



Remediation to Restoration to Revitalization: A Social-Ecological Systems Approach to Integrate Ecosystem Services and Human Wellbeing in Waterfront Communities

Joel Hoffman and Kathleen Williams

EPA Office of Research and Development

**MARCH 1–3, 2021 • VIRTUAL
11th Annual St. Louis River Summit
Resilient Ecosystems, Resilient Communities**

The R³ Paradigm: “Its not just sediment remediation”



Remediation to Restoration to Revitalization (R2R2R)

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

Restoration & Revitalization



Managing Contamination
Partnering companies purchased a 19-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 Hah-tah-hah River is returning to its former glory as a "river of many fish."

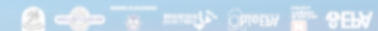


Using funds from the US EPA, US ACF, industry and the State of Ohio, approximately 700,000 cubic yards of contaminated sediment was removed from the river between 2006 and 2011, pumped up through a 2.5 mile pipeline to a upland sediment consolidation facility and into gravelly ridges. Ridges that separate contaminated sediment from the river water.

The Ashabula River Partnership: A model approach to environmental cleanup




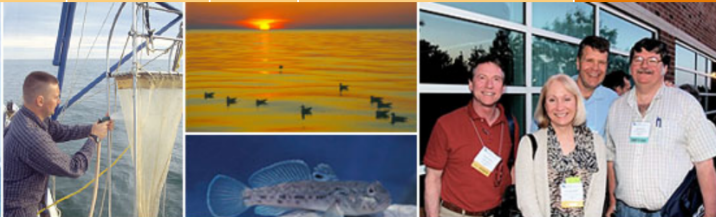
2011-2012 Ashabula River Partnership Annual Report



2011-2012 Ashabula River Partnership Annual Report

Login: [Member](#) | [Board](#)
[Home](#) | [About Us](#) | [Calendar](#) | [News](#) | [Jobs](#) | [Contact](#)

[Conference](#) | [Journal](#) | [Awards](#) | [Scholarships](#) | [Policy](#) | [Membership](#) | [Lakes](#) | [SUPPORT US](#)

International Association for Great Lakes Research

[Home](#) > [AOC](#)

Evaluating Great Lakes Area of Concern Restoration


What have we achieved and learned after more than 30 years of Remedial Action Plans to restore Great Lakes Areas of Concern?

In 1985, the eight Great Lakes states, Ontario, and the U.S. and Canadian federal governments committed to developing and implementing comprehensive remedial action plans (RAPs) to restore impaired beneficial uses in Great Lakes Areas of Concern (AOCs). In 1987, this commitment was codified in a Protocol to the Canada-U.S. Great Lakes Water Quality Agreement.

In 2017, a symposium titled “Restoring Great Lakes Areas of Concern” was convened at IAGLR’s Conference on Great Lakes Research in Detroit. Twenty-seven papers and five posters were presented. The symposium was sponsored by the Aquatic Ecosystem Health & Management Society, the Great Lakes Commission, and the Detroit River International Wildlife Refuge.

Case Studies




1. [River Raisin Area of Concern](#)
2. [Detroit River Area of Concern](#)
3. [Severn Sound Area of Concern](#)
4. [Collingwood Harbour Area of Concern](#)
5. [Hamilton Harbour Area of Concern](#)
6. [Muskegon Lake Area of Concern](#)
7. [Cuyahoga River Area of Concern](#)
8. [Buffalo River Area of Concern](#)


[For Commissioners](#) | [For the Media](#)

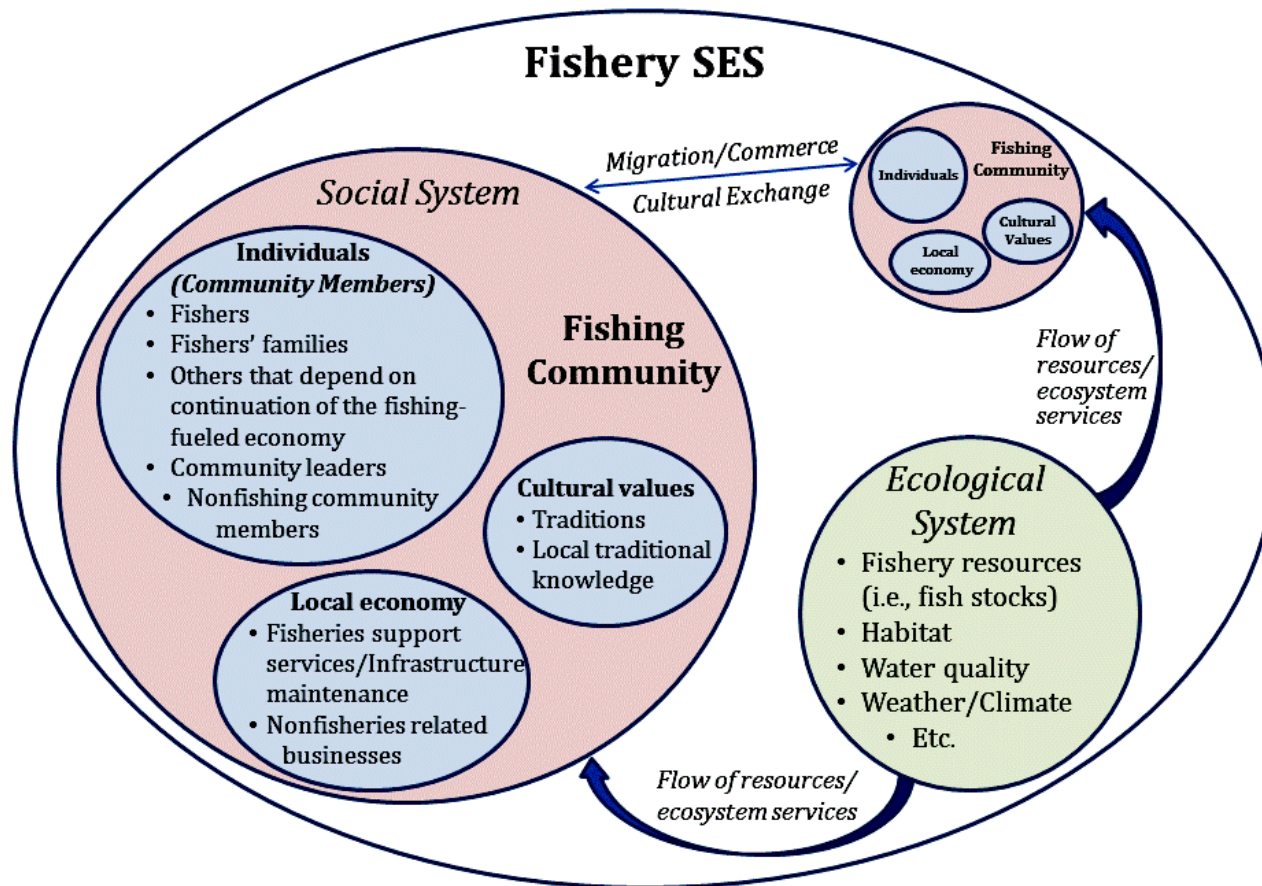
[About](#) | [News](#) | [Our Work](#) | [Partnerships](#) | [Library](#) | [About the Lakes](#)

Economic Development & Waterfront Community Revitalization

The unique freshwater resources of the Great Lakes fueled the region’s early development, with waterfront areas historically serving as centers of economic activity. However, the industrialization and development of the basin over the past 200 years has had an impact on the ecological health of the lakes. Currently, many coastal communities are working to restore and reclaim waterfronts and leverage fresh water assets to promote economic growth, support water-dependent industry, and sustain a high quality of life in the Great Lakes region. The Great Lakes Restoration Initiative is accelerating this process, particularly in the region’s worst toxic hotspots. With its member states and provinces, the Great Lakes Commission is working to support the revitalization of waterfront communities and support water-dependent economy through research, policy development, information exchange and technology transfer, and stakeholder collaboration.

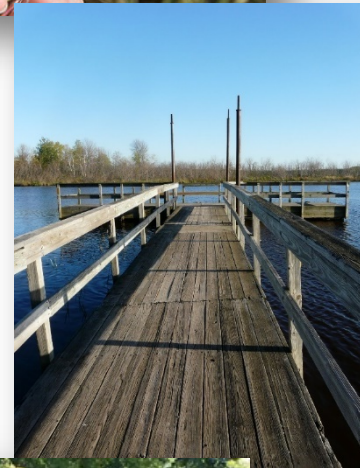




What are Social-Ecological Systems (SES)?

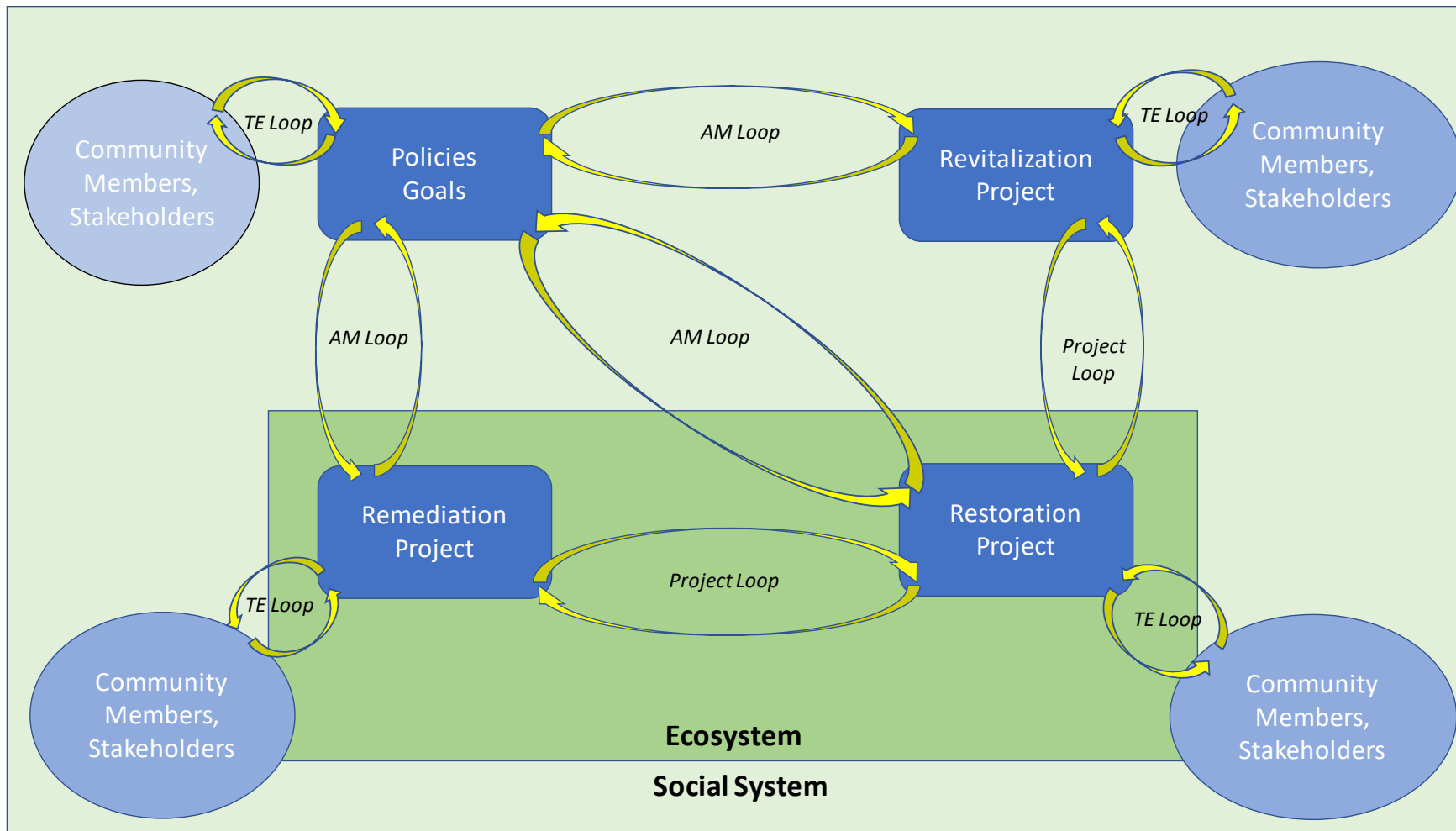


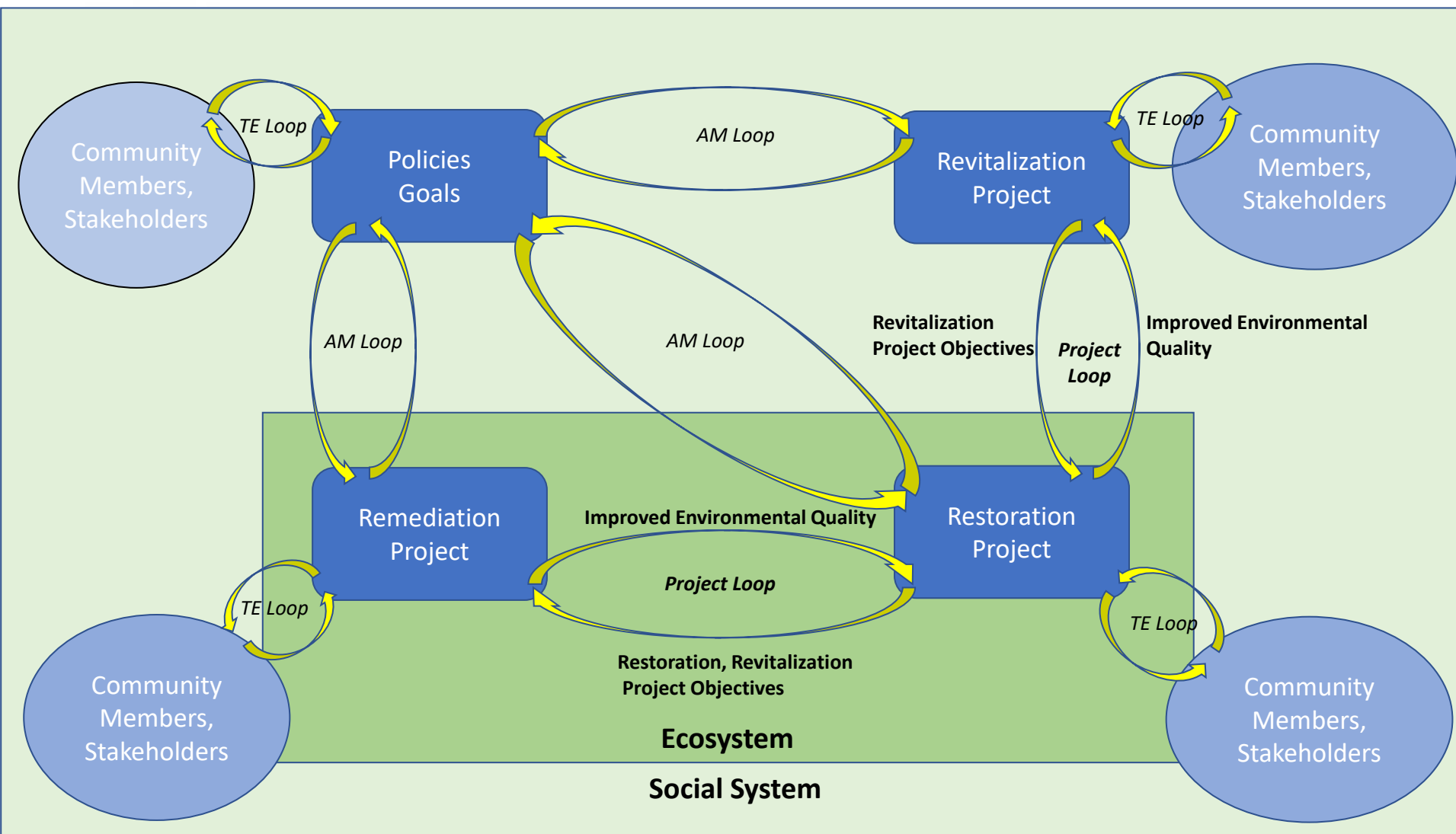
R2R2R as a Social-Ecological System

- Ecosystem-based
- Adaptive management (project effectiveness)
- Ecosystem services ~ environmental quality, ecological integrity
- Beneficiaries
- Community and stakeholder engagement
- Feedback loops

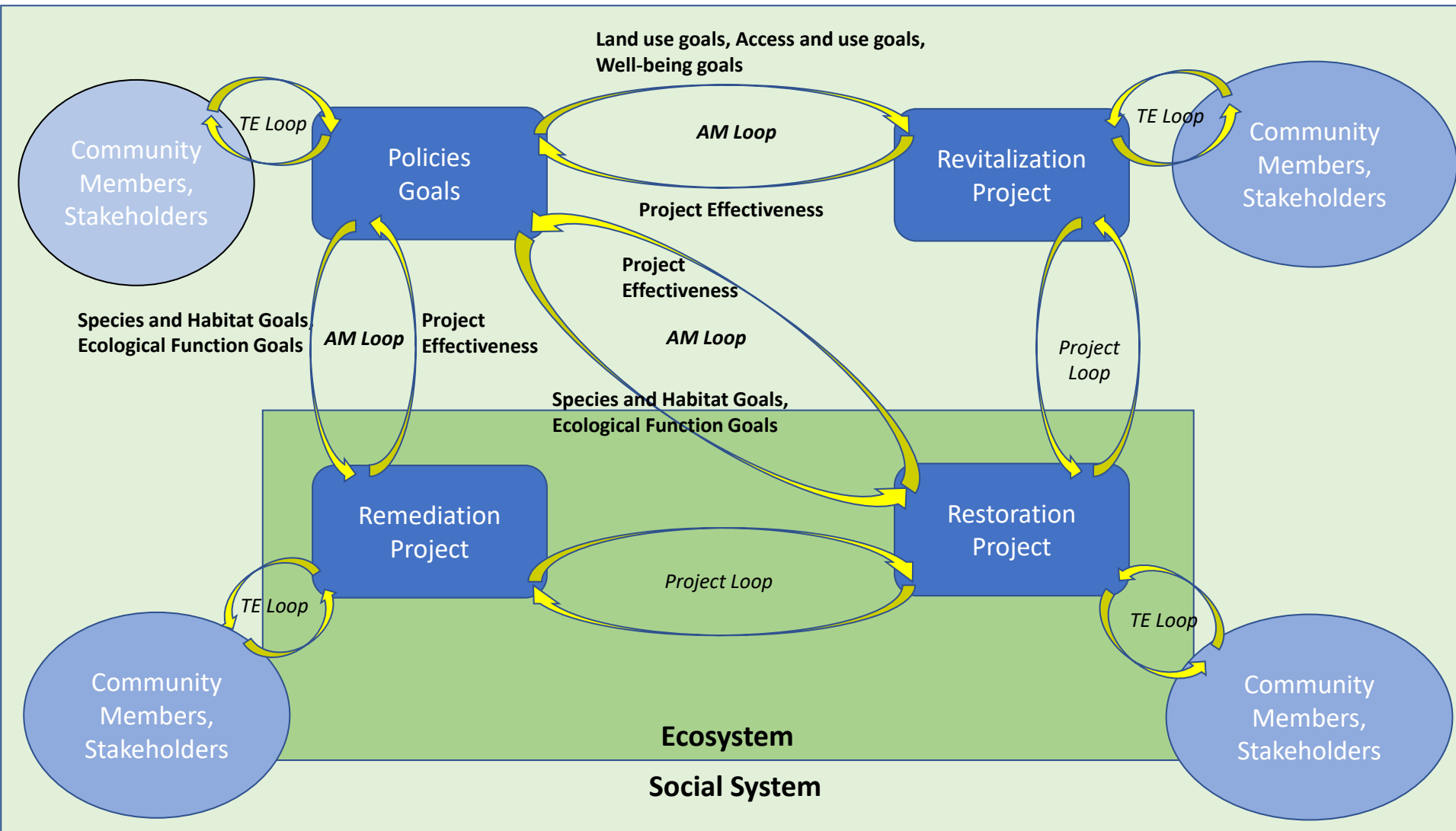


The R2R2R Framework

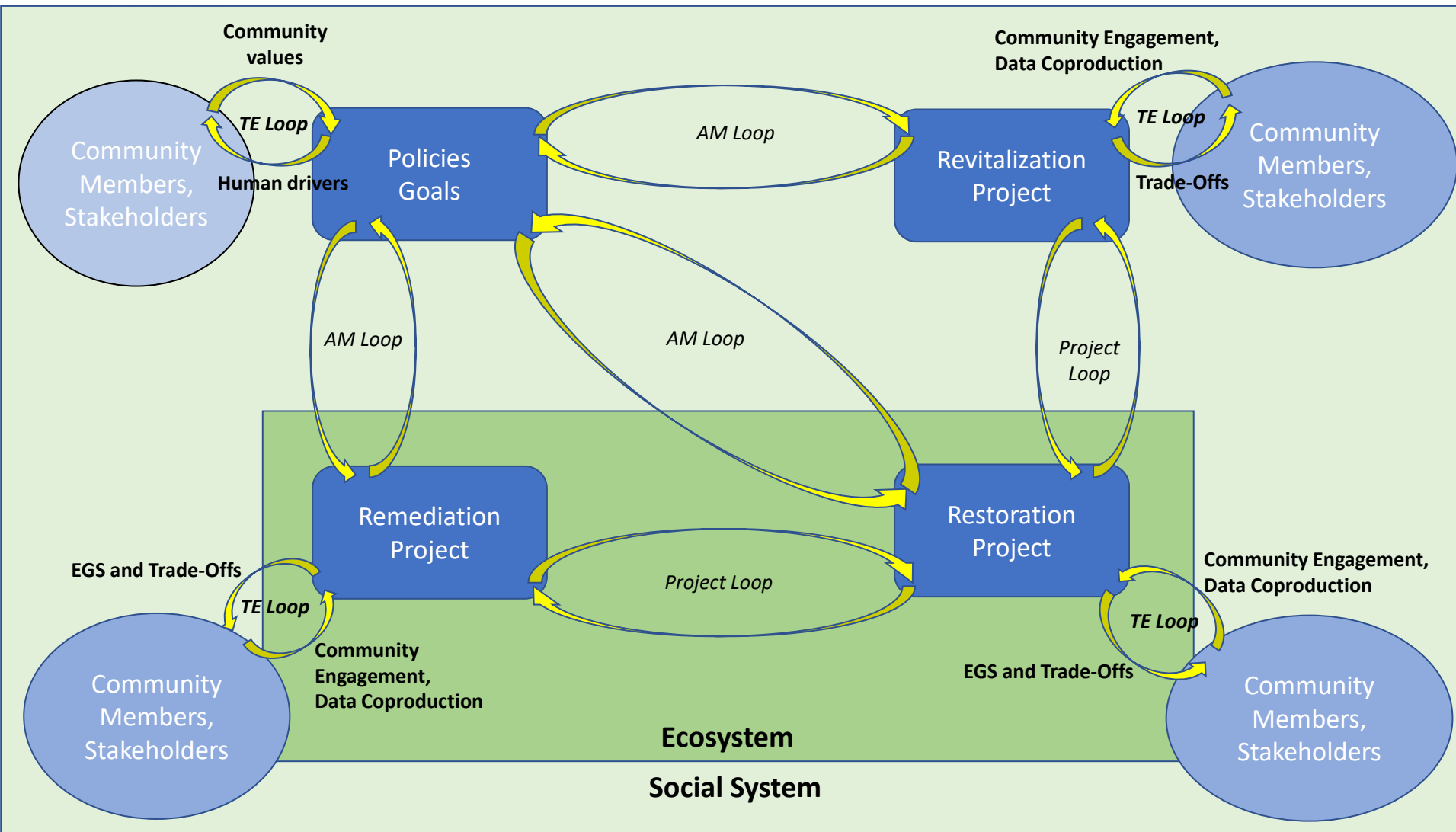




Project Loop



Adaptive Management Loop

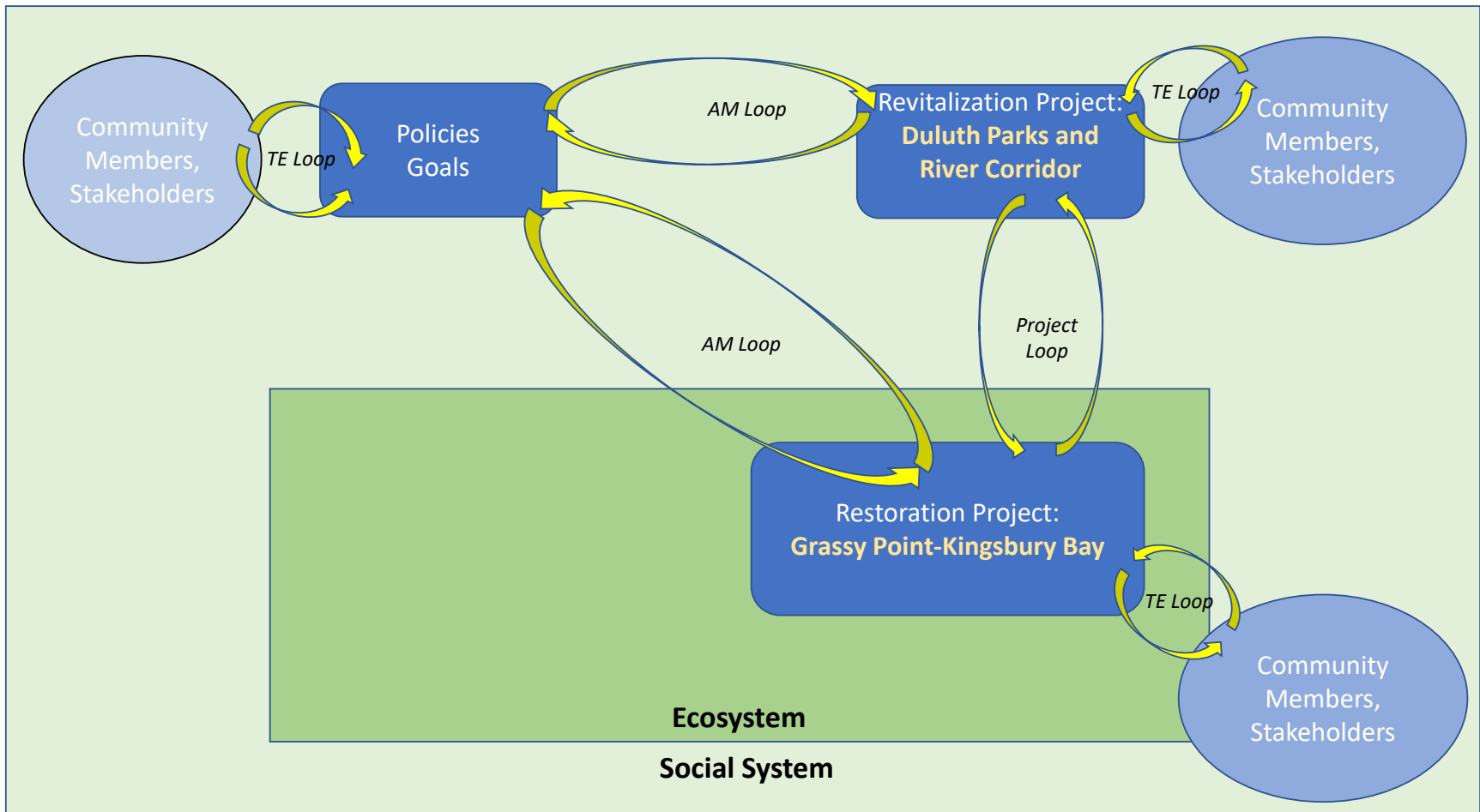


Translational Ecology Loop

Principles of R2R2R

- Ecological integrity and sustainability
- Spatial planning
- Effectiveness metrics
- Remediation, restoration, and revitalization adaptively linked
- Agency of people
- Social system integral to the framework
- Participatory process that integrates different kinds of knowledge

R2R2R in Practice



Health Impact Assessment

- By what means would the Kingsbury Bay-Grassy Point Restoration affect community health and well-being?
- How big are those effects?
- How likely are those effects?



Restoration

Ecosystem Services



Amenities

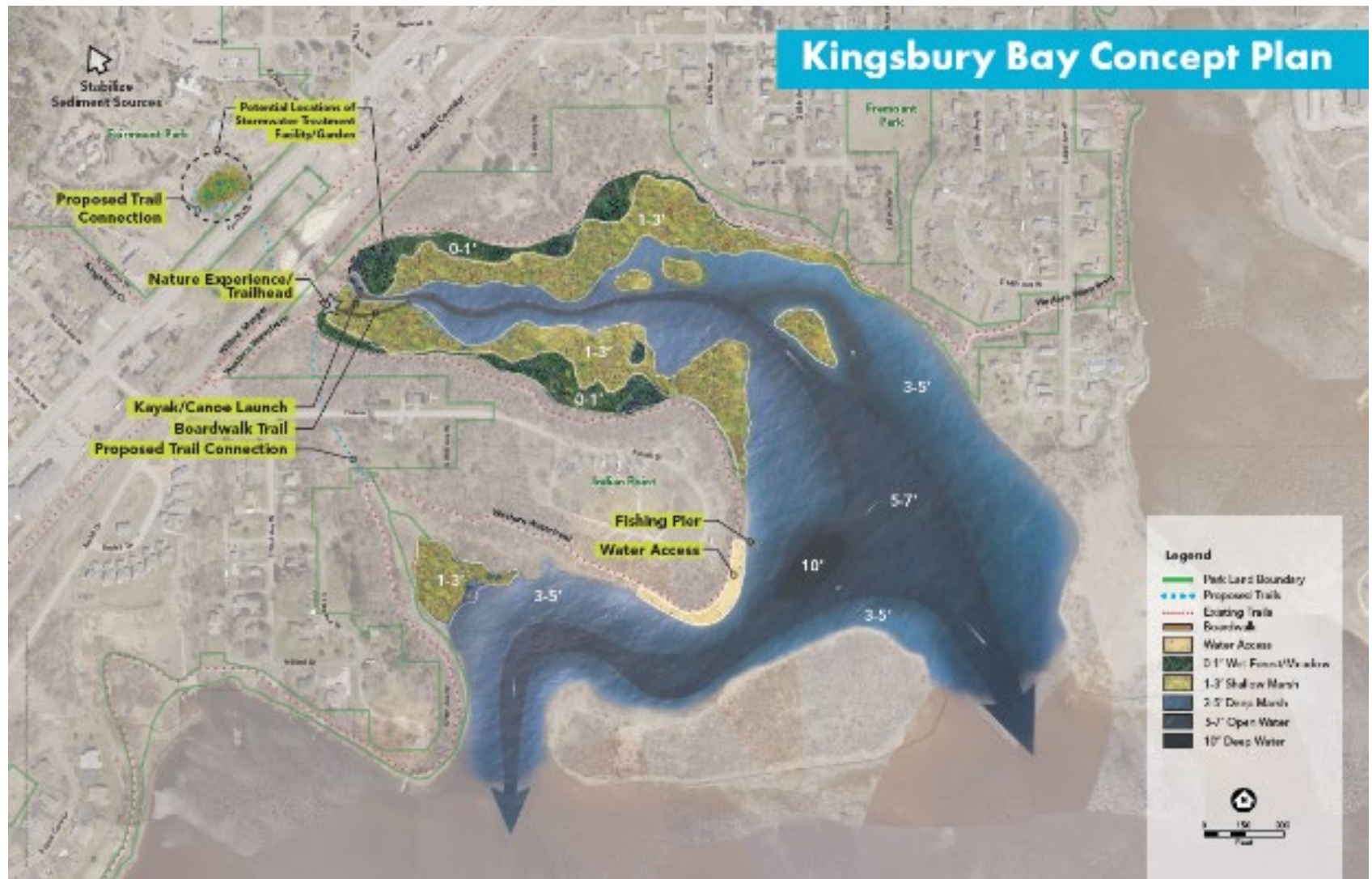


Wellbeing

Grassy Point Habitat Restoration



Kingsbury Bay Habitat Restoration



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

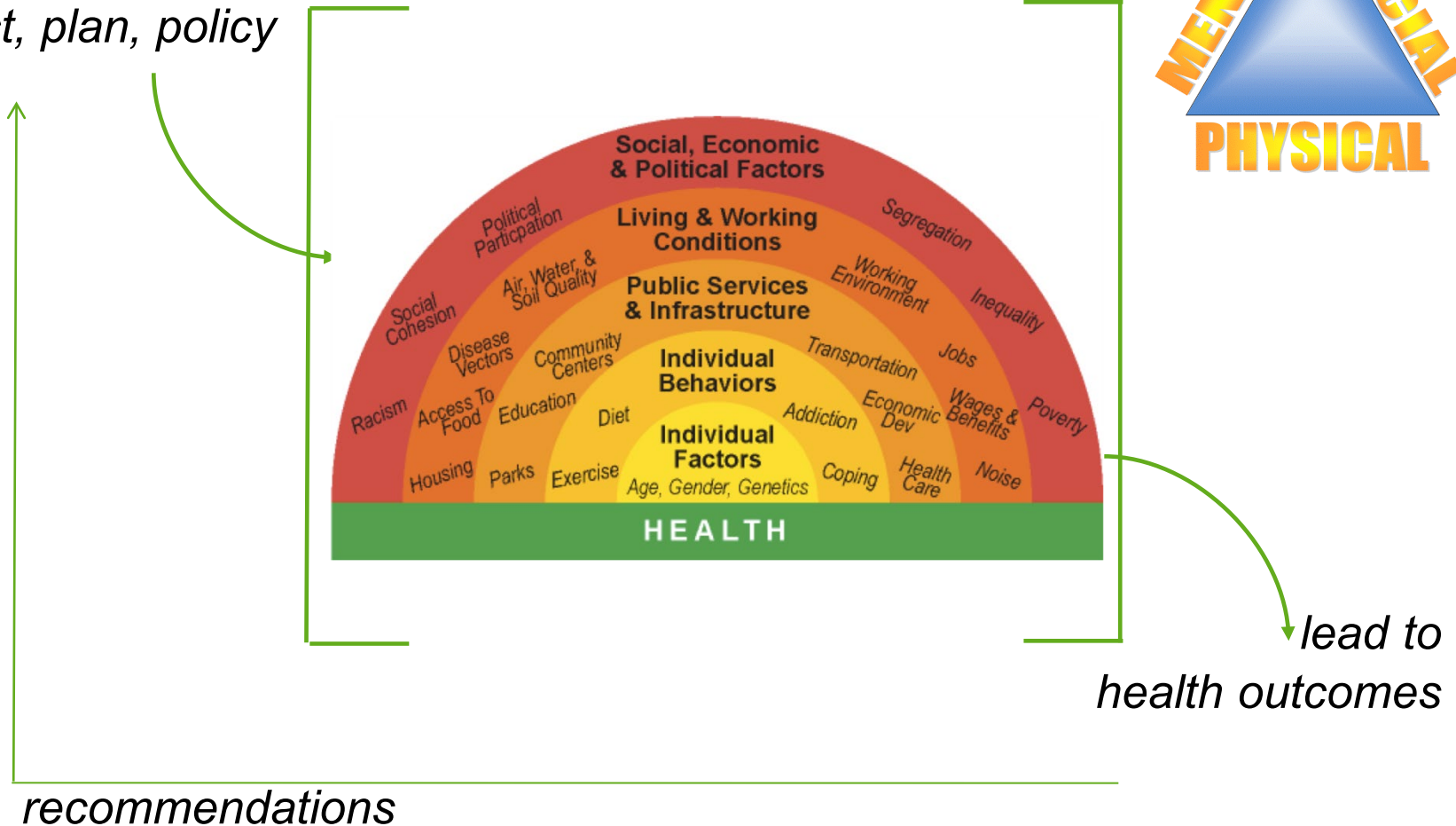
HIAs give decision-makers the information they need to consider health in pending programs, policies, plans, and projects:

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



*How does the proposed
project, plan, policy*

affect



Health determinants = factors that lead to health outcomes

-
- Kingsbury Bay Concept Plan**
- The map illustrates the Kingsbury Bay area with various features and depth zones. Key elements include:
- Shubley Seaford Source**: Located at the top left.
 - Potential Locations of Intermediate Treatment Facility/Garden**: Indicated by a green circle in the upper left.
 - Proposed Trail Connection**: Shown as a dashed line connecting the treatment facility to the bay.
 - Nature Experience/Trailhead**: Located near the center of the bay.
 - Kayak/Canoes Launch Boardwalk Trail Proposed Trail Connection**: Shown as a dashed line connecting the trailhead to the bay.
 - Fishing Pier** and **Water Access**: Located in the lower right of the bay.
 - Depth Zones**: Labeled with numbers (0.1', 1.3', 3.5', 5.7', 10') indicating different water depths.
 - Legend**:
 - Phish Land Boundary**: Solid green line.
 - Proposed Trails**: Dashed green line.
 - Existing Trails**: Dotted green line.
 - Roadwalk**: Solid brown line.
 - Water Access**: Yellow shaded area.
 - 0.1' W. Phish/V. Lake**: Light green shaded area.
 - 1.3' Phish/V. Lake**: Medium green shaded area.
 - 3.5' Deep Marsh**: Dark green shaded area.
 - 5.7' Open Water**: Blue shaded area.
 - 10' Deep Water**: Dark blue shaded area.
 - Scale**: 0 to 100 feet.
 - North Arrow**: Located at the bottom right.





Thank you!!!

HIA Leadership Team

Rosita Clarke	EPA Region 5 Brownfields Program
Florence Fulk	EPA Office of Research and Development
Joel Hoffman	EPA Office of Research and Development
Bill Majewski	Morgan Park Community Club & St. Louis River Alliance
Justicia Rhodus	Pegasus Technical Services, contractor to EPA
Katie Williams	EPA Office of Research and Development

HIA Research Team

Ted Angradi	EPA Office of Research and Development
Dave Bolgrien	EPA Office of Research and Development
Jessy Carlson	EPA Sustainable and Healthy Communities Research Assistant at time of HIA; currently Cook County Local Energy Project
Florence Fulk	EPA Office of Research and Development
Joel Hoffman	EPA Office of Research and Development
Tom Hollenhorst	EPA Office of Research and Development
Alexis Lan	EPA Office of Research and Development
Jonathon Launspach	General Dynamics Information Technology
Glenn Merrick	Lake Superior College, Izaak Walton League
Chelsea Poeppel	University of Wisconsin Center for Public Health
Katie Preiner	EPA Sustainable and Healthy Communities Research Assistant at time of HIA, currently with University of Minnesota Extension
Amy Prues	Pegasus Technical Services, contractor to EPA
Justicia Rhodus	Pegasus Technical Services, contractor to EPA
Samantha Shattuck	Pegasus Technical Services, contractor to EPA
Paul Trygstad	Pegasus Technical Services, contractor to EPA
Katie Williams	EPA Office of Research and Development

Advisory Committee

Ken Gilbertson	University of Minnesota-Duluth (UMD), Department of Outdoor Education
Richard Gitar	Fond du Lac Band of Lake Superior Chippewa
John Lindgren	Minnesota Department of Natural Resources
Lisa Luokkala	City of Duluth Parks Department
Dwight Morrison	Wheels on Trails, Friends of Western Parks and Trails
Will Munger	Business Owner, Friends of Western Parks and Trails
Carol Reschke	UMD Natural Resources Research Institute
Melissa Sjolund	Minnesota Department of Natural Resources
Heidi Timm-Bijold	City of Duluth
Salaam Witherspoon	Health in All Policies Coalition (HiAP)

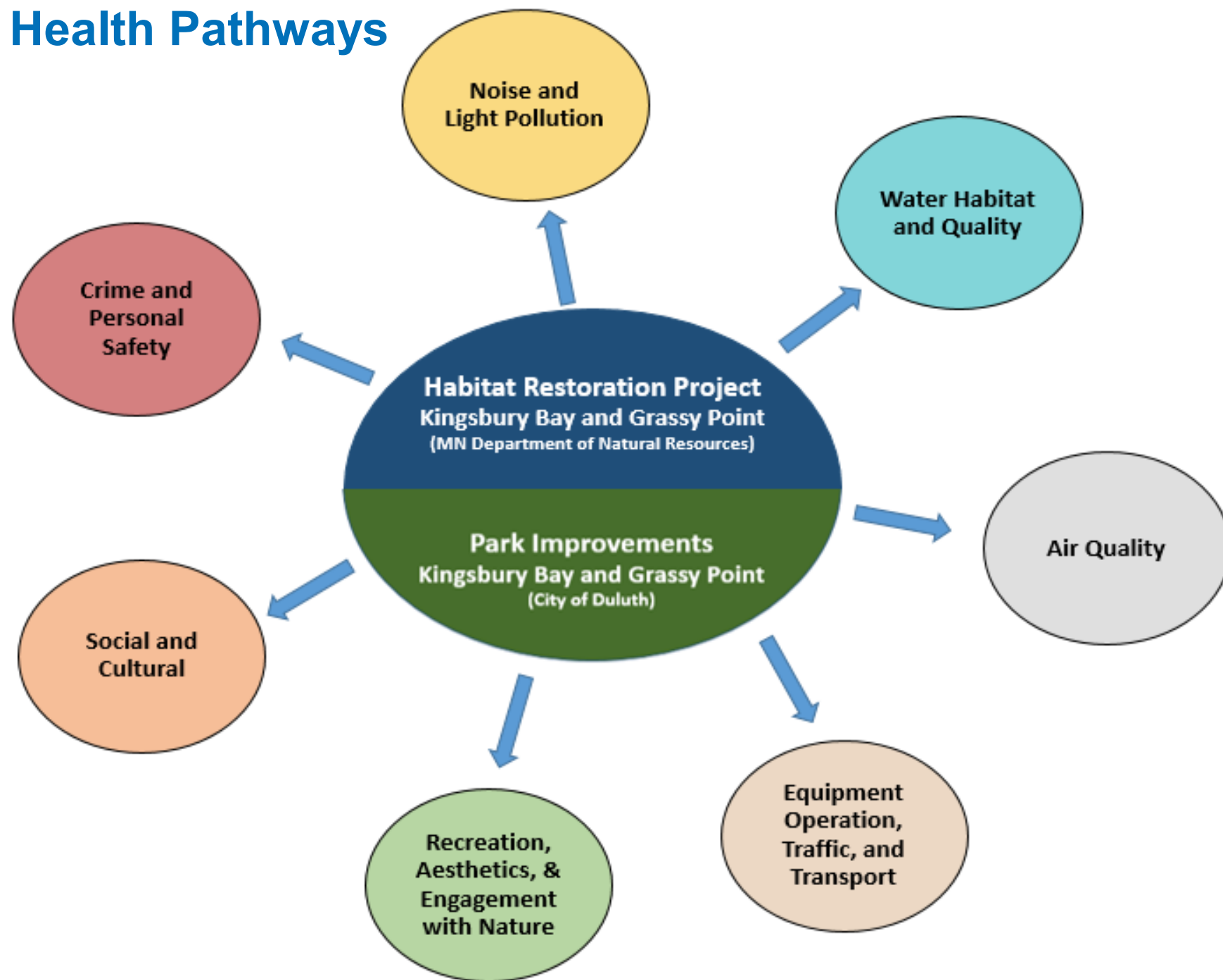
Community Engagement

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

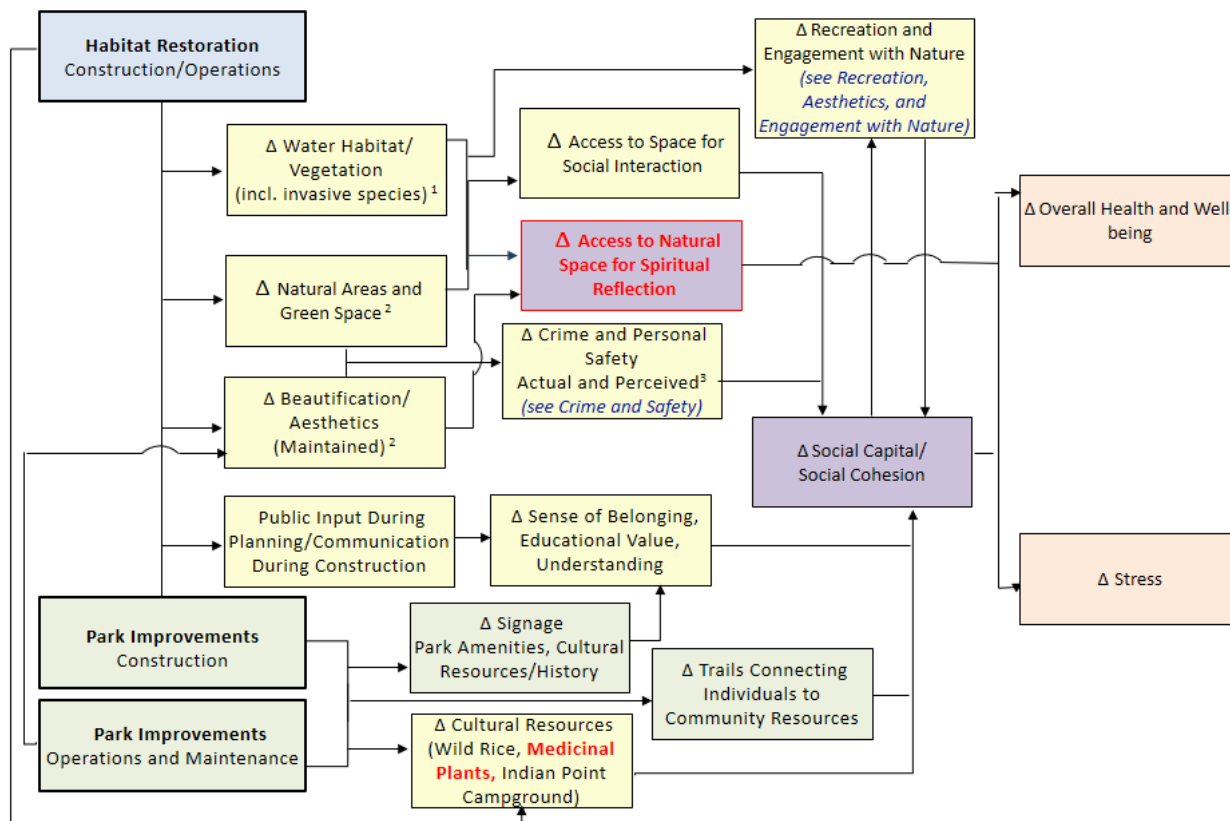


Health Pathways



Health Pathway

Social and Cultural



What's the connection to health?

Parks and green spaces provide space for socialization, which builds social capital and cohesion (the formation of social bonds and connections), spiritual reflection, and cultural resource use. The ability of the public to enjoy parks and green spaces in these capacities has been shown to improve health and well-being and reduce stress.

The opportunity for public input during the planning of these spaces can also build social capital and lead to improved community health.

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

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

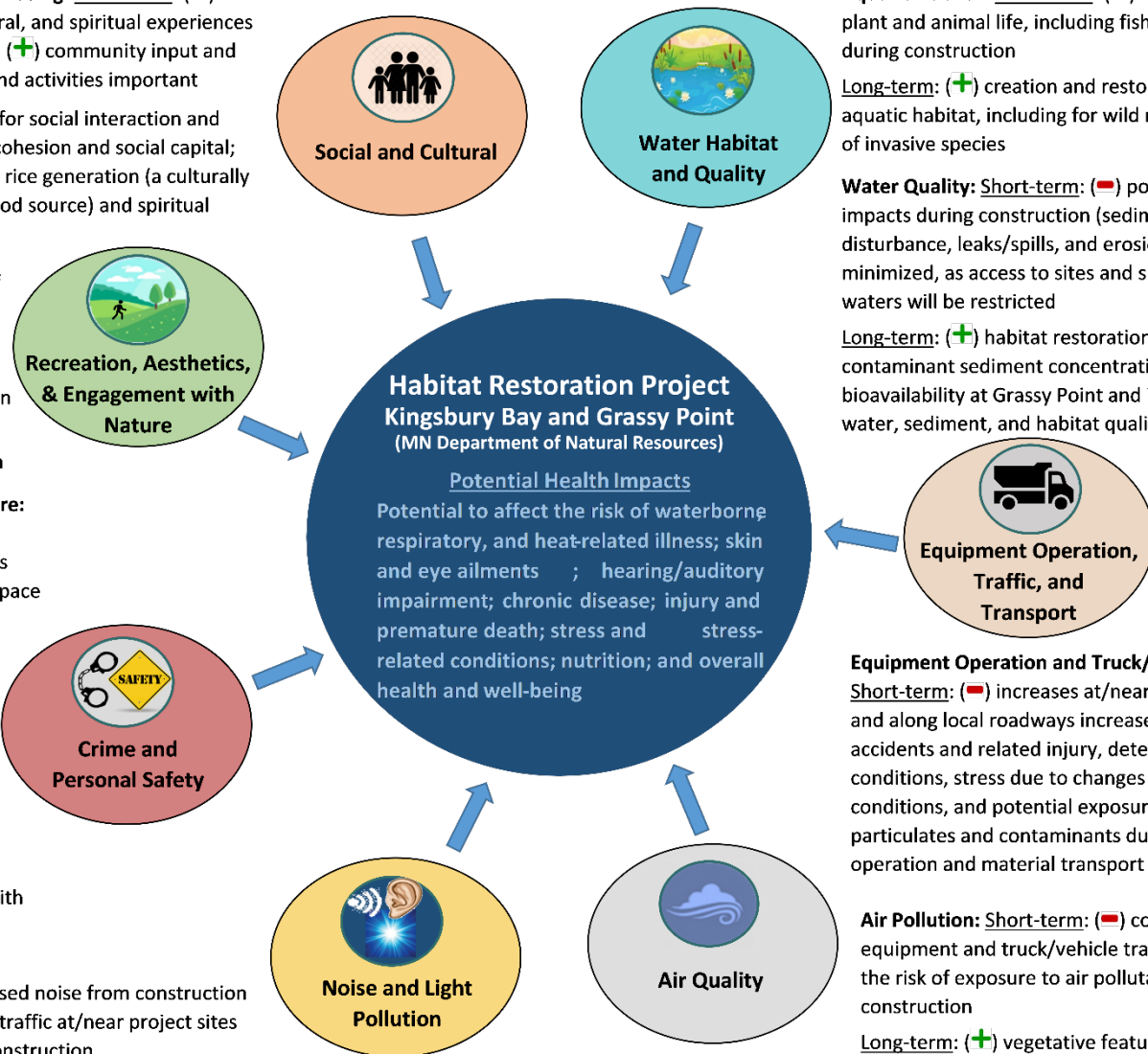
Crime: Long-term: (+) beautified natural areas deter crime

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



RECREATION, AESTHETICS, AND ENGAGEMENT WITH NATURE

Major Findings

Well-maintained spaces with **diverse recreational options** will enhance opportunities for recreation and overall health.

Both Grassy Point and Indian Point Campground, like most parks in the HIA study area, have maintenance challenges and more limited opportunities for recreation (i.e., Indian Point Campground is a special use area and not open for public recreation).

Recreational fishing improves nutrition and overall health.

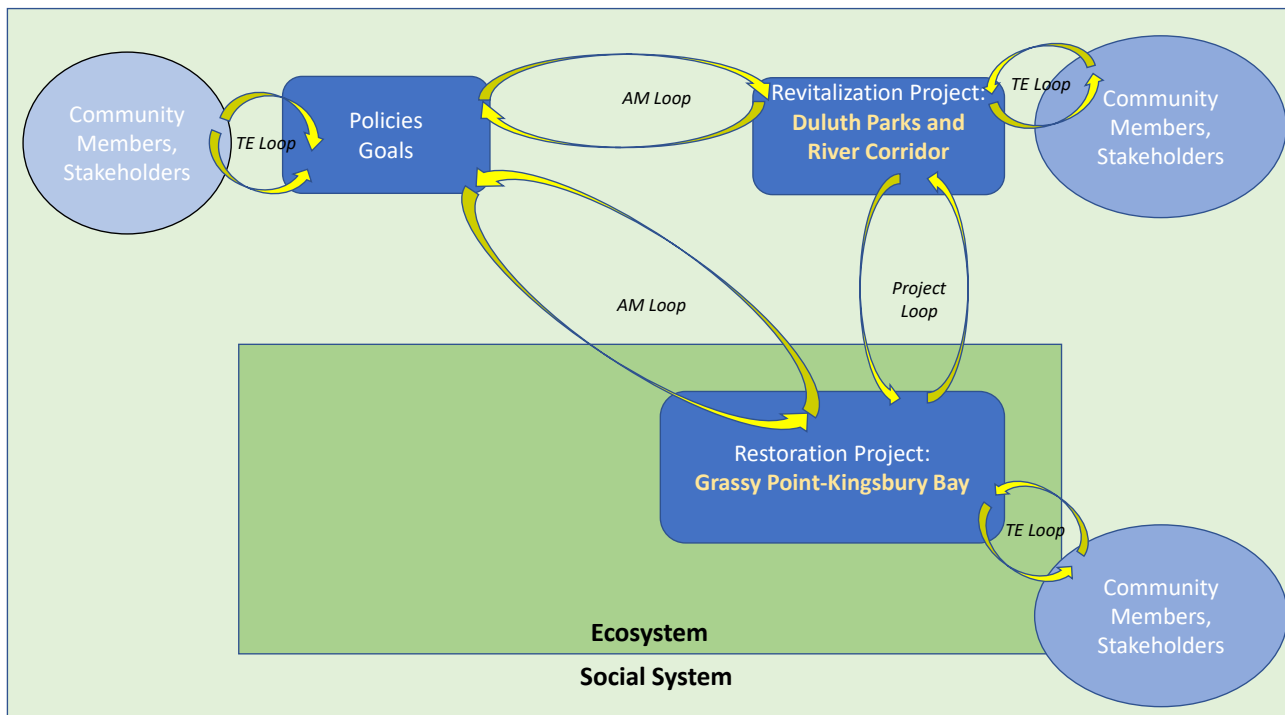
Different populations fish for different reasons: subsistence, recreation, and as a social activity. *However, there are currently limited opportunities for shore and boat-based fishing in the study area.*

Associated Recommendations

- Offer diverse opportunities for recreation at both sites, including publically-accessible gathering spaces, **fishing piers**, **access to the water for water-based recreation**, and trails, taking into account maintenance requirements of installed features
- **Preserve and enhance fishing opportunities, with more formal locations (e.g., piers) and social gathering opportunities adjacent to those locations. The creation of Big Island at Grassy Point would provide an opportunity for a fishing pier and access to a fishery with more biodiversity; a bridge would be needed to access Big Island**
- Create a higher upland area on Big Island to form a more sheltered bay, providing safer harbor for kayaks and canoes
- All swimming areas should include measures to enhance safety and minimize potential for user conflict. Measures should include signage about the availability of lifeguards and current water quality status. Buoys should separate swimming and boating areas
- In advance of construction, clearly communicate to recreational users through multiple media sources disruptions to the Western Waterfront Trail and walkability and accessibility to both project sites
- Provide additional parking to increase access to and utilization of the restored Kingsbury Bay and Grassy Point sites
- Perform wetland restoration at the mouth of Kingsbury Creek to preserve the cold water habitat for trout and provide deeper water for kayak and canoe access
- Create opportunities for social gatherings in close proximity to the additional planned **fishing piers**, especially at Grassy Point, similar to improvements at

HIA in the R2R2R Framework? Yes!

- TE Loop: Community Engagement, Data Co-Production
- AM Loop: Metrics, Future Monitoring and Assessment
- Project Loop: Revitalization (Health, Wellbeing) a function of Restoration
- Adhered to Principles of R2R2R

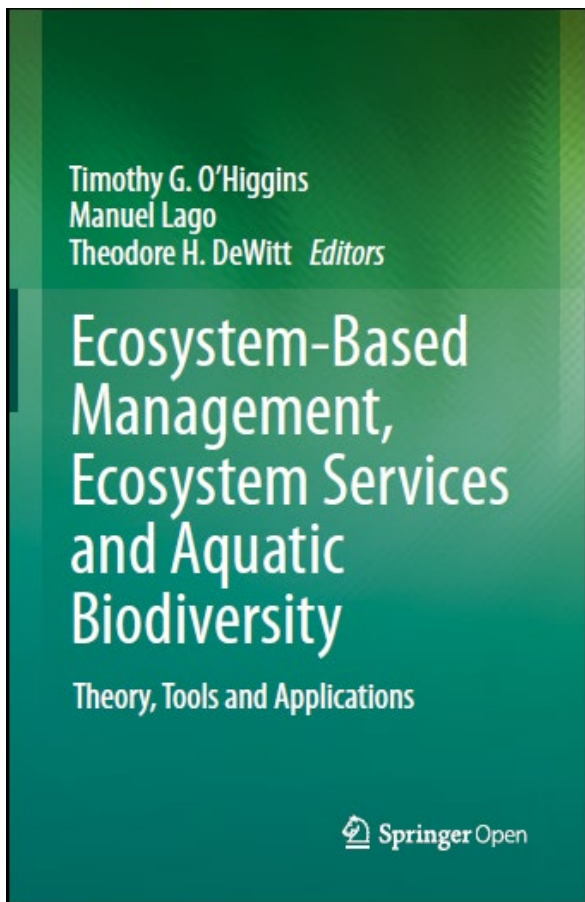


Resilience

- Foundation: Built around two-way communication, building trust, and equity
- Process:
 - Stakeholders and community were involved in creating the recommendations
 - Research was responsive to the project design
- Impact: MNDNR has included the recommendations – projected to improve eco and health outcomes



Thank you!



Free book!!

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

K. C. Williams · J. C. Hoffman (✉)
Great Lakes Toxicology and Ecology Division, United States Environmental Protection
Agency, Office of Research and Development, Center for Computational Toxicology and
Exposure, Duluth, MN, USA
e-mail: hoffman.joel@epa.gov

© The Author(s) 2020
T. G. O'Higgins et al. (eds.), *Ecosystem-Based Management, Ecosystem Services
and Aquatic Biodiversity*, https://doi.org/10.1007/978-3-030-45843-0_27

543

HIA Report

Coming Soon!