

Great Lakes Rivermouths: A Class All Their Own

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Introduction

Great Lakes Rivermouths are centers of economic vitality and environmental diversity. The dynamic nature of these systems leads to **rich natural communities and favorable conditions for human use**. Prolonged, intense human use has led to substantial pressures and alterations to these ecosystems often **diminishing or degrading** their ecological functions and associated **ecosystem services**.

Despite their **ecological and economic importance**, rivermouths are rarely the focus of system-scale research or management efforts.

Enter the Great Lakes Rivermouth Collaboratory:

Initiated in 2010, the Collaboratory brings together scientists and managers from across disciplines, institutions, and lake basins in an effort to collectively:

- 1) highlight the importance of these important ecosystems;
- 2) synthesize current scientific understanding of their structure and function;
- 3) identify key research needs
- 4) provide guidance to natural resource managers and policy-makers for effective and sustainable ecosystem management.



Aesthetics



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Current research programs fall short of addressing rivermouths as a unique set

Characteristics

Great Lakes rivermouth ecosystems occur at the interface between riverine and lacustrine ecosystems. All rivermouths are similarly influenced by inputs from the river and the adjacent Great Lake, and yet distinct due to the local hydrogeography. Rivermouth ecosystems can be broken into **three geographic features**:

- 1. Lower River Valley**
 - Dominated by riverine processes
 - Widespread and dynamic depositional patterns
 - Complex channel morphology
 - Extensive riparian and floodplain wetlands
- 2. Receiving Basin or Hydrologic Retention Zone**
 - Characterized by transition from riverine to lacustrine processes.
 - Can vary from distinct and enclosed to semi-enclosed (Figure A) to absent and contiguous with the nearshore (Figure B).
- 3. Plume-influenced Great Lakes Nearshore**
 - Dominated by lacustrine processes.
 - Nutrient-rich and sediment-rich water from the rivermouth interacts with nearshore water movement and sedimentation processes.
 - Plume direction, cohesiveness, and size are highly variable.

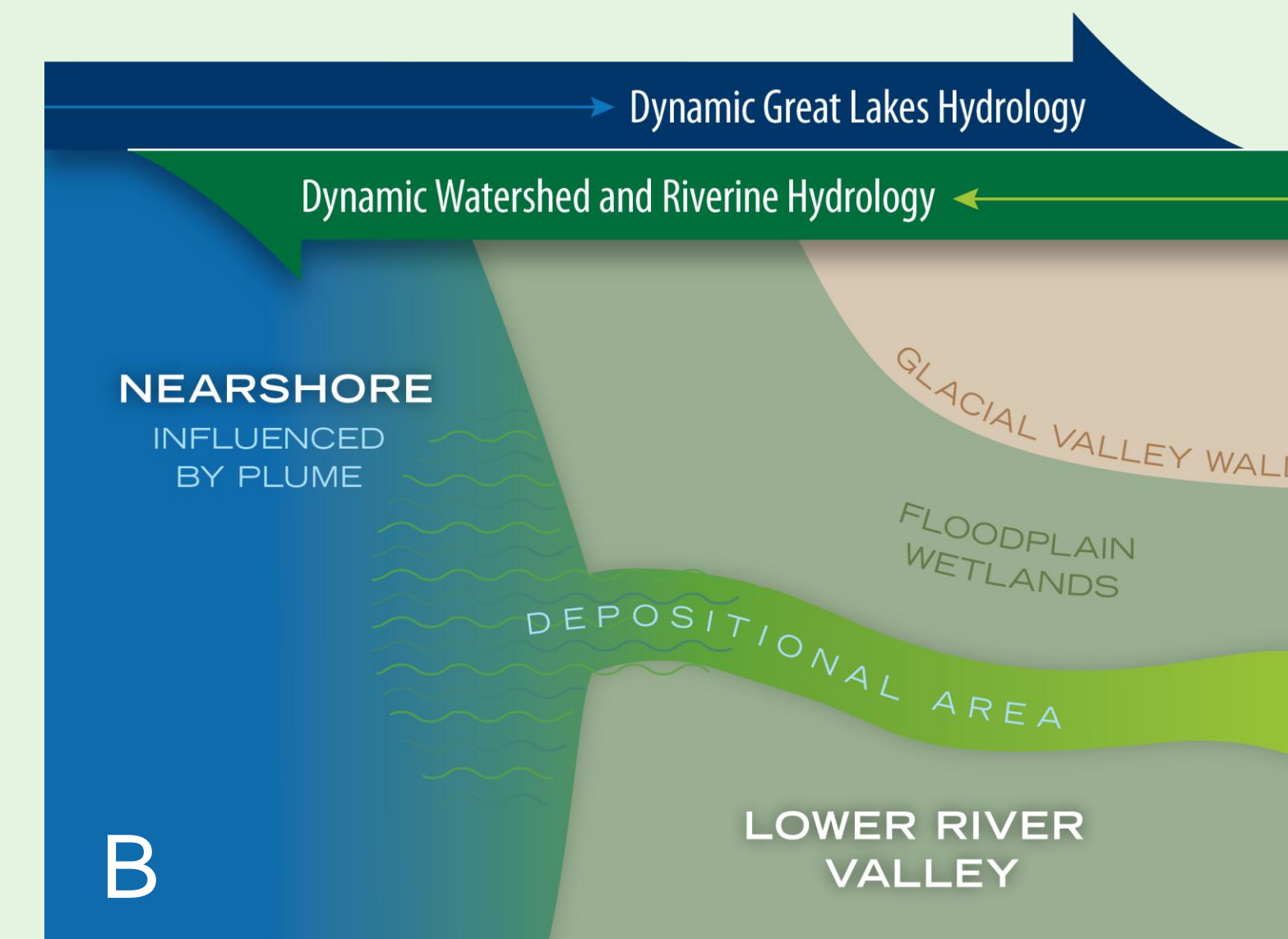
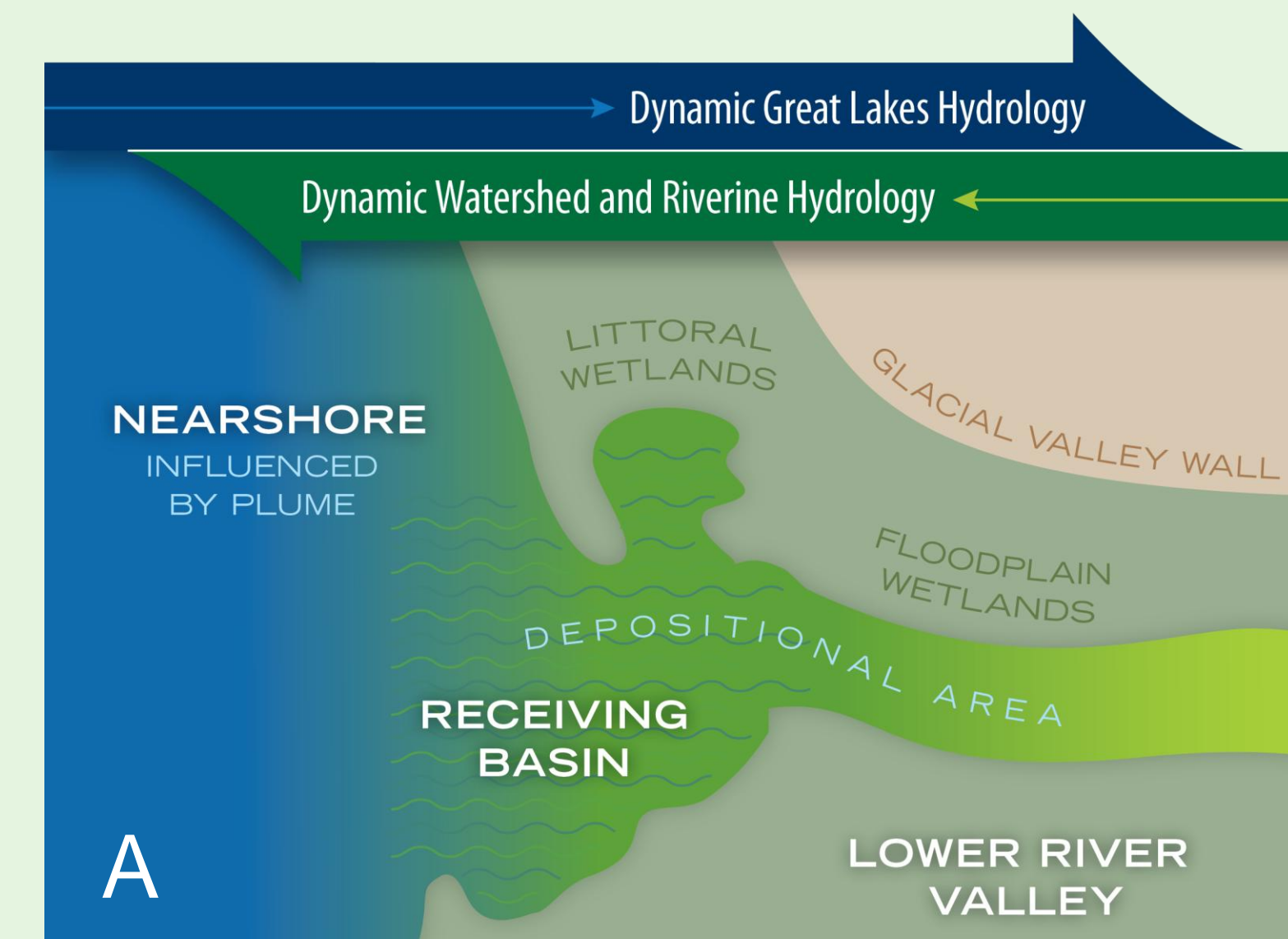


Figure A & B: Conceptual diagrams of two Great Lakes rivermouth ecosystems with contrasting geomorphology. While each system is influenced by riverine and lacustrine inputs, local geography sets them apart from one another and influences the location of the mixing zone, depositional area, and the plume-influenced nearshore area.

Ecosystem Services, Conservation & Management

Rivermouths, as a **class**, have long supported social and economic networks that surround the Great Lakes by providing:

- **Provisioning Services:** *Products obtained from ecosystems (water supply)*
- **Regulating Services:** *Benefits obtained from maintaining ecosystem processes (Harbor)*
- **Cultural Services:** *Nonmaterial benefits (Aesthetics)*
- **Supporting Services:** *Services necessary for the production of all other ecosystem services (Primary production)*

The ability of the ecosystem to **deliver** these services has been **fundamentally altered by human activities**.

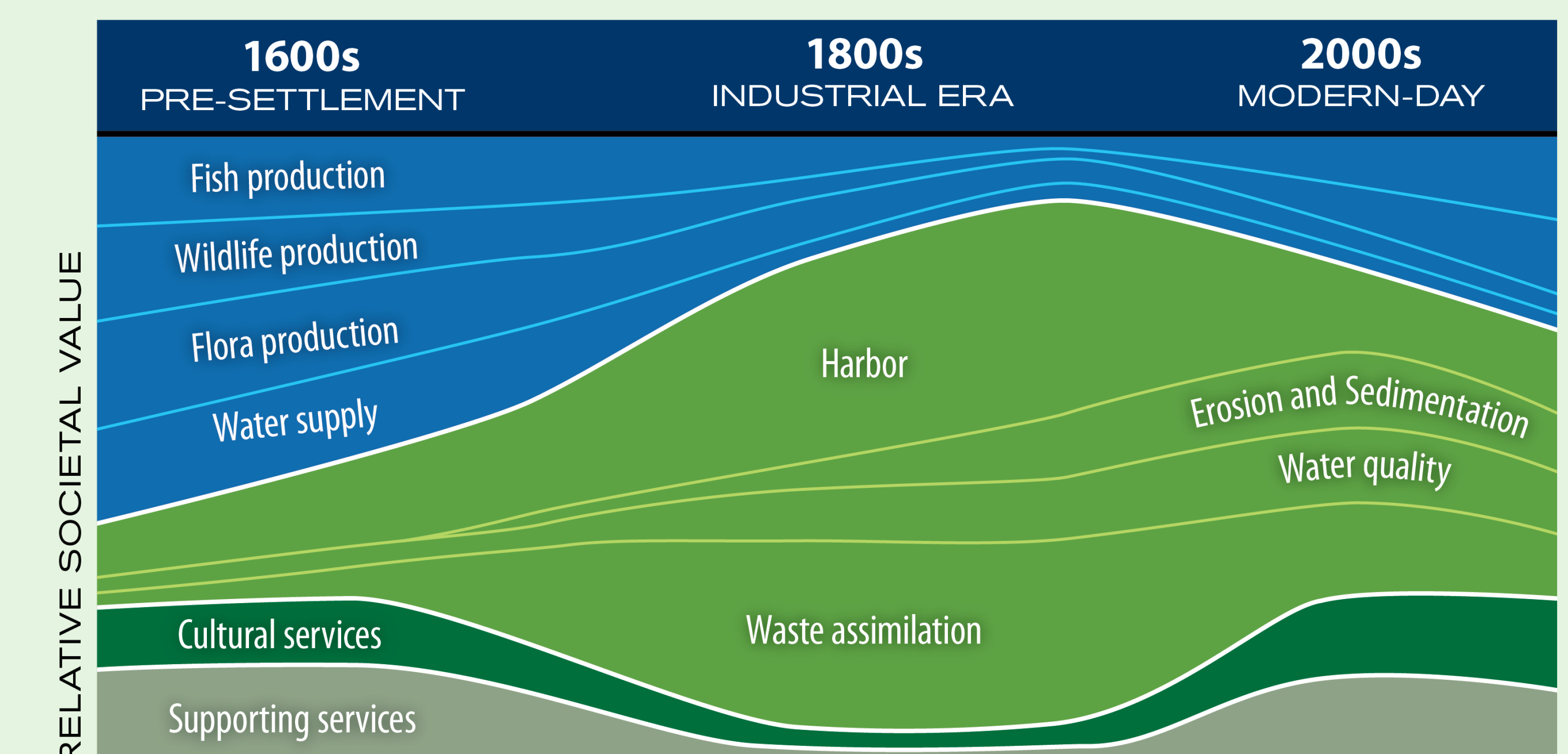


Figure C: Relative societal value of ecosystem services has changed through time, often resulting in the degradation of other services.

Successful rivermouth conservation and management will require a more holistic approach that explicitly recognizes all ecosystem services, not just those that are relatively easy to value.

Connections to and influences on the Great Lakes Nearshore

- Biogeochemical processing
- Influence on nearshore algal blooms
- Fish production
- Great Lakes food webs inputs

Linking restoration to ecosystem services

- Evaluation of ecosystem services
- Decision making framework to help prioritize actions

Rivermouths as a set, the range and variation of ecosystem properties:

- Hydrodynamics
- Nutrient transformation and export
- Impacts of
 - habitat manipulations
 - climate change
 - upstream restrictions
 - watershed disturbance

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<http://www.glc.org/habitat/Rivermouth-Collaboratory.html>

Research needs include: