

Ecosystem service and community values analysis to support ecological restoration of Great Lakes coastal wetlands

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Remediation to Restoration to Revitalization (R2R2R)

To help transform remediation and restoration projects into sustainable revitalization of the surrounding community by maximizing the positive societal and environmental outcomes

Restoration & Revitalization



Managing Contamination

Partnering companies purchased a 15-acre parcel in Ashabula Township for a Sediment Consolidation Facility, where contaminated sediments from the riverbed would be stored. This facility was completed in 2006.

State and federal agencies implemented dredging of the Ashabula River between 2006 and 2011, removing over 700,000 cubic yards of contaminated sediment from the river and reopening it for commercial shipping and recreational boating. The contaminated material was pumped into a specifically designed landfill and isolated from the environment.



Restoring the River

Restoration of the Ashabula River began in 2008. About 2,500 feet of fish shelves and a total of 10.5 acres of river, wetland, and upland habitat were created, providing a home for mammals, birds, and fish.

Through the efforts of many, the Hush-tah-hush River is returning to its former glory as a "river of many fish."



The Ashabula River Partnership: A model approach to environmental cleanup



For more information, visit www.ashabulapartnership.org

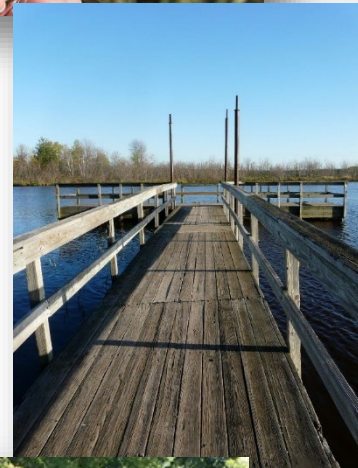


For more information, visit www.ashabulapartnership.org

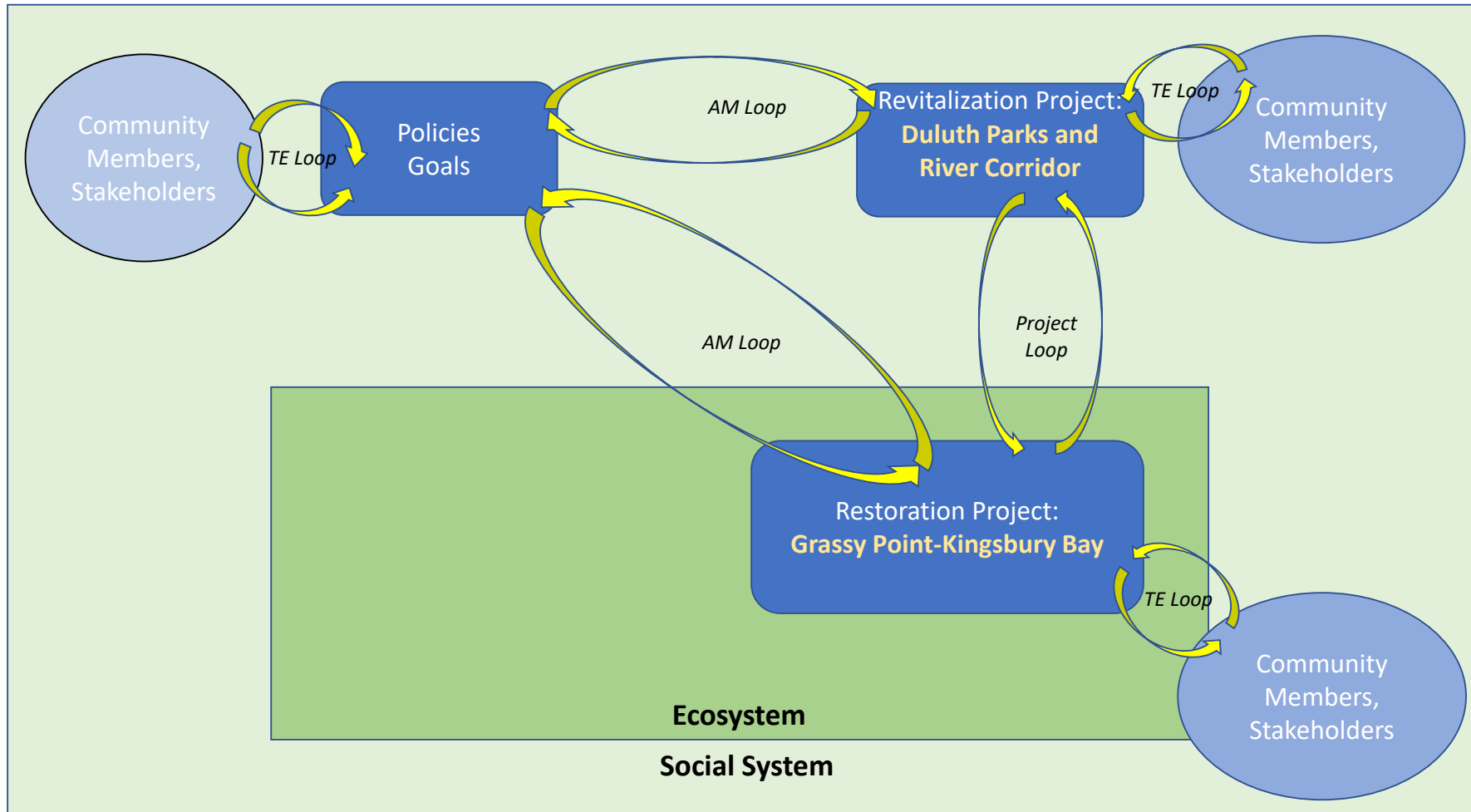


R2R2R Principles

- Ecosystem-based
- Ecosystem services ~ environmental quality
ecological integrity
- Beneficiaries
- Stakeholder engagement, data co-production
- Feedback loops
 - Project loops
 - Adaptive Management (AM) loops
 - Translational Ecology (TE) loops



R2R2R as Social-Ecological System



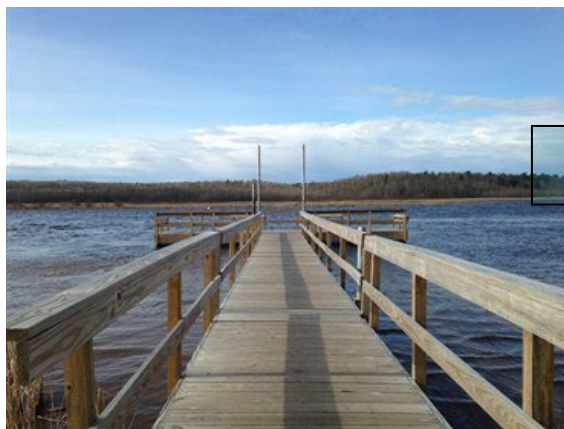
Bringing A Community Back to the Water

- By what means does coastal wetland restoration affect community health and well-being?
- How big are those effects?
- How likely are those effects?



Restoration

Ecosystem Services



Amenities



Wellbeing



Health Impact Assessment (HIA)

HIA is a process that uses
scientific data, health expertise and public input
to factor public health considerations into the
decision-making process

HIAs give decision-makers the information they need to consider health in pending programs, policies, plans, and projects:

- *In advance* of a decision
- Identifies *public health* consequences
- Provides *recommendations*
- Health protection **and** health promotion



Kingsbury Bay-Grassy Point Habitat Restoration Project: A Health Impact Assessment

- Health Impact Assessment at St. Louis River AOC (FY17-FY19)
 - Grassy Point-Kingsbury Bay Projects
 - 81 ha, 270K m³ sediment
- Project timeline
 - Conducted in a series of workshops
 - Start in JAN 2017; final design FEB 2018
- Partner needs
 - Project scopes/plans/options
 - Contribute throughout
 - Listen and respond





Figure 1.3 St. Louis River Corridor Ongoing Projects

Waabizheshikana (waa-bah-zhay-shay- kuh-nuh) in Anishinaabe or "The Marten Trail", in honor of the Marten Clan that settled in this part of the St. Louis River.



Figure 1.6 Existing Trail near Indian Point Campground

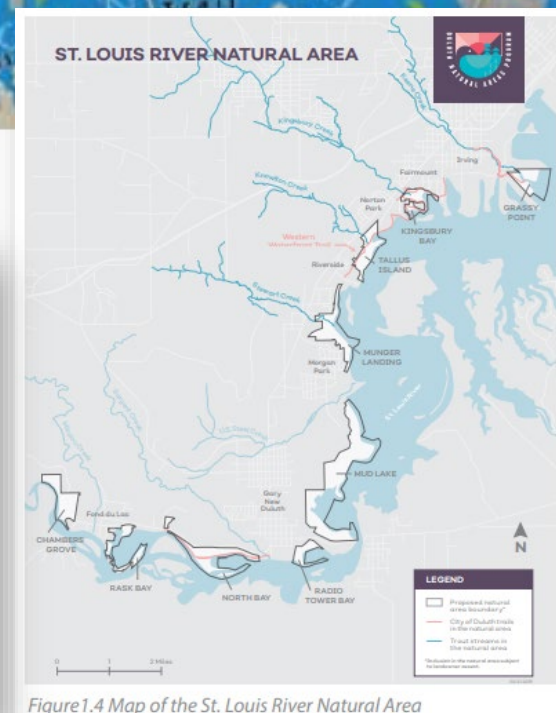


Figure 1.4 Map of the St. Louis River Natural Area



Grassy Point Habitat Restoration



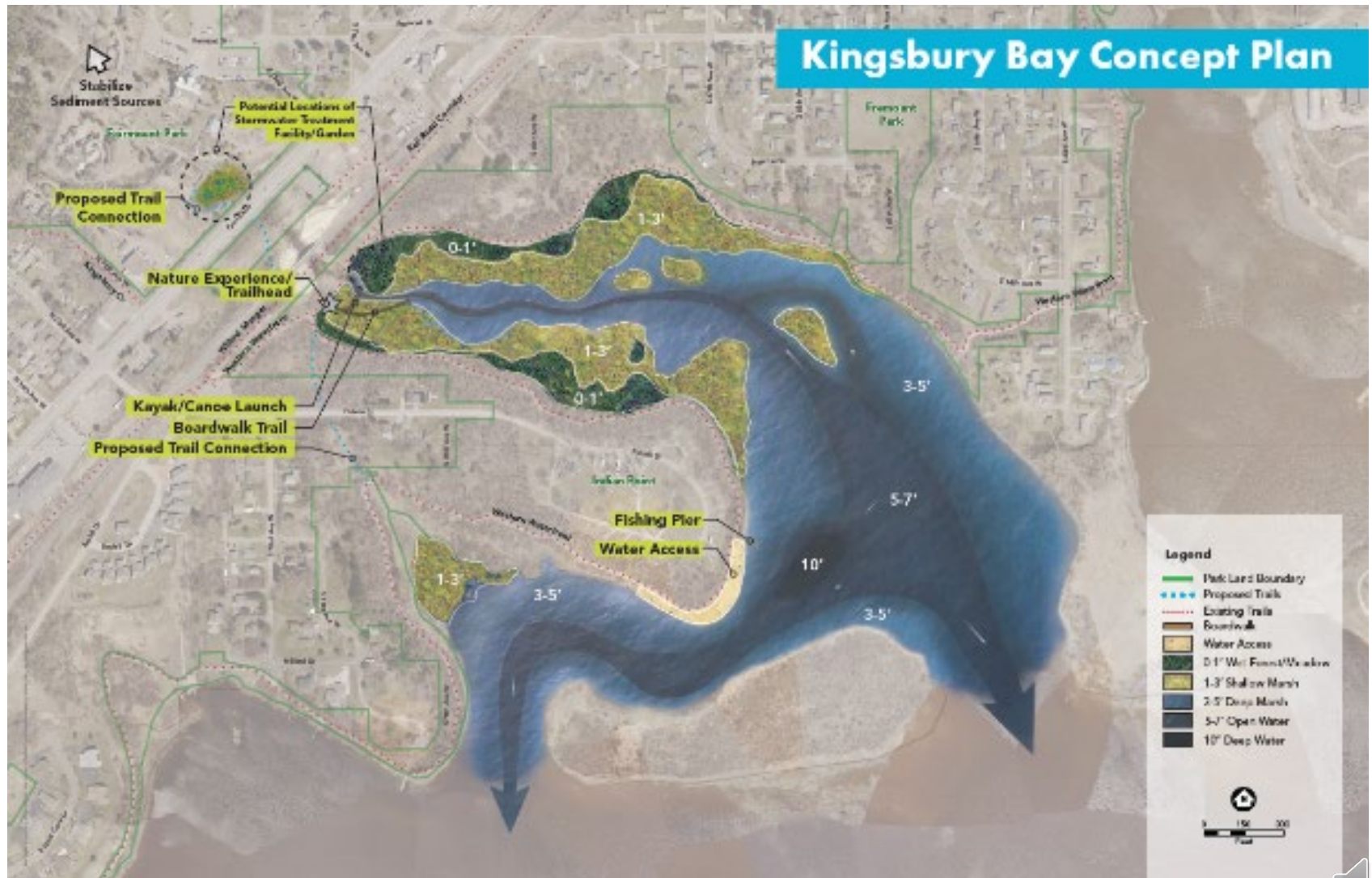
Grassy Point Construction

Footage courtesy Melissa Sjolund, MN DNR

WOOD WASTE RELOCATION Island/Sheltered Bay



Kingsbury Bay Habitat Restoration



Kingsbury Bay Restoration Progress



Community Engagement

HIA began with knowledge co-production

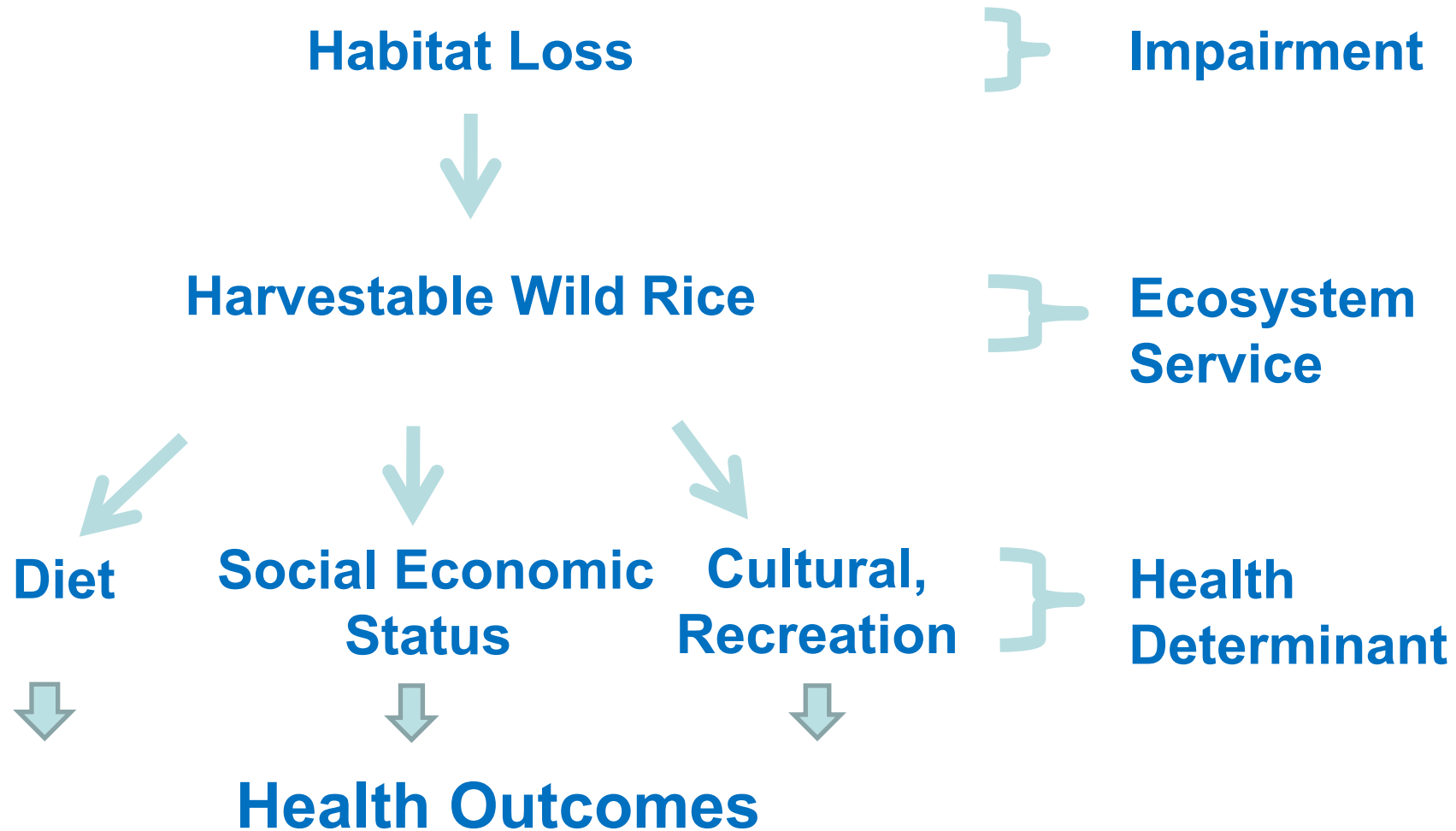
- Participatory mapping for HIA
- Engage in conversation around the restoration sites
- Used maps to capture different types of knowledge based on relationships to the river
 - Traditional
 - Professional
 - Local
 - Scientific

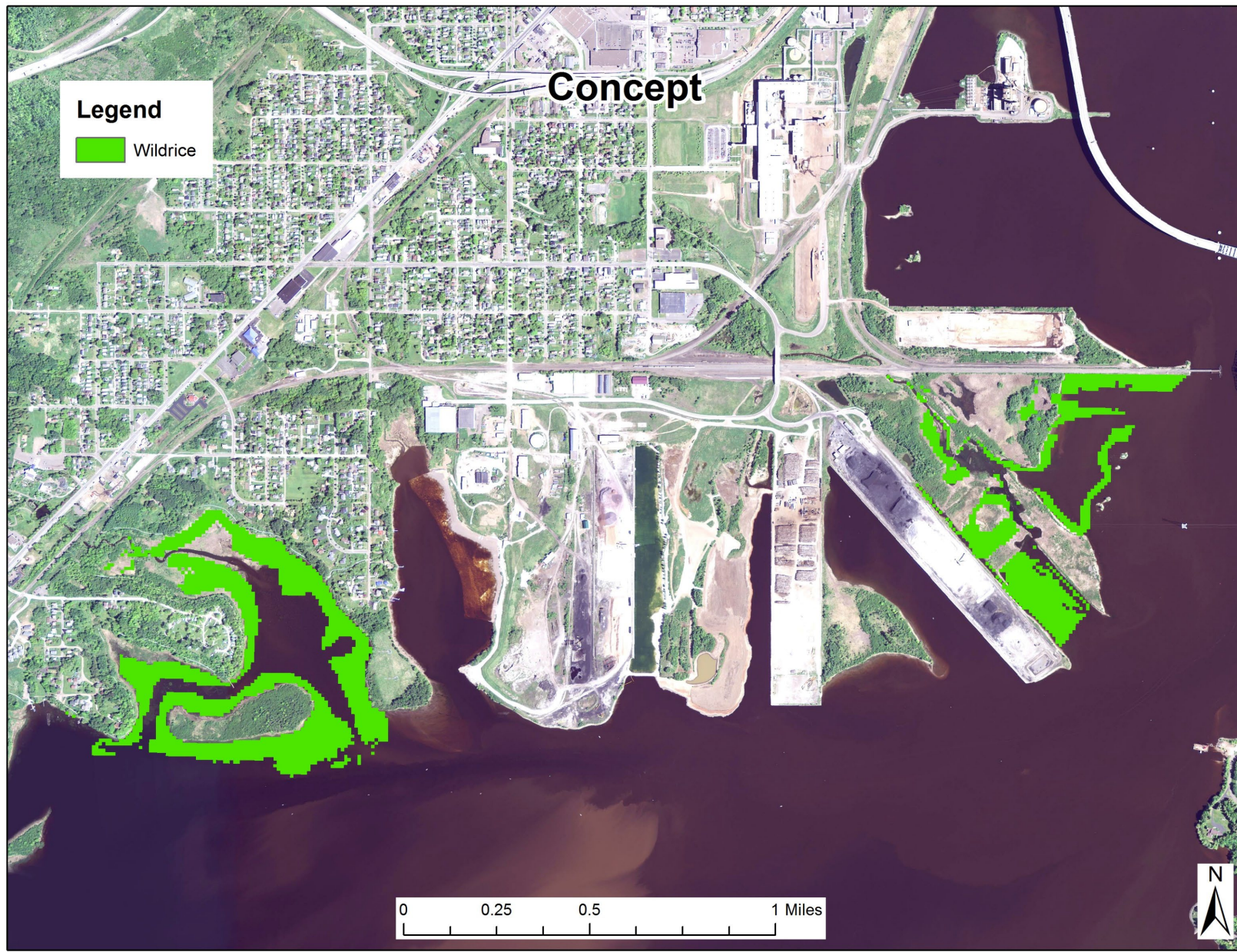


Health Pathways Assessed



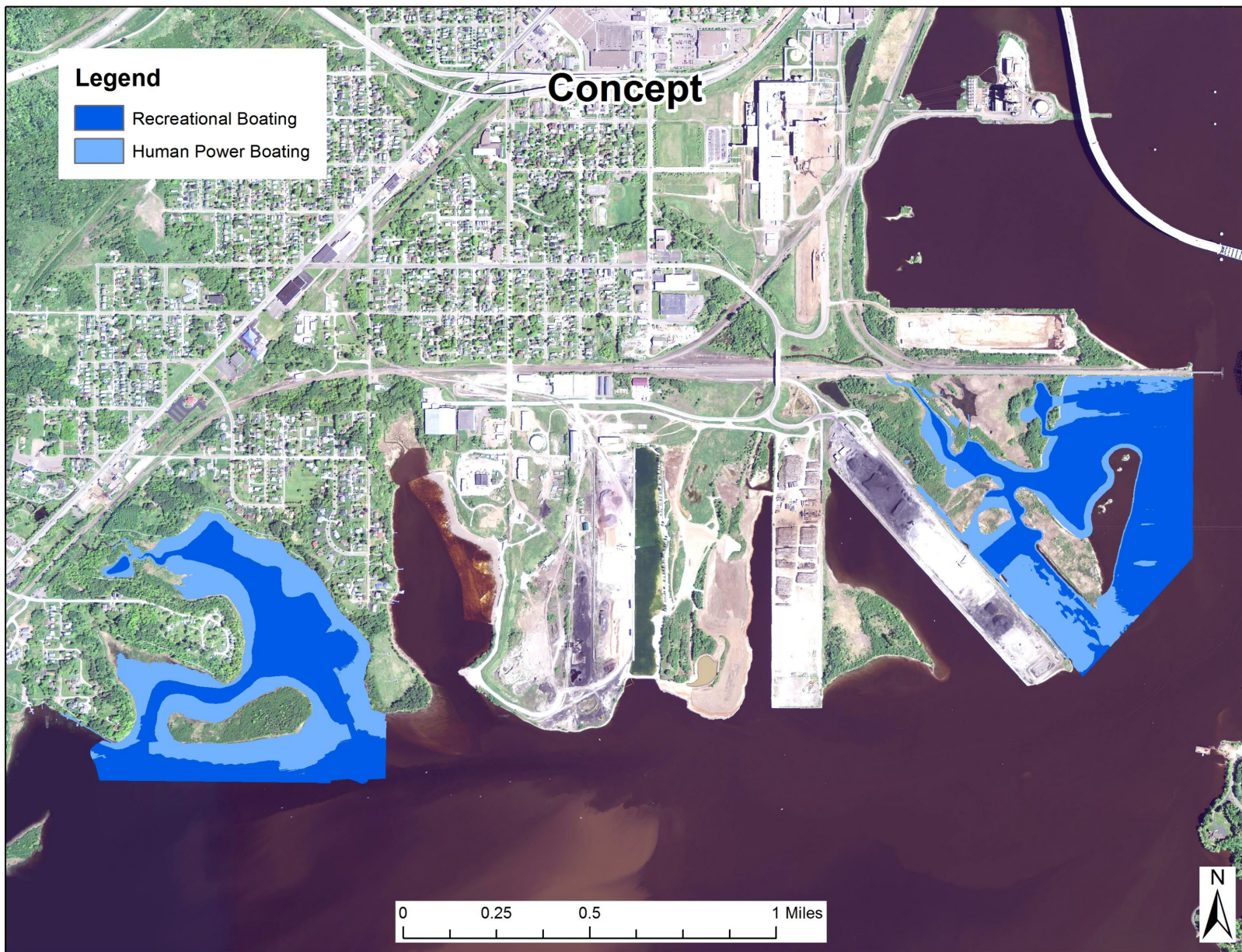
Pathways and Ecosystem Services





Angradi et al., 2016



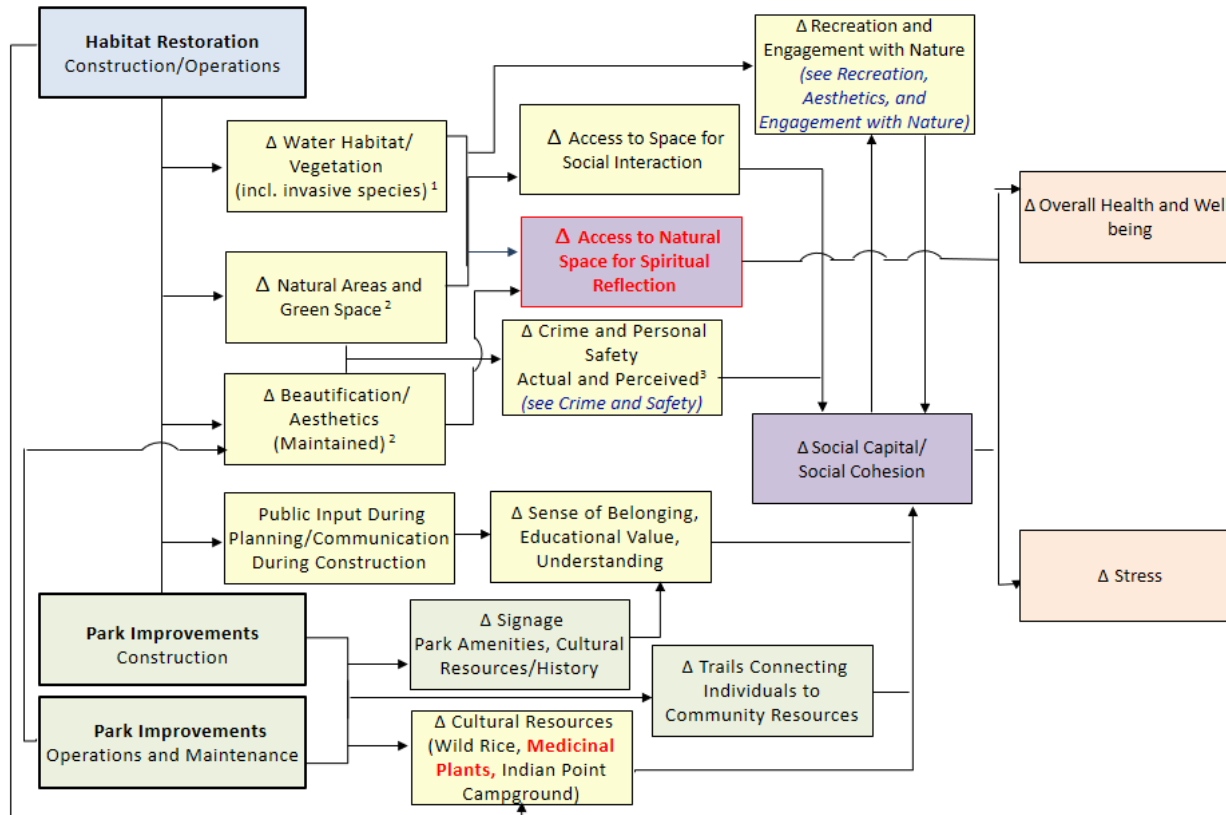


Angradi et al., 2016



Social and Cultural Pathway

Social and Cultural



What's the connection to health?

- Social capital and cohesion
- Spiritual reflection
- Cultural resource use
- Reduce stress

¹ From Water Habitat and Quality Pathway ² From Recreation, Aesthetics, and Engagement with Nature Pathway ³ From Crime and Personal Safety Pathway

• Health impacts of stress include: poor mental health, high blood pressure, heart disease, obesity, diabetes, decreased immune response

Ecological Connection to Health

Ecosystem Component	Ecosystem Services	Beneficiaries	Associated Health Determinant or Health Outcome
Reduced sediment contamination and improved water quality	Improved habitat for resident fish	People who consume fish from the river, including subsistence and recreational anglers	Improving water and sediment quality can decrease contaminant bioaccumulation, improve nutrition, and decrease chronic disease incidence due to consumption of contaminated fish
Wetland habitat	Habitat for marsh birds, wading birds, and migratory waterfowl	Recreational birdwatchers	Outdoor recreation can provide opportunities to engage with nature; reduce stress, cardiovascular disease, obesity, and other chronic disease; and provide opportunities for social cohesion
Natural area and green space	Accessible natural areas	Park visitors, hikers on adjacent trails,	Green spaces can decrease crime; provide opportunities for physical activity, spiritual reflection, cultural fulfillment, engagement with nature, and social cohesion; reduce stress, and improve mental and overall health and well-being



Social, Cultural, and Spiritual Well-being: Short-term: (–) lack of access or impaired social, cultural, and spiritual experiences at these sites during construction; (+) community input and communication of project plans and activities important

Long-term: (+) creation of space for social interaction and enhanced safety improves social cohesion and social capital; also provides opportunity for wild rice generation (a culturally important and highly nutritious food source) and spiritual reflection

Recreation: Short-term: (–) lack of access or impaired experiences at Grassy Point, Indian Point Campground, and Western Waterfront Trail during construction

Long-term: (+) habitat restoration provides opportunity for recreation

Aesthetics/Engagement with Nature:

Long-term: (+) creation of aquatic habitat and beautified natural areas improves aesthetics and provides space for engagement with nature

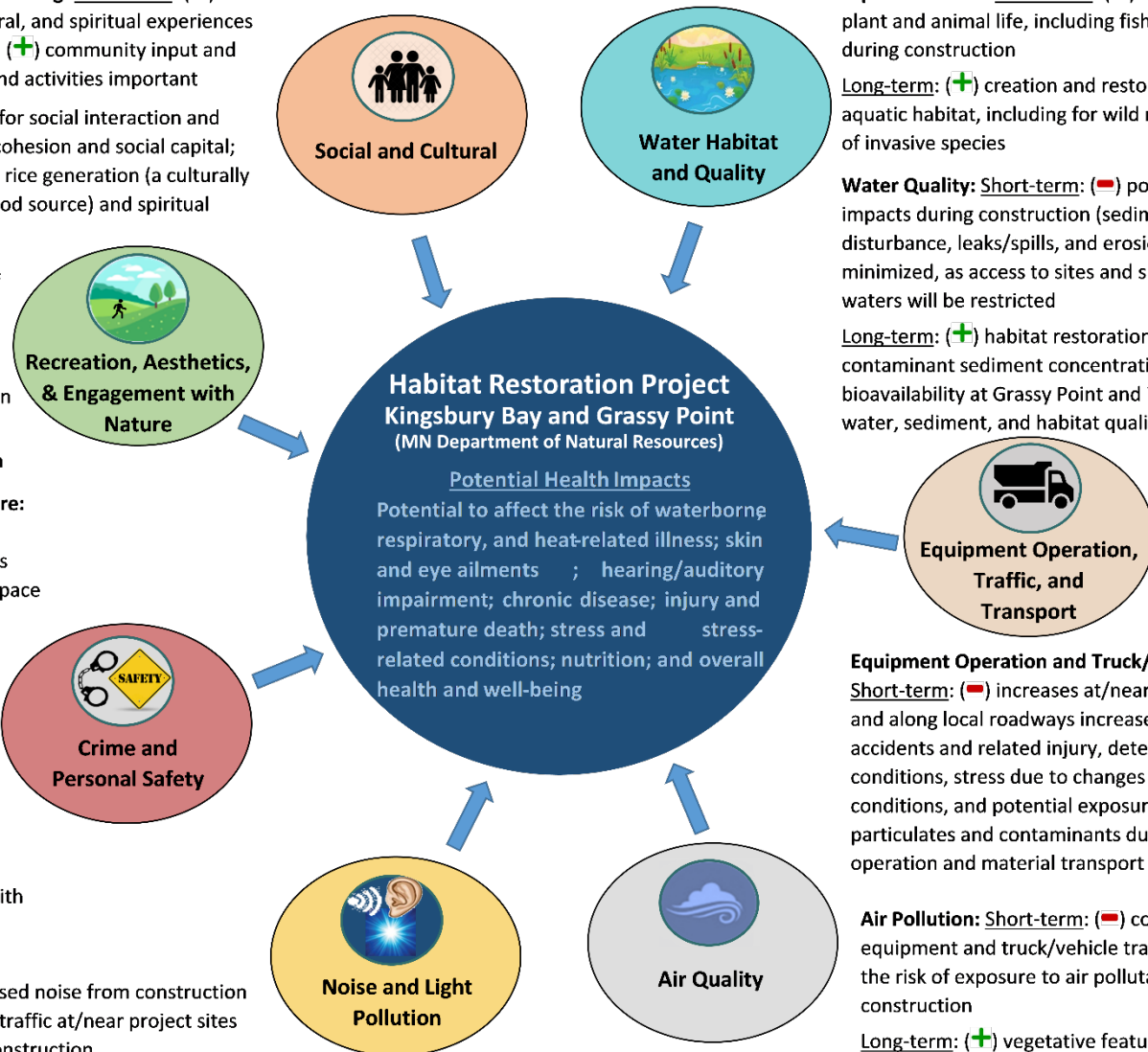
Crime: Long-term: (+) beautified natural areas deter crime

Safety: Short-term: (–) increased truck and vehicle traffic impacts pedestrian and bicycle safety

Long-term: (+) improvements in personal safety expected at sites with beautification and deterred crime

Noise: Short-term: (–) increased noise from construction equipment and truck/vehicle traffic at/near project sites and along roadways during construction

Light: Short-term: (–) if nighttime dredging needed, lighting impacts to individuals and animals at/near project sites and along roadways possible



Aquatic Habitat: Short-term: (–) disturbance of plant and animal life, including fish populations, during construction

Long-term: (+) creation and restoration of aquatic habitat, including for wild rice; removal of invasive species

Water Quality: Short-term: (–) potential impacts during construction (sediment disturbance, leaks/spills, and erosion/runoff) minimized, as access to sites and surrounding waters will be restricted

Long-term: (+) habitat restoration will decrease contaminant sediment concentrations and bioavailability at Grassy Point and improve water, sediment, and habitat quality

Equipment Operation and Truck/Vehicle Traffic: Short-term: (–) increases at/near project sites and along local roadways increases the risk of accidents and related injury, deteriorated road conditions, stress due to changes in travel conditions, and potential exposure to particulates and contaminants during equipment operation and material transport

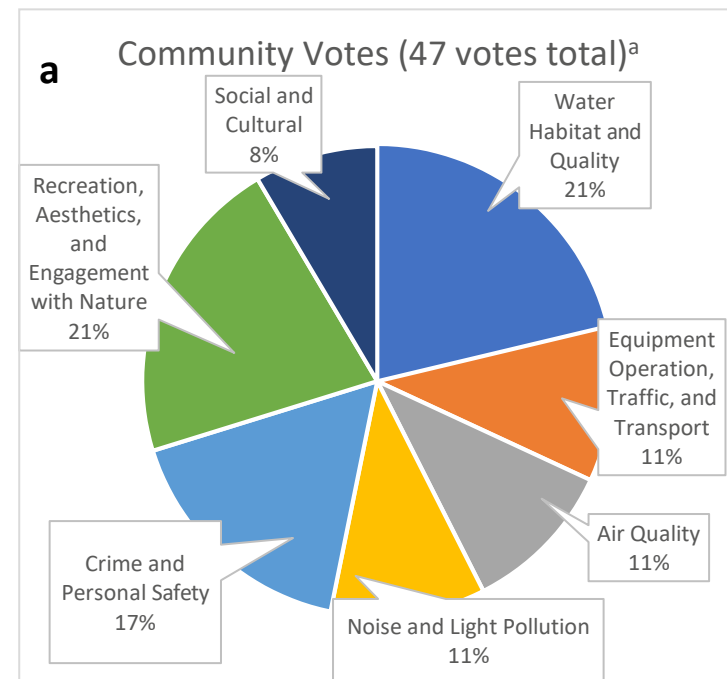
Air Pollution: Short-term: (–) construction equipment and truck/vehicle traffic increases the risk of exposure to air pollutants during construction

Long-term: (+) vegetative features created have the ability to filter air pollutants and particulates and reduce localized surface and air temperatures

Mitigating Health Impacts, Improving Health Outcomes

73 evidence-based recommendations

- water, sediment, and biota management;
- aquatic and terrestrial habitat plans;
- equipment operation, traffic, and transport of materials;
- mitigation of air, noise, and light pollution;
- crime and safety;
- park access and amenities;
- cultural and social resources;
- communication and informational signage; and
- health supportive measures



US EPA (2021)



Impact: Bringing People Back to the Water

- **Foundation:** build trust and incorporate equity
 - translation (health)
 - two-way communication
 - formal decision-support
- **Process:**
 - Stakeholders were involved in creating the recommendations
 - Research was responsive to the project design
- **Impact:** MNDNR has included many recommendations – *projected to improve eco and health outcomes*



Currently planning post-project ecological and social monitoring

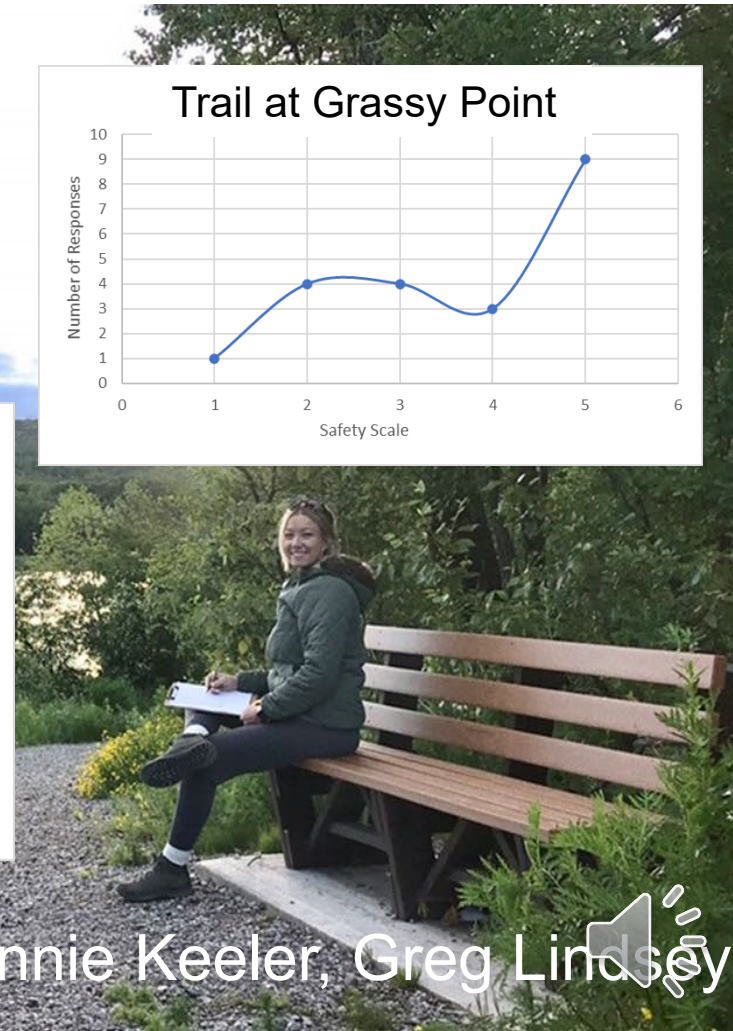
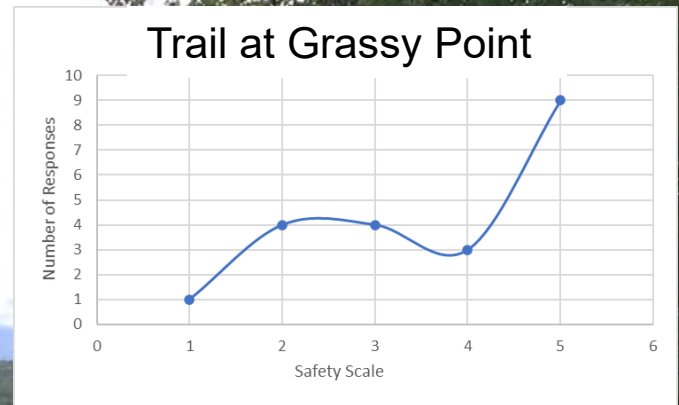
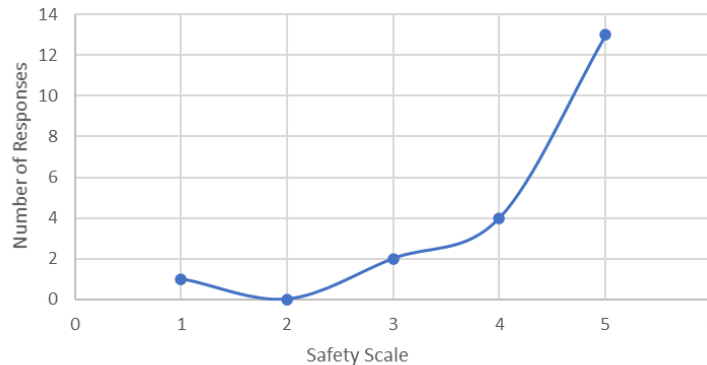


Post Project Social – Eco Monitoring

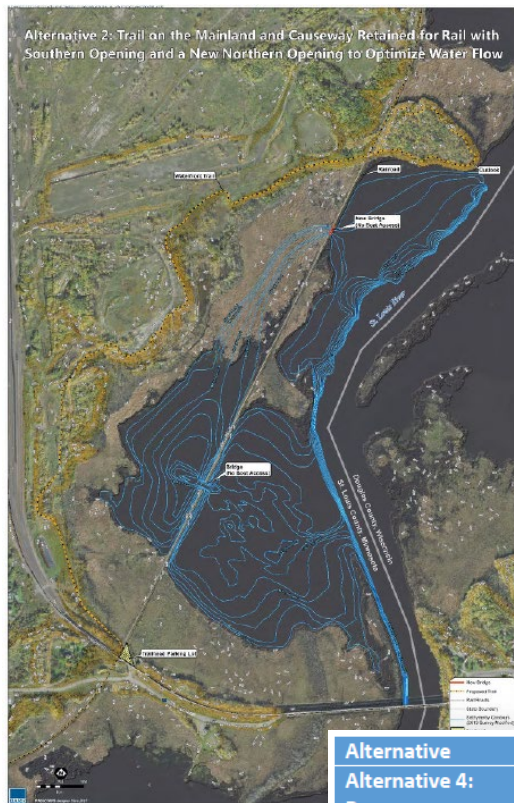
*Rate on a scale of 1-5 how safe you feel while using this trail?
1 being described as not safe and 5 as no concern of safety.*



Trail at Kingsbury Bay



Transferability – Mud Lake Restoration



EPA/600/F19/043
EPA/600/F19/054

Ecosystem Service (units)	Current Condition (Alt 1)	Retain Rail, North Opening (Alt 2A)	Retain Rail, North Opening, Bay Mouth Bar (Alt 2Av2)	Remove Causeway, North Opening, Bay Mouth Bar (Alt 3)
River greater than 6 feet deep (acres)	33.2	37.1	36.5	51.1
Highly-sheltered bay (acres)	23.4	26.5	30.9	9.8
Moderately-sheltered bay (acres)	29.8	28.2	42.6	21.0
Fill in public waters (lineal feet)	4894	4782	4782	3067
Protected shoreline (lineal feet)	4379	4107	4107	1302
75-100 percent probability of SAV occurrence (acres)	75.9	84.3	79.3	73.3
25-75 percent probability of SAV occurrence (acres)	42.7	40.5	40.4	46.2
50-100 percent probability (acres) of FLV occurrence (acres)	42.2	51.2	57.9	2.9
Power boating (acres)	75.9	75.9	75.9	110.9
Human-power boating (acres)	129.7	129.7	129.7	184.0
Esocid spawning (acres)	75.7	84.0	78.9	72.9
Designated shore fishing (acres)	0.0	0.0	0.0	1.2
Boat/ice fishing (acres)	144.6	153.5	149.2	160.6
Trapping (acres)	133.6	124.7	128.2	118.7

positive change

no change

negative change

Alternative	Recreational Access	Uses	Description of Impacts	Impacts to Health
Alternative 4: Remove Causeway	<ul style="list-style-type: none"> Trail on land Parking lot Designated outlook Fishing on causeway remnants and new fishing pier Canoe launch and kayak landing 	<ul style="list-style-type: none"> Bird and wildlife watching Canoeing and kayaking Fishing Trapping Hiking and biking Power boating 	This alternative will result in great loss for the railroad organization in terms of social cohesion and sense of purpose. This alternative has the potential to improve habitat more than the other alternatives through the creation of a high-quality coastal wetland, which will likely positively impact indigenous communities who wish to exercise treaty rights, along with bird and wildlife watchers and anglers. The alternative will also positively impact hikers and bikers through the addition of the trail.	This alternative would have a <i>positive</i> impact on recreational users given the trail and other amenities; the Anishinaabe people as the bay is returned closer to its original state to allow for the exercise of treaty rights; anglers through more shore and boat fishing access; and boaters through more deep water. This alternative would have a <i>negative</i> impact on the social cohesion and place attachment for the LSMR, the neighborhood that identifies with the train, and train passengers, and bird watchers who will lose highly-sheltered shallow-water habitat and the access to the river that the causeway provides.

Thank you!

Timothy G. O'Higgins
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Theodore H. DeWitt *Editors*

Ecosystem-Based Management, Ecosystem Services and Aquatic Biodiversity

Theory, Tools and Applications

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Remediation to Restoration to Revitalization: Engaging Communities to Support Ecosystem-Based Management and Improve Human Wellbeing at Clean-up Sites



Kathleen C. Williams and Joel C. Hoffman

Abstract Remediation to Restoration to Revitalization (R2R2R) is a framework to identify ecological and policy-based relationships between large-scale aquatic sediment remediation projects, subsequent habitat restoration projects, and waterfront revitalization. A defining feature of R2R2R is that it possesses three essential feedback loops: a translational ecology feedback loop, an adaptive management feedback loop, and a project management feedback loop. The R2R2R framework builds on Ecosystem-Based Management (EBM) theory by addressing the role of humans through these feedback loops, and by recognizing the ability of communities to learn and make choices that improve the environment through translational science. In this framework, translating ecological changes from remediation and restoration projects to public benefits (e.g., swimmable water, potential for urban greenspace) using the concept of ecosystem services is critical to support decision-making. In practice, community perceptions and uses of the remediated and restored ecosystem or habitat are central to EBM. We use the Great Lakes Area of Concern program to illustrate how R2R2R exemplifies EBM for large, complex sediment remediation and aquatic habitat restoration projects.

Lessons Learned

- The Remediation to Restoration to Revitalization (R2R2R) framework is integrative of diverse interests through ongoing opportunities for engagement and a synthesis of input to inform research and project alternatives
- Consideration of translational ecology and adaptive management, in addition to the project, create distinct opportunities for engagement with the community, stakeholders, and project implementers

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KB-GP HIA Report

www.epa.gov/healthresearch/health-impact-assessments

HIA Resources

www.cdc.gov/healthyplaces/hia.htm

www.who.int/health-topics/health-impact-assessment#tab=tab_1

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