form a coldwater tributary to Keene Creek.	
53	Best Practices	Plan	Develop stormwater management plans and implement projects that reduce the negative impacts of stormwater discharged to Brook Trout watersheds	Sediment basin BMP established by MNDOT during Grand Avenue upgrade in 2016. The basin takes runoff from Grand Avenue and will require long-term maintenance. MNDOT responsible for long-term maintenance.	
54	Priority Actions	Steward	Identify and establish government units responsible for long term maintenance of past, present and future projects.	Sediment basin BMP established by MNDOT during Grand Avenue upgrade in 2016. The basin takes runoff from Grand Avenue and will require long-term maintenance. MNDOT responsible for long-term maintenance.	
55	Priority Actions	Preserve	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	Headwaters wetlands and springs are critical for sustaining baseflows and cold water inputs. This area contains miles of headwaters habitat and in-tact woody wetlands. Some springs also evident from aerial photos. Area is under development pressure/proposed for development.	
56	Considerations	Collaborate	Work to acquire easements to preserve or restore high quality habitat and maintain connectivity	Headwaters wetlands and springs are critical for sustaining baseflows and cold water inputs. This area contains miles of headwaters habitat and in-tact woody wetlands. Some springs also evident from aerial photos. Area is under development pressure/proposed for development.	
57	Best Practices	Steward	Ensure existing regulations are being implemented to protect habitat	Headwaters wetlands and springs are critical for sustaining baseflows and cold water inputs. This area contains miles of headwaters habitat and in-tact woody wetlands. Some springs also evident from aerial photos. Area is under development pressure/proposed for development.	
58	Information Gaps	Assess	Gather baseline data such as water temperature, sediment loading, habitat quality, and hydrology to determine the feasibility of future projects and to aid in the prioritization of projects for Brook Trout watersheds.	This is a large woody wetland comlpex within the developed area around Proctor. A tributary courses through this wetland, but no monitoring data exist for characterization. Recommend monitoring for temperature and biota.	
59	Priority Actions	Restore	Manage erosion from heavily incised tributaries.	Severe gully erosion is occurring as a result of runoff being concentrated by the railroad causeway. Sediment is being transported downstream and into the stream restoration project that was completed in 2015/2016. This erosion should be controlled. Access is difficult. Identification of an appropriate funding source is difficult. Even though controlling sediment being transported into the stream restoration area and ultimately downstream and into the Tallas Island wetlands should be a priority, the complicating factors and other prioritizations on the landscape make it challenging MNDNR would be responsible for implementing this project in partnership with the City of Duluth.	
60	Information Gaps	Plan	Work through how to restore a challenging site with available resources	Severe gully erosion is occurring as a result of runoff being concentrated by the railroad causeway. Sediment is being transported downstream and into the stream restoration project that was completed in 2015/2016. This erosion should be controlled. Access is difficult. Identification of an appropriate funding source is difficult. Even though controlling sediment being transported into the stream restoration area and ultimately downstream and into the Tallas Island wetlands should be a priority, the complicating factors and other prioritizations on the landscape make it challenging MNDNR would be responsible for implementing this project in partnership with the City of Duluth.	
61	Considerations	Collaborate	Work with the City of Duluth on city managed land and projects	Severe gully erosion is occurring as a result of runoff being concentrated by the railroad causeway. Sediment is being transported downstream and into the stream restoration project that was completed in 2015/2016. This erosion should be controlled. Access is difficult. Identification of an appropriate funding source is difficult. Even though controlling sediment being transported into the stream restoration area and ultimately downstream and into the Tallas Island wetlands should be a priority, the complicating factors and other prioritizations on the landscape make it challenging MNDNR would be responsible for implementing this project in partnership with the City of Duluth.	
62	Priority Actions	Preserve	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	Elevated woody wetlands with springs. These areas have been shown to contribute to and/or form coldwater headwaters tributaries. Headwaters wetlands and springs are critical for sustaining baseflows and cold water inputs.	

BROOK TROUT STREAMS					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
63	Best Practices	Maintain	Advance currently funded projects to completion	59th Avenue West Green Infrastructure Project is being advanced by the MNDNR and the City and funded by the GLRI. The project will treat 85 acres of stormshed, with a system of bio-infiltration and biochar basins and will be constructed in 2026. The size of the construction site is limiting, which will allow for the treatment of a one-inch rain event over a 24-period. The project will address water quality issues related to the designated E. coli impairment and also address other issues such as sediment and temperature. Additionally, the project has already been funded. More specific information about this project is contained in the City of Duluth Draft Resiliency Report for Keene Creek watershed.	
64	Priority Actions	Steward	Identify and establish government units responsible for long term maintenance of past, present and future projects.	Stormwater BMP established as part of housing development. Need to identify in this document who is responsible for long-term maintenance.	
65	Considerations	Collaborate	Work with the City of Duluth on city managed land and projects	A runoff control system was constructed below Spirit Mountain in 2015 intended to reduce excess flow and sediment transport to Knowlton Creek. That system requires continuous maintenance for effective operation. Long-term maintenance can be challenging. The runoff and sediment control system will not function as designed without an effective long-term maintenance plan. Control of sediment transport downstream to Tallas Island is a high priority. City of Duluth responsible for long-term maintenance.	
66	Priority Actions	Steward	Identify and establish government units responsible for long term maintenance of past, present and future projects.	Stormwater BMP created as part of Grand Avenue upgrade and bridge installation in 2016. This will require ongoing maintenance. Not sure who is responsible for maintenance of this feature. Need to verify that long-term maintenance has been identified and is being accomplished.	
67	Considerations	Collaborate	Work with municipal authorities to develop processes and protocols for preserving priority habitats	Untreated stormwater from the dirt track. This runoff flows south and eventually to the stormwater system discharging to a tributary to Kingsbury Creek. That tributary is transporting excess sediment from extreme bank erosion. Would have to work with the City of Proctor to advance an objective at this location. It is a high priority outcome, but the strategy for advancing the objective is complicated and requires the formation of a partnership.	
68	Priority Actions	Preserve	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	Headwaters wetlands and springs are critical for sustaining baseflows and cold water inputs .	
69	Considerations	Collaborate	Work with the City of Duluth on city managed land and projects	The stormwater conveyance structures near to the Keene Creek Dog Park are prohibitively deep for effective diversion to stormwater treatment features, making this location infeasible for green infrastructure implementation. More specific information about this project is contained in the City of Duluth Draft Resiliency Report for Keene Creek watershed.	
70	Priority Actions	Preserve	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	Tributary emerging from this wetland is extremely cold. Elevated woody wetlands with springs. These areas have been shown to contribute to and/or form coldwater headwaters tributaries. Headwaters wetlands are critical for sustaining baseflows and cold water inputs.	
71	Priority Actions	Preserve	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	Cold spring wetland contribution that drives Stewart Creeks baseflow and substantially cools the warmer months. Currently semi protected by Magnery-Snively DNAP. Cold spring driven by valley wall seep from infiltration wetland.	
72	Best Practices	Steward	Ensure existing regulations are being implemented to protect habitat	Cold spring wetland contribution that drives Stewart Creeks baseflow and substantially cools the warmer months. Currently semi protected by Magnery-Snively DNAP. Cold spring driven by valley wall seep from infiltration wetland.	
73	Priority Actions	Preserve	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	Large area of woody wetlands and springs which help form the headwaters of Knowlton Creek.	
74	Priority Actions	Preserve	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	Large area of woody wetlands with channelized tributary coursing through it. Likely not worth restoring the ditch, but efforts should be made to protect headwaters of this cold tributary. Headwaters wetlands and springs are critical for sustaining baseflows and cold water inputs.	
75	Best Practices	Plan	Develop stormwater management plans and implement projects that reduce the negative impacts of stormwater discharged to Brook Trout watersheds	Potential area for establishment of a Stormwater BMP. Presume the City of Duluth would administer construction and take on long-term maintenance responsibilities. Project needs to be developed.	

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Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
76	**Considerations**	**Collaborate**	Work with the City of Duluth on city managed land and projects	Potential area for establishment of a Stormwater BMP. Presume the City of Duluth would administer construction and take on long-term maintenance responsibilities. Project needs to be developed.	
77	**Best Practices**	**Maintain**	Advance currently funded projects to completion	57th Avenue West Green Infrastructure Project is being advanced by the City of Duluth, and funded by the GLRI. The project will treat 17 acres of stormshed, with a system of bio-infiltration and biochar basins and will be constructed in 2025. The amount of land available for construction of the project was limited by other public uses in the same area. The project will address water quality issues related to the designated E. coli impairment and also address other issues such as sediment and temperature. Additionally, the project has already been funded and design is almost complete. More specific information about this project is contained in the City of Duluth Draft Resiliency Report for Keene Creek watershed	
78	**Priority Actions**	**Steward**	Identify and establish government units responsible for long term maintenance of past, present and future projects.	Stormwater BMP established as part of housing development. Need to identify in this document who is responsible for long-term maintenance.	
79	**Best Practices**	**Plan**	Develop stormwater management plans and implement projects that reduce the negative impacts of stormwater discharged to Brook Trout watersheds	City of Duluth and Spirit Mountain Recreation Authority will design and build a stormwater management project to control runoff from unpaved ski hill parking lots that are causing severe gully erosion and depositing sediment into Knowlton Creek. The City is in the process of developing a stormwater management plan for the entire Spirit Mountain Recreation Area in 2026. Need to secure funding This project has been discussed for several years and it's completion is critical for reducing sediment being transported downstream to the restored Tallas Island wetlands. City of Duluth will take on the primary responsibility for advancing this project.	
80	**Considerations**	**Collaborate**	Work with the City of Duluth on city managed land and projects	City of Duluth and Spirit Mountain Recreation Authority will design and build a stormwater management project to control runoff from unpaved ski hill parking lots that are causing severe gully erosion and depositing sediment into Knowlton Creek. The City is in the process of developing a stormwater management plan for the entire Spirit Mountain Recreation Area in 2026. Need to secure funding This project has been discussed for several years and it's completion is critical for reducing sediment being transported downstream to the restored Tallas Island wetlands. City of Duluth will take on the primary responsibility for advancing this project.	
81	**Priority Actions**	**Preserve**	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	Elevated woody wetlands with unmapped tributaries. No monitoring data for the tributaries, but they share characteristics associated with cold spring fed tributaries monitored in adjacent watersheds.	
82	**Best Practices**	**Plan**	Develop stormwater management plans and implement projects that reduce the negative impacts of stormwater discharged to Brook Trout watersheds	Sediment and debris forebay; bioswale with native perennial/pollinator plantings with added overflow structure. Catchment includes approximately 1 block of Cody Street and about 3 blocks of North 64th Avenue West, which totals about 2.3 acres. City is currently negotiating with the USACE to secure funding to design and construct this feature. It is a result of the roadmap process. There are not utility, right of way, or recreational issues associated with this project. Although the project has not been fully scoped, the lack of ownership, utility, right of way or recreational issues suggest that it should be a high priority. More specific information about this project is contained in the City of Duluth Draft Resiliency Report for Keene Creek watershed.	
83	**Considerations**	**Collaborate**	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Sediment and debris forebay; bioswale with native perennial/pollinator plantings with added overflow structure. Catchment includes approximately 1 block of Cody Street and about 3 blocks of North 64th Avenue West, which totals about 2.3 acres. City is currently negotiating with the USACE to secure funding to design and construct this feature. It is a result of the roadmap process. There are not utility, right of way, or recreational issues associated with this project. Although the project has not been fully scoped, the lack of ownership, utility, right of way or recreational issues suggest that it should be a high priority. More specific information about this project is contained in the City of Duluth Draft Resiliency Report for Keene Creek watershed.	
84	**Priority Actions**	**Preserve**	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	These wetlands/springs form coldwater tributary to Keene Creek. Headwaters wetlands and springs are critical for sustaining baseflows and cold water inputs	
85	**Best Practices**	**Plan**	Develop stormwater management plans and implement projects that reduce the negative impacts of stormwater discharged to Brook Trout watersheds	Stormwater catchment drains to City Hall and Pionk Dr currently without treatment. Currently in the process of getting funding and designing treatment structures for 2026. No treatment for downtown stormwater and will drain straight into Kingsbury Creek restoration project.	

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Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
86	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Water quality structures on both sides of the bridge, established when Grand Avenue was upgraded and the bridge was installed. Need to identify responsible party for long-term maintenance.	
87	Priority Actions	Steward	Identify and establish government units responsible for long term maintenance of past, present and future projects	Water quality structures on both sides of the bridge, established when Grand Avenue was upgraded and the bridge was installed. Need to identify responsible party for long-term maintenance.	
88	Information Gaps	Assess	Gather baseline data such as water temperature, sediment loading, habitat quality, and hydrology to determine the feasibility of future projects and to aid in the prioritization of projects for Brook Trout watersheds.	Woody wetlands with springs. These areas have been shown to contribute to and/or form coldwater headwaters tributaries. A short tributary emerges from this area an flows into Kingsbury Creek, but no data are available to characterize this trib. Headwaters wetlands and springs are critical for sustaining baseflows and cold water inputs.	
89	Priority Actions	Preserve	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	Woody wetlands with springs. These areas have been shown to contribute to and/or form coldwater headwaters tributaries. A short tributary emerges from this area an flows into Kingsbury Creek, but no data are available to characterize this trib. Headwaters wetlands and springs are critical for sustaining baseflows and cold water inputs.	
90	Priority Actions	Preserve	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	Large wetland area with tributary emerging from it. Headwaters wetlands and springs are critical for sustaining baseflows and cold water inputs.	
91	Priority Actions	Preserve	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	Large area of elevated woody wetlands and springs. This area forms several headwaters tributaries to Kingsbury Creek. These tributaries are cold and could support Brook Trout.	
92	Information Gaps	Study	Protect and restore natural and balanced stream channels with connections to their floodplains.	Tributary is thought to be incised and disconnected from floodplain with high sediment input. Need more monitoring and assessment. High potential for floodplain connectivity and increased habitat but need more data.	
93	Information Gaps	Assess	Gather baseline data such as water temperature, sediment loading, habitat quality, and hydrology to determine the feasibility of future projects and to aid in the prioritization of projects for Brook Trout watersheds.	Tributary is thought to be incised and disconnected from floodplain with high sediment input. Need more monitoring and assessment. High potential for floodplain connectivity and increased habitat but need more data.	
94	Best Practices	Maintain	Advance currently funded projects to completion	This reach of Keene Creek is ditched along Okerstrom Road. As a result, it is disconnected from its floodplain and habitat quality is poor. This project has been funded and is being advanced by the SSL SWCD in partnership with the City of Hermantown and MNTU. Proximity to the road, undersized culvert at the upstream end. Brook Trout suitability is very good due to cold water and good connectivity to upstream reaches. There is also very little shading on river right. The creek poses a risk to infrastructure if not restored. This project is currently in the design phase. Construction will likely be in 2026.	
95	Priority Actions	Restore	Protect and restore natural and balanced stream channels with connections to their floodplains.	This reach of Keene Creek is ditched along Okerstrom Road. As a result, it is disconnected from its floodplain and habitat quality is poor. This project has been funded and is being advanced by the SSL SWCD in partnership with the City of Hermantown and MNTU. Proximity to the road, undersized culvert at the upstream end. Brook Trout suitability is very good due to cold water and good connectivity to upstream reaches. There is also very little shading on river right. The creek poses a risk to infrastructure if not restored. This project is currently in the design phase. Construction will likely be in 2026.	
96	Priority Actions	Restore	Protect and restore natural and balanced stream channels with connections to their floodplains.	An abandoned road embankment intersects the stream. It is recommended that the abandoned embankment be removed and step-pools be created. The channel should be reconnected to the floodplain.	
97	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds that inhibit the migration of fish and other aquatic organisms, which also improves natural transport of sediment, and reconnection of the stream to its floodplain.	This reach has extreme aggradation and is influenced by the culvert at the Munger Trail and the very long culvert from 93rd ave W through Grand Ave.	
98	Priority Actions	Restore	Protect and restore natural and balanced stream channels with connections to their floodplains.	This reach is channelized and severely incised Private land without an easement. Low priority for channel restoration or enhancement due to limited baseflow and extremely small size of the stream.	

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Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
99	Considerations	Collaborate	Work to acquire easements to preserve or restore high quality habitat and maintain connectivity	This reach is channelized and severely incised Private land without an easement. Low priority for channel restoration or enhancement due to limited baseflow and extremely small size of the stream.	
100	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	The stream is stable and healthy. This section of stream is located on private land and is bordered by City of Duluth property to the East (downstream) and to the south. These parcels should be protected from the introduction of invasive species and vegetation should remain undisturbed.	
101	Priority Actions	Preserve	Preserve coldwater tributaries that offer thermal refugia and spawning habitat	The stream is stable and healthy. This section of stream is located on private land and is bordered by City of Duluth property to the East (downstream) and to the south. These parcels should be protected from the introduction of invasive species and vegetation should remain undisturbed.	
102	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms and improve natural transport of sediment and connection of the stream to its floodplain.	Restore this reach by partially filling the pond and re-meandering the channel around the pond. Private land without an easement. This in-line pond has severe impacts on water temperatures in Keene Creek. Brook Trout suitability is poor due to the warm temperatures and stagnant conditions created by the pond. The pond also interrupts sediment and detritus transport.	
103	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Restore this reach by partially filling the pond and re-meandering the channel around the pond. Private land without an easement. This in-line pond has severe impacts on water temperatures in Keene Creek. Brook Trout suitability is poor due to the warm temperatures and stagnant conditions created by the pond. The pond also interrupts sediment and detritus transport.	
104	Priority Actions	Restore	Protect and restore natural and balanced stream channels with connections to their floodplains.	This reach is ditched and incised. Private land without an easement. Reach is a high priority for channel restoration on the condition that simultaneous channel restoration also occurs at the in-line impoundment just upstream in order to mitigate warm water flowing into the reach. Brook Trout suitability in this reach is poor due to degraded ditched habitat and extremely warm conditions from the upstream impoundment. Water temperatures are in the Brook Trout growth range only 34% of the summer and are in the lethal range 10% of the time.	
105	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	This reach is ditched and incised. Private land without an easement. Reach is a high priority for channel restoration on the condition that simultaneous channel restoration also occurs at the in-line impoundment just upstream in order to mitigate warm water flowing into the reach. Brook Trout suitability in this reach is poor due to degraded ditched habitat and extremely warm conditions from the upstream impoundment. Water temperatures are in the Brook Trout growth range only 34% of the summer and are in the lethal range 10% of the time.	
106	Priority Actions	Restore	Prioritize and sequence future stream restoration efforts in a way that will enhance previously completed projects to maximize the ecological uplift of the entire system.	This reach is ditched and incised. Private land without an easement. Reach is a high priority for channel restoration on the condition that simultaneous channel restoration also occurs at the in-line impoundment just upstream in order to mitigate warm water flowing into the reach. Brook Trout suitability in this reach is poor due to degraded ditched habitat and extremely warm conditions from the upstream impoundment. Water temperatures are in the Brook Trout growth range only 34% of the summer and are in the lethal range 10% of the time.	
107	Considerations	Collaborate	Work with appropriate natural resource management agencies to prioritize restoration and monitoring needs	This reach recommended for habitat enhancement through the addition of large woody debris to benefit Brook Trout. Private land without an easement. The stream channel is stable and habitat quality is mostly good although there is a general lack of large woody debris in the channel.	
108	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	This reach recommended for habitat enhancement through the addition of large woody debris to benefit Brook Trout. Private land without an easement. The stream channel is stable and habitat quality is mostly good although there is a general lack of large woody debris in the channel.	
109	Considerations	Collaborate	Work with appropriate natural resource management agencies to prioritize restoration and monitoring needs	Reach is recommended for habitat enhancement through the addition of large woody debris to benefit Brook Trout. The stream channel is stable and habitat quality is mostly good although there is a general lack of large woody debris in the channel.	
110	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Reach is recommended for habitat enhancement through the addition of large woody debris to benefit Brook Trout. The stream channel is stable and habitat quality is mostly good although there is a general lack of large woody debris in the channel.	

BROOK TROUT STREAMS					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
111	Priority Actions	Restore	Protect and restore natural and balanced stream channels with connections to their floodplains.	Channel needs to be restored to reconnect it to the floodplain. Mostly on private land without an easement. The reach is moderately to severely incised and moderately unstable and is a major source of sediment to Keene Creek. Brook Trout suitability in reach is very good mostly due to cold water (92% growth). Trout habitat is somewhat limited; pools are mostly filled in and shallow and the stream bed is embedded with fine sediment.	
112	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Channel needs to be restored to reconnect it to the floodplain. Mostly on private land without an easement. The reach is moderately to severely incised and moderately unstable and is a major source of sediment to Keene Creek. Brook Trout suitability in reach is very good mostly due to cold water (92% growth). Trout habitat is somewhat limited; pools are mostly filled in and shallow and the stream bed is embedded with fine sediment.	
113	Priority Actions	Restore	Protect and restore natural and balanced stream channels with connections to their floodplains.	Channel needs to be restored to reconnect it to the floodplain. Mostly on private land without an easement. The reach is moderately to severely incised and moderately unstable and is a major source of sediment to Keene Creek. Brook Trout suitability in reach is very good mostly due to cold water (92% growth). Trout habitat is somewhat limited; pools are mostly filled in and shallow and the stream bed is embedded with fine sediment.	
114	Considerations	Collaborate	Work to acquire easements to preserve or restore high quality habitat and maintain connectivity	Reach is recommended for easement acquisition and habitat enhancement through the addition of large woody debris to benefit Brook Trout. Easement acquisition on these three private parcels would provide protection and continuous access west of Okerstrom Road.	
115	Considerations	Collaborate	Work to acquire easements to preserve or restore high quality habitat and maintain connectivity	Easement acquisition is recommended upstream of Skyline Parkway. Several landowners, therefore several easements would be necessary. Obtaining these easements would connect two large swaths of public land, providing access and protection to a significant portion of Keene Creek.	
116	Priority Actions	Restore	Protect and restore natural and balanced stream channels with connections to their floodplains.	Reach is a significant sediment source. Restoration of the floodplain would dissipate energy and reduce erosion. Reach is at the downstream end of a steep bedrock cascade and transport reach, significantly increasing the risk of channel restoration at this location. Additionally, there is an undersized culvert just upstream of this location at Cody Street. Risk to benefit ratio does not favor restoration at this location at this time.	
117	Information Gaps	Study	Understand what factors could be addressed to make difficult projects more feasible.	Reach is a significant sediment source. Restoration of the floodplain would dissipate energy and reduce erosion. Reach is at the downstream end of a steep bedrock cascade and transport reach, significantly increasing the risk of channel restoration at this location. Additionally, there is an undersized culvert just upstream of this location at Cody Street. Risk to benefit ratio does not favor restoration at this location at this time.	
118	Priority Actions	Restore	Protect and restore natural and balanced stream channels with connections to their floodplains.	Reach has been ditched and is incised, but is a low sediment source due to rip rap and a high density of invasive willow roots in the stream banks. Restoration is recommended to reconnect to the floodplain and improve habitat. MNDOT is considering changing the I35 ramps in this location. The invasive willows may be beloved by the local community. Existing park - restoration would have to reduce the size of the park or the park would have to also function as a floodplain. No floodplain connection. Habitat quality is poor and there is a concrete dam that is a migration barrier. However, this reach is managed as a Brown Trout resource by the MN DNR.	The invasive willows may be beloved by the local community. Existing park - restoration would have to reduce the size of the park or the park would have to also function as a floodplain. A series of pre-restoration community meetings are required to build local support for this project. Ordinance revision may be needed to allow for parkland to be able to also function as floodplain.
119	Considerations	Collaborate	Work with appropriate natural resource management agencies to prioritize restoration and monitoring needs	Reach has been ditched and is incised, but is a low sediment source due to rip rap and a high density of invasive willow roots in the stream banks. Restoration is recommended to reconnect to the floodplain and improve habitat. MNDOT is considering changing the I35 ramps in this location. The invasive willows may be beloved by the local community. Existing park - restoration would have to reduce the size of the park or the park would have to also function as a floodplain. No floodplain connection. Habitat quality is poor and there is a concrete dam that is a migration barrier. However, this reach is managed as a Brown Trout resource by the MN DNR.	The invasive willows may be beloved by the local community. Existing park - restoration would have to reduce the size of the park or the park would have to also function as a floodplain. A series of pre-restoration community meetings are required to build local support for this project. Ordinance revision may be needed to allow for parkland to be able to also function as floodplain.

BROOK TROUT STREAMS					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
120	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Reach has been ditched and is incised, but is a low sediment source due to rip rap and a high density of invasive willow roots in the stream banks. Restoration is recommended to reconnect to the floodplain and improve habitat. MNDOT is considering changing the I35 ramps in this location. The invasive willows may be beloved by the local community. Existing park - restoration would have to reduce the size of the park or the park would have to also function as a floodplain. No floodplain connection. Habitat quality is poor and there is a concrete dam that is a migration barrier. However, this reach is managed as a Brown Trout resource by the MN DNR.	The invasive willows may be beloved by the local community. Existing park - restoration would have to reduce the size of the park or the park would have to also function as a floodplain. A series of pre-restoration community meetings are required to build local support for this project. Ordinance revision may be needed to allow for parkland to be able to also function as floodplain.
121	Priority Actions	Restore	Protect and restore natural and balanced stream channels with connections to their floodplains.	Reach is ditched. Restoration recommended to remeander the stream, reconnect it to its floodplain, and improve habitat. Private land, Allete electrical towers are in the riparian corridor. Reach is very unstable due to ditching and severe channel incision, and habitat quality is poor. However, this reach is currently managed as a Brown Trout resource by the MNDNR.	
122	Considerations	Collaborate	Work with appropriate natural resource management agencies to prioritize restoration and monitoring needs	Reach is ditched. Restoration recommended to remeander the stream, reconnect it to its floodplain, and improve habitat. Private land, Allete electrical towers are in the riparian corridor. Reach is very unstable due to ditching and severe channel incision, and habitat quality is poor. However, this reach is currently managed as a Brown Trout resource by the MNDNR.	
123	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Reach is ditched. Restoration recommended to remeander the stream, reconnect it to its floodplain, and improve habitat. Private land, Allete electrical towers are in the riparian corridor. Reach is very unstable due to ditching and severe channel incision, and habitat quality is poor. However, this reach is currently managed as a Brown Trout resource by the MNDNR.	
124	Priority Actions	Restore	Protect and restore natural and balanced stream channels with connections to their floodplains.	Reach is ditched. Restoration is recommended to remeander the stream, reconnect it to its floodplain, and improve habitat. Existing park - restoration would either have to reduce the size of the park space or the park space would have to somehow also function as a floodplain. Reach is very unstable due to ditching and severe channel incision, and habitat quality is poor. However, this reach is currently managed as a Brown Trout resource by the MNDNR	Existing park - restoration would either have to reduce the size of the park space or the park space would have to somehow also function as a floodplain. Ordinance revision may be needed to allow for parkland to be able to also function as floodplain.
125	Considerations	Collaborate	Work with appropriate natural resource management agencies to prioritize restoration and monitoring needs	Reach is ditched. Restoration is recommended to remeander the stream, reconnect it to its floodplain, and improve habitat. Existing park - restoration would either have to reduce the size of the park space or the park space would have to somehow also function as a floodplain. Reach is very unstable due to ditching and severe channel incision, and habitat quality is poor. However, this reach is currently managed as a Brown Trout resource by the MNDNR	Existing park - restoration would either have to reduce the size of the park space or the park space would have to somehow also function as a floodplain. Ordinance revision may be needed to allow for parkland to be able to also function as floodplain.
126	Best Practices	Steward	Ensure existing regulations are being implemented to protect habitat	Reach is ditched. Restoration is recommended to remeander the stream, reconnect it to its floodplain, and improve habitat. Existing park - restoration would either have to reduce the size of the park space or the park space would have to somehow also function as a floodplain. Reach is very unstable due to ditching and severe channel incision, and habitat quality is poor. However, this reach is currently managed as a Brown Trout resource by the MNDNR	Existing park - restoration would either have to reduce the size of the park space or the park space would have to somehow also function as a floodplain. Ordinance revision may be needed to allow for parkland to be able to also function as floodplain.
127	Priority Actions	Restore	Protect and restore natural and balanced stream channels with connections to their floodplains.	Reach is ditched. Restoration is recommended to remeander the stream, reconnect it to its floodplain, and improve habitat. Private land without an easement. Reach is very unstable due to ditching and severe channel incision, and habitat quality is poor. However, this reach is currently managed as a Brown Trout resource by the MNDNR	
128	Considerations	Collaborate	Work with appropriate natural resource management agencies to prioritize restoration and monitoring needs	Reach is ditched. Restoration is recommended to remeander the stream, reconnect it to its floodplain, and improve habitat. Private land without an easement. Reach is very unstable due to ditching and severe channel incision, and habitat quality is poor. However, this reach is currently managed as a Brown Trout resource by the MNDNR	

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Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
129	**Considerations**	**Collaborate**	Work to acquire easements to preserve or restore high quality habitat and maintain connectivity	Reach is ditched. Restoration is recommended to remeander the stream, reconnect it to its floodplain, and improve habitat. Private land without an easement. Reach is very unstable due to ditching and severe channel incision, and habitat quality is poor. However, this reach is currently managed as a Brown Trout resource by the MNDNR	
130	**Information Gaps**	**Study**	Understand what factors could be addressed to make difficult projects more feasible.	Portions of this reach through the zoo are ditched and armored on at least one bank with a historic rock wall. Channel bed is planar with very few observed stream features. High risk location, being at the downstream end of a bedrock controlled, steep gradient reach with several waterfalls. Presence within the zoo is also a complication. High risk project.	
131	**Priority Actions**	**Restore**	Protect and restore natural and balanced stream channels with connections to their floodplains.	Portions of this reach through the zoo are ditched and armored on at least one bank with a historic rock wall. Channel bed is planar with very few observed stream features. High risk location, being at the downstream end of a bedrock controlled, steep gradient reach with several waterfalls. Presence within the zoo is also a complication. High risk project.	
132	**Considerations**	**Collaborate**	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Portions of this reach through the zoo are ditched and armored on at least one bank with a historic rock wall. Channel bed is planar with very few observed stream features. High risk location, being at the downstream end of a bedrock controlled, steep gradient reach with several waterfalls. Presence within the zoo is also a complication. High risk project.	
133	**Priority Actions**	**Restore**	Protect and restore natural and balanced stream channels with connections to their floodplains.	Reach is ditched. Project is currently underway by the SWCD to remeander the stream, reconnect it to its floodplain, and improve habitat. Narrow corridor to work in - hemmed in by roads, ball fields and golf course. Reach is severely incised and a major sediment source. Brook Trout have potentially been extirpated from this area of the watershed - this project may allow Brook Trout reintroduction.	City of Proctor is planning on making this area a "people's park" with trails and interpretive signage. Restoration project needs to be implemented first.
134	**Priority Actions**	**Restore**	Manage erosion from heavily incised tributaries.	Reach is ditched. Project is currently underway by the SWCD to remeander the stream, reconnect it to its floodplain, and improve habitat. Narrow corridor to work in - hemmed in by roads, ball fields and golf course. Reach is severely incised and a major sediment source. Brook Trout have potentially been extirpated from this area of the watershed - this project may allow Brook Trout reintroduction.	City of Proctor is planning on making this area a "people's park" with trails and interpretive signage. Restoration project needs to be implemented first.
135	**Considerations**	**Collaborate**	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Reach is ditched. Project is currently underway by the SWCD to remeander the stream, reconnect it to its floodplain, and improve habitat. Narrow corridor to work in - hemmed in by roads, ball fields and golf course. Reach is severely incised and a major sediment source. Brook Trout have potentially been extirpated from this area of the watershed - this project may allow Brook Trout reintroduction.	City of Proctor is planning on making this area a "people's park" with trails and interpretive signage. Restoration project needs to be implemented first.
136	**Priority Actions**	**Restore**	Protect and restore natural and balanced stream channels with connections to their floodplains.	Restoration recommended to reconnect the stream to its floodplain. Private land with no easement. The upper portions of the tributary are impacted by urban development from the Zenith Terrace housing project. High sediment source, but no Brook Trout are present in this tributary.	
137	**Priority Actions**	**Restore**	Protect and restore natural and balanced stream channels with connections to their floodplains.	Restoration recommended to reconnect the stream to its floodplain. The upper portions of the tributary are impacted by urban development from the Zenith Terrace housing project. High sediment source, but no Brook Trout are present in this tributary .	
138	**Priority Actions**	**Restore**	Protect and restore natural and balanced stream channels with connections to their floodplains.	Ditched reach. Restoration is recommended to remeander the stream, reconnect it to its floodplain, and improve habitat. Lower part of the reach is hemmed in by park facilities. Reach is severely incised and habitat is poor. Water temps are cold. However, baseflow is low and is a trickle in the summer.	
139	**Priority Actions**	**Restore**	Manage erosion from heavily incised tributaries.	Ditched reach. Restoration is recommended to remeander the stream, reconnect it to its floodplain, and improve habitat. Lower part of the reach is hemmed in by park facilities. Reach is severely incised and habitat is poor. Water temps are cold. However, baseflow is low and is a trickle in the summer.	
140	**Priority Actions**	**Restore**	Protect and restore natural and balanced stream channels with connections to their floodplains.	Reach is ditched. Restoration recommended to remeander the stream, reconnect it to its floodplain, and improve habitat. Property is mostly owned by Canadian National Railway, meaning that access would likely not be granted to complete this project. Sediments may also be contaminated due to the proximity to the railyard. Reach represents a significant portion of Kingsbury Creek.	
141	**Considerations**	**Collaborate**	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Reach is ditched. Restoration recommended to remeander the stream, reconnect it to its floodplain, and improve habitat. Property is mostly owned by Canadian National Railway, meaning that access would likely not be granted to complete this project. Sediments may also be contaminated due to the proximity to the railyard. Reach represents a significant portion of Kingsbury Creek.	

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Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
142	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Trib to Kingsbury with poor connectivity that get plumbed into stormwater sewer and is believed to run into the trailer park trib (S-002-003-001) instead of continuing in its original watercourse through proctor to trib S-002-003-004. Invasive Willow here. Routing stream back in old channel might require upsizing /altering storm water infrastructure. Mostly city land but some private landowners. Could be hugely influential on resotration efforts in trailer park trib but be complicated to 'replumb'. Connectivity, invasives, habitat and erosion concerns and altered hydrology.	
143	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Trib to Kingsbury with poor connectivity that get plumbed into stormwater sewer and is believed to run into the trailer park trib (S-002-003-001) instead of continuing in its original watercourse through proctor to trib S-002-003-004. Invasive Willow here. Routing stream back in old channel might require upsizing /altering storm water infrastructure. Mostly city land but some private landowners. Could be hugely influential on resotration efforts in trailer park trib but be complicated to 'replumb'. Connectivity, invasives, habitat and erosion concerns and altered hydrology.	
144	Information Gaps	Assess	Gather baseline data such as water temperature, sediment loading, habitat quality, and hydrology to determine the feasibility of future projects and to aid in the prioritization of projects for Brook Trout watersheds.	Need additional data on presence absence of trout and associated habitat above Mogie Lake and section line trout boundary. Currently not regulated as a trout stream, so likely some resistance if the stream class was changed. Potentially important headwaters at risk of being developed.	
145	Priority Actions	Preserve	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	Need additional data on presence absence of trout and associated habitat above Mogie Lake and section line trout boundary. Currently not regulated as a trout stream, so likely some resistance if the stream class was changed. Potentially important headwaters at risk of being developed.	
146	Best Practices	Steward	Ensure existing regulations are being implemented to protect habitat	Need additional data on presence absence of trout and associated habitat above Mogie Lake and section line trout boundary. Currently not regulated as a trout stream, so likely some resistance if the stream class was changed. Potentially important headwaters at risk of being developed.	
147	Best Practices	Monitor	Assess and characterize high quality wetland complexes within priority Brook Trout watersheds	Further refinement and perhaps protection of the headwaters of Stewart Creek is need as most map resources do not have connection upstream of I35.	
148	Priority Actions	Preserve	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	Further refinement and perhaps protection of the headwaters of Stewart Creek is need as most map resources do not have connection upstream of I35.	
149	Information Gaps	Assess	Gather baseline data such as water temperature, sediment loading, habitat quality, and hydrology to determine the feasibility of future projects and to aid in the prioritization of projects for Brook Trout watersheds.	Reach is ditched. Restoration project may be recommended to remeander the stream, reconnect it to its floodplain, and improve habitat. More temperature data is needed to help prioritize this reach. Reach is on multiple private parcels. Temperatures may be relatively warm - just downstream of Mogie Lake.	
150	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Reach is ditched. Restoration project may be recommended to remeander the stream, reconnect it to its floodplain, and improve habitat. More temperature data is needed to help prioritize this reach. Reach is on multiple private parcels. Temperatures may be relatively warm - just downstream of Mogie Lake.	
151	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	This tributary reach is in need of restoration. Flow is concentrated here due to the railroad causeway. Significant bank erosion occurs here and sediment is transported downstream to the mainstem.	
152	Priority Actions	Restore	Manage erosion from heavily incised tributaries.	This drainage has significant erosion occurring. Flows are concentrated here due to the railroad causeway. This reach was identified in the 2013 Stantec report for the Knowlton watershed.	
153	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Past efforts have narrowed and straightened this portion of the channel. It is believed that historically, the railroad has caused the creek to be laterally constrained; as a result, rip-rap has been placed along the banks, effectively constricting the channel to an even greater extent. While this area does not appear to be contributing a significant amount of sediment to Knowlton Creek, it is still very unstable and could result in failure along the railroad.	

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Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
154	Priority Actions	Restore	Manage erosion from heavily incised tributaries.	Past efforts have narrowed and straightened this portion of the channel. It is believed that historically, the railroad has caused the creek to be laterally constrained; as a result, rip-rap has been placed along the banks, effectively constricting the channel to an even greater extent. While this area does not appear to be contributing a significant amount of sediment to Knowlton Creek, it is still very unstable and could result in failure along the railroad.	
155	Best Practices	Maintain	Maintain the quality of areas that have already undergone restoration efforts	Protect and maintain the stream restoration work that was completed in 2016/2017.	
156	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Culvert is a barrier to fish migration. Stream is cold but upstream subwatershed is highly developed.	
157	Best Practices	Preserve	Mitigate the negative impacts of development to the greatest degree possible	Culvert is a barrier to fish migration. Stream is cold but upstream subwatershed is highly developed.	
158	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Full barrier culvert on a trout stream. Headwaters of Keene Creek with questionable uplift potential.	
159	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Full Barrier and in poor condition box culvert. Pending interstate work may change conditions/situations in 2030. Culvert is a full barrier and in need of replacement but pending interstate could complicate future projects. Also more discussion needed about uplift of Trib 1.	
160	Considerations	Collaborate	Work with appropriate natural resource management agencies to prioritize restoration and monitoring needs	Full Barrier and in poor condition box culvert. Pending interstate work may change conditions/situations in 2030. Culvert is a full barrier and in need of replacement but pending interstate could complicate future projects. Also more discussion needed about uplift of Trib 1.	
161	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Full barrier culvert at bottom of Duluth hill. Culvert is perched, velocity barrier and has blown out baffles previously installed. Cody Street crossing replacement would be a large undertaking for minimal uplift because its just downstream of barrier falls.	
162	Information Gaps	Study	Understand what factors could be addressed to make difficult projects more feasible.	Full barrier culvert at bottom of Duluth hill. Culvert is perched, velocity barrier and has blown out baffles previously installed. Cody Street crossing replacement would be a large undertaking for minimal uplift because its just downstream of barrier falls.	
163	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Barrier Culvert of Trib 1 under interstate 35. Crossing under I35 would be extremely unlikely/expensive with arguably minimal uplift potential for extremely expensive and challenging project.	
164	Information Gaps	Study	Understand what factors could be addressed to make difficult projects more feasible.	Barrier Culvert of Trib 1 under interstate 35. Crossing under I35 would be extremely unlikely/expensive with arguably minimal uplift potential for extremely expensive and challenging project.	
165	Information Gaps	Assess	Gather baseline data such as water temperature, sediment loading, habitat quality, and hydrology to determine the feasibility of future projects and to aid in the prioritization of projects for Brook Trout watersheds.	Missing assessment on crossing	

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Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
166	Information Gaps	Study	Identify connectivity barriers to critical habitat areas	Culvert should be assessed for barrier status due to loss of substrate. May just need enhancement of substrate or redo of culrvert. Grand Ave would be a large undertaking and was recently redone. Complicated issue and needs further assessment.	
167	Information Gaps	Study	Understand what factors could be addressed to make difficult projects more feasible.	Culvert should be assessed for barrier status due to loss of substrate. May just need enhancement of substrate or redo of culrvert. Grand Ave would be a large undertaking and was recently redone. Complicated issue and needs further assessment.	
168	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Barrier culvert with rip rap fall at mouth. Skyline crossing could be difficult with questionable uplift due to tributary location and connectivity of Keene itself, but it is the only barrier on this trib.	
169	Information Gaps	Study	Understand what factors could be addressed to make difficult projects more feasible.	Barrier culvert with rip rap fall at mouth. Skyline crossing could be difficult with questionable uplift due to tributary location and connectivity of Keene itself, but it is the only barrier on this trib.	
170	Considerations	Collaborate	Work to acquire easements to preserve or restore high quality habitat and maintain connectivity	Railroad crossing is not a barrier, but is an at risk crossing that is eroding and in poor condition. Railroad vacating ownership or getting on board with crossing restoration had proven difficult at this location and other crossings. High priority for riparian corridor restoration and floodplain connection, but likely to experience high level of difficulty with railroad complications. Acquisition of the railroad by the city or another public entity would ensure that this crossing is restored and the riparian corridor enhanced.	
171	Information Gaps	Study	Understand what factors could be addressed to make difficult projects more feasible.	Railroad crossing is not a barrier, but is an at risk crossing that is eroding and in poor condition. Railroad vacating ownership or getting on board with crossing restoration had proven difficult at this location and other crossings. High priority for riparian corridor restoration and floodplain connection, but likely to experience high level of difficulty with railroad complications. Acquisition of the railroad by the city or another public entity would ensure that this crossing is restored and the riparian corridor enhanced.	
172	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Railroad crossing is not a barrier, but is an at risk crossing that is eroding and in poor condition. Railroad vacating ownership or getting on board with crossing restoration had proven difficult at this location and other crossings. High priority for riparian corridor restoration and floodplain connection, but likely to experience high level of difficulty with railroad complications. Acquisition of the railroad by the city or another public entity would ensure that this crossing is restored and the riparian corridor enhanced.	
173	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Partial/seasonal barrier to fish/sediment passage. Crossing goes through road grade of I35 which would require a lot of work to alter and this area of interstate will be in flux with scheduled roadwork in 2030. Medium priority with high levels of complexity, but could be raised in priority if low head dam in dog park was removed increasing connectivity up to Cody St.	
174	Information Gaps	Study	Understand what factors could be addressed to make difficult projects more feasible.	Partial/seasonal barrier to fish/sediment passage. Crossing goes through road grade of I35 which would require a lot of work to alter and this area of interstate will be in flux with scheduled roadwork in 2030. Medium priority with high levels of complexity, but could be raised in priority if low head dam in dog park was removed increasing connectivity up to Cody St.	
175	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Low head dam - Full barrier to fish and other aquatic organisms, which should be removed. Was identified as low hanging fruit and good project to initiate stream restoration work in Lower Keene.	Low head dam creates local swimming and fishing hole. Need community outreach and involvement to shape future of this public park and water resource. Community/EJ engagement is needed and site could change with future interstate work in 2030.

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Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
176	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Low head dam - Full barrier to fish and other aquatic organisms, which should be removed. Was identified as low hanging fruit and good project to initiate stream restoration work in Lower Keene.	Low head dam creates local swimming and fishing hole. Need community outreach and involvement to shape future of this public park and water resource. Community/EJ engagement is needed and site could change with future interstate work in 2030.
177	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Sediment barrier/instability concern. Should be upsized/replaced. Low priority and may propagate a headcut upstream. Organisms are blocked at Cody St, but this could be a sediment loading/water quality concern. Culvert in poor condition.	
178	Priority Actions	Restore	Prioritize and sequence future stream restoration efforts in a way that will enhance previously completed projects to maximize the ecological uplift of the entire system.	Sediment barrier/instability concern. Should be upsized/replaced. Low priority and may propagate a headcut upstream. Organisms are blocked at Cody St, but this could be a sediment loading/water quality concern. Culvert in poor condition.	
179	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Barrier culvert on low priority trib as it's mid hillscarp and has unknown temp/habitat status. Temp data or a stream walk could assess tributary for habitat/health status. Large road grade.	
180	Information Gaps	Assess	Gather baseline data such as water temperature, sediment loading, habitat quality, and hydrology to determine the feasibility of future projects and to aid in the prioritization of projects for Brook Trout watersheds.	Barrier culvert on low priority trib as it's mid hillscarp and has unknown temp/habitat status. Temp data or a stream walk could assess tributary for habitat/health status. Large road grade.	
181	Best Practices	Monitor	Assess and characterize high quality wetland complexes within priority Brook Trout watersheds	Unassessed trib for temp/habitat/health, more data should be collected to evaluate trout stream conditions. Data gap on water temps or trout abundance (if any).	
182	Information Gaps	Assess	Gather baseline data such as water temperature, sediment loading, habitat quality, and hydrology to determine the feasibility of future projects and to aid in the prioritization of projects for Brook Trout watersheds.	Unassessed trib for temp/habitat/health, more data should be collected to evaluate trout stream conditions. Data gap on water temps or trout abundance (if any).	
183	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Culvert is a seasonal barrier. Low potential due to little channel upstream before wetland complex.	
184	Best Practices	Monitor	Assess and characterize high quality wetland complexes within priority Brook Trout watersheds	Culvert is a seasonal barrier. Low potential due to little channel upstream before wetland complex.	
185	Information Gaps	Assess	Gather baseline data such as water temperature, sediment loading, habitat quality, and hydrology to determine the feasibility of future projects and to aid in the prioritization of projects for Brook Trout watersheds.	Culvert is a seasonal barrier. Low potential due to little channel upstream before wetland complex.	

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Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
186	**Information Gaps**	**Assess**	Gather baseline data such as water temperature, sediment loading, habitat quality, and hydrology to determine the feasibility of future projects and to aid in the prioritization of projects for Brook Trout watersheds.	Monitor temp for upstream critical wetlands.	
187	**Best Practices**	**Maintain**	Maintain the quality of areas that have already undergone restoration efforts	New culvert for fish passage needs to be maintained and habitat protected.	
188	**Priority Actions**	**Restore**	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Seasonal barrier culvert would ideally be upsized/replaced. Would need to couple this project with replacing the private culvert immediately upstream to actually unlock an appreciable amount of stream. Would need to have upstream landowner on board. Would need to be maintained and habitat protected.	
189	**Considerations**	**Collaborate**	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Seasonal barrier culvert would ideally be upsized/replaced. Would need to couple this project with replacing the private culvert immediately upstream to actually unlock an appreciable amount of stream. Would need to have upstream landowner on board. Would need to be maintained and habitat protected.	
190	**Information Gaps**	**Study**	Identify connectivity barriers to critical habitat areas	Assess and replace culvert that is believed to be seasonal to full barrier to passage (may be perched). Need to have landowner on board. Would need to replace Okerstrom culvert immediately downstream as well and have landowner on board with replacing main drive/access culvert.	
191	**Considerations**	**Collaborate**	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Assess and replace culvert that is believed to be seasonal to full barrier to passage (may be perched). Need to have landowner on board. Would need to replace Okerstrom culvert immediately downstream as well and have landowner on board with replacing main drive/access culvert.	
192	**Priority Actions**	**Restore**	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Assess and replace culvert that is believed to be seasonal to full barrier to passage (may be perched). Need to have landowner on board. Would need to replace Okerstrom culvert immediately downstream as well and have landowner on board with replacing main drive/access culvert.	
193	**Best Practices**	**Maintain**	Maintain the quality of areas that have already undergone restoration efforts	Culvert recently replaced - monitor for success. Good project and not expected to be at high risk, but it is a priority reach/connectivity project.	
194	**Information Gaps**	**Assess**	Gather baseline data such as water temperature, sediment loading, habitat quality, and hydrology to determine the feasibility of future projects and to aid in the prioritization of projects for Brook Trout watersheds.	Culvert recently replaced - monitor for success. Good project and not expected to be at high risk, but it is a priority reach/connectivity project.	
195	**Priority Actions**	**Restore**	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Improve passage through culvert under I35, address drops and add velocity breaks. Big lift and sandwiched by barrier falls.	
196	**Best Practices**	**Maintain**	Maintain the quality of areas that have already undergone restoration efforts	Improve passage through culvert under I35, address drops and add velocity breaks. Big lift and sandwiched by barrier falls.	
197	**Priority Actions**	**Restore**	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Barrier culvert needs to be replaced - small and perched. Need additional data on uplift potential of trib but could be a really good project with few complications. This culvert replacement may be tied into Kingsbury Creek Restoration in the park and by City hall.	

BROOK TROUT STREAMS					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
198	Information Gaps	Assess	Gather baseline data such as water temperature, sediment loading, habitat quality, and hydrology to determine the feasibility of future projects and to aid in the prioritization of projects for Brook Trout watersheds.	Barrier culvert needs to be replaced - small and perched. Need additional data on uplift potential of trib but could be a really good project with few complications. This culvert replacement may be tied into Kingsbury Creek Restoration in the park and by City hall.	
199	Considerations	Collaborate	Work with the City of Duluth on city managed land and projects	Barrier culvert needs to be replaced - small and perched. Need additional data on uplift potential of trib but could be a really good project with few complications. This culvert replacement may be tied into Kingsbury Creek Restoration in the park and by City hall.	
200	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Partial barrier culvert needs replacement and is in poor condition. Unknown habitat/ uplift potential upstream of culvert. Not full barrier but would provide more small trib habitat to downstream restoration scheduled for 2025. Done in tandem with downstream foot path crossing.	
201	Priority Actions	Restore	Prioritize and sequence future stream restoration efforts in a way that will enhance previously completed projects to maximize the ecological uplift of the entire system.	Partial barrier culvert needs replacement and is in poor condition. Unknown habitat/ uplift potential upstream of culvert. Not full barrier but would provide more small trib habitat to downstream restoration scheduled for 2025. Done in tandem with downstream foot path crossing.	
202	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Barrier culvert could be replaced. Low uplift for passage and actually arresting headcuts from ditching downstream. Would need a lot of channel work. Barrier is actually halting headcut and if replaced, there would be additional channel work needed to prevent this.	
203	Priority Actions	Restore	Prioritize and sequence future stream restoration efforts in a way that will enhance previously completed projects to maximize the ecological uplift of the entire system.	Barrier culvert could be replaced. Low uplift for passage and actually arresting headcuts from ditching downstream. Would need a lot of channel work. Barrier is actually halting headcut and if replaced, there would be additional channel work needed to prevent this.	
204	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Partial barrier culvert to passage in wetland complex. Questionable uplift, and undersizing might increase 'storage' upstream. Not believed to be super cold/trouty. Partial barrier that's low priority because it's wetland complex.	
205	Best Practices	Monitor	Assess and characterize high quality wetland complexes within priority Brook Trout watersheds	Partial barrier culvert to passage in wetland complex. Questionable uplift, and undersizing might increase 'storage' upstream. Not believed to be super cold/trouty. Partial barrier that's low priority because it's wetland complex.	
206	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Partial barrier culvert should be replaced. Good cold trib but there are several problematic culverts upstream that also need addressing. In a very developed portion of Proctor.	
207	Priority Actions	Restore	Prioritize and sequence future stream restoration efforts in a way that will enhance previously completed projects to maximize the ecological uplift of the entire system.	Partial barrier culvert should be replaced. Good cold trib but there are several problematic culverts upstream that also need addressing. In a very developed portion of Proctor.	
208	Considerations	Collaborate	Work with municipal authorities to develop processes and protocols for preserving priority habitats	Partial barrier culvert should be replaced. Good cold trib but there are several problematic culverts upstream that also need addressing. In a very developed portion of Proctor.	

BROOK TROUT STREAMS					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
209	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Partial barrier culvert on cold trib needs replacing. Other problematic culverts up and downstream from crossing and likely some channel work would also be required. Would need other crossings done as well to provide and reasonable uplift.	
210	Priority Actions	Restore	Prioritize and sequence future stream restoration efforts in a way that will enhance previously completed projects to maximize the ecological uplift of the entire system.	Partial barrier culvert on cold trib needs replacing. Other problematic culverts up and downstream from crossing and likely some channel work would also be required. Would need other crossings done as well to provide and reasonable uplift.	
211	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Partial barrier on cold trib (Silver Crock Creek) in need of upsizing/improvement. Just recently replaced in 2023, but undersized with poor passage. Would need to be done in tandem with several problematic culverts on this trib.	
212	Priority Actions	Restore	Prioritize and sequence future stream restoration efforts in a way that will enhance previously completed projects to maximize the ecological uplift of the entire system.	Partial barrier on cold trib (Silver Crock Creek) in need of upsizing/improvement. Just recently replaced in 2023, but undersized with poor passage. Would need to be done in tandem with several problematic culverts on this trib.	
213	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Full barrier culvert on cold trib (Silver Rock Creek) in need of replacing. Busy street next to school, would need other culverts done in tandem, as there are several problematic culverts downstream of here.	High public engagement location adjacent to high school.
214	Priority Actions	Restore	Prioritize and sequence future stream restoration efforts in a way that will enhance previously completed projects to maximize the ecological uplift of the entire system.	Full barrier culvert on cold trib (Silver Rock Creek) in need of replacing. Busy street next to school, would need other culverts done in tandem, as there are several problematic culverts downstream of here.	High public engagement location adjacent to high school.
215	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Full barrier culvert on cold trib (Silver Rock Creek) in need of replacing. Busy street next to school, would need other culverts done in tandem, as there are several problematic culverts downstream of here.	High public engagement location adjacent to high school.
216	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Trib that is plumbed into stormwater system, could be converted into crossing and returned to its natural watercourse following kittle S-002-003-004. Stream will enter stormwater system either way, but new way might have less capacity. Would only gain 1,200ft of natural channel for the trib, but could reduce discharge of trailer park trib (S-002-003-001). Lots of complications for questionable uplift, Trib 4 could be re-plumbed to discharge to Kingsbry in a different location.	
217	Information Gaps	Study	Understand what factors could be addressed to make difficult projects more feasible.	Trib that is plumbed into stormwater system, could be converted into crossing and returned to its natural watercourse following kittle S-002-003-004. Stream will enter stormwater system either way, but new way might have less capacity. Would only gain 1,200ft of natural channel for the trib, but could reduce discharge of trailer park trib (S-002-003-001). Lots of complications for questionable uplift, Trib 4 could be re-plumbed to discharge to Kingsbry in a different location.	
218	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Partial barrier culvert to be replaced. Low uplift unless coupled with other projects on trib.	
219	Priority Actions	Restore	Prioritize and sequence future stream restoration efforts in a way that will enhance previously completed projects to maximize the ecological uplift of the entire system.	Partial barrier culvert to be replaced. Low uplift unless coupled with other projects on trib.	

BROOK TROUT STREAMS					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
220	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Stream is plumbed into stormwater which is believed to be full barrier. No other reasonable location to put stream or approach for enhancing passage through stormwater system. High complications for questionable uplift, so low priority.	
221	Information Gaps	Study	Understand what factors could be addressed to make difficult projects more feasible.	Stream is plumbed into stormwater which is believed to be full barrier. No other reasonable location to put stream or approach for enhancing passage through stormwater system. High complications for questionable uplift, so low priority.	
222	Information Gaps	Study	Identify connectivity barriers to critical habitat areas	Believed to be a partial barrier culvert that should be replaced. Railroad company owns road and would be unlikely to do project. Crossing needs assessment.	
223	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Believed to be a partial barrier culvert that should be replaced. Railroad company owns road and would be unlikely to do project. Crossing needs assessment.	
224	Information Gaps	Study	Identify connectivity barriers to critical habitat areas	Crossing under rail yard needs assessing and likely upsizing, likely partial passage barrier. Rail yard work would be highly disruptive and likely an unwilling partner. Very complicated site.	
225	Information Gaps	Study	Understand what factors could be addressed to make difficult projects more feasible.	Crossing under rail yard needs assessing and likely upsizing, likely partial passage barrier. Rail yard work would be highly disruptive and likely an unwilling partner. Very complicated site.	
226	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Crossing under rail yard needs assessing and likely upsizing, likely partial passage barrier. Rail yard work would be highly disruptive and likely an unwilling partner. Very complicated site.	
227	Information Gaps	Assess	Gather baseline data such as water temperature, sediment loading, habitat quality, and hydrology to determine the feasibility of future projects and to aid in the prioritization of projects for Brook Trout watersheds.	In line pond for ducks and geese is potential barrier and thermal issue for cold water organisms. Potentially impactful project but cold water ecosystem needs assessing to see potential uplift and if stream needs reclassification.	
228	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Partial Barrier in need of upsizing and substrate. Large road grade and questionable uplift. Need data on coldwater ecosystem.	
229	Information Gaps	Assess	Gather baseline data such as water temperature, sediment loading, habitat quality, and hydrology to determine the feasibility of future projects and to aid in the prioritization of projects for Brook Trout watersheds.	Partial Barrier in need of upsizing and substrate. Large road grade and questionable uplift. Need data on coldwater ecosystem.	
230	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Partial barrier culvert and outlet control for old orchid club greenhouse impoundment. Partial barrier and thermal pollutant contributor. The orchid club is in ownership flux as different developers come and go.	
231	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Partial barrier culvert and outlet control for old orchid club greenhouse impoundment. Partial barrier and thermal pollutant contributor. The orchid club is in ownership flux as different developers come and go.	

BROOK TROUT STREAMS					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
232	**Priority Actions**	**Restore**	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Partial barrier - recommended for upsizing. Unmapped high quality trib with longitudinal connectivity is main issue.	
233	**Priority Actions**	**Restore**	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Partial Barrier culvert, upsizing/replacement reccomended. Unmapped high quality trib with longitudinal connectivity is main concern. Several private culverts with moderate passage.	
234	**Considerations**	**Collaborate**	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Partial Barrier culvert, upsizing/replacement reccomended. Unmapped high quality trib with longitudinal connectivity is main concern. Several private culverts with moderate passage.	
235	**Priority Actions**	**Restore**	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Partial Barrier Culvert - recommend upsizing/adding substrate. Skinny water but high quality trib.	
236	**Priority Actions**	**Restore**	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Partial barrier culvert - - recommended for upsizing/substrate addition. Skinny water but high quality resource.	
237	**Priority Actions**	**Restore**	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Barrier Culvert - Replacement/removal suggested. Low uplift and complicated infrastructure with rail road and skyline bridge (newly redone) Questionable uplift due to proximity to natural barrier falls.	
238	**Information Gaps**	**Study**	Understand what factors could be addressed to make difficult projects more feasible.	Barrier Culvert - Replacement/removal suggested. Low uplift and complicated infrastructure with rail road and skyline bridge (newly redone) Questionable uplift due to proximity to natural barrier falls.	
239	**Priority Actions**	**Restore**	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Replacement of partial barrier culvert. Questionable uplift but very few other barriers in the headwaters.	
240	**Priority Actions**	**Restore**	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Partial barrier culvert - recommend replacement/removal but the railroad crossings are challenging and low uplift. Might reduce E coli regrowth in Stewart creek.	
241	**Considerations**	**Collaborate**	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	Partial barrier culvert - recommend replacement/removal but the railroad crossings are challenging and low uplift. Might reduce E coli regrowth in Stewart creek.	
242	**Priority Actions**	**Restore**	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Barrier culvert - replacement recommended. Large road grade/long culvert crossing. Large undertaking that wouldn't unlock that much stream length upstream before next barrier.	

BROOK TROUT STREAMS					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
243	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Barrier culvert under Munger Trail -recommend replacement. Complications include large trail grade, historical impacts (?), and is immediately downstream of natural barrier falls. Large lift for little uplift.	
244	Information Gaps	Study	Understand what factors could be addressed to make difficult projects more feasible.	Barrier culvert under Munger Trail -recommend replacement. Complications include large trail grade, historical impacts (?), and is immediately downstream of natural barrier falls. Large lift for little uplift.	
245	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Barrier culvert recommended for replacement. Stream is skinny and likely ephemeral at this high upstream. Very high in the headwaters and would not unlock much more stream distance prior to I35.	
246	Information Gaps	Study	Understand what factors could be addressed to make difficult projects more feasible.	Barrier culvert recommended for replacement. Stream is skinny and likely ephemeral at this high upstream. Very high in the headwaters and would not unlock much more stream distance prior to I35.	
247	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Partial Barrier culvert under I35 recommended for replacement. I35 highway poses huge challenge. Large project, many complicating factors with minimal uplift. Low priority.	
248	Information Gaps	Study	Understand what factors could be addressed to make difficult projects more feasible.	Partial Barrier culvert under I35 recommended for replacement. I35 highway poses huge challenge. Large project, many complicating factors with minimal uplift. Low priority.	
249	Priority Actions	Restore	Remove connectivity barriers within high-priority Brook Trout watersheds to restore the migration of fish and other aquatic organisms, and improve natural transport of sediment and connection of the stream to its floodplain.	Barrier culvert on cold water trib in need of replacement. Ephemeral trib but can be cold and might offer spawning habitat/cold water refugia. Really skinny water/ephemeral but monitored for temp.	
250	Priority Actions	Preserve	Preserve coldwater tributaries that offer thermal refugia and spawning habitat	Small spring fed tributary emerging from wetlands. Two years of data show cold temperatures. Habitat is poor due to ditching.	
251	Priority Actions	Restore	Manage erosion from heavily incised tributaries.	Small spring fed tributary emerging from wetlands. Two years of data show cold temperatures. Habitat is poor due to ditching.	
252	Information Gaps	Plan	Work through how to restore a challenging site with available resources	This area was historically wetlands/springs but has been converted to excavated ponds. Private property.	
253	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	This area was historically wetlands/springs but has been converted to excavated ponds. Private property.	
254	Information Gaps	Plan	Work through how to restore a challenging site with available resources	Area has been converted from woody wetlands/springs to excavated ponds. Opportunity to restore wetlands/springs.	
255	Information Gaps	Assess	Gather baseline data such as water temperature, sediment loading, habitat quality, and hydrology to determine the feasibility of future projects and to aid in the prioritization of projects for Brook Trout watersheds.	Two years of temperature data show very cold temps. Coldwater tributaries offer thermal refugia and spawning habitat for Brook Trout .	
256	Priority Actions	Preserve	Preserve coldwater tributaries that offer thermal refugia and spawning habitat	Two years of temperature data show very cold temps. Coldwater tributaries offer thermal refugia and spawning habitat for Brook Trout .	

BROOK TROUT STREAMS					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
257	Priority Actions	Preserve	Preserve existing high quality springs and headwaters habitats, including elevated woody wetlands	small spring fed tributary emerging from elevated woody wetlands	
258	Information Gaps	Assess	Gather baseline data such as water temperature, sediment loading, habitat quality, and hydrology to determine the feasibility of future projects and to aid in the prioritization of projects for Brook Trout watersheds.	Two years of data from this trib show extremely cold temperatures. Recommend some fish sampling to verify P/A of Brook Trout in this tributary. Coldwater tributaries offer thermal refugia and spawning habitat for Brook Trout.	
259	Priority Actions	Preserve	Preserve coldwater tributaries that offer thermal refugia and spawning habitat	Two years of data from this trib show extremely cold temperatures. Recommend some fish sampling to verify P/A of Brook Trout in this tributary. Coldwater tributaries offer thermal refugia and spawning habitat for Brook Trout.	
260	Priority Actions	Preserve	Preserve coldwater tributaries that offer thermal refugia and spawning habitat	Existing data shows very cold stream temps. Coldwater tributaries offer thermal refugia and spawning habitat for Brook Trout.	
261	Priority Actions	Preserve	Preserve coldwater tributaries that offer thermal refugia and spawning habitat	Existing data shows very cold stream temps. Coldwater tributaries offer thermal refugia and spawning habitat for Brook Trout.	
262	Considerations	Collaborate	Establish partnerships with landowners and community to implement actions that improve the ecological function of watersheds.	A stormwater collection system and sediment vault were established below Spirit Mountain ski runs in 2015. This system requires long-term maintenance by the City and SMRA. The City is currently developing a stormwater management plan for the entire recreation area. All these efforts are intended to reduce sediment discharged to Tallas Island sheltered bay.	
263	Priority Actions	Steward	Identify and establish government units responsible for long term maintenance of past, present and future projects	A stormwater collection system and sediment vault were established below Spirit Mountain ski runs in 2015. This system requires long-term maintenance by the City and SMRA. The City is currently developing a stormwater management plan for the entire recreation area. All these efforts are intended to reduce sediment discharged to Tallas Island sheltered bay.	
264	Best Practices	Plan	Develop stormwater management plans and implement projects that reduce the negative impacts of stormwater discharged to Brook Trout watersheds	A stormwater collection system and sediment vault were established below Spirit Mountain ski runs in 2015. This system requires long-term maintenance by the City and SMRA. The City is currently developing a stormwater management plan for the entire recreation area. All these efforts are intended to reduce sediment discharged to Tallas Island sheltered bay.	

COASTAL WETLANDS					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community /Cultural Information**
265	Consideration	Preserve	Prevent invasive species from becoming re-established in newly restored areas or where previous work has occurred to prevent loss of potential ecological gains.	Eurasian water milfoil has been found in this area in 2024, and it is spreading fast. This is a concern for wild rice, which has been being restored in Allouez Bay since 2015. This is a very concerning species. Control eurasian water milfoil in Allouez Bay to protect the wild rice that has been restored and continues to be restored. Significant investment has now been made into improving marsh bird habitat, too. The fetch here from a northwest wind and a west wind are strong.	Wild rice should be protected and is culturally significant. This is a visible location, it has many visitors on the point, boaters, and duck hunters.
266	Priority Actions	Preserve	Preserve and protect high quality wetlands, and use these locations as references for restoration design.	Little Pokegama Bay - very high quality aquatic bed with some wild rice and highly diverse submerged aquatic vegetation. Floating mats and emergent vegetation are small, but less impacted due to its location. This site is fairly isolated along the shore, but it is providing a bird corridor from Oliver wetland to Little Pokegama to Pokegama for bird populations. Maintaining this wetland upholds that corridor. This would be a good reference wetland for future restorations when looking for a species list for aquatic beds in the near vicinity. The protection from wind and wave action and lack of human alteration are likely leading to the high diversity of aquatics here. This site might have cattail or purple loosestrife invasions, since that is a problem in the wetlands that are part of that corridor mentioned above. It would be important to manage those if there. More study of the area and the Oliver wetland to the west on the Wisconsin side could reveal more high quality features, since this is a site that doesn't get visited very often due to the difficulty to access.	Wild rice was found in the GL CWMP surveys. This site is difficult to access due to the private property and distance from many public launches. This might contribute to the higher quality of it, too. This might be one location that is a positive that it is difficult to access. Keeping it limited to non-motorized boats seems appropriate.
267	Priority Actions	Preserve	Protect and improve small and limited wetlands that are creating a habitat corridor between larger wetlands for birds, fish and other wildlife.	This is a very small floating mat with a lot of open water and wave action impact. Quite shrubby. Other wetlands included in this are very tiny. Access is difficult. But there aren't many wetlands in this area. This is such a small wetland, though it may be providing a critical link to other wetlands. This site would be challenging to improve or expand due to its proximity to the shipping area, bigger water, and accessibility challenges.This likely provides the same benefits as other coastal wetlands, but it is small. Addled goose eggs were found there during a survey, showing that it is a nesting area for resident geese. This might be a critical link between the numerous wetlands in this mapping exercise on the west to the wetlands on the east (Hog Island, Nemadji, Allouez). But it also might be small enough in size that it doesn't provide the same benefits.Unknown. Part of GL CWMP sampling.GL CWMP found state listed shrub species at this site.	Isn't visited because water can get pretty wavy and it isn't close to other areas. Waves restrict wild rice. Probably surrounded by private land but also contains no foot paths to get to. Must canoe to site on bigger water.
268	Consideration	Preserve	Prevent invasive species from becoming re-established in newly restored areas or where previous work has occurred to prevent loss of potential ecological gains.	Marsh bird habitat has been created in this region within the cattail monoculture. A large investment was made into this area and project, so continued monitoring and response to increased cattail or other invasives will need to occur to ensure this restoration remains a success. Continue to respond to monitoring by controlling cattail and purple loosestrife as well as any other invasives that show up. Plant native species from approved list in areas that do not have enough species present. Not all cattail was removed, so the cattail that remains will continue to grow back. Purple loosestrife has been increasing significantly in Allouez Bay in the last 5 years, and it should be addressed somehow. Chemical control can not be used in Douglas County.	Possible location for wild rice seeding within the potholes and channels created during the restoration.
269	Priority Actions	Restore	Restore specific wetland types or habitat conditions such as hemi-marsh, sheltered floating mat, and incorporate wild rice where conditions are appropriate.	Site was heavily infested with thick cattail in 2015. Sedge meadow was inland from shore, but cattail mat was thick and wide. With this railroad acting as a natural buffer, this appears to be an ideal site for a sheltered bay floating mat. This has already been identified by others as a high priority but its visibility, its ability to address multiple issues and priority concerns all place this high on the list. Restoration is already planned for this site. This site also seems like it would be a great place for wild rice. Just beyond the cattail mat and anywhere it was broken up, there were floating leaved and submerged aquatics, suggesting appropriate sediment and water depth.	Not many other species can grow in this thick cattail. Some community members walk the tracks. This is a highly visible wetland from the railroad, so some educational opportunities could exist here. A viewing platform of stone or something else could keep traffic off of the tracks.
270	Consideration	Preserve	Prevent invasive species from becoming re-established in newly restored areas or where previous work has occurred to prevent loss of potential ecological gains.	Historic superfund site that was cleaned upSLIDRT superfund location, could use additional monitoring and likely invasive species control.	
271	Consideration	Preserve	Prevent invasive species from becoming re-established in newly restored areas or where previous work has occurred to prevent loss of potential ecological gains.	Previous restoration site. Invasive species are impacting this site, EWM and purple loosestrife. This is part of the Kingsbury Bay restoration site, there are small but high quality floating mat habitats on the west side of Indian Point that should be included in this polygon. See Aquatic Habitat Types (2020) layer for detailed map of area west of Indian Point prior to restoration work, and more accurate site boundaries. Floating mat habitats were small, so included in "hemi-marsh" polygon.	Highly visible site along the Marten Trail

COASTAL WETLANDS					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community /Cultural Information**
272	**Priority Actions**	**Restore**	Address shoreline erosion due to fetch through barrier island creation and shoreline softening.	This island and the surrounding wetlands are rapidly eroding due to high water levels killing the vegetation.	
273	**Best Practices**	**Plan**	Continue to control invasive species (e.g. cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Continue to control invasives species, including cattail, purple loosestrife, and phragmites as they occur. This area has had a major marsh bird restoration occur, and it is still in the recovering stages. A significant investment has been made for this restoration, and to ensure that the investment is successful, continued invasive species control and monitoring as well as possible planting should occur. Control invasive species as they are identified as a problem for the restoration. Planting and seeding of native species should occur when monitoring shows it is necessary. Monitoring should continue to identify the above needs. High fetch and ice scour, existing invasive species remain, and chemical treatment of invasive species in not allowed in Douglas County.	This area may be suitable for wild rice seeding in the future within the potholes and channels that were created. Possible sign creation, but on the point for the public to learn about this effort.
274	**Consideration**	**Preserve**	Prevent invasive species from becoming re-established in newly restored areas or where previous work has occurred to prevent loss of potential ecological gains.	Work has already been done that can be learned from in the future. Future actions may be needed to improve upon existing restoration. There is a concept plan developed for this area. Spirit Lake pre-restoration conditions were mapped in 2020 Aquatic Habitat Types layer - see that for more precise boundaries. Restoration plans should have maps of intended outcome of restoration work. Eurasian water milfoil has been expanding and is now present in Spirit Lake. Recent remediation will prevent some types of restoration in areas.	Includes the areas around US Steel and Spirit Island. Spirit Island is owned and managed by Fond du Lac Ojibwe, it is a sacred site with historical significance to Ojibwe people.
275	**Priority Actions**	**Preserve**	Preserve and protect high quality wetlands, and use these locations as references for restoration design.	Native phragmites is behaving like nonnative phragmites, as it has also been observed to behave like in Bark Bay, Sioux River, and Port Wing. It shades out the higher quality species, leaving primarily shrubs to barely hang on in the understory. This is one of the largest floating mat wetlands left in the SLRE and supports multiple priority concerns. It is also isolated from many other wetlands, so negative influence from others will have a more difficult time reaching Allouez. With the restoration, any remaining invasive species will contribute to reintroductions of these species back into areas where they were removed. Continue to build off of the Audubon marsh breeding bird habitat restoration. Phragmites treatment is obvious next step. It may take additional work to convince other natural resource managers that native phragmites is more aggressive than currently believed. In more untouched areas like BWCA or northern Canada, cattail and native phragmites are considered invasive species	
276	**Consideration**	**Preserve**	Identify overlapping objectives with other priority concern teams to enhance benefits of projects.	Native phragmites is behaving like nonnative phragmites, as it has also been observed to behave like in Bark Bay, Sioux River, and Port Wing. It shades out the higher quality species, leaving primarily shrubs to barely hang on in the understory. This is one of the largest floating mat wetlands left in the SLRE and supports multiple priority concerns. It is also isolated from many other wetlands, so negative influence from others will have a more difficult time reaching Allouez. With the restoration, any remaining invasive species will contribute to reintroductions of these species back into areas where they were removed. Continue to build off of the Audubon marsh breeding bird habitat restoration. Phragmites treatment is obvious next step. It may take additional work to convince other natural resource managers that native phragmites is more aggressive than currently believed. In more untouched areas like BWCA or northern Canada, cattail and native phragmites are considered invasive species	
277	**Priority Actions**	**Restore**	Promote dynamic native plant communities that are able to respond to fluctuating estuary water levels by reducing monocultures of cattail and other invasive species.	Control cattail monoculture that is preventing the natural dynamic community shift that occurs with changing water levels. This is not as important as other cattail monoculture patches since the high quality community on the shoreline is long and narrow. However, Pokegama Bay supports several state listed species, so any effort to improve the habitat is a net benefit. Control the cattail monoculture that restricts the natural dynamic shift in plant communities from coastal fen/wet meadow to scrub shrub or aquatic zone. Douglas County does not allow chemical to treat invasive species.	Pokegama Bay supports wild rice, though not within the floating mat. This is a visible area for boaters, kayakers, and canoers.
278	**Best Practices**	**Plan**	Continue to control invasive species (e.g. cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Purple loosestrife beetles have been released here in the past and should continue to be released to control the spreading population of PL into the high quality coastal fen behind it. Allouez Bay is the last remaining high quality coastal fen, and this western side is the highest quality within Allouez Bay. Preservation of the remaining fen and restoration of the adjacent areas should be completed for long-term protection. There is no good control measure for purple loosestrife other than chemical, which is not allowed in Douglas County. Beetles can keep the PL from flowering, but ideally, PL would be removed from this important area.	

COASTAL WETLANDS					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community /Cultural Information**
279	**Priority Actions**	**Preserve**	Preserve and protect high quality wetlands, and use these locations as references for restoration design.	Purple loosestrife beetles have been released here in the past and should continue to be released to control the spreading population of PL into the high quality coastal fen behind it. Allouez Bay is the last remaining high quality coastal fen, and this western side is the highest quality within Allouez Bay. Preservation of the remaining fen and restoration of the adjacent areas should be completed for long-term protection. There is no good control measure for purple loosestrife other than chemical, which is not allowed in Douglas County. Beetles can keep the PL from flowering, but ideally, PL would be removed from this important area.	
280	**Consideration**	**Preserve**	Prevent invasive species from becoming re-established in newly restored areas or where previous work has occurred to prevent loss of potential ecological gains.	Control invasive monoculture cattail adjacent to wild rice restoration and coastal fen. This area has undergone mechanical control, but the results are not yet determined as to the efficacy of mechanical control on monoculture cattail. A lot of resources have gone into this area with years of wild rice restoration and now cattail control. Control monoculture cattail and potentially plant natives or seed natives to help outcompete the aggressive cattail. Mechanical control effectiveness is yet to be determined in the SLRE.	This cattail monoculture is occupying wild rice habitat, as observed in 2018 when cattail was cut underwater, and wild rice was seeded in and did very well.
281	**Consideration**	**Preserve**	Control invasive species in high quality reference native plant community locations.	Remaining high quality habitat that is threatened significantly by purple loosestrife, cattail, and phragmites. High quality species still remain in these areas and would be good examples of what other areas in the estuary once were and could be again. This has been included in high quality bird habitat, and we may find out that it is the presence of these remaining high quality areas that are what is sustaining these bird populations. Invasive cattails have spread significantly in the past 15 years. We used to be able to see the open water while standing on floating mat or from a canoe in the bay, now there's a thick border of cattails obscuring that view. We need to control and remove cattails to protect the floating mat habitat and to establish better manoomin habitat. Cattail removal is finally being undertaken, and the success of the project will inform if it is a viable option for this area as well. This is the largest and most intact floating mat in the SLR estuary. The best reference sites for the floating mat habitat are in other WI estuaries, such as Bark Bay and Raspberry Bay on the Bayfield Peninsula. Removal of invasive cattails is essential.	Species might be present here that would be culturally significant, but those species should be cross-referenced with a resource like Ganawendiwag.
282	**Information Gaps**	**Study & Assess**	Understand the importance of high quality wetlands to other priority concerns such as birds.	Remaining high quality habitat that is threatened significantly by purple loosestrife, cattail, and phragmites. High quality species still remain in these areas and would be good examples of what other areas in the estuary once were and could be again. This has been included in high quality bird habitat, and we may find out that it is the presence of these remaining high quality areas that are what is sustaining these bird populations. Invasive cattails have spread significantly in the past 15 years. We used to be able to see the open water while standing on floating mat or from a canoe in the bay, now there's a thick border of cattails obscuring that view. We need to control and remove cattails to protect the floating mat habitat and to establish better manoomin habitat. Cattail removal is finally being undertaken, and the success of the project will inform if it is a viable option for this area as well. This is the largest and most intact floating mat in the SLR estuary. The best reference sites for the floating mat habitat are in other WI estuaries, such as Bark Bay and Raspberry Bay on the Bayfield Peninsula. Removal of invasive cattails is essential.	Species might be present here that would be culturally significant, but those species should be cross-referenced with a resource like Ganawendiwag.
283	**Priority Actions**	**Preserve**	Preserve and protect high quality wetlands and use these locations as references for restoration design.	This area used to be extremely high quality coastal fen with some minor cattail populations on shoreline. It is now difficult to find the fen and the higher quality plant communities that exist have mostly been replaced with lake sedge. This is probably low on the list of priorities for many since it is never visited, doesn't contain fish, and is not likely a main birding location. It is a coastal wetland monitoring program site, though. Unless this has been identified for other reasons as being significant, it will likely not be preserved. Which partners would work toward restoring an area with the main goal to be saving a plant community? It has changed in less than 10 years from a spectacular site to one that is barely recognizable. Hard to find the small patches of fen left. But where they are, they are still spectacular. A good spot to use species list for future restorations as reference.	This site could contain culturally significant plants but they should be cross-referenced with a resource or a group of elders to identify which species are culturally significant. It already appears that enough driving within the wetland has occurred. Driving around through the wetland cannot be good for reducing the spread of invasives or maintaining the ecological integrity.
284	**Best Practices**	**Plan**	Use high quality reference sites within the St Louis River estuary or a similar functioning Great Lakes coastal wetlands to inform future restoration designs and derive species planting lists.	This area used to be extremely high quality coastal fen with some minor cattail populations on shoreline. It is now difficult to find the fen and the higher quality plant communities that exist have mostly been replaced with lake sedge. This is probably low on the list of priorities for many since it is never visited, doesn't contain fish, and is not likely a main birding location. It is a coastal wetland monitoring program site, though. Unless this has been identified for other reasons as being significant, it will likely not be preserved. Which partners would work toward restoring an area with the main goal to be saving a plant community? It has changed in less than 10 years from a spectacular site to one that is barely recognizable. Hard to find the small patches of fen left. But where they are, they are still spectacular. A good spot to use species list for future restorations as reference.	This site could contain culturally significant plants but they should be cross-referenced with a resource or a group of elders to identify which species are culturally significant. It already appears that enough driving within the wetland has occurred. Driving around through the wetland cannot be good for reducing the spread of invasives or maintaining the ecological integrity.

COASTAL WETLANDS					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community /Cultural Information**
285	**Priority Actions**	**Preserve**	Protect and improve small and limited wetlands that are creating a habitat corridor between larger wetlands for birds, fish and other wildlife.	This is a protected bay that still has access to seiche. The aquatics are high quality. Wild rice restoration has been talked about in this area, but it depends on rice availability. Another restoration is occurring for bird habitat within the floating mat. Aquatic habitats in this region are rather limited, and we must work together to protect those that exist. Remove aquatic invasive species and keep cattail at bay. This might be another possible location to cut cattail underwater to see if mechanical control could work. There is a lot of cattail that might continue to impact this wetland. Eurasian water milfoil has been spreading in aquatic habitats, and it could already be in this protected bay.	The train takes people through this wetland, and community members like to visit it for birding and other wildlife viewing. The access to this site isn't great. People walk the tracks or when canoeing have to lift the canoe over the tracks to access.
286	**Consideration**	**Preserve**	Control invasive species in high quality reference native plant community locations.	This is a protected bay that still has access to seiche. The aquatics are high quality. Wild rice restoration has been talked about in this area, but it depends on rice availability. Another restoration is occurring for bird habitat within the floating mat. Aquatic habitats in this region are rather limited, and we must work together to protect those that exist. Remove aquatic invasive species and keep cattail at bay. This might be another possible location to cut cattail underwater to see if mechanical control could work. There is a lot of cattail that might continue to impact this wetland. Eurasian water milfoil has been spreading in aquatic habitats, and it could already be in this protected bay.	The train takes people through this wetland, and community members like to visit it for birding and other wildlife viewing. The access to this site isn't great. People walk the tracks or when canoeing have to lift the canoe over the tracks to access.
287	**Consideration**	**Preserve**	Prevent invasive species from becoming re-established in newly restored areas or where previous work has occurred to prevent loss of potential ecological gains.	Previous remediation site for contaminants. Prior to remediation was good quality habitat, but contained invasives. Need to monitor to ensure native vegetation is returning and likely control of invasive species. Monitor for purple loosestrife, Eurasian water milfoil, Phragmites australis var australis.	
288	**Best Practices**	**Plan**	Pro-actively plant trees and shrubs in forested wetlands where they are at risk of forest conversion due to emerald ash borer, browse pressure, or climate change disturbance.	The island is fairly high-quality with a diverse range of strictures within the site. A good bird nesting habitat. Munger Island (?) is almost entirely wetland, and a large section is forested ash swamp which will likely die off in the near future. The condition seems good otherwise, but some management to ensure invasives to not overtake during this transition. Likely public land. Adjacent to a marina, potential for damaging wave action. Seems to be private ownership. This channel has signage that says "NO WAKE", which most boaters follow.	
289	**Best Practices**	**Plan**	Use high quality reference sites within the St Louis River estuary or a similar functioning Great Lakes coastal wetlands to inform future restoration designs and derive species planting lists.	Coastal fen with high quality plants and little to no invasives beyond the wall of cattail at the shore. Could use species list as a reference for floating mat restoration projects in the area. This is a smaller geographical area that is high quality. Other larger areas of high quality should take priority, but the number of high quality floating mats remaining continues to dwindle as cattail increases. This is a GL CWMP site where a transect went right through it. Species list can be obtained from that transect data over several years. Defining cattail expansion over the years can also be achieved with CWMP data. Property ownership might be an issue for invasives control or any other projects. Prior access has always been canoeing from Oliver.	Difficult to access, but easy to see from the railroad and a good birding spot. Has been driven through in the past with an ATV or some vehicle.
290	**Consideration**	**Preserve**	Control invasive species in high quality reference native plant community locations.	Large and impactful cattail monoculture that continues to push into the high quality fen behind it. Purple loosestrife is also an issue. Cattail should be controlled, either with chemical or mechanical treatment. Adjacent fen the highest quality in SLRE. Extra emphasis and resources should be placed on the highest quality remaining coastal fen in the SLRE. Cattail monoculture chemical or mechanical control project to protect the high quality coastal fen behind it. Purple loosestrife beetle release area as well or purple loosestrife control area. High fetch and ice scour has built a berm of sand that is restricting the natural dynamic plant community shift and is favoring cattail, which is much more tolerant and will root itself into the sand rather than continuing as a floating mat.	Too much fetch for wild rice to survive in this area. Not easily accessible, only via boat. No action needed at this time.
291	**Priority Actions**	**Preserve**	Preserve and protect high quality wetlands, and use these locations as references for restoration design.	This is one of the highest quality coastal wetlands in the SLRE with Sphagnum moss, sundews, and a list of very high quality species. This polygon represents an area to preserve, is representative of what used to be the estuary, and needs help. This is one of the last remaining high quality coastal fens in the area. We don't truly know what other species it is supporting. We might find that out once it is gone. Part of this is learning from the Allouez Bay cattail removal to see if it is effective. If not, a new strategy needs to be developed to save this particular area. Chemical is typically not approved here. Cattail has been known to travel 3.9 meters a year in the Kakagon Slough. If left for too long, cattail will cover that distance and shade out the smaller species as it has from the shoreline moving inland.	Species in this area are found in Ganawendiwag, but would need further guidance on which are culturally significant.

COASTAL WETLANDS					
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292	**Priority Actions**	**Preserve**	Preserve and protect high quality wetlands, and use these locations as references for restoration design.	Along this shoreline two state listed floating leaf aquatic species have been observed over multiple years in the small bays along the shoreline. Pokegama Bay is known to house 3 different state listed species and wild rice though not all in this segment. These sheltered bays are not slated for any upcoming changes, so keeping everything as is will benefit them very well. Mostly just a place holder for the presence of those state listed species and to draw attention that other similar sheltered bays might also harbor sensitive species. This is also the tail end of the larger Pokegama Bay wetland complex, which has its problems like cattail and purple loosestrife. This is somewhat close to locations where nonnative phragmites was treated by GLIFWC. Always good to check adjacent areas occasionally to ensure they aren't developing new introductions.	These small bays are likely too small to be considered a destination for boaters, kayakers, canoers. There is a small chance wild rice is present, though unlikely. This would not be a good candidate for wild rice due to the small size. This shoreline is likely viewed by many boaters and kayakers who use the public launch.
293	**Consideration**	**Preserve**	Prevent invasive species from becoming re-established in newly restored areas or where previous work has occurred to prevent loss of potential ecological gains.	Grassy Point Restoration site. Needs invasive species work and possibly more native planting	
294	**Best Practices**	**Plan**	Manage dredge spoils to prevent the spread of aquatic invasive species, especially to new or high quality areas.	Eurasian water milfoil has been found here, possibly from placement of dredge material, and this has now become a source for EWMF in the larger bay in Allouez where it hadn't been found before until 2024. This is supplying plant fragments to the rest of Allouez Bay. Control Eurasian water milfoil to keep the wild rice in Allouez Bay protected. This is only accessible from boat.	Eurasian water milfoil negatively impacts wild rice, which is being restored in Allouez Bay. The spread to Allouez Bay is a big concern to the health of the wild rice.
295	**Information Gaps**	**Study & Assess**	Identify areas where large scale factors (shoreline change, fetch) impact the existing or potential plant community.	Floating mat has transitioned to decent quality aquatic bed due to high water. Purple loosestrife is a problem on the islands of sweet gale and into the remaining floating mat. Cattail has invaded floating mat. Signs of numerous muskrat huts. This wetland has a high potential for increasing hemi-marsh habitat that was lost long ago while also not disrupting industrial efforts. This would positively impact birds, fish, and wild rice, but it would cost a lot to implement. This would benefit mammals who use this area. Muskrat huts can be observed in the 2017 Google Earth imagery. Some barrier river levees still exist but go underwater at high water times. Decreasing depth and invasives removal would improve this site. WDNR surveyed this for EDRR due to its proximity to the main channel and a larger fetch where early detection species might float in from much further away. State listed shrub found for GL CWMP. It likely had or still has a high quality fen behind the cattail due to its proximity to the Oliver fen.	Wild rice might be present, but this would be a possible place for wild rice restoration. Hearding map shows much of this large bay up to Little Pokegama Bay was a sheltered wetland with areas of open ponds. Barrier islands? This area is already avoided by boaters due to the shallow condition and possible logs to hit. This would provide another opportunity to enhance suitable bird habitat and wild rice habitat. Might not be a high priority, but a possible future idea.
296	**Priority Actions**	**Restore**	Restore specific wetland types or habitat conditions such as hemi-marsh, sheltered floating mat, and incorporate wild rice where conditions are appropriate.	Floating mat has transitioned to decent quality aquatic bed due to high water. Purple loosestrife is a problem on the islands of sweet gale and into the remaining floating mat. Cattail has invaded floating mat. Signs of numerous muskrat huts. This wetland has a high potential for increasing hemi-marsh habitat that was lost long ago while also not disrupting industrial efforts. This would positively impact birds, fish, and wild rice, but it would cost a lot to implement. This would benefit mammals who use this area. Muskrat huts can be observed in the 2017 Google Earth imagery. Some barrier river levees still exist but go underwater at high water times. Decreasing depth and invasives removal would improve this site. WDNR surveyed this for EDRR due to its proximity to the main channel and a larger fetch where early detection species might float in from much further away. State listed shrub found for GL CWMP. It likely had or still has a high quality fen behind the cattail due to its proximity to the Oliver fen.	Wild rice might be present, but this would be a possible place for wild rice restoration. Hearding map shows much of this large bay up to Little Pokegama Bay was a sheltered wetland with areas of open ponds. Barrier islands? This area is already avoided by boaters due to the shallow condition and possible logs to hit. This would provide another opportunity to enhance suitable bird habitat and wild rice habitat. Might not be a high priority, but a possible future idea.
297	**Information Gaps**	**Study & Assess**	Identify and learn more about wetlands not included in the Great Lakes Coast Wetland Monitoring Program.	This is not included in Great Lakes Coastal Wetland Monitoring Program - too small? Very limited research has been done. LSRI might have studied water quality back in 2013, but coastal wetlands are not well known. We need to know more.	
298	**Best Practices**	**Plan**	Use high quality reference sites within the St Louis River estuary or a similar functioning Great Lakes coastal wetlands to inform future restoration designs and derive species planting lists.	Water lily shallow marsh grading into mixed macrophyte hemi-marsh that was in very good condition in 2016; monitor for invasives, especially cattails. This was a really good reference site for water lily shallow marsh and for hemi-marsh, one of best in this reach of the river. High quality coastal wetland to protect and use as a reference site.	

COASTAL WETLANDS					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community /Cultural Information**
299	**Best Practices**	**Plan**	Implement Early Detection Rapid Response principles to identify the establishment of new invasive species that have a high probability of negatively impacting native plant communities or the spread of existing invasive species populations to new areas.	Water lily shallow marsh grading into mixed macrophyte hemi-marsh that was in very good condition in 2016; monitor for invasives, especially cattails. This was a really good reference site for water lily shallow marsh and for hemi-marsh, one of best in this reach of the river. High quality coastal wetland to protect and use as a reference site.	
300	**Consideration**	**Preserve**	Prevent invasive species from becoming re-established in newly restored areas or where previous work has occurred to prevent loss of potential ecological gains.	USS remediation/restoration project. Restrictions caused by remedial action.	Many new trails here with USS project
301	**Consideration**	**Preserve**	Prevent invasive species from becoming re-established in newly restored areas or where previous work has occurred to prevent loss of potential ecological gains.	MNDNR is planning a restoration project here with construction beginning in 2025. Construction planned to create another opening in causeway, selectively remove cattail, create hemi marsh, soften some shoreline areas and create deep open water. Invasive cattails should be removed or managed throughout the area, being careful in management timing to avoid disturbing marsh birds nesting nearby. Hemi-marsh goal should include dominance by native hemi-marsh plant species, and not just creating openings in cattail marsh (because those openings will soon be filled by cattails). US steel ownership and railroads	
302	**Consideration**	**Preserve**	Control invasive species in high quality reference native plant community locations.	Work has been done to control cattail, but continued cattail control should be done. Plant community is still in good shape despite the cattail with high quality species still comprising the majority of this wetland. Continued work on a wetland that has had work done in the past is a priority, but this wetland is not as large or high quality as some of the others. The emphasis and resources should be placed on those wetlands first. Control invasives to ensure the legacy work that has been done here continues to be successful. High fetch when there is a south/southwest wind.	This is very accessible on foot, but few people choose to visit it. It is not generally visible from the road.
303	**Best Practices**	**Plan**	Continue to control invasive species (e.g. cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Control Filipendula ulmaria along roadside to protect the downstream higher quality coastal wetland. This is a high concern species - NR40 in Wisconsin. This plant can tolerate more acidic conditions, threatening the downstream wetland. Seeds can float. Chemical is the most effective way to control this species, but is not allowed in Douglas County, and mechanical control has been used in the past with poor results.	
304	**Consideration**	**Preserve**	Prioritize shoreline softening and new coastal wetland creation in areas that might connect existing wetlands or create a habitat corridor.	Tax forfeit land in which there has been interest in removing or filling to facilitate shipping/storage. Functional wetland in an area of hardened shoreline. Near work piers.	
305	**Priority Actions**	**Restore**	Address shoreline erosion due to fetch through barrier island creation and shoreline softening.	This is an important area that would be expected to support a diverse floating and submerged aquatic plant community, but it is contained to mostly Vallisneria americana due to the strong fetch that can develop and possibly other reasons. This isn't a direct action, but it is here to support decision making around future actions. This area used to have floating mats but boaters like to travel fast around the perimeter where the river primarily flows, increasing fetch and wave activity.	The Fond du Lac tribe retains stewardship of this area, and it is a significant area for them. This is part of the St. Louis River Alliance water trail. Additional educational signage along the water trail would help community members improve understanding of "weeds" and their role in fish and bird habitat.
306	**Priority Actions**	**Educate**	Develop public demonstration areas for public education on the control and restoration of an area impacted by invasive species..	This is an important area that would be expected to support a diverse floating and submerged aquatic plant community, but it is contained to mostly Vallisneria americana due to the strong fetch that can develop and possibly other reasons. This isn't a direct action, but it is here to support decision making around future actions. This area used to have floating mats but boaters like to travel fast around the perimeter where the river primarily flows, increasing fetch and wave activity.	The Fond du Lac tribe retains stewardship of this area, and it is a significant area for them. This is part of the St. Louis River Alliance water trail. Additional educational signage along the water trail would help community members improve understanding of "weeds" and their role in fish and bird habitat.

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307	**Best Practices**	**Plan**	Continue to control invasive species (e.g. cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Control purple loosestrife and cattail here. They are taking over the otherwise high quality hemi marsh. If Eurasian water milfoil is found, control it. Due to challenging access, this isn't the highest priority, but any degradation of coastal wetland impacts the remaining coastal wetlands because of the exchange of water, plant fragments, and seedbank. Invasives should be controlled. Limited access. Large fetch here as well if wind is from the north or northeast.	This site might have wild rice restoration or could be suitable for wild rice in the future. Wild rice is a culturally significant species. This is a highly visible area with very limited access.
308	**Priority Actions**	**Preserve**	Protect and improve small and limited wetlands that are creating a habitat corridor between larger wetlands for birds, fish and other wildlife.	Control purple loosestrife and cattail here. They are taking over the otherwise high quality hemi marsh. If Eurasian water milfoil is found, control it. Due to challenging access, this isn't the highest priority, but any degradation of coastal wetland impacts the remaining coastal wetlands because of the exchange of water, plant fragments, and seedbank. Invasives should be controlled. Limited access. Large fetch here as well if wind is from the north or northeast.	This site might have wild rice restoration or could be suitable for wild rice in the future. Wild rice is a culturally significant species. This is a highly visible area with very limited access.
309	**Best Practices**	**Plan**	Implement Early Detection Rapid Response principles to identify the establishment of new invasive species that have a high probability of negatively impacting native plant communities or the spread of existing invasive species populations to new areas.	Continue to respond to invasive species that are observed. There are unique species in this small bay that haven't been observed elsewhere in the estuary. Unique species make this a higher priority. No species are state listed, but they generally indicate groundwater and aren't observed elsewhere in the estuary.	Wild rice sometimes occurs in this area. Visible from the water and the bridge above. Otherwise, not very accessible. This should remain out of the way, but invasives should be controlled since it is such a visible location.
310	**Best Practices**	**Plan**	Implement Early Detection Rapid Response principles to identify the establishment of new invasive species that have a high probability of negatively impacting native plant communities or the spread of existing invasive species populations to new areas.	Control purple loosestrife and other invasive species that have begun to move into this quiet bay. This has shifted from a floating fen mat to hemi marsh with cattail becoming a concern as well. Across the road is a dense patch of purple loosestrife that should also be controlled to improve the condition of the bay. It is a significant seed source.	Very visible from a popular road and walking/skiing area. Educational signage about restoration might be a good idea. This could be another possible location for wild rice.
311	**Priority Actions**	**Educate**	Develop public demonstration areas for public education on the control and restoration of an area impacted by invasive species.	Control purple loosestrife and other invasive species that have begun to move into this quiet bay. This has shifted from a floating fen mat to hemi marsh with cattail becoming a concern as well. Across the road is a dense patch of purple loosestrife that should also be controlled to improve the condition of the bay. It is a significant seed source.	Very visible from a popular road and walking/skiing area. Educational signage about restoration might be a good idea. This could be another possible location for wild rice.
312	**Best Practices**	**Plan**	Continue to control invasive species (e.g. cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Remove or manage for invasive species like cattails and purple loosestrife. Small wetland that doesn't contain known sensitive species or is a very high quality plant community. More important areas to work on. Various sized wood waste in floating mat.	Cross-reference with known species lists after identifying which ones are significant.
313	**Best Practices**	**Plan**	Continue to control invasive species (e.g. cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Purple loosestrife is increasing in the high quality areas here. Beetles have been released in recent past (2017, 2021). Some survive, but damage to the plants are very spotty. More impactful efforts should be taken to eliminate through pulling, digging. Purple loosestrife is known to harm coastal wetlands, and it has just begun to increase in population from an early detection species to a greater threat. Still would require a lot of effort to eliminate, but integrity of plant community is intact. This can be a phase 2 or phase 3 of the Allouez Bay Breeding Marsh Bird Habitat or a continued effort by Douglas County AIS team or LSRI. Salix planifolia is common in this floating mat.	

COASTAL WETLANDS					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community /Cultural Information**
314	**Best Practices**	**Plan**	Proactively plant trees and shrubs in forested wetlands where they are at risk of forest conversion due to emerald ash borer, browse pressure, or climate change disturbance.	Ash forests line banks of Bear Creek and have already begun to show signs of ash borer. This is an area that could be under planted with appropriate species. Some suggestions: cedar, tamarack, yellow birch, elm, bur oak. This is a relatively small area in comparison to many other places in the estuary that could use restoration. It might not cost much to plant, but it requires greater effort to get out to it - high mobilization. Based on results of LS-NERR's under planting effort and past study, species could be selected and planted. Possible partners could include LS-NERR, WDNR, SLRA. River channel is navigable in canoe up to foot bridge.	Could replace it with a different cultural resource - cedar. Though, that doesn't replace the function of ash.
315	**Best Practices**	**Plan**	Proactively plant trees and shrubs in forested wetlands where they are at risk of forest conversion due to emerald ash borer, browse pressure, or climate change disturbance.	Black ash swamp that is quickly transitioning to alder thicket as ash die. Under planting would benefit this area. Some minor data has been collected, but possibly more could be collected to describe what is happening. Monitor impact of planting. Multiple benefits, but small. Easy to access for transporting materials.LS-NERR is obvious partner but could be more.	Easy for public to see stewardship in action, but most do not get out of vehicle here. Currently no infrastructure to accommodate vehicles.
316	**Priority Actions**	**Educate**	Develop public demonstration areas for public education on the control and restoration of an area impacted by invasive species.	Black ash swamp that is quickly transitioning to alder thicket as ash die. Under planting would benefit this area. Some minor data has been collected, but possibly more could be collected to describe what is happening. Monitor impact of planting. Multiple benefits, but small. Easy to access for transporting materials.LS-NERR is obvious partner, but could be more.	Easy for public to see stewardship in action, but most do not get out of vehicle here. Currently no infrastructure to accommodate vehicles.
317	**Priority Actions**	**Design**	Design and implement restoration of coastal wetland to reconnect or maintain connectivity to the estuary and restore habitat requirements to enhance native vegetation that supports fish, invertebrates, and bird populations.	MNDNR has money to design a project in these wetlands. This location is the wetlands near Stewart Creek and to the east that was isolated from the estuary and each other by the construction of the railroad.	
318	**Priority Actions**	**Design**	Design and implement restoration of coastal wetland to reconnect or maintain connectivity to the estuary and restore habitat requirements to enhance native vegetation that supports fish, invertebrates, and bird populations.	This location was restored in approximately 2010. The 2012 flood flushed more sediment down Knowlton Creek. More dredging anticipated in 2026	
319	**Consideration**	**Preserve**	Prevent invasive species from becoming re-established in newly restored areas or where previous work has occurred to prevent loss of potential ecological gains.	Previous restoration site. Invasive species are impacting this site, EWM and purple loosestrife. This is part of the Kingsbury Bay restoration site, there are small but high-quality floating mat habitat on the west side of Indian Point that should be included in the same site as east of Indian Point, see 2020 Aq Habitat Map layer for boundaries. Appears to be high quality wetland at the head of Indian Bay. Could be a great reference site! This area was mapped as "hemi-marsh" only small patches were floating mat.	Along Marten Trail and visible

COMMUNITY ENGAGEMENT						
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Info.**	**Location**
320	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	paddling, birding, listening to frogs, fishing		Allouez Bay
321	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	visiting the Estuarium, jogging		Barker's Island
322	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	fish, hunt, work, hike, paddle, take family and friends to recreate on the river		Between Oliver Landing and Hwy 23
323	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	hike and picnic		Billings Park
324	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	fishing, paddling, exploring the bays upstream from here, birdwatching, meditating, canoe, snorkel, swim, sit on the shore, watching for jumping sturgeon		Boy Scout Landing
325	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	paddling, kayaking, walking, biking, foraging, birding, hiking; seeing the pelicans in spring; exploring nearby islands; The water is like glass in most places, and it is amazingly peaceful.		Chambers Grove
326	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	canoeing		Clough Island
327	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	fire rings, benches, swimming, camping; Towards the end of the point, lake breezes help to create a near-boreal climate and a patch of boreal forest dominated by evergreens: tall pines and spruce, old cedars, and balsam fir.		Dwight's Point
328	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	hiking, running, xc ski, bird watching, road biking		Fond du Lac
329	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	terns and friends		Interstate Island
330	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	exploring little pebble beaches downstream from the swinging bridge, picnics, fishing, birdwatching, hiking, meeting new people, photography, whitewater kayaking		Jay Cooke State Park
331	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	hiking, running, xc ski, bird watching, road biking		Keene Creek
332	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	lined by cedar forest. When I want to experience a boreal forest close to home that is similar to places in the Boundary Waters, this is the place to go. I think I like it best in winter while cross-country skiing in the Superior Municipal Forest.		Kimball's Bay
333	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	hiking		Kingsbury Creek
334	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	At the end of the historic bridge (in Lincoln Park) where you can watch the harbor and shipping channel. It is especially beautiful on a foggy calm morning, when the rest of the world melts away.		Lincoln Park - Miller Creek

COMMUNITY ENGAGEMENT						
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Info.**	**Location**
335	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	ice skating, paddling, birdwatching		Lower bays of St Louis River
336	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	riding the train with my family at least once a year. We love the train,the peace, & the view		LS&M Duluth River Train
337	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	canoeing, skiing, hiking, art, biking, learning; The old growth forest is the best example of what our forests used to look like. You can get far enough in that it can feel remote, and there are places that you can't hear traffic or human noise.		Magney-Snively
338	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	mountain biking		Mission Creek
339	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	hiking, reflection, swimming, birding, exercise		MN Point
340	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	birding, walking		Morgan Park
341	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	birding, fishing		Mud Lake
342	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	fishing and swimming		Oliver
343	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	kayaking, canoeing, bird watching, fishing, snowshoeing, boating, hiking		Perch Lake
344	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	paddling, walking, biking, foraging, birding		Pokegema Bay
345	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	picnicking		Pokegema Landing
346	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	paddling upriver		Red River
347	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	solace, reflection on how far we've come with intention		Rice's Point
348	**Best Practices**	**Plan**	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	hiking, birding		Slag Point

COMMUNITY ENGAGEMENT						
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Info.**	**Location**
349	Best Practices	Plan	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	canoeing		Spirit Island
350	Best Practices	Plan	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	biking		Spirit Mt - DWP
351	Best Practices	Plan	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	hiking		Superior Hiking Trail/ North Country trail
352	Best Practices	Plan	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	My favorite cross-country skiing place in winter with its amazing boreal forest on Chases Point		Superior Municipal Forest
353	Best Practices	Plan	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	canoe, hike, kayak, bird watch.		Tallus Island
354	Best Practices	Plan	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.			Upper St. Louis River downstream from 210 bridge and Munger Trail train bridge
355	Best Practices	Plan	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	birdwatching, walking, biking, running, canoeing		Waabizheshikana - Marten Trail
356	Best Practices	Plan	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	canoeing		Walleye Bay
357	Best Practices	Plan	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	hiking, plant gazing, campfires		WI Point
358	Best Practices	Plan	Learn about the community where work is being done. Consider community uses values and needs. Use the Community Atlas as a first step.	canoeing, walking		Woodstock Bay

HYDROLOGIC INTEGRITY					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
359	Priority Actions	Preserve	Preserve coldwater tributaries, wetlands, springs, forested greenspaces, and designated natural areas to maintain baseflow conditions, and coldwater refugia for aquatic organisms and reduce sediment input.	Cold spring driven by valley wall seep from infiltration wetland. Contribution drives Stewart Creeks baseflow and substantially cools the warmer months. Currently semi protected by Magney-Snively Natural Area.	
360	Considerations	Collaborate	Coordinate stormwater management planning with other jurisdictions, state, county and municipal, township.	Potential area for establishment of a stormwater BMP. Presume the City of Duluth would administer construction and take on long-term maintenance responsibilities. Project needs development	
361	Information Gap	Assess	Conduct baseline inventories to inform sub-watershed planning, which may include an inventory of water storage opportunities, wetlands, cold water inputs, biological community health, storm sewer system mapping, road-stream crossings, habitat, or stream health.	Knowlton Creek is trout stream with past stability issues, what impact does ski hill continue to have?	
362	Best Practices	Steward	Implement an infrastructure upgrade plan for climate resiliency.	City of Duluth and Spirit Mountain Recreation Authority will design and build a stormwater management project to control runoff from unpaved ski hill parking lots that are causing severe gully erosion and depositing sediment into Knowlton Creek. The City is in the process of developing a stormwater management plan for the entire Spirit Mountain Recreation Area in 2026. Need to secure funding This project has been discussed for several years and it's completion is critical for reducing sediment being transported downstream to the restored Tallas Island wetlands. City of Duluth will take on the primary responsibility for advancing this project.	
363	Priority Actions	Preserve	Preserve coldwater tributaries, wetlands, springs, forested greenspaces, and designated natural areas to maintain baseflow conditions, and coldwater refugia for aquatic organisms and reduce sediment input.	St. Louis River Natural Area - Kingsbury Bay	
364	Priority Actions	Preserve	Preserve coldwater tributaries, wetlands, springs, forested greenspaces, and designated natural areas to maintain baseflow conditions, and coldwater refugia for aquatic organisms and reduce sediment input.	St. Louis River Natural Area - Mud Lake	
365	Considerations	Collaborate	Coordinate stormwater management planning with other jurisdictions, state, county and municipal, township.	Existing BMP to take backflow from the Spirit Mountain snow-making system. Requires long-term maintenance performed by Spirit Mountain Recreation Authority and the City of Duluth. Need for positive identification of long-term maintenance plan.	
366	Considerations	Collaborate	Coordinate stormwater management planning with other jurisdictions, state, county and municipal, township.	Water quality structures on both sides of the bridge, established when Grand Avenue was upgraded and the bridge was installed. Need to identify the party responsible for long-term maintenance.	
367	Priority Actions	Preserve	Preserve coldwater tributaries, wetlands, springs, forested greenspaces, and designated natural areas to maintain baseflow conditions, and coldwater refugia for aquatic organisms and reduce sediment input.	St. Louis River Natural Area - Munger Landing	
368	Considerations	Collaborate	Emphasize green infrastructure solutions, especially to capture excess sediment before it reaches downstream waterbodes.	Sediment and debris forebay; bioswale with native perennial/pollinator plantings with added overflow structure. Catchment includes approximately 1 block of Cody Street and about 3 blocks of North 64th Avenue West, which totals about 2.3 acres. There are not utility, right of way or recreational issues associated with this project. Although the project has not been fully scoped, the lack of ownership, utility, right of way or recreational issues suggest that it should be a high priority. More specific information about this project is contained in the City of Duluth Draft Resiliency Report for Keene Creek watershed.	
369	Considerations	Collaborate	Coordinate stormwater management planning with other jurisdictions, state, county and municipal, township.	Sediment and debris forebay; bioswale with native perennial/pollinator plantings with added overflow structure. Catchment includes approximately 1 block of Cody Street and about 3 blocks of North 64th Avenue West, which totals about 2.3 acres. There are not utility, right of way or recreational issues associated with this project. Although the project has not been fully scoped, the lack of ownership, utility, right of way or recreational issues suggest that it should be a high priority. More specific information about this project is contained in the City of Duluth Draft Resiliency Report for Keene Creek watershed.	
370	Considerations	Collaborate	Coordinate stormwater management planning with other jurisdictions, state, county and municipal, township.	Sediment basin BMP established by MNDOT during Grand Avenue upgrade in 2016. The basin takes runoff from Grand Avenue and will require long-term maintenance. MNDOT responsible for long-term maintenance.	

HYDROLOGIC INTEGRITY					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
371	Considerations	Collaborate	Coordinate stormwater management planning with other jurisdictions, state, county and municipal, township.	Stormwater BMP created as part of Grand Avenue upgrade and bridge installation in 2016. This will require ongoing maintenance. Need to verify that long-term maintenance has been identified and is being accomplished. Determine who is responsible.	
372	Considerations	Collaborate	Emphasize green infrastructure solutions, especially to capture excess sediment before it reaches downstream waterbodes.	57th Avenue West Green Infrastructure Project is being advanced by the City of Duluth, and funded by the GLRI. The project will treat 17 acres of stormshed, with a system of bio-infiltration and biochar basins and will be constructed in 2025. The amount of land available for construction of the project was limited by other public uses in the same area. The project will address water quality issues related to the designated E. coli impairment and also address other issues such as sediment and temperature. Additionally, the project has already been funded and design is almost complete. More specific information about this project is contained in the City of Duluth Draft Resiliency Report for Keene Creek watershed	
373	Considerations	Collaborate	Coordinate stormwater management planning with other jurisdictions, state, county and municipal, township.	Stormwater BMP established as part of housing development. Need to identify in this document who is responsible for long-term maintenance. Need to identify who is responsible for long-term maintenance.	
374	Considerations	Collaborate	Coordinate stormwater management planning with other jurisdictions, state, county and municipal, township.	A runoff control system was constructed below Spirit Mountain in 2015 intended to reduce excess flow and sediment transport to Knowlton Creek. That system requires continuous maintenance for effective operation. The City of Duluth is responsible. Long-term maintenance can be challenging. The runoff and sediment control system will not function as designed without an effective long-term maintenance plan. Control of sediment transport downstream to Tallas Island is a high priority.	
375	Priority Actions	Preserve	Preserve coldwater tributaries, wetlands, springs, forested greenspaces, and designated natural areas to maintain baseflow conditions, and coldwater refugia for aquatic organisms and reduce sediment input.	Magney-Snively Natural Area	
376	Priority Actions	Design	Develop implementation focused sub-watershed management plans at HUC 10-12 scale that comprehensively identify and address ecological and physical stressors.	The Keene Creek watershed is identified as needing a sub-watershed plan created to identified priority restoration, protection, and enhancement projects. Partners have discussed this planning effort and are in support.	
377	Priority Actions	Preserve	Preserve coldwater tributaries, wetlands, springs, forested greenspaces, and designated natural areas to maintain baseflow conditions, and coldwater refugia for aquatic organisms and reduce sediment input.	St. Louis River Natural Area - Grassy Point	
378	Considerations	Collaborate	Coordinate stormwater management planning with other jurisdictions, state, county and municipal, township.	Stormwater BMP established as part of housing development. Need to identify in this document who is responsible for long-term maintenance. Need to maintain this stormwater BMP. Need to identify in this document who is responsible for long-term maintenance.	
379	Considerations	Collaborate	Emphasize green infrastructure solutions, especially to capture excess sediment before it reaches downstream waterbodes.	Installation of curb and gutter to Westgate Boulevard to convey stormwater flows to underutilized vegetated area on east bank of Keene Creek. installation of drainage basin with biofiltration features and native perennial/pollinator plantings Existing sanitary sewer infrastructures in this area would need to be carefully referenced prior to being crossed by proposed alterations to the stormwater conveyance systems needed for green infrastructure improvements at this site. MNDOT right of way. Project has not been fully scoped to determine feasibility. Ownership issues with MNDOT. More specific information about this project is contained in the City of Duluth Draft Resiliency Report for Keene Creek watershed.	
380	Priority Actions	Preserve	Preserve coldwater tributaries, wetlands, springs, forested greenspaces, and designated natural areas to maintain baseflow conditions, and coldwater refugia for aquatic organisms and reduce sediment input.	St. Louis River Natural Area - Tallus Island	

HYDROLOGIC INTEGRITY					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
381	Considerations	Collaborate	Emphasize green infrastructure solutions, especially to capture excess sediment before it reaches downstream waterbodes.	Curb cut with Rain Guardian pre-treatment; drainage basin with biofiltration features and native perennial/pollinator plantings; public educational signage; optional extensive green roof addition to Duluth-owned buildings. A 10-inch vitreous clay sanitary sewer pipe exits the public library and runs parallel to the 4-inch polyvinyl chloride stormwater conveyance system at this location. The proposed biofiltration basin must consider these systems in site design parameters. The site is owned by the City of Duluth, there is an adequate footprint for the objective and the completed effort would provide opportunity for development of educational outreach. More specific information about this project is contained in the City of Duluth Draft Resiliency Report for Keene Creek watershed.	Potential for community education signage.
382	Priority Actions	Educate	Support citizen science opportunities and participatory science (e.g. school and community engagement, updated Lake Superior Streams website, public service announcements, one on one contact with landowners, site stewardship by recreation and community groups).	Curb cut with Rain Guardian pre-treatment; drainage basin with biofiltration features and native perennial/pollinator plantings; public educational signage; optional extensive green roof addition to Duluth-owned buildings. A 10-inch vitreous clay sanitary sewer pipe exits the public library and runs parallel to the 4-inch polyvinyl chloride stormwater conveyance system at this location. The proposed biofiltration basin must consider these systems in site design parameters. The site is owned by the City of Duluth, there is an adequate footprint for the objective and the completed effort would provide opportunity for development of educational outreach. More specific information about this project is contained in the City of Duluth Draft Resiliency Report for Keene Creek watershed.	Potential for community education signage.
383	Considerations	Collaborate	Coordinate stormwater management planning with other jurisdictions, state, county and municipal, township.	Stormwater BMP established as part of housing development. Need to identify in this document who is responsible for long-term maintenance. Need to identify in this document who is responsible for long-term maintenance. Need to maintain this stormwater BMP	
384	Considerations	Collaborate	Coordinate stormwater management planning with other jurisdictions, state, county and municipal, township.	Zenith Terrace development has little stormwater management at this time. Would be desirable to work together with the City of Proctor to determine the feasibility of developing a stormwater plan for this area. No baseline information and lack of a foundational relationship with the City of Proctor to address stormwater issues on this site. Although there is minimal baseline information, the benefit of advancing stormwater management at this site should be pursued.	
385	Considerations	Collaborate	Coordinate stormwater management planning with other jurisdictions, state, county and municipal, township.	A sediment collection basin was constructed at the mouth of Knowlton Creek behind Tallas Island prior to the restoration of Knowlton Creek. The basin filled as a result of rain events. it will be dredged through the USX Superfund process. Although sediment transport has been greatly reduced as a result of implementing watershed projects upstream, long-term maintenance will be required. Responsible party not identified. Although long-term maintenance of the sediment basin will be necessary, it is anticipated to be less of an issue after since completion of the sediment control structures below Spirit Mountain and continued effort to control sediment from the ski hill. Identifying an entity to fund the maintenance of the basin will be challenging.	
386	Priority Actions	Preserve	Prioritize lands to be sold or developed that should be protected in headwaters, wetlands, and other vulnerable areas.	High preservation need - City of Hermantown intends to develop this area further and make Maple Grove the downtown of Hermantown. Development is making it's way to interior parcels by extending stub road like Oak Drive and Lober Rd using sewer easements. Heawaters of Keene Creek are currently in excellent condition but at risk. Preservation of interior high quality parcels would benefit Keene Creek Trail users recreation experience and make them better connected to a healthy stream ecosystem.	
387	Considerations	Collaborate	Coordinate stormwater management planning with other jurisdictions, state, county and municipal, township.	Untreated stormwater from the dirt track. This runoff flows south and eventually to the stormwater system discharging to a tributary to Kingsbury Creek. That tributary is transporting excess sediment from extreme bank erosion. Would have to work with the City of Proctor to advance an objective at this location. It is a high priority outcome, but the strategy for advancing the objective is complicated and requires the formation of a partnership.	
388	Considerations	Collaborate	Coordinate stormwater management planning with other jurisdictions, state, county and municipal, township.	There is a 36-inch outfall that discharges into a tributary to Kingsbury Creek. However, the area of the stormshed is currently unknown. Although there is minimal baseline information, the benefit of advancing stormwater management at this site should be pursued. Although it is known that erosion within the tributary is an issue, the stormsheds that convey runoff have not been evaluated. Would need to develop a relationship with the City of Proctor to determine opportunities for stormwater management in this area.	

HYDROLOGIC INTEGRITY					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
389	Information Gaps	Assess	Conduct baseline inventories to inform sub-watershed planning, which may include an inventory of water storage opportunities, wetlands, cold water inputs, biological community health, storm sewer system mapping, road-stream crossings, habitat, or stream health	There is a 36-inch outfall that discharges into a tributary to Kingsbury Creek. However, the area of the stormshed is currently unknown. Although there is minimal baseline information, the benefit of advancing stormwater management at this site should be pursued. Although it is known that erosion within the tributary is an issue, the stormsheds that convey runoff have not been evaluated. Would need to develop a relationship with the City of Proctor to determine opportunities for stormwater management in this area.	
390	Considerations	Collaborate	Emphasize green infrastructure solutions, especially to capture excess sediment before it reaches downstream waterbodes.	59th Avenue West Green Infrastructure Project is being advanced by the MNDNR and the City and funded by the GLRI. The project will treat 85 acres of stormshed, with a system of bio-infiltration and biochar basins and will be constructed in 2026. The size of the construction site is limiting, which will allow for the treatment of a one-inch rain event over a 24-period. The project will address water quality issues related to the designated E. coli impairment and also address other issues such as sediment and temperature. Additionally, the project has already been funded with an estimated construction in 2026. More specific information about this project is contained in the City of Duluth Draft Resiliency Report for Keene Creek watershed.	
391	Best Practices	Maintain	Develop priorities for protection – forests, wetlands, streams, riparian areas, shoreline setbacks, and watershed storage.	WI Point Resiliency Study area - 2025 to 2026	
392	Information Gaps	Assess	Evaluate if stream crossings are limiting stream functions such as passage barrier and wetland connections. A focus on railroad crossings or causeways and culverts; including the railroad causeway along the St. Louis River.	Railroad causeway limits wetland connections to St. Louis River. Hardened shoreline in spots. Unsure if there are stream crossings that limit stream function. LSMR train and BNSF operations. City ownership	
393	Priority Actions	Restore	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	This reach has extreme aggradation and is influenced by the culvert at the munger trail and the very long culvert from 93rd ave W through Grand Ave.	
394	Priority Actions	Preserve	Preserve coldwater tributaries, wetlands, springs, forested greenspaces, and designated natural areas to maintain baseflow conditions, and coldwater refugia for aquatic organisms and reduce sediment input.	The stream is stable and healthy. This section of stream is located on private land and is bordered by City of Duluth property to the East and to the south. These parcels should be protected from invasive species and vegetation should remain undisturbed.	
395	Priority Actions	Restore	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	An abandoned road embankment intersects the stream. It is recommended that the abandoned embankment be removed and step-pools be created. The channel should be reconnected to the floodplain.	
396	Best Practices	Maintain	Develop priorities for protection – forests, wetlands, streams, riparian areas, shoreline setbacks, and watershed storage	Protect and maintain the stream restoration work that was completed in 2016/2017.	
397	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	This drainage has significant erosion occurring. Flows are concentrated here due to the railroad causeway. This reach was identified in the 2013 Stantec report for the Knowlton watershed.	
398	Priority Actions	Restore	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	Railroad past efforts have narrowed and straightened this portion of the channel. It is believed that historically, the railroad has caused the creek to be laterally constrained; as a result, rip-rap has been placed along the banks, effectively constricting the channel to an even greater extent. While this area does not appear to be contributing a significant amount of sediment to Knowlton Creek, it is still very unstable and could result in failure along the railroad.	
399	Priority Actions	Restore	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	This tributary reach is in need of restoration. Flow is concentrated here due to the railroad causeway. Significant bank erosion occurs here and sediment is transported downstream to the mainstem.	

HYDROLOGIC INTEGRITY					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
400	**Priority Actions**	**Restore**	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	Reach is ditched. Restoration recommended to remeander the stream, reconnect it to its floodplain, and improve habitat. Property is mostly owned by Canadian National Railway, meaning that access would likely not be granted to complete this project. Sediments may also be contaminated due to the proximity to the railyard. Reach represents a significant portion of Kingsbury Creek.	
401	**Priority Actions**	**Restore**	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	Reach is ditched. Project is currently underway by the SWCD to remeander the stream, reconnect it to its floodplain, and improve habitat. Narrow corridor to work in - hemmed in by roads, ball fields and golf course. Reach is severely incised and a major sediment source. Brook Trout have potentially been extirpated from this area of the watershed - this project may allow Brook Trout reintroduction.	City of Proctor is planning on making this area a "people's park" with trails and interpretive signage. Restoration project needs to be implemented first.
402	**Priority Actions**	**Restore**	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	Ditched reach. Restoration is recommended to remeander the stream, reconnect it to its floodplain, and improve habitat. Lower part of the reach is hemmed in by park facilities Reach is severely incised and habitat is poor. Water temps are cold. However, baseflow is low and is a trickle in the summer.	
403	**Priority Actions**	**Restore**	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	Restoration recommended to reconnect the stream to its floodplain. Private land with no easement. The upper portions of the tributary are impacted by urban development from the Zenith Terrace housing project. High sediment source, but no Brook Trout are present in this tributary	
404	**Priority Actions**	**Restore**	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	Restoration recommended to reconnect the stream to its floodplain. The upper portions of the tributary are impacted by urban development from the Zenith Terrace housing project. High sediment source, but no Brook Trout are present in this tributary	
405	**Priority Actions**	**Restore**	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	Portions of this reach through the zoo are ditched and armored on at least one bank with a historic rock wall. Channel bed is planar with very few observed stream features. High risk location, being at the downstream end of a bedrock controlled, steep gradient reach with several waterfalls. Presence within the zoo is also a complication. High risk project.	
406	**Priority Actions**	**Restore**	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	Reach is ditched. Restoration project may be recommended to remeander the stream, reconnect it to its floodplain, and improve habitat. More temperature data is needed to help prioritize this reach. Reach is on multiple private parcels. Temperatures may be relatively warm - just downstream of Mogie Lake	
407	**Priority Actions**	**Restore**	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	This reach is channelized and severely incised Private land without an easement. Low priority for channel restoration or enhancement due to limited baseflow and extremely small size of the stream.	
408	**Priority Actions**	**Restore**	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	Restore this reach by partially filling the pond and re-meandering the channel around the pond. Private land without an easement This in-line pond has severe impacts on water temperatures in Keene Creek. Brook Trout suitability is poor due to the warm temperatures and stagnant conditions created by the pond. The pond also interrupts sediment and detritus transport.	
409	**Priority Actions**	**Restore**	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	This reach is ditched and incised. Private land without an easement Reach is a high priority for channel restoration on the condition that simultaneous channel restoration also occurs at the in-line impoundment just upstream in order to mitigate warm water flowing into the reach.	

HYDROLOGIC INTEGRITY					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
410	Priority Actions	Restore	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	This reach recommended for habitat enhancement through the addition of large woody debris to benefit Brook Trout. Private land without an easement The stream channel is stable and habitat quality is mostly good although there is a general lack of large woody debris in the channel.	
411	Priority Actions	Restore	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	Reach is recommended for easement acquisition and habitat enhancement through the addition of large woody debris to benefit Brook Trout Easement acquisition on these three private parcels would provide protection and continuous access west of Okerstrom Road. Easement acquisition on these three private parcels would provide protection and continuous access west of Okerstrom Road.	
412	Priority Actions	Restore	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	This reach of Keene Creek is ditched along Okerstrom Road. As a result, it is disconnected from its floodplain and habitat quality is poor. Restoration of this reach is currently being pursued by Hermantown, SSL SWCD and MNTU. Brook Trout suitability is very good due to cold water and good connectivity to upstream reaches. There is also very little shading on river right. The creek poses a risk to infrastructure if not restored. This project is currently in the design phase. Construction will likely be in 2026.	
413	Priority Actions	Restore	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	Reach is recommended for habitat enhancement through the addition of large woody debris to benefit Brook Trout. The stream channel is stable and habitat quality is mostly good although there is a general lack of large woody debris in the channel.	
414	Priority Actions	Restore	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	Channel needs to be restored to reconnect it to the floodplain Mostly on private land without an easement. The reach is moderately to severely incised and moderately unstable and is a major source of sediment to Keene Creek. Brook Trout suitability in reach is very good mostly due to cold water (92% growth). Trout habitat is somewhat limited; pools are mostly filled in and shallow and the stream bed is embedded with fine sediment.	
415	Priority Action	Preserve	Preserve coldwater tributaries, wetlands, springs, forested greenspaces, and designated natural areas to maintain baseflow conditions, and coldwater refugia for aquatic organisms and reduce sediment input.	Easement acquisition is recommended upstream of Skyline Parkway. Several landowners, therefore several easements would be necessary. Obtaining these easements would connect two large swaths of public land, providing access and protection to a significant portion of Keene Creek.	
416	Priority Actions	Restore	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	Reach is a significant sediment source. Restoration of the floodplain would dissipate energy and reduce erosion. Reach is at the downstream end of a steep bedrock cascade and transport reach, significantly increasing the risk of channel restoration at this location. Additionally, there is an undersized culvert just upstream of this location at Cody Street. Risk to benefit ratio does not favor restoration at this location at this time.	
417	Information Gaps	Assess	Implement an urban stormwater management strategy.	Reach has been ditched and is incised, but is a low sediment source due to rip rap and a high density of invasive willow roots in the stream banks. Restoration is recommended to reconnect to the floodplain and improve habitat. MNDOT is considering changing the I35 ramps in this location. The invasive willows may be beloved by the local community. Existing park - restoration would have to reduce the size of the park or the park would have to also function as a floodplain. No floodplain connection. Habitat quality is poor and there is a concrete dam that is a migration barrier. However, this reach is managed as a Brown Trout resource by the MN DNR.	A series of pre-restoration community meetings are required to educate the community and build local support for this project. Ordinance revision may be needed to allow for parkland to be able to also function as floodplain.
418	Information Gaps	Assess	Conduct baseline inventories to inform sub-watershed planning, which may include an inventory of water storage opportunities, wetlands, cold water inputs, biological community health, storm sewer system mapping, road-stream crossings, habitat, or stream health	Tributary is thought to be incised and disconnected from floodplain with high sediment input. Need more monitoring and assessment. High potential for floodplain connectivity and increased habitat but need more data.	
419	Priority Actions	Restore	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	Reach is ditched. Restoration recommended to remeander the stream, reconnect it to its floodplain, and improve habitat. Private land, Allete electrical towers are in the riparian corridor Reach is very unstable due to ditching and severe channel incision, and habitat quality is poor. However, this reach is currently managed as a Brown Trout resource by the MNDNR	

HYDROLOGIC INTEGRITY					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
420	Priority Actions	Restore	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	Reach is ditched. Restoration is recommended to remeander the stream, reconnect it to its floodplain, and improve habitat. Existing park - restoration would either have to reduce the size of the park space or the park space would have to somehow also function as a floodplain. Reach is very unstable due to ditching and severe channel incision, and habitat quality is poor. However, this reach is currently managed as a Brown Trout resource by the MNDNR	Ordinance revision may be needed to allow for parkland to be able to also function as floodplain.
421	Priority Actions	Restore	Restore streams by addressing channel pattern and form, and establishing floodplain connection to reduce sediment input, decrease water temperatures, provide groundwater recharge, and improve habitat.	Reach is ditched. Restoration is recommended to remeander the stream, reconnect it to its floodplain, and improve habitat. Private land without an easement. Reach is very unstable due to ditching and severe channel incision, and habitat quality is poor. However, this reach is currently managed as a Brown Trout resource by the MNDNR.	
422	Priority Action	Preserve	Preserve coldwater tributaries, wetlands, springs, forested greenspaces, and designated natural areas to maintain baseflow conditions, and coldwater refugia for aquatic organisms and reduce sediment input.	Potential opportunity for future acquisition.	
423	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Trout stream is confined to culvert for several hundred feet. Plunge pool at bottom.	
424	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Culvert under Hwy 2 limits fish movement inhibits stream connectivity.	
425	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Partial barrier culvert - recommend replacement/removal Railroad crossing unlikely to collaborate until high risk difficult to work with the railroad/landowner Partial barrier culvert - recommend replacement/removal but the railroad crossings are challenging and low uplift but high risk crossing potentially and might reduce E coli regrowth in Stewart creek.	
426	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Barrier Culvert - replacement recommended Large road grade/long culvert crossing not much stream length upstream before next barrier. large undertaking that wouldn't unlock that much stream length upstream. Barrier Culvert - replacement recommended but it is a large road grade/long culvert crossing not much stream length upstream before next barrier.	
427	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Barrier culvert under Munger Trail -recommend replacement large trail grade, historical impacts (?), and is immediately downstream of natural barrier falls possible historic/SHPO stuff natural barrier upstream.	
428	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Barrier culvert in need of replacement. Ephemeral trib but can be cold and might offer spawning habitat/cold water refugia.	
429	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Barrier culvert recommended for replacement Stream is likely ephemeral this high upstream Barrier culvert recommended for replacement. Little uplift as it's very high in the headwaters and would not unlock much more stream distance prior to I35.	
430	Considerations	Collaborate	Coordinate stormwater management planning with other jurisdictions, state, county and municipal, township.	Sediment vault at the base of the Spirit Mountain sediment and stormwater system, established in 2015, requires long term maintenance. There also needs to be effective coordination with SMRA to reduce sediment coming from the ski hill. Need effective communication between City stormwater and Spirit Mountain Recreation Authority. Need better sediment management on Spirit Mountain to reduce sediment discharged to Tallas Island sheltered bay.	
431	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Barrier Culvert - Replacement/removal suggested. Low uplift and complicated infrastructure with rail road and skyline bridge (newly redone) Questionable uplift due to proximity to natural barrier falls.	
432	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Believed to be a Partial Barrier culvert that should be replaced. railroad company road who are generally hard to work with not complete barrier and with a landowner that would be unlikely to do project Crossing needs assessment and potentially replacement, under railroad service road.	

HYDROLOGIC INTEGRITY					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
433	Information Gaps	Assess	Evaluate if stream crossings are limiting stream functions such as passage barrier and wetland connections. A focus on railroad crossings or causeways and culverts; including the railroad causeway along the St. Louis River.	Crossing under rail yard needs assessing, likely partial passage barrier. Rail yard work would be highly disruptive and likely an unwilling partner Super complicated site due to railroad ownership Railyard xing needs assessment and likely upsizing but with many complicating factors.	
434	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Partial barrier culvert should be replaced. Good cold trib but there are several problematic culverts upstream that also need addressing in a very developed portion of Proctor.	
435	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Partial barrier culvert needs replacing. Other problematic culverts up and downstream from crossing and likely some channel work would also be required.	
436	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Partial barrier on cold trib (Silver rock Creek) in need of upsizing/improvement Just recently replaced in 2023 but undersized with poor passage Would need to be done in tandem with several problematic culverts on this trib.	
437	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Barrier Culvert in need of replacing Busy street next to school, would need other culverts done in tandem. Worst crossing on this trib (Silver Rock Creek) but also most upstream problem culvert.	High public engagement location adjacent to high school
438	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Barrier culvert needs to be replaced - small and perched. Need addtional data on uplift potential of trib but could be a really good project with few complications. This culvert replacement may be tied into Kingsbury Creek Restoration in the park and by City hall.	
439	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Partial barrier culvert needs replacement and is in poor condition. Unknown habitat uplift/potential upstream of culvert. Not full barrier but would provide more small trib habitat to downstream restoration scheduled for 2025. Partial barrier culvert to be done in tandem with downstream foot path crossing.	
440	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Full Barrier Culvert on a trout stream. Headwaters of Keene Creek with questionable uplift potential.	
441	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Partial barrier culvert and outlet control for old orchid club greenhouse impoundment The orchid club is in ownership flux as different developers come and go. Partial barrier and thermal pollutant contributor.	
442	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Partial barrier culvert - - recommended for upsizing/substrate addition. Skinny water but high quality resource.	
443	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Partial barrier culvert - - recommended for upsizing/substrate addition. Skinny water but high quality resource.	
444	Priority Action	Preserve	Preserve coldwater tributaries, wetlands, springs, forested greenspaces, and designated natural areas to maintain baseflow conditions, and coldwater refugia for aquatic organisms and reduce sediment input.	Very cold tributary. Coldwater tributaries offer thermal refugia and spawning habitat for Brook Trout. Two years of temperature data show very cold temps.	
445	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Partial Barrier culvert, upsizing/replacement recommended. Unmapped high quality trib with longitudinal connectivity is main concern. Several private culverts with moderate passage.	
446	Priority Actions	Restore	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Partial barrier - recommended for upsizing Unmapped high quality trib with longitudinal connectivity is main issue. Partial barrier - recommended for upsizing.	

HYDROLOGIC INTEGRITY					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
447	**Priority Actions**	**Restore**	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Assess and replace culvert that is believed to be seasonal to full barrier to passage (may be perched). Need to get landowner on board. Would need to replace Okerstrom culvert immediately downstream as well and get landowner on board with replacing main drive/access culvert.	
448	**Priority Actions**	**Restore**	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Seasonal barrier culvert would ideally be upsized/replaced. Would need to couple this project with replacing the private culvert immediately upstream to actually unlock an appreciable amount of stream. Would need to replace two culverts and have upstream landowner on board. New Culvert for fish passage needs to be maintained and habitat protected.	
449	**Priority Action**	**Preserve**	Preserve coldwater tributaries, wetlands, springs, forested greenspaces, and designated natural areas to maintain baseflow conditions, and coldwater refugia for aquatic organisms and reduce sediment input.	Small spring fed tributary emerging from elevated woody wetlands.	
450	**Priority Actions**	**Restore**	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Culvert is a seasonal barrier. Low potential due to little channel upstream before wetland complex.	
451	**Priority Actions**	**Restore**	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Culvert is a barrier to fish migration. Stream is cold but upstream subwatershed is highly developed.	
452	**Information Gaps**	**Assess**	Conduct baseline inventories to inform sub-watershed planning, which may include an inventory of water storage opportunities, wetlands, cold water inputs, biological community health, storm sewer system mapping, road-stream crossings, habitat, or stream health	Two years of data from this trib show extremely cold temperatures. Recommend some fish sampling to verify P/A of Brook Trout in this tributary. Coldwater tributaries offer thermal refugia and spawning habitat for Brook Trout.	
453	**Priority Actions**	**Restore**	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Barrier culvert with rip rap fall at mouth. Skyline crossing could be difficult with questionable uplift due to tributary location and connectivity of Keene itself, but it is the only barrier on this trib.	
454	**Priority Action**	**Preserve**	Preserve coldwater tributaries, wetlands, springs, forested greenspaces, and designated natural areas to maintain baseflow conditions, and coldwater refugia for aquatic organisms and reduce sediment input.	Existing data shows very cold stream temps. Coldwater tributaries offer thermal refugia and spawning habitat for Brook Trout	
455	**Priority Action**	**Preserve**	Preserve coldwater tributaries, wetlands, springs, forested greenspaces, and designated natural areas to maintain baseflow conditions, and coldwater refugia for aquatic organisms and reduce sediment input.	Existing data shows cold water temps. Coldwater tributaries offer thermal refugia and spawning habitat for Brook Trout.	
456	**Priority Actions**	**Restore**	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Full barrier culvert at bottom of Duluth hill. Culvert is perched, velocity barrier and has blown out baffles previously installed. Cody street would be a large undertaking and crossing is downstream of likely natural barrier falls.	
457	**Information Gaps**	**Assess**	Evaluate if stream crossings are limiting stream functions such as passage barrier and wetland connections. A focus on railroad crossings or causeways and culverts; including the railroad causeway along the St. Louis River.	Partial/seasonal barrier to fish/sediment passage Crossing goes through road grade of I35 which would require a lot of work to alter and this area of interstate will be in flux with scheduled roadwork in 2030 Medium priority with high levels of complexity but could be raised in priority if low head dam in dog park was removed increasing connectivity up to Cody St.	
458	**Best Practices**	**Steward**	Prioritize green infrastructure opportunities and areas to be restored/protected.	Low head dam - Full barrier to fish and other aquatic organisms which should be removed. Site could change with future interstate work in 2030. Was identified as low hanging fruit and good project to initiate stream restoration work in Lower Keene.	Low head dam creates local swimming and fishing hole. Need community outreach and involvement to shape future of this public park and water resource.

HYDROLOGIC INTEGRITY					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
459	**Priority Actions**	**Restore**	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Full Barrier and in poor condition box culvert. Pending interstate work may change conditions/situations in 2030 Culvert is a full barrier and in need of replacement but pending interstate could complicate future projects. Also more discussion needed about uplift of Trib 1.	
460	**Information Gaps**	**Assess**	Conduct baseline inventories to inform sub-watershed planning, which may include an inventory of water storage opportunities, wetlands, cold water inputs, biological community health, storm sewer system mapping, road-stream crossings, habitat, or stream health	Need assessment of crossing	
461	**Information Gaps**	**Assess**	Conduct baseline inventories to inform sub-watershed planning, which may include an inventory of water storage opportunities, wetlands, cold water inputs, biological community health, storm sewer system mapping, road-stream crossings, habitat, or stream health	Culvert should be assessed for barrier status due to loss of substrate. May just need enhancement of substrate or redo of culvert. Grand Ave would be a large undertaking and was recently redone. Complicated issue and needs further assessment.	
462	**Best Practices**	**Steward**	Prioritize green infrastructure opportunities and areas to be restored/protected.	Railroad crossing is not a barrier, but is an at risk crossing that is eroding and in poor condition. Acquisition of the railroad by the city or another public entity would ensure that this crossing is restored and the riparian corridor enhanced. Railroad vacating ownership or getting on board with crossing restoration had proven difficult at this location and other crossings. High priority for riparian corridor restoration but likely to experience high level of difficulty with railroad complications.	
463	**Priority Actions**	**Restore**	Restore longitudinal connectivity by replacing priority stream crossings to ensure natural stream flows, sediment transport, and aquatic organism passage.	Three Rail Culverts - fish passage issue. Likely difficult and high cost project.	
464	**Considerations**	**Collaborate**	Emphasize green infrastructure solutions, especially to capture excess sediment before it reaches downstream waterbodes.	Culvert replacement, hemi marsh creation, plantings. this project has been conceptually designed to 60% in 2024 and is seeking funding for final design and implementation. Needs funding for final design and implementation. Good project momentum and partners are working on funds.	
465	**Best Practices**	**Steward**	Implement an infrastructure upgrade plan for climate resiliency	Make connections with the Northwest Regional Planning Commission who is completing a culvert assessment in the watershed.	
466	**Considerations**	**Collaborate**	Coordinate stormwater management planning with other jurisdictions, state, county and municipal, township.	The 2020 WDNR targeted watershed assessment for Bear and Bluff Creeks identified the need to work with partners to identify options for slowing peak flows in the watershed.	

INVASIVE SPECIES					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
467	Best Practices	Steward	Prioritize areas where previous restoration work or invasive treatments have occurred to help ensure previous achievements are not degraded and investments are not wasted.	Owned by WIDNR. Has terrestrial invasive plants, mainly common honeysuckle, and common buckthorn in varying densities, with potential seed bank and saplings. Phragmites treated/ monitored. Largest Island on river. Purple Loosestrife beetle release. High quality coastal wetlands surround, with some manoomin seeding completed.	Cultural resources are present. Concern of potential over harvest, sharing/advertising sensitive location(s) and impacts from use of herbicide as control of invasive species. Should consult with tribes and management entities before work is performed. Island is WI state owned and accessible.
468	Information Gaps	Connect	Acknowledge the indigenous traditional ecological knowledge perspective when developing management actions and seek opportunities for appropriate engagement to help inform actions.	Owned by WIDNR. Has terrestrial invasive plants, mainly common honeysuckle, and common buckthorn in varying densities, with potential seed bank and saplings. Phragmites treated/ monitored. Largest Island on river. Purple Loosestrife beetle release. High quality coastal wetlands surround, with some manoomin seeding completed.	Cultural resources are present. Concern of potential over harvest, sharing/advertising sensitive location(s) and impacts from use of herbicide as control of invasive species. Should consult with tribes and management entities before work is performed. Island is WI state owned and accessible.
469	Best Practices	Steward	Prioritize areas where previous restoration work or invasive treatments have occurred to help ensure previous achievements are not degraded and investments are not wasted.	Must maintain control work to keep site free of invasive species and to keep site good habitat for endangered species. Closed as bird sanctuary part of year.	
470	Information Gaps	Connect	Acknowledge the indigenous traditional ecological knowledge perspective when developing management actions and seek opportunities for appropriate engagement to help inform actions.	Must maintain control work to keep site free of invasive species and to keep site good habitat for endangered species. Closed as bird sanctuary part of year.	
471	Best Practices	Steward	Prioritize areas where previous restoration work or invasive treatments have occurred to help ensure previous achievements are not degraded and investments are not wasted.	Spirit Lake was a BUI 9 habitat restoration/sediment remediation site. Work was completed in 2024. Phragmites has been detected and treated. Other IS has been found. Need to survey for new and revisit existing IS sites. Concerned about impacts from EAB. Navigation can be difficult in Spirit Lake due to shallow water. Erosion and water quality concerns in Spirit Lake. Currently limited access in the restoration/remediation area owned by US Steel.	Private ownership of some areas containing invasive species. Cultural significance to the Fond du Lac Band and other Anishinaabe/Ojibwe bands such as Bois Forte and Grand Portage. Spirit Island is owned by Fond du Lac, which was the 6th stopping place of the westward migration of the Ojibwe.
472	Information Gaps	Connect	Acknowledge the indigenous traditional ecological knowledge perspective when developing management actions and seek opportunities for appropriate engagement to help inform actions.	Spirit Lake was a BUI 9 habitat restoration/sediment remediation site. Work was completed in 2024. Phragmites has been detected and treated. Other IS has been found. Need to survey for new and revisit existing IS sites. Concerned about impacts from EAB. Navigation can be difficult in Spirit Lake due to shallow water. Erosion and water quality concerns in Spirit Lake. Currently limited access in the restoration/remediation area owned by US Steel.	Private ownership of some areas containing invasive species. Cultural significance to the Fond du Lac Band and other Anishinaabe/Ojibwe bands such as Bois Forte and Grand Portage. Spirit Island is owned by Fond du Lac, which was the 6th stopping place of the westward migration of the Ojibwe.
473	Priority Action	Educate	Develop consistent messaging for invasive species outreach & education utilizing well established campaigns such has Stop Aquatic Hitchhikers and Play Clean Go.	Underplanting and EAB trapping efforts in this area. Is within Stewart Creek Restoration Project Area. Munger trail in area and abundant wild parsnip patches.	Area may be within the Fond du Lac Band's cultural corridor. Cultural considerations for treatment of wild parsnip. Herbicide may not be an option and may have to use mechanical control/removal. Access and safety may be a concern due to wild parsnip. Need to ensure proper signage, if not already present, to inform people of wild parsnip impacts to human health.
474	Information Gaps	Connect	Acknowledge the indigenous traditional ecological knowledge perspective when developing management actions and seek opportunities for appropriate engagement to help inform actions.	Underplanting and EAB trapping efforts in this area. Is within Stewart Creek Restoration Project Area. Munger trail in area and abundant wild parsnip patches.	Area may be within the Fond du Lac Band's cultural corridor. Cultural considerations for treatment of wild parsnip. Herbicide may not be an option and may have to use mechanical control/removal. Access and safety may be a concern due to wild parsnip. Need to ensure proper signage, if not already present, to inform people of wild parsnip impacts to human health.

INVASIVE SPECIES					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
475	Best Practices	Steward	Prioritize areas where previous restoration work or invasive treatments have occurred to help ensure previous achievements are not degraded and investments are not wasted.	Completed BUI 9 habitat restoration project in 2021. Current wild rice restoration efforts and Waabizheshikana Trail.Yellow iris present. Eurasian water milfoil within wild rice area and terrestrial invasive species along Waabi Trail. Must use mechanical removal.	Wild rice and Waabizheshikana Trail. Has trail, canoe/kayak access and a fishing pier. Good signage communicating cultural significance of area. Unsure of invasive species signage. TIS such as wild parsnip along Waabi Trail, which can cause severe blistering and is a human health concern.
476	Information Gaps	Connect	Acknowledge the indigenous traditional ecological knowledge perspective when developing management actions and seek opportunities for appropriate engagement to help inform actions.	Completed BUI 9 habitat restoration project in 2021. Current wild rice restoration efforts and Waabizheshikana Trail.Yellow iris present. Eurasian water milfoil within wild rice area and terrestrial invasive species along Waabi Trail. Must use mechanical removal.	Wild rice and Waabizheshikana Trail. Has trail, canoe/kayak access and a fishing pier. Good signage communicating cultural significance of area. Unsure of invasive species signage. TIS such as wild parsnip along Waabi Trail, which can cause severe blistering and is a human health concern.
477	Priority Action	Restore	Prioritize areas for invasive species control where critical habitat or species are present, such as native plant communities, manoomin, or walleye and sturgeon spawning habitat.	The Magney-Snively Natural Area is protected under the Duluth Natural Areas Program. It is ranked as an Area of High Biodiversity Significance by the MN DNR. MLT conducted an IS survey in 2024. Magney-Snively Natural Area is a diverse, well used, public recreation area including many multi-use trails. Known IS include Buckthorn, Invasive Honeysuckle, Spotted Knapweed, Tansy, Canada Thistle, Japanese Knotweed and probably others. The City of Duluth has done significant control of Buckthorn and other species but much more work is needed due to the size and public use of the area.	The multiple use trails throughout the area make IS spread and control difficult to address. Improve signage here. A greater educational effort on IS presence, prevention, and control, as well as the ecological impacts of IS on Native Plant Communities. Better enforcement of ATV ordinance is needed. The area holds several protected and biologically significant plants and NPCs and is used for urban foraging & gathering.
478	Priority Action	Educate	Develop consistent messaging for invasive species outreach & education utilizing well established campaigns such has Stop Aquatic Hitchhikers and Play Clean Go.	The Magney-Snively Natural Area is protected under the Duluth Natural Areas Program. It is ranked as an Area of High Biodiversity Significance by the MN DNR. MLT conducted an IS survey in 2024. Magney-Snively Natural Area is a diverse, well used, public recreation area including many multi-use trails. Known IS include Buckthorn, Invasive Honeysuckle, Spotted Knapweed, Tansy, Canada Thistle, Japanese Knotweed and probably others. The City of Duluth has done significant control of Buckthorn and other species but much more work is needed due to the size and public use of the area.	The multiple use trails throughout the area make IS spread and control difficult to address. Improve signage here. A greater educational effort on IS presence, prevention, and control, as well as the ecological impacts of IS on Native Plant Communities. Better enforcement of ATV ordinance is needed. The area holds several protected and biologically significant plants and NPCs and is used for urban foraging & gathering.
479	Priority Action	Educate	Develop consistent messaging for invasive species outreach & education utilizing well established campaigns such has Stop Aquatic Hitchhikers and Play Clean Go.	Dumping yard site from neighborhood- knotweed, garlic mustard, and other invasives are spreading here.	This site has been managed by volunteers and other DCISMA partners, with contract spraying for the knotweed. More outreach and enforcement for illegal dumping of invasive plants.
480	Priority Action	Collaborate	Engage with decision makers, stakeholders, citizens, resource managers and partners to communicate threats posed by invasive species and encourage participation in prevention and management activities.	Dumping yard site from neighborhood- knotweed, garlic mustard, and other invasives are spreading here.	This site has been managed by volunteers and other DCISMA partners, with contract spraying for the knotweed. More outreach and enforcement for illegal dumping of invasive plants.
481	Priority Action	Collaborate	Engage with decision makers, stakeholders, citizens, resource managers and partners to communicate threats posed by invasive species and encourage participation in prevention and management activities.	Follow-up monitoring/treatment of Phragmites and wild parsnip is needed in this area. Many patches of Phragmites in area and two water access points that can facilitate spread. Mixed land ownership, Spirit Lake Marina (private owner) and Munger Landing (public), can make access for monitoring and treatment/retreatment difficult.	Need to engage with partners that have been actively managing invasives in this area, including Community Action Duluth-Stream Corps, Duluth CISMA, U of MN, Great Lakes Indian Fish and Wildlife Commission, Fond du Lac Band, 1854 Treaty Authority. Need to ensure follow-up monitoring and treatment is performed and there is adequate funding available to do so. Need more information. This area may become part of the Fond du Lac Band's cultural corridor. Munger Landing area recently had sediment remediation completed, due to body contact and fish consumption concerns, and renovations to the public landing area (2024). Swimming advisory sign has been removed.
482	Best Practices	Steward	Prioritize areas where previous restoration work or invasive treatments have occurred to help ensure previous achievements are not degraded and investments are not wasted.	Follow-up monitoring/treatment of Phragmites and wild parsnip is needed in this area. Many patches of Phragmites in area and two water access points that can facilitate spread. Mixed land ownership, Spirit Lake Marina (private owner) and Munger Landing (public), can make access for monitoring and treatment/retreatment difficult.	Need to engage with partners that have been actively managing invasives in this area, including Community Action Duluth-Stream Corps, Duluth CISMA, U of MN, Great Lakes Indian Fish and Wildlife Commission, Fond du Lac Band, 1854 Treaty Authority. Need to ensure follow-up monitoring and treatment is performed and there is adequate funding available to do so. Need more information. This area may become part of the Fond du Lac Band's cultural corridor. Munger Landing area recently had sediment remediation completed, due to body contact and fish consumption concerns, and renovations to the public landing area (2024). Swimming advisory sign has been removed.

INVASIVE SPECIES					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
483	Best Practices	Steward	Prioritize areas where previous restoration work or invasive treatments have occurred to help ensure previous achievements are not degraded and investments are not wasted.	Wild rice is present and has had good density in recent years. Purple Loosestrife is present and management efforts still occur. LSNERR long-term ash monitoring site.	Wild rice and black ash are culturally significant, present, and central to Anishinaabe lifeways. Wild rice is present and has had good density in recent years. A public boat access (rustic access) was installed in recent years.
484	Priority Action	Restore	Prioritize areas for invasive species control where critical habitat or species are present, such as native plant communities, manoomin, or walleye and sturgeon spawning habitat.	Wild rice is present and has had good density in recent years. Purple Loosestrife is present and management efforts still occur. LSNERR long-term ash monitoring site.	Wild rice and black ash are culturally significant, present, and central to Anishinaabe lifeways. Wild rice is present and has had good density in recent years. A public boat access (rustic access) was installed in recent years.
485	Information Gaps	Study	Monitor public access areas (e.g. boat launch, trail head) or other locations where invasive species may likely be spread or establish.	Yellow Iris manual control conducted at Woodstock Bay landing, Superior WI by Douglas County Surface Waters	Recently improved the launch into a small park. Used by ice fishermen, kayakers.
486	Priority Action	Restore	Continue to control invasive species (cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Yellow Iris manual control conducted at Woodstock Bay landing, Superior WI by Douglas County Surface Waters	Recently improved the launch into a small park. Used by ice fishermen, kayakers.
487	Priority Action	Educate	Develop consistent messaging for invasive species outreach & education utilizing well established campaigns such has Stop Aquatic Hitchhikers and Play Clean Go.	Yellow Iris manual control conducted at Woodstock Bay landing, Superior WI by Douglas County Surface Waters	Recently improved the launch into a small park. Used by ice fishermen, kayakers.
488	Priority Action	Educate	Develop consistent messaging for invasive species outreach & education utilizing well established campaigns such has Stop Aquatic Hitchhikers and Play Clean Go.	Wild parsnip management mostly hand pulling and outreach has been done in the past in this area. Future treatment options primarily should be herbicide due to the increased density.	Signage for wild parsnip would be wise with both local residents and recreators in this area.
489	Priority Action	Restore	Continue to control invasive species (cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Wild parsnip management mostly hand pulling and outreach has been done in the past in this area. Future treatment options primarily should be herbicide due to the increased density.	Signage for wild parsnip would be wise with both local residents and recreators in this area.
490	Considerations	Collaborate	Recommend inclusion of invasive species management as a component of projects completed by others when/where appropriate.	Removal of contaminated sediment, openings into pond through RR spur, addition of better storm water outflow, addition of better depths, habitat for various species, removal of invasive species.	Tourist area, high traffic.
491	Information Gaps	Study	Monitor public access areas (e.g. boat launch, trail head) or other locations where invasive species may likely be spread or establish.	Removal of contaminated sediment, openings into pond through RR spur, addition of better storm water outflow, addition of better depths, habitat for various species, removal of invasive species.	Tourist area, high traffic.
492	Information Gaps	Study	Monitor public access areas (e.g. boat launch, trail head) or other locations where invasive species may likely be spread or establish.		Tourism, significant dune structure, erosion
493	Priority Action	Educate	Develop consistent messaging for invasive species outreach & education utilizing well established campaigns such has Stop Aquatic Hitchhikers and Play Clean Go.		Tourism, significant dune structure, erosion
494	Best Practices	Steward	Prioritize areas where previous restoration work or invasive treatments have occurred to help ensure previous achievements are not degraded and investments are not wasted.	Grassy Point was a BUI 9 project site completed in 2021. It has also been identified as a priority wetland site for a GLRI AIS project led by MNDNR. Hemi-marsh habitat was created and may be considered for wild rice restoration. Had 15 acres invasive cattails removed. Had Phragmites, purple loosestrife, common buckthorn treated. Has trail access. Ship traffic. Private property adjacent. Did have non-native Phragmites and has invasive cattails and purple loosestrife. Beetle release site. Protected plant species were found in the northeast area of the site.	Boardwalk was replaced with gravel walking path. Canoe/kayak access, may have additional access and/or bird observation platform. Consider putting back a sign explaining the different rock types shipped/placed there. Improve signage for restoration work.

INVASIVE SPECIES					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
495	Priority Action	Educate	Develop consistent messaging for invasive species outreach & education utilizing well established campaigns such has Stop Aquatic Hitchhikers and Play Clean Go.	Grassy Point was a BUI 9 project site completed in 2021. It has also been identified as a priority wetland site for a GLRI AIS project led by MNDNR. Hemi-marsh habitat was created and may be considered for wild rice restoration. Had 15 acres invasive cattails removed. Had Phragmites, purple loosestrife, common buckthorn treated. Has trail access. Ship traffic. Private property adjacent. Did have non-native Phragmites and has invasive cattails and purple loosestrife. Beetle release site. Protected plant species were found in the northeast area of the site.	Boardwalk was replaced with gravel walking path. Canoe/kayak access, may have additional access and/or bird observation platform. Consider putting back a sign explaining the different rock types shipped/placed there. Improve signage for restoration work.
496	Information Gaps	Study	Monitor public access areas (e.g. boat launch, trail head) or other locations where invasive species may likely be spread or establish.	Best Cella beetle insectary	Tourism, upcoming update to causeway
497	Priority Action	Educate	Develop consistent messaging for invasive species outreach & education utilizing well established campaigns such has Stop Aquatic Hitchhikers and Play Clean Go.	Best Cella beetle insectary	Tourism, upcoming update to causeway
498	Best Practices	Steward	Prioritize areas where previous restoration work or invasive treatments have occurred to help ensure previous achievements are not degraded and investments are not wasted.	Wild rice restoration sites. Has See Allouez Bay Restoration Vision. Supported by GLRI through a Cooperative Agreement between USFWS and MN Land Trust. Input was provided by the LS Headwaters Partnership Advisory Group. Priority IS in Vision for and present in this area include: Curley Leaf Pondweed, EAB, Eurasian Watermilfoil, invasive cattails, Phragmites, Yellow Iris, Purple Loosestrife.	Culturally significant area to the Anishinaabe (Ojibwe) people for many reasons (hunting, fishing, gathering wild rice and medicinal plants), including WI Point (burial grounds). Active wild rice restoration in the area. Public access can be limited and communities would like to see more access (see Restoration Vision for Allouez Bay for details).
499	Best Practices	Plan	Identify target invasive species on a site-specific basis based on management goals, public health risk, habitat quality, potential for spread or range expansion, state-listed noxious weeds, and risk to culturally significant and sensitive species.	Funding to hire contractors for herbicide control on wild parsnip because it has surpassed volunteer efforts. Enforcement needed. Cutleaf teasel is early detection in this area along Munger and across Grand Ave. Knotweed patch along Bayhill Dr.	Wild parsnip is exploding on both public and private property here. Education by CISMA, MDA, CAI has been conducted in the past- in-person meetings, workshops, landowner letters, PSA's, phone calls. Some landowners responsive, while others are not. Permanent signage may need to be installed for Waabi Trail parsnip since it is a health hazard with multiple rec areas. Bayhill HOA has been actively managing parsnip and buckthorn on their property and at the HOA's waterfront.
500	Priority Action	Educate	Develop consistent messaging for invasive species outreach & education utilizing well established campaigns such has Stop Aquatic Hitchhikers and Play Clean Go.	Funding to hire contractors for herbicide control on wild parsnip because it has surpassed volunteer efforts. Enforcement needed. Cutleaf teasel is early detection in this area along Munger and across Grand Ave. Knotweed patch along Bayhill Dr.	Wild parsnip is exploding on both public and private property here. Education by CISMA, MDA, CAI has been conducted in the past- in-person meetings, workshops, landowner letters, PSA's, phone calls. Some landowners responsive, while others are not. Permanent signage may need to be installed for Waabi Trail parsnip since it is a health hazard with multiple rec areas. Bayhill HOA has been actively managing parsnip and buckthorn on their property and at the HOA's waterfront.
501	Priority Action	Educate	Develop consistent messaging for invasive species outreach & education utilizing well established campaigns such has Stop Aquatic Hitchhikers and Play Clean Go.	Wild parsnip is exploding on both public and private property here - Waabizheshikana Trail (The Martin Trail), formerly Western Waterfront Trail. Education by CISMA, MDA, CAI has been done in the past. Over the last 7 yrs has slowed it down from spreading north on the trail.	Culturally significant to the Anishinaabe. Very accessible, used by the public and has wild parsnip (heath concern due to severe blistering) and other invasive plants.Has a trail head with paved/accessible parking lot. Cultural signage along the trail. Features hiking, biking, birding, fishing, beach access. Along/close to the river.
502	Priority Action	Restore	Prioritize areas for invasive species control where critical habitat or species are present, such as native plant communities, manoomin, or walleye and sturgeon spawning habitat.	Wild parsnip is exploding on both public and private property here - Waabizheshikana Trail (The Martin Trail), formerly Western Waterfront Trail. Education by CISMA, MDA, CAI has been done in the past. Over the last 7 yrs has slowed it down from spreading north on the trail.	Culturally significant to the Anishinaabe. Very accessible, used by the public and has wild parsnip (heath concern due to severe blistering) and other invasive plants.Has a trail head with paved/accessible parking lot. Cultural signage along the trail. Features hiking, biking, birding, fishing, beach access. Along/close to the river.

INVASIVE SPECIES					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
503	Priority Action	Restore	Continue to control invasive species (cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Location of past and present PL beetle/weevil releases.	
504	Priority Action	Restore	Continue to control invasive species (cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Location of past and present PL beetle/weevil releases.	
505	Priority Action	Restore	Continue to control invasive species (cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Location of past and present PL beetle/weevil releases. Good insectary.	
506	Priority Action	Restore	Continue to control invasive species (cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Location of past and present PL beetle/weevil releases. Amazing insectary.	
507	Priority Action	Restore	Continue to control invasive species (cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Location of past and present PL beetle/weevil releases. Potential beetle insectary.	
508	Priority Action	Restore	Continue to control invasive species (cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Location of past and present significant PL beetle/weevil releases. Worst location of PL in the estuary in 2019. Significant work has been done to control Purple Loosestrife and to bring back space for native vegetation.	
509	Priority Action	Restore	Continue to control invasive species (cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Location of past and present PL beetle/weevil releases. Have removed most rootstock from this point vicinity, but it thrives on islands and shorelines heading toward HWY 105.	
510	Priority Action	Restore	Continue to control invasive species (cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Significant work has been done to control Purple Loosestrife and to bring back space for native vegetation. Based on 2024 PL bloom, site needs PL beetles.	
511	Priority Action	Restore	Continue to control invasive species (cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Location of past and present PL beetle/weevil releases. PL has toned down here.	
512	Priority Action	Restore	Continue to control invasive species (cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Location of past and present PL beetle/weevil releases. PL has toned down here.	
513	Priority Action	Restore	Continue to control invasive species (cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Location of past and present PL beetle/weevil releases. Definitely needs more beetles on both sides of bridge.	

INVASIVE SPECIES					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
514	Priority Action	Restore	Continue to control invasive species (cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Location of past and present PL beetle/weevil releases. PL toned down significantly here.	
515	Priority Action	Educate	Develop consistent messaging for invasive species outreach & education utilizing well established campaigns such has Stop Aquatic Hitchhikers and Play Clean Go.	Several AIS have been identified here and some limited control measures have been carried out over the years. Purple Loosestrife Beetles were released in the early 2000's and hand pulling of Yellow Iris may have been done more recently.	Boy Scout Landing is one of the most popular fishing and boating access points in the upper St Louis River estuary. Also provides access for ricing in the bays of the upper estuary.
516	Information Gaps	Study	Monitor public access areas (e.g. boat launch, trail head) or other locations where invasive species may likely be spread or establish.	Several AIS have been identified here and some limited control measures have been carried out over the years. Purple Loosestrife Beetles were released in the early 2000's and hand pulling of Yellow Iris may have been done more recently.	Boy Scout Landing is one of the most popular fishing and boating access points in the upper St Louis River estuary. Also provides access for ricing in the bays of the upper estuary.
517	Best Practices	Plan	Consider prioritization criteria from partners managing invasive species within and outside of the St. Louis River estuary, such as the Great Lakes Indian Fish and Wildlife Commission	Fraser Shipyard: Non-native Phragmites has been identified by GLIFWC at this site. It was mapped in June 2025. May be a source of spread to areas nearby. Control work will hopefully be completed in 2025. WDNR and GLIFWC will follow up on this site.	Private property. Need permission to assess and treat the non-native Phragmites population.
518	Priority Action	Restore	Continue to control invasive species (cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Fraser Shipyard: Non-native Phragmites has been identified by GLIFWC at this site. It was mapped in June 2025. May be a source of spread to areas nearby. Control work will hopefully be completed in 2025. WDNR and GLIFWC will follow up on this site.	Private property. Need permission to assess and treat the non-native Phragmites population.
519	Information Gaps	Study	Monitor public access areas (e.g. boat launch, trail head) or other locations where invasive species may likely be spread or establish.		Picnic site with short trail up hill, signage at landing.
520	Priority Action	Educate	Develop consistent messaging for invasive species outreach & education utilizing well established campaigns such has Stop Aquatic Hitchhikers and Play Clean Go.		Picnic site with short trail up hill, signage at landing.
521	Priority Action	Restore	Continue to control invasive species (cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Knotweed has been herbicide treated here for several years due to the proximity of Knowlton Creek.	
522	Information Gaps	Study	Monitor public access areas (e.g. boat launch, trail head) or other locations where invasive species may likely be spread or establish.	Knotweed site has been managed for years by volunteers, CAD, CCMI, and private contractor.	Site is at intersection of several recreation trails- could be a vector of spread.
523	Priority Action	Collaborate	Engage with decision makers, stakeholders, citizens, resource managers and partners to communicate threats posed by invasive species and encourage participation in prevention and management activities.	Knotweed site has been managed for years by volunteers, CAD, CCMI, and private contractor.	Site is at intersection of several recreation trails- could be a vector of spread.
524	Priority Action	Restore	Continue to control invasive species (cattails, purple loosestrife, phragmites, and Eurasian watermilfoil) using a combination of mechanical, biological, and chemical control based on size of infestation and land governance guidelines.	Knotweed has been herbicide treated here for several years due to the proximity of Knowlton Creek.	
525	Considerations	Collaborate	Recommend inclusion of invasive species management as a component of projects completed by others when/where appropriate.	Garlic mustard site along the building landscaping.	

INVASIVE SPECIES					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
526	Considerations	Collaborate	Recommend inclusion of invasive species management as a component of projects completed by others when/where appropriate.	Knotweed patch near Keene.	
527	Considerations	Collaborate	Recommend inclusion of invasive species management as a component of projects completed by others when/where appropriate.	Knotweed site along Keene.	
528	Best Practices	Plan	Identify target invasive species on a site-specific basis based on management goals, public health risk, habitat quality, potential for spread or range expansion, state-listed noxious weeds, and risk to culturally significant and sensitive species.	Knotweed management should be considered as streams and wet areas are most vulnerable for spread.	
529	Best Practices	Plan	Identify target invasive species on a site-specific basis based on management goals, public health risk, habitat quality, potential for spread or range expansion, state-listed noxious weeds, and risk to culturally significant and sensitive species.	Knotweed management suggested to prevent further spread in vulnerable stream corridor.	
530	Best Practices	Plan	Identify target invasive species on a site-specific basis based on management goals, public health risk, habitat quality, potential for spread or range expansion, state-listed noxious weeds, and risk to culturally significant and sensitive species.	Knotweed management suggested to prevent spread along the creek corridor	
531	Best Practices	Plan	Identify target invasive species on a site-specific basis based on management goals, public health risk, habitat quality, potential for spread or range expansion, state-listed noxious weeds, and risk to culturally significant and sensitive species.	2 knotweed sites here. Knotweed management is suggested to prevent spread along creek.	Outreach is important for preventing the spread in this neighborhood. A few homeowners have patches and others might too that are unreported.
532	Best Practices	Educate	Develop consistent messaging for invasive species outreach & education utilizing well established campaigns such has Stop Aquatic Hitchhikers and Play Clean Go.	2 knotweed sites here. Knotweed management is suggested to prevent spread along creek.	Outreach is important for preventing the spread in this neighborhood. A few homeowners have patches and others might too that are unreported.
533	Best Practices	Plan	Identify target invasive species on a site-specific basis based on management goals, public health risk, habitat quality, potential for spread or range expansion, state-listed noxious weeds, and risk to culturally significant and sensitive species.	Knotweed management suggested along the creek corridor to prevent spread.	Outreach along Keene Creek suggested; likely more sites unreported here.
534	Best Practices	Plan	Develop consistent messaging for invasive species outreach & education utilizing well established campaigns such has Stop Aquatic Hitchhikers and Play Clean Go.	Knotweed management suggested along the creek corridor to prevent spread.	Outreach along Keene Creek suggested; likely more sites unreported here.
535	Best Practices	Plan	Identify target invasive species on a site-specific basis based on management goals, public health risk, habitat quality, potential for spread or range expansion, state-listed noxious weeds, and risk to culturally significant and sensitive species.	Knotweed management suggested along the creek corridor to prevent spread.	Outreach along Keene Creek suggested; likely more sites unreported here.
536	Priority Action	Educate	Develop consistent messaging for invasive species outreach & education utilizing well established campaigns such has Stop Aquatic Hitchhikers and Play Clean Go.	Knotweed management suggested along the creek corridor to prevent spread.	Outreach along Keene Creek suggested; likely more sites unreported here.

TERRESTRIAL HABITAT CONNECTIVITY					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
537	Considerations	Preserve	Continue to protect and enhance current core areas of large intact terrestrial habitat.	Magney-Snively Designated Natural Area. Ash underplanting, old growth protection, invasive species control, educating user groups. Silvicultural treatments to provide age class structure. Pressure from ATV users. Example of relatively intact, high quality forest. Access. Terrain. Wetlands - protecting vernal pools if/when silvicultural treatments are planned/implemented. Large, intact forest ecosystem. Rare species. Low impacts (currently).	Many uses. Gathering/foraging/medicinal plants. City deer hunt (access is tough). Access to facilitate deer harvest. Invasive species alerts/rules. ATV restrictions.
538	Considerations	Preserve	Continue to protect and enhance current core areas of large intact terrestrial habitat.	Intact habitat & good connectivity. Invasives present (controlled by DNR Parks staff?). Rare species present. No large management or protection actions necessary but ongoing monitoring, & maintenance will be necessary to maintain high quality habitat. Terrain makes access difficult in some areas. Jay Cooke State Park has good protection and is in good ecological condition relative to other sites within the SLRE.	Many opportunities for gathering berries, mushrooms and other edible and medicinal plants. Fishing opportunities within the park and a muzzleloader Deer hunt. Important local recreation area - State Park designation.
539	Considerations	Preserve	Continue to protect and enhance current core areas of large intact terrestrial habitat.	Jay Cooke State Park is protected and relatively intact habitat. Invasives are present (treated by DNR Parks staff?). Many rare species and Native Plant Communities are present. Steep terrain makes access to some areas difficult. The park is protected and provides good quality habitat and connectivity.	Many opportunities for gathering berries, fungi and edible plants as well as medicinal plants. Fishing opportunities in the park as well as a muzzleloader Deer hunt. Historical CCC buildings, swing bridge and "Pioneer Cemetery". Important local recreation area - State Park designation.
540	Considerations	Preserve	Continue to protect and enhance current core areas of large intact terrestrial habitat.	Protected area administered by WDNR. St. Louis and Red River Streambank Protection Area - currently protected with limited access. Example of intact, core habitat area. The St. Louis and Red River Streambank Protection Area is the largest land component in the 16,697-acre Lake Superior Reserve. Details: https://dnr.wisconsin.gov/topic/Lands/FisheriesAreas/2460stlouisriver.html. Data collection on animal movement.	Likely contains culturally important locations, species, etc.
541	Priority Actions	Collaborate	Develop comprehensive forest management plans to protect core areas. Collaborate with partners and the community.	Douglas County does not have a comprehensive forest management plan (conservation plan). Competing land use decisions could fragment the core area. Immediate attention, fill in data gaps to inform management.	Unknown. Hunting? Research and surveys needed.
542	Considerations	Preserve	Continue to protect and enhance current core areas of large intact terrestrial habitat.	Identified as intact habitat core from Midwest Conservation Blueprint Indicators dataset. Near Copper Creek and Nemadji River in Wisconsin.	
543	Considerations	Preserve	Continue to protect and enhance current core areas of large intact terrestrial habitat.	Identified as intact habitat core from Midwest Conservation Blueprint Indicators dataset.	
544	Priority Actions	Restore	Restore or enhance habitat to create landscape corridors for increased connectivity.	Owned and managed by WDNR. Ongoing restoration/enhancement work to remove invasive buckthorn and conduct understory planting. Wild rice restoration sites along eastern shoreline impacted by goose herbivory. Invasive species. Large block of intact habitat although invasive species are present. Has protection.	Known culturally important location, species, etc. Boat access beach landing w/ picnic table. Invasive species concerns.
545	Considerations	Preserve	Continue to protect and enhance current core areas of large intact terrestrial habitat.	Identified as intact habitat core from Midwest Conservation Blueprint Indicators dataset. Near Copper Creek and Nemadji River in Wisconsin.	
546	Considerations	Preserve	Continue to protect and enhance current core areas of large intact terrestrial habitat.	Identified as intact habitat core from Midwest Conservation Blueprint Indicators dataset. Near Copper Creek in Wisconsin.	
547	Considerations	Preserve	Continue to protect and enhance current core areas of large intact terrestrial habitat.	Identified as intact habitat core from Midwest Conservation Blueprint Indicators dataset. Near Rocky Run Creek in Wisconsin.	
548	Considerations	Preserve	Continue to protect and enhance current core areas of large intact terrestrial habitat.	Identified as intact habitat core from Midwest Conservation Blueprint Indicators dataset. Near Nemadji River in Wisconsin.	
549	Priority Actions	Preserve	Protect and enhance existing or newly restored landscape corridors including, aquatic organism passage and riparian/stream connectivity.	Hemi-marsh habitat and wood waste removal project completed here. Currently planning a shoreline softening enhancement on barrier island. Restoration and enhancement work has been completed here. Monitoring is recommended. Shoreline softening project in planning for the Grassy Point island.	Likely presence of culturally important locations, species, etc. Bird watching area.

TERRESTRIAL HABITAT CONNECTIVITY					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
550	**Priority Actions**	**Preserve**	Protect and enhance existing or newly restored landscape corridors including, aquatic organism passage and riparian/stream connectivity.	Recently completed restoration work should be monitored and maintained. Wild rice restoration and invasive species management ongoing. Provides important habitat within a mixed landuse area of Duluth's waterfront. Invasive species. Goose herbivory impacting wild rice restoration effort. Continue ongoing monitoring and restoration/enhancement work.	Known culturally important locations, species, etc. Waabizheshikana trail traverses parcel. New fishing pier installed with Kingsbury Bay restoration project.
551	**Priority Actions**	**Preserve**	Protect and enhance existing or newly restored landscape corridors including, aquatic organism passage and riparian/stream connectivity.	Tallus Island project to remove sediment deposition. Knowlton Creek restoration work - including removal of fish barrier under Munger State Trail is underway. Invasive species concern (Phragmites) with known population at Tate & Lyle plant upstream. HWY 23 fragments small DNAP parcels from the large Spirit Mountain Recreation Area to the northwest. Invasive species. Multiple land ownership. Multiple projects ongoing will improve aquatic and terrestrial connectivity under Munger Trail and HWY 23. Linear habitat feature along river provides some stepping stone connectivity to adjacent DNAP parcels and neighborhood parks.	Likely presence of culturally important locations, species, etc. Waabizheshikana and Munger State Trail corridor.
552	**Priority Actions**	**Restore**	Restore or enhance habitat to create landscape corridors for increased connectivity.	Part of Duluth Natural Area Program but mix of ownership. Some contaminated sediment present along Stewart & Snively creeks. Invasive species & low dissolved O2 in Munger Wetlands - cutoff from channel by railroad causeway. Possible stream restoration and fish barrier removal. Abandoned railroad causeway. LSMRR causeway - in use - cutting off Munger Wetlands from main channel. Invasive species. Fish barrier. Linear connectivity along river corridor.	Likely presence of culturally important locations, species, etc. Includes Munger Landing - heavily used boat launch. Waabizheshikana to extent through area.
553	**Priority Actions**	**Restore**	Restore or enhance habitat to create landscape corridors for increased connectivity.	Part of Duluth Natural Area Program. Restoration work in Mud Lake to begin in 2026 - enhancements to hemi-marsh, restoring connection to main river channel, deep water habitat creation. Linear habitat protected along river corridor benefits avian habitat. Railroad causeway. Invasive species. Sediment contamination (addressed through Mud Lake Restoration Project). Provides stepping stone connectivity with other DNAP parcels and along river corridor. Connections across river during winter months.	Known culturally important locations, species, etc. Waabizheshikana to extend through site. LSMRR scenic train operates along railroad causeway.
554	**Priority Actions**	**Preserve**	Protect and enhance existing or newly restored landscape corridors including, aquatic organism passage and riparian/stream connectivity.	Protected as Duluth Natural Areas Program but mix of ownership. Restoration work completed to improve deep water habitat for fish and remove wood waste. Additional wood waste could be removed. Listed as a site for wild rice restoration in shallow water. Remnant wood waste, invasive species, goose herbivory on wild rice plantings. Part of DNAP and not likely to be fragmented by future development. HWY 39 could be a fragmenting factor. Illegal dumping on north side of highway.	Known culturally important locations, species, etc. Waabizheshikana trail section planned for this area.
555	**Best Practices**	**Plan**	Develop an index of fragmentation and track over time to measure change and aid in prioritization of restoration and protection actions.	Tax-forfeit property - could be acquired and protected in perpetuity. Encompasses recent hemi-marsh habitat restoration completed in 2024. Traffic along HWY 23 (and the road itself) could be a barrier to semi-aquatic species (turtles, frogs, etc.) but data is lacking. Important buffer to hemi-marsh habitat and adjacent forest.	Likely contains culturally important sites, species, etc. Unknown. Although Perch Lake Landing - on the other side of HWY 23 is a well used site for fishing and will be the focus of future City of Duluth improvements.
556	**Priority Actions**	**Preserve**	Protect and enhance existing or newly restored landscape corridors including, aquatic organism passage and riparian/stream connectivity.	Tax-forfeit property - could be acquired and protected in perpetuity. Encompasses recent hemi-marsh habitat restoration completed in 2024. Traffic along HWY 23 (and the road itself) could be a barrier to semi-aquatic species (turtles, frogs, etc.) but data is lacking. Important buffer to hemi-marsh habitat and adjacent forest.	Likely contains culturally important sites, species, etc. Unknown. Although Perch Lake Landing - on the other side of HWY 23 is a well used site for fishing and will be the focus of future City of Duluth improvements.
557	**Priority Actions**	**Restore**	Restore or enhance habitat to create landscape corridors for increased connectivity.	Part of Duluth Natural Area Program but contains a mix of ownership. Part of Waabizheshikana. Ash die-off due to EAB. Goose herbivory affecting wild rice restoration effort. Illegal dumping along HWY 23 - specifically at overlook. Current restoration efforts should be continued. Provides stepping stone connectivity to other DNAP properties and across the river - especially during winter months.	Known culturally important sites, species, etc. Opportunity for education on wild rice restoration along Waabizheshikana.
558	**Priority Actions**	**Preserve**	Protect and enhance existing or newly restored landscape corridors including, aquatic organism passage and riparian/stream connectivity.	Protected as part of Duluth Natural Areas Program. Understory planting to replace ash trees affected by EAB. Invasive species in terrestrial and aquatic areas. Wild rice restoration ongoing in Rask Bay. EAB, invasive species (aquatic and terrestrial), excessive goose herbivory on wild rice plantings. Current restoration efforts should be continued (forest and wild rice, specifically). Provides stepping stone connectivity to other DNAP properties and across the river - especially during winter months.	Known culturally important sites, species, etc. Public access for future wild rice harvesting in Rask Bay could be considered.

TERRESTRIAL HABITAT CONNECTIVITY					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
559	Priority Actions	Preserve	Protect and enhance existing or newly restored landscape corridors including, aquatic organism passage and riparian/stream connectivity.	Protected as part of Duluth Natural Areas Program. Understory planting to replace ash trees affected by EAB. Invasive species in terrestrial and aquatic areas. Wild rice restoration ongoing in Rask Bay. EAB infestation. Goose herbivory on wild rice plantings. Current restoration efforts should be continued (forest and wild rice, specifically). Provides stepping stone connectivity to other DNAP parcels and across the river - especially during winter months.	Known culturally important sites, species, etc. Residential properties adjacent and along Water Street.
560	Considerations	Preserve	Continue to protect and enhance current core areas of large intact terrestrial habitat.	Chamber's Grove - part of the Duluth Natural Areas Program. Invasive species management. The Duluth Natural Areas Program is designated by city ordinance to designate certain lands with environmental value as permanently protected natural places.	Likely contains culturally important locations, species, etc. Popular city park and natural area with many trails and amenities. Recent restoration work in Chamber's Grove completed in partnership with MNDNR.
561	Considerations	Preserve	Continue to protect and enhance current core areas of large intact terrestrial habitat.	Unnamed island in St Louis River between Clough Island and Chases Point. Might be important corridor between mainland and island.	
562	Considerations	Preserve	Continue to protect and enhance current core areas of large intact terrestrial habitat.	Part of City of Superior Municipal Forest. Current protection in place. Large intact habitat area.	Known culturally important locations, species, etc. Paddle access and boat launch in Pokegama Bay.
563	Considerations	Preserve	Continue to protect and enhance current core areas of large intact terrestrial habitat.	Part of City of Superior Municipal Forest. Current protection in place. Large intact habitat area.	Known culturally important locations, species, etc. Unknown.
564	Considerations	Preserve	Continue to protect and enhance current core areas of large intact terrestrial habitat.	Protected area administered by WDNR. St. Louis and Red River Streambank Protection Area - currently protected with limited access. Example of intact, core habitat area. The St. Louis and Red River Streambank Protection Area is the largest land component in the 16,697-acre Lake Superior Reserve. Details: https://dnr.wisconsin.gov/topic/Lands/FisheriesAreas/2460stlouisriver.html. Data collection on animal movement.	Likely contains culturally important locations, species, etc.
565	Considerations	Preserve	Continue to protect and enhance current core areas of large intact terrestrial habitat.	Protected area administered by WDNR. St. Louis and Red River Streambank Protection Area - currently protected with limited access. Example of intact, core habitat area. The St. Louis and Red River Streambank Protection Area is the largest land component in the 16,697-acre Lake Superior Reserve. Details: https://dnr.wisconsin.gov/topic/Lands/FisheriesAreas/2460stlouisriver.html. Data collection on animal movement.	Likely contains culturally important locations, species, etc.
566	Considerations	Preserve	Continue to protect and enhance current core areas of large intact terrestrial habitat.	Identified as intact habitat core from Midwest Conservation Blueprint Indicators dataset.	
567	Considerations	Preserve	Continue to protect and enhance current core areas of large intact terrestrial habitat.	Frederick Rodney Paine Forest Preserve. Some forest restoration/enhancements to increase forest structural diversity; enhance avian habitat; protect cold water trout streams; remove fish barriers. Has protection from future fragmentation.	Likely contains culturally important locations, species, etc. Numerous trails - Duluth Traverse, Superior Hiking Trail, Munger State Trail, etc.
568	Considerations	Preserve	Continue to protect and enhance current core areas of large intact terrestrial habitat.	Short Line Park - currently protected as City of Duluth Park. Invasive species, "spaghetti" network of trails. Becks Road bisects the park. Currently protected from future fragmentation. Efforts could be made to better understand needs to enhance connectivity across Becks Road. This could be a site for a wildlife crossing structure. More investigation needed.	Likely contains culturally important locations, species, etc. Community efforts to improve access for hiking, climbing, cycling.
569	Information Gaps	Assess	Compile wildlife movement and road mortality data to better understand existing barriers, identify connectivity opportunities, and collect additional data to fill data gaps that hinder our ability to identify safe road crossing locations and critical linkages between core habitat patches.	Sargent Creek and Hwy 23	

TERRESTRIAL HABITAT CONNECTIVITY					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
570	**Information Gaps**	**Assess**	Compile wildlife movement and road mortality data to better understand existing barriers, identify connectivity opportunities, and collect additional data to fill data gaps that hinder our ability to identify safe road crossing locations and critical linkages between core habitat patches.	US Steel Creek and Hwy 23	
571	**Information Gaps**	**Assess**	Compile wildlife movement and road mortality data to better understand existing barriers, identify connectivity opportunities, and collect additional data to fill data gaps that hinder our ability to identify safe road crossing locations and critical linkages between core habitat patches.	Becks Road. Identified in MIdwest Conservation Blueprint as a connection between prioritized areas.	
572	**Information Gaps**	**Assess**	Compile wildlife movement and road mortality data to better understand existing barriers, identify connectivity opportunities, and collect additional data to fill data gaps that hinder our ability to identify safe road crossing locations and critical linkages between core habitat patches.	Becks Road. Identified in MIdwest Conservation Blueprint as a connection between prioritized areas.	
573	**Information Gaps**	**Assess**	Compile wildlife movement and road mortality data to better understand existing barriers, identify connectivity opportunities, and collect additional data to fill data gaps that hinder our ability to identify safe road crossing locations and critical linkages between core habitat patches.	Steward Creek and Hwy 23 crossing	
574	**Information Gaps**	**Assess**	Compile wildlife movement and road mortality data to better understand existing barriers, identify connectivity opportunities, and collect additional data to fill data gaps that hinder our ability to identify safe road crossing locations and critical linkages between core habitat patches.	Knowlton Creek and Hwy 23 crossing	
575	**Information Gaps**	**Assess**	Compile wildlife movement and road mortality data to better understand existing barriers, identify connectivity opportunities, and collect additional data to fill data gaps that hinder our ability to identify safe road crossing locations and critical linkages between core habitat patches.	Kingsbury Creek and Hwy 23 crossing near Lake Superior Zoo	
576	**Information Gaps**	**Assess**	Compile wildlife movement and road mortality data to better understand existing barriers, identify connectivity opportunities, and collect additional data to fill data gaps that hinder our ability to identify safe road crossing locations and critical linkages between core habitat patches.	Carnegie wetlands?	
577	**Information Gaps**	**Assess**	Compile wildlife movement and road mortality data to better understand existing barriers, identify connectivity opportunities, and collect additional data to fill data gaps that hinder our ability to identify safe road crossing locations and critical linkages between core habitat patches.	Jay Cooke State Park and Hwy 23.	
578	**Information Gaps**	**Assess**	Compile wildlife movement and road mortality data to better understand existing barriers, identify connectivity opportunities, and collect additional data to fill data gaps that hinder our ability to identify safe road crossing locations and critical linkages between core habitat patches.	Nemadji River and WI State Hwy 35	
579	**Information Gaps**	**Assess**	Compile wildlife movement and road mortality data to better understand existing barriers, identify connectivity opportunities, and collect additional data to fill data gaps that hinder our ability to identify safe road crossing locations and critical linkages between core habitat patches.	Hwy 105. Identified in MIdwest Conservation Blueprint as a connection between prioritized areas.	

TERRESTRIAL HABITAT CONNECTIVITY					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
580	**Information Gaps**	**Assess**	Compile wildlife movement and road mortality data to better understand existing barriers, identify connectivity opportunities, and collect additional data to fill data gaps that hinder our ability to identify safe road crossing locations and critical linkages between core habitat patches.	Hwy 105. Identified in MIdwest Conservation Blueprint as a connection between prioritized areas.	
581	**Information Gaps**	**Assess**	Compile wildlife movement and road mortality data to better understand existing barriers, identify connectivity opportunities, and collect additional data to fill data gaps that hinder our ability to identify safe road crossing locations and critical linkages between core habitat patches.	Dutchman's Creek and Wisconsin Hwy 2	
582	**Information Gaps**	**Assess**	Compile wildlife movement and road mortality data to better understand existing barriers, identify connectivity opportunities, and collect additional data to fill data gaps that hinder our ability to identify safe road crossing locations and critical linkages between core habitat patches.	Becks Road	
583	**Information Gaps**	**Assess**	Compile wildlife movement and road mortality data to better understand existing barriers, identify connectivity opportunities, and collect additional data to fill data gaps that hinder our ability to identify safe road crossing locations and critical linkages between core habitat patches.	I35	
584	**Information Gaps**	**Assess**	Compile wildlife movement and road mortality data to better understand existing barriers, identify connectivity opportunities, and collect additional data to fill data gaps that hinder our ability to identify safe road crossing locations and critical linkages between core habitat patches.	Hwy 23	
585	**Information Gaps**	**Assess**	Compile wildlife movement and road mortality data to better understand existing barriers, identify connectivity opportunities, and collect additional data to fill data gaps that hinder our ability to identify safe road crossing locations and critical linkages between core habitat patches.	Minnesota Hwy 2	
586	**Information Gaps**	**Assess**	Compile wildlife movement and road mortality data to better understand existing barriers, identify connectivity opportunities, and collect additional data to fill data gaps that hinder our ability to identify safe road crossing locations and critical linkages between core habitat patches.	Hwy 105	
587	**Priority Actions**	**Restore**	Restore or enhance habitat to create landscape corridors that increase connectivity for wildlife.	Restoration: restore connectivity. Enhancement: identify crossing zones to enhance connectivity. Monitoring: conduct research and monitoring to identify key wildlife linkages. Ownership: land acquisition and/or easements to improve connectivity rights of way, development, railroads unclear to degree to which the highway poses a barrier to terrestrial wildlife movement	Potential to engage community members to aid in linkage identification.
588	**Information Gaps**	**Assess**	Compile wildlife movement and road mortality data to better understand existing barriers, identify connectivity opportunities, and collect additional data to fill data gaps that hinder our ability to identify safe road crossing locations and critical linkages between core habitat patches.	Restoration: restore connectivity. Enhancement: identify crossing zones to enhance connectivity. Monitoring: conduct research and monitoring to identify key wildlife linkages. Ownership: land acquisition and/or easements to improve connectivity rights of way, development, railroads unclear to degree to which the highway poses a barrier to terrestrial wildlife movement	Potential to engage community members to aid in linkage identification.
589	**Information Gaps**	**Assess**	Compile wildlife movement and road mortality data to better understand existing barriers, identify connectivity opportunities, and collect additional data to fill data gaps that hinder our ability to identify safe road crossing locations and critical linkages between core habitat patches.	Wisconsin Hwy 2	

WATER QUALITY					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
590	Information Gaps	Study	Develop understanding of how limited hydrologic connection impacts water quality in wetlands.	LSMR disconnects emergent and hemi-marsh wetlands from main St. Louis River estuary. It is not well understood how this impacts water quality in the disconnected wetlands. A project is underway by MNDNR to install second bridge and new channel in rail to add an additional hydrologic connection to Mud Lake.	LSMR rail is commonly used as an assess point for community members to fish in Mud Lake or go birding.
591	Information Gaps	Study	Develop understanding of how limited hydrologic connection impacts water quality in wetlands.	Roughly 5.5 acres of emergent marsh have limited connection to St. Louis River estuary because of LCMR railroad with unknown impacts to water quality. The City of Duluth owns the railway.	The railway is often used by community as a walkway.
592	Information Gaps	Study	Develop understanding of how limited hydrologic connection impacts water quality in wetlands.	Develop understanding of how limited hydrologic connection impacts water quality in wetlands.	
593	Information Gaps	Study	Develop understanding of how limited hydrologic connection impacts water quality in wetlands.	Develop understanding of how limited hydrologic connection impacts water quality in wetlands.	
594	Information Gaps	Assess	Characterize baseline phosphorus and turbidity conditions in Bear and Bluff Creeks and Allouez Bay to define natural variability and watershed influences on water quality.	Bluff Creek is on Wisconsin's impaired waters list due to high total phosphorus. The 2020 WDNR targeted watershed assessment for Bear and Bluff Creek identified elevated total phosphorus, total suspended solids, turbidity, and E. coli in Bluff Creek. The watershed is located in the Lake Superior Clay Plain ecoregion. Clay rich soils in the Clay Plain have very low infiltration rates and high runoff rates which can enhance the export of nutrients and bacteria from land surfaces. Baseline data are needed to distinguish normal conditions from watershed-driven changes and to support future water-quality management and restoration decisions.	
595	Information Gaps	Assess	Characterize baseline phosphorus and turbidity conditions in Bear and Bluff Creeks and Allouez Bay to define natural variability and watershed influences on water quality.	Bear Creek is on Wisconsin's impaired waters list due to high total phosphorus. The 2020 WDNR targeted watershed assessment for Bear and Bluff Creek identified elevated total phosphorus, total suspended solids, turbidity, and E. coli in Bear Creek. The watershed is located in the Lake Superior Clay Plain ecoregion. Clay rich soils in the Clay Plain have very low infiltration rates and high runoff rates which can enhance the export of nutrients and bacteria from land surfaces. Baseline data are needed to distinguish normal conditions from watershed-driven changes and to support future water-quality management and restoration decisions.	
596	Considerations	Collaborate	Improve hydrologic connectivity to sheltered bays and disconnected wetlands to address water quality issues.	A culvert replacement would better hydrologically connect the 1.82 acre emergent wetland to Kimball's bay.	
597	Information Gaps	Assess	Assess the site-specific potential for water quality contamination from nearby contaminated sites.	An assessment of potential risks for contamination from US Steel slag pile to Mud Lake West is needed. An understanding of hydrologic connectivity and potential impacts to Mud Lake water quality is also needed. There is land owned by US Steel around Mud Lake.	
598	Information Gaps	Study	Develop understanding of how limited hydrologic connection impacts water quality in wetlands.	An assessment of potential risks for contamination from US Steel slag pile to Mud Lake West is needed. An understanding of hydrologic connectivity and potential impacts to Mud Lake water quality is also needed. There is land owned by US Steel around Mud Lake.	
599	Information Gaps	Study	Characterize spatial and temporal patterns in water quality through all seasons.	Study the causes and impacts of low under ice dissolved oxygen. This is a bay with previous NERR data showing low dissolved oxygen in winter. This bay and others nearby need further study as to the cause and impacts of low DO that investigates sediment, nutrients, ice cover, and water flux.	

WILD RICE					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
600	**Best Practices**	**Plan**	Identify hydrologic and geomorphic restoration and/or enhancement opportunities to benefit the creation of suitable manoomin habitat, where possible.	Mud Lake restoration work to begin in 2026. Potential improvement for suitable wild rice habitat. Cattail management and hemi-marsh construction planned. Good aquatic veg. comm. Herbivory management challenges. Access for equipment to manage vegetation may be limited. Contaminated sediments may be present. This site is not being actively managed as a Core Restoration Site identified in the 2024 Manoomin Plan. Consult priorities in the 2024 Manoomin Plan for more detail. This site is not currently included in the 1854 Treaty Authority annual SLRE manoomin monitoring effort but was evaluated for suitability in the 2014 Wild Rice Plan.	Access for harvest is limited. Entire estuary is culturally significant. This site may have supported wild rice in the past. This site may, or may not, support a large and dense enough bed of wild rice to support future harvest. Although wild rice could be a component in the veg. comm.
601	**Best Practices**	**Plan**	Identify hydrologic and geomorphic restoration and/or enhancement opportunities to benefit the creation of suitable manoomin habitat, where possible.	Evaluated as a potential restoration site in 2014 Plan (pg 59) w/ some high potential habitat in southern marsh (see OBJECTID 13). Mud Lake Project (MNDNR) to create deep water habitat. 1854 monitoring - low rice density & biomass. Last seeded in 2017. Consult Manoomin Restoration Partnership Mud Lake Restoration project will create deep water habitat that will be unsuitable to wild rice. Exposure to wind/wave energy and wake from motor craft may inhibit establishment. Goose herbivory is difficult to control at this site. This site is not being actively managed as a Core Restoration Site identified in the 2024 Manoomin Plan. Consult priorities in 2024 Manoomin Plan for more detail. This site is currently included in the 1854 Treaty Authority annual SLRE manoomin monitoring effort and was evaluated for suitability in the 2014 Wild Rice Plan.	Entire estuary is culturally significant. This site likely supported wild rice in the past. This site may, or may not, support a large and dense enough bed of wild rice to support future harvest.
602	**Best Practices**	**Plan**	Evaluate positive/negative impacts to manoomin and manoomin habitat during project development.	Evaluated as a potential restoration site in the 2014 Plan (pg. 61) w/ some high potential habitat present. 1854 Treaty Authority monitoring detected some low density scattered rice in recent years. Has not been seeded. State listed shrub located during GL CWMP surveys. Wild rice found in these surveys as well. This site is not being actively managed as a Core Restoration Site identified in the 2024 Manoomin Plan. Consult priorities in 2024 Manoomin Plan for more detail. Oliver Bay is included in the 1854 Treaty Authority annual monitoring effort and was evaluated for suitability in the 2014 Wild Rice Plan.	Entire estuary is culturally significant. This site may have supported dense wild rice in the past and may, or may not, support a large and dense enough bed of wild rice to support future harvest.
603	**Best Practices**	**Plan**	Evaluate positive/negative impacts to manoomin and manoomin habitat during project development.	Evaluated as a potential restoration site in 2014 Plan (pg. 63). U.S. Steel NRDA settlement = future restoration work. Concept planning/visioning has been completed and will likely be updated. Spirit Lake is not included in the annual 1854 Treaty Authority monitoring. Not seeded. NRDA Trustees, SLRE Manoomin Restoration Partnership Future restoration may enhance the habitat suitability for wild rice. Herbivory management will be important. Lots of geese using the U.S. Steel site currently. This site is not being actively managed as a Core Restoration Site identified in the 2024 Manoomin Plan. Consult priorities in 2024 Manoomin Plan This site is not currently included in the 1854 Treaty Authority annual SLRE manoomin monitoring effort but was evaluated for suitability in the 2014 Wild Rice Plan.	A manoomin restoration sign could be added to the newly restored pedestrian trail at U.S. Steel site to highlight the cultural significance of the estuary w/ a focus on wild rice. Entire estuary is culturally significant. This site likely supported wild rice in the past. The site may, or may not, support a large and dense enough bed of wild rice to support future harvest. Spirit Lake and Spirit Island culturally significant.
604	**Priority Actions**	**Educate**	Develop local education and outreach programs (e.g., signage, seminars, workshops, rice camps, etc.) to recruit future stewards and build community consensus for long-term stewardship.	Evaluated as a potential restoration site in 2014 Plan (pg. 63). U.S. Steel NRDA settlement = future restoration work. Concept planning/visioning has been completed. Spirit Lake is not included in the annual 1854 Treaty Authority monitoring. Not seeded. NRDA Trustees, SLRE Manoomin Restoration Partnership Future restoration may enhance the habitat suitability for wild rice. Herbivory management will be important. Lots of geese using the U.S. Steel site currently. This site is not being actively managed as a Core Restoration Site identified in the 2024 Manoomin Plan. Consult priorities in 2024 Manoomin Plan This site is not currently included in the 1854 Treaty Authority annual SLRE manoomin monitoring effort but was evaluated for suitability in the 2014 Wild Rice Plan.	A manoomin restoration sign could be added to the newly restored pedestrian trail at U.S. Steel site to highlight the cultural significance of the estuary w/ a focus on wild rice. Entire estuary is culturally significant. This site likely supported wild rice in the past. The site may, or may not, support a large and dense enough bed of wild rice to support future harvest. Spirit Lake and Spirit Island culturally significant.
605	**Best Practices**	**Plan**	Evaluate positive/negative impacts to manoomin and manoomin habitat during project development.	Munger Landing - ID'd in the 2014 restoration plan as future restoration site (pg. 65). Some rice present. Future restoration work in Stewart Creek wetlands could support wild rice. Consult priorities in 2024 Manoomin Plan	
606	**Best Practices**	**Plan**	Evaluate positive/negative impacts to manoomin and manoomin habitat during project development.	Clough Island ID'd in the 2014 restoration plan as future restoration site (pg. 68). Wild rice restoration seeding in the wetlands on the east side of the island. Herbivory management needed.1854 Treaty Authority monitoring ongoing. Consult priorities in 2024 Manoomin Plan.	
607	**Best Practices**	**Maintain**	Manage the impact of Canada goose herbivory as recommended in the 2024 St. Louis River Manoomin Restoration and Stewardship Plan.	Clough Island ID'd in the 2014 restoration plan as future restoration site (pg. 68). Wild rice restoration seeding in the wetlands on the east side of the island. Herbivory management needed.1854 Treaty Authority monitoring ongoing. Consult priorities in 2024 Manoomin Plan.	
608	**Best Practices**	**Plan**	Evaluate positive/negative impacts to manoomin and manoomin habitat during project development.	ID'd in the 2014 restoration plan as future restoration site (pg. 70). Recently dredged as part of SLRIDT mitigation... rice came up after dredging (no known seeding). Consult priorities in 2024 Manoomin Plan.	
609	**Best Practices**	**Maintain**	Implement the Manoomin Restoration Model at Core Restoration Sites as directed by the 2024 SLRE Manoomin Restoration and Stewardship Plan.	Kingsbury Bay - ID'd in the 2014 restoration plan as future restoration site (pg. 71). Core Restoration Site, MRSM implementation ongoing - monitoring, seeding, herbivory mgmt. EWM present - project underway to reduce impact of EWM. Consult priorities in 2024 Manoomin Plan Same as Mud Lake East unless otherwise noted.	Some signage present already. Great location for future rice camp - Indian Point Campground.

WILD RICE					
Matrix ID	**Category**	**Theme**	**Guideline**	**Comments from Mapping Space**	**Community / Cultural Information**
610	**Best Practices**	**Maintain**	Manage the impact of Canada goose herbivory as recommended in the 2024 St. Louis River Estuary Manoomin Restoration and Stewardship Plan.	Continue herbivory managment actions to reduce impacts to wild rice restoration at Core Restoration Sites.	
611	**Priority Actions**	**Educate**	Develop local education and outreach programs (e.g., signage, seminars, workshops, rice camps, etc.) to recruit future stewards and build community consensus for long-term stewardship.	Kingsbury Bay - ID'd in the 2014 restoration plan as future restoration site (pg. 71). Core Restoration Site, MRSM implementation ongoing - monitoring, seeding, herbivory mgmt. EWM present - project underway to reduce impact of EWM. Consult priorities in 2024 Manoomin Plan Same as Mud Lake East unless otherwise noted.	Some signage present already. Great location for future rice camp - Indian Point Campground.
612	**Best Practices**	**Plan**	Evaluate positive/negative impacts to manoomin and manoomin habitat during project development.	Stryker Bay - ID'd in the 2014 restoration plan as potential restoration site but fewer suitable acres of wild rice habitat than other sites on the list (pg. 72). See limitations in plan - water depth and substrate conditions not suitable/limiting. Existing substrate not conducive to manoomin establishment.	
613	**Best Practices**	**Plan**	Evaluate positive/negative impacts to manoomin and manoomin habitat during project development.	Dwight's Point - ID'd in the 2014 restoration plan as potential restoration site but fewer suitable acres of wild rice habitat than other sites on the list (pg. 74). Exposure a factor, low quality wetland (cattail), little/no aquatic vegetation. See priorities in 2024 Manoomin Plan.	Entire estuary is culturally significant. This site likely supported wild rice.
614	**Best Practices**	**Plan**	Evaluate positive/negative impacts to manoomin and manoomin habitat during project development.	Wisconsin Tributaries - ID'd in the 2014 restoration plan as future restoration site (pg. 76). Consult priorities in 2024 Manoomin Plan.	Entire estuary is culturally significant. This site likely supported wild rice.
615	**Best Practices**	**Plan**	Evaluate positive/negative impacts to manoomin and manoomin habitat during project development.	Billings Park - ID'd in the 2014 restoration plan as future restoration site (pg. 78). Small areas, high fetch, low quality aquatic vegetation. Potential for addition of barrier islands.	
616	**Best Practices**	**Plan**	Evaluate positive/negative impacts to manoomin and manoomin habitat during project development.	High quality coastal fen with invading cattail. One of the few coastal fens left in the SLRE. Restoration might include cattail management and seeding/planting or hemi-marsh enhancements with wild rice being a component in a diverse plant assemblage. The 2014 Rice Plan mentions the following limitations: (1) potential contaminated sediments, (2) invasive species requiring persistent control, and (3) accumulated woody material present.This site is not being actively managed as a Core Restoration Site identified in the 2024 Manoomin Plan. This site is not currently included in the 1854 Treaty Authority annual SLRE manoomin monitoring effort but was evaluated for suitability in the 2014 Wild Rice Plan.	This site may, or may not, support a large and dense enough bed of wild rice to support future harvest. Rather, this site could support wild rice interspersed with other native vegetation to enhance biodiversity.
617	**Priority Actions**	**Restore**	Implement aquatic invasive species management strategies where conflicts with manoomin restoration objectives arise.	Existing and sustaining wild rice population that could benefit from increased seeding. Lower herbivory. High quality wetlands with cattail and purple loosestrife invading. Manoomin partnership and LS-NERR. Limited based on seed availability.	Easy access to wild rice and quiet bay for kayaking and canoeing.
618	**Informatio n Gaps**	**Study**	Develop research and montioring programs to address Research Priorities identified in the Goals and Objectives for wild rice.	Existing and sustaining wild rice population that could benefit from increased seeding. Lower herbivory. High quality wetlands with cattail and purple loosestrife invading. Engage, City of Superior, GLIFWC, Fond du Lac, manoomin partnership and LS-NERR. Investigate relationships between wild rice and muskrat populations.	Easy access to wild rice and quiet bay for kayaking and canoeing.
619	**Priority Actions**	**Educate**	Develop local education and outreach programs (e.g., signage, seminars, workshops, rice camps, etc.) to recruit future stewards and build community consensus for long-term stewardship.	Easy access to wild rice and quiet bay for canoeing. Signage can be improved to allow for a better user experience and compliance with wild rice harvesting rules.	
620	**Best Practices**	**Plan**	Identify hydrologic and geomorphic restoration and/or enhancement opportunities to benefit the creation of suitable manoomin habitat, where possible.	Very high quality wetland that is very far from disturbance, including humans because it is far from public boat launches. Manoomin Partners would need to be consulted and make the decision. This might be part of the Oliver Pokegama boundary, but placing a separate point because they are separate sites in GL CWMP. Wild rice at both of these sites are likely historic wild rice. A state listed shrub has been found at both this site and the Oliver site to the southwest still on the Wisconsin side. This priority is dependent on rice seed availability. Rice will be prioritized in existing restorations because resources have already been expended there. But this is a good candidate for future seeding to enhance this site. Rice has been succeeding to some degree in this wetland for a long time. Adding a minor amount of seed will likely improve this site. Other recommendations include protecting this site due to its high diversity of aquatic plants. Cutting away native vegetation is not recommended for this site. Increasing suitable habitat via bathymetry alterations and barrier islands would be the preferred enhancement to increase potential wild rice habitat and maintain the high quality of the wetland.	It is likely that the high quality is somewhat contributed to the lack of access. Wild rice has been found here, though none has been seeded in the past in this location that we know of.
621	**Best Practices**	**Maintain**	Manage the impact of Canada goose herbivory as recommended in the 2024 St. Louis River Manoomin Restoration and Stewardship Plan.	Nice stand of manoomin growing here in 2024. Site included in the 1854 Treaty Authority manoomin monitoring effort. Herbivory exclosures would be key here due to a lot of geese in this area.	