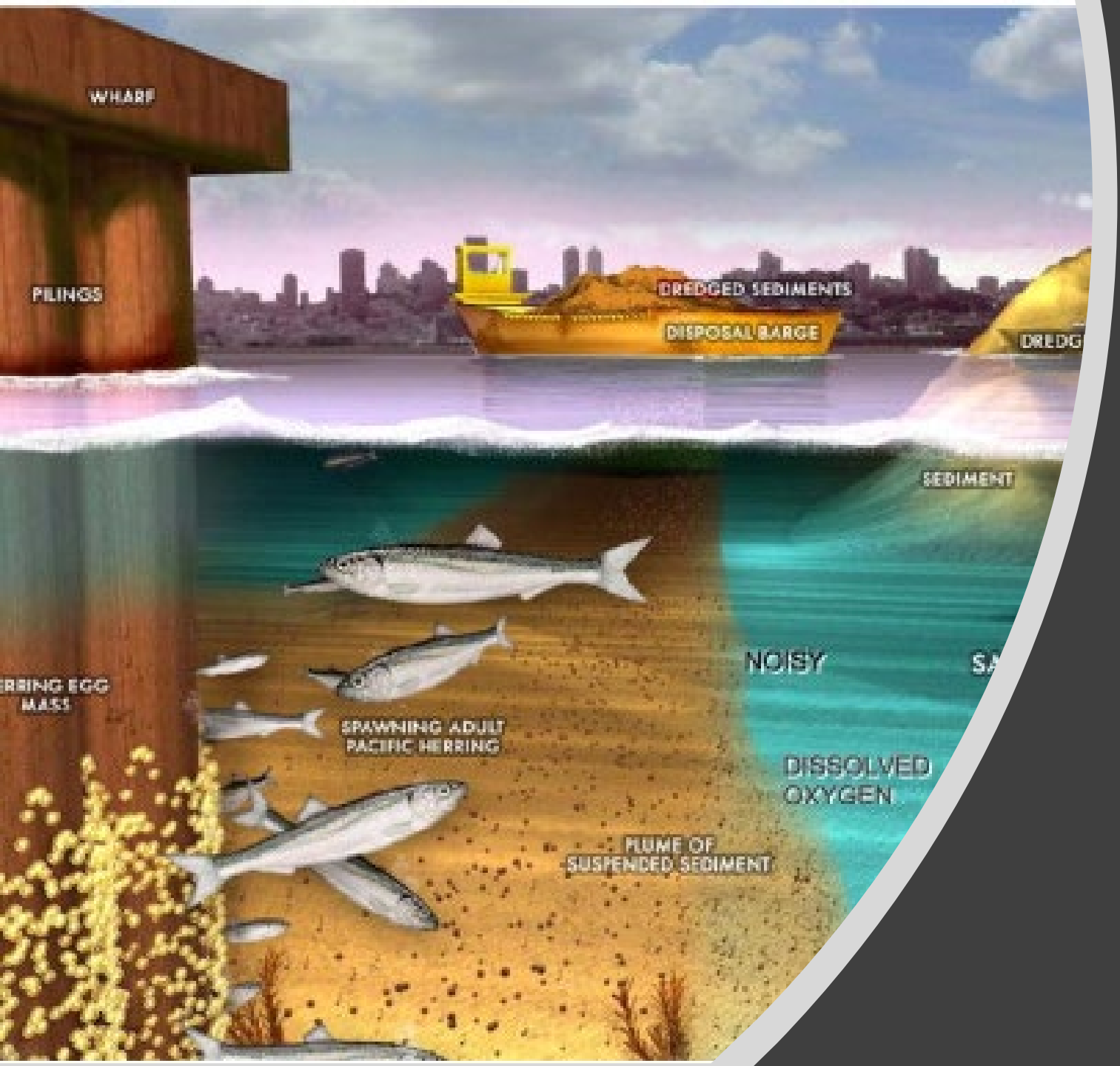


Environmental Windows: Recent Work and Research Needs

Presentation and Group Discussion

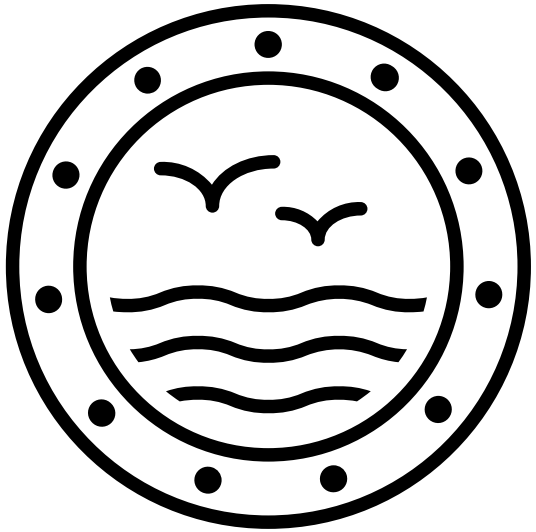
HTAC Dredging Subcommittee Meeting

November 30, 2022

Time periods during which dredging may be performed to reduce the environmental risk of these activities.

Minimize effects of resuspended sediments on fish, benthos, and shellfish

Impacts on sensitive nearshore resources and habitat



Reduce entrainment of organisms

Reduce seasonal impacts on adult and juvenile fish

Minimize disruption to shorebirds during nesting periods

Minnesota Sea Grant's Work on Environmental Windows

Why Minnesota Sea Grant?

Environmental Windows Scoping Meeting

- June 30, 2018
- What would we do today if we sought to define environmental windows using best available science and technology?

Minnesota Sea Grant's Biennial Request for Proposals

2020

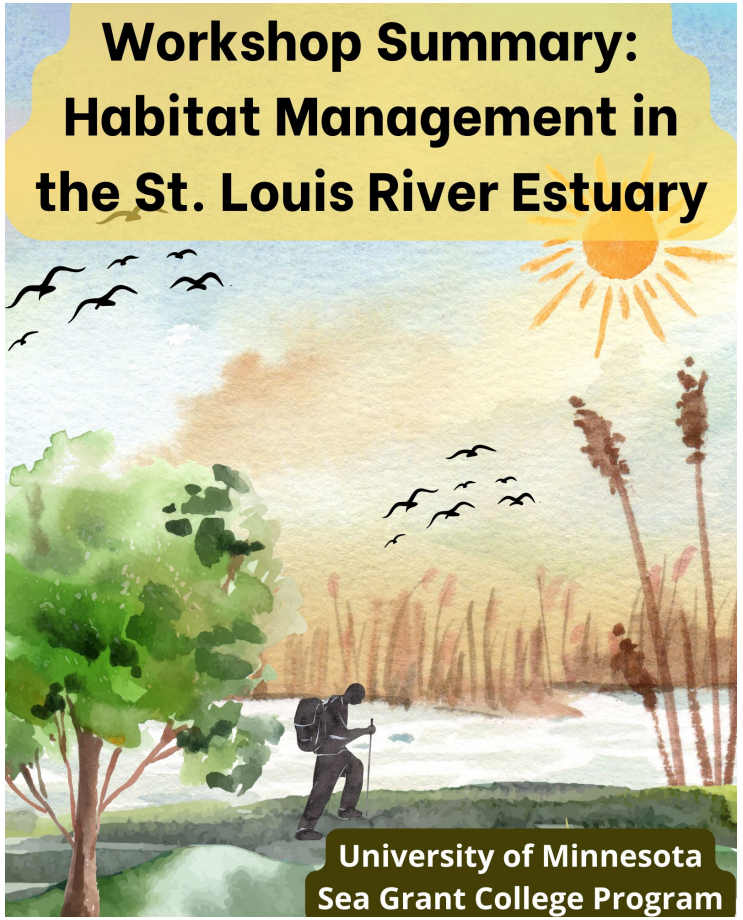
- Dredge material disposal and reuse issues. What are the spatiotemporal windows for minimizing dredging effects on fisheries? What are the sediment sources that cause harbor dredging? How can dredging in the harbor be reduced?

2022

- Draw together all existing available data on fish habitat use, habitat, spawning and movement to summarize the locations and times most critical to sustaining healthy fish stocks in the Duluth-Superior harbor and the estuary. This knowledge is meant to inform when and where we should and should not be dredging for shipping (the idea of "windows" in time and space for dredging that minimize damage to the fishery). Identify data and knowledge gaps.

Habitat Management in the St. Louis River Estuary (SLRE) Workshop

- April 14, 2022
- Objectives:
  - Identify research needs for birds, wild rice, and fishes
  - Develop new tools for data visualization in the SLRE
  - Define and prioritize future research needs

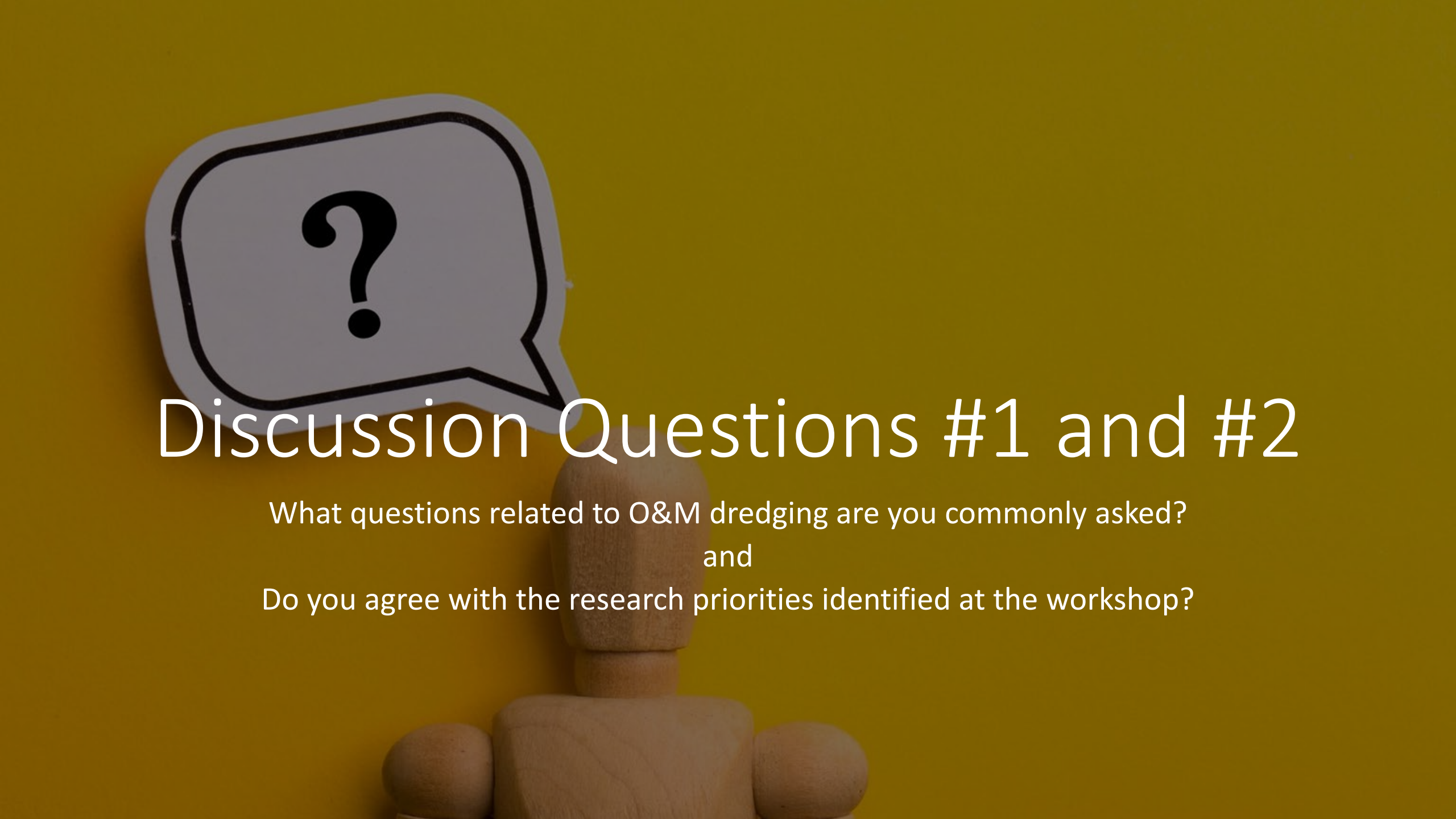


Workshop Framing

- Common questions related to operation and maintenance dredging:
  - When is the best time of the year to conduct dredging?
  - When and where should dredging work be avoided?
  - How can dredge material be used beneficially?
  - Is the dredge material used in habitat restoration projects contaminated?

Research Priorities Related to Environmental Windows

- How do fish use the federal navigation channel in the Port of Duluth-Superior?
- How does in-water work (e.g., dredging, construction) impact fish populations and fish movement within the SLRE?
- What habitat types within the SLRE are important for juvenile fish?



Discussion Questions #1 and #2

What questions related to O&M dredging are you commonly asked?

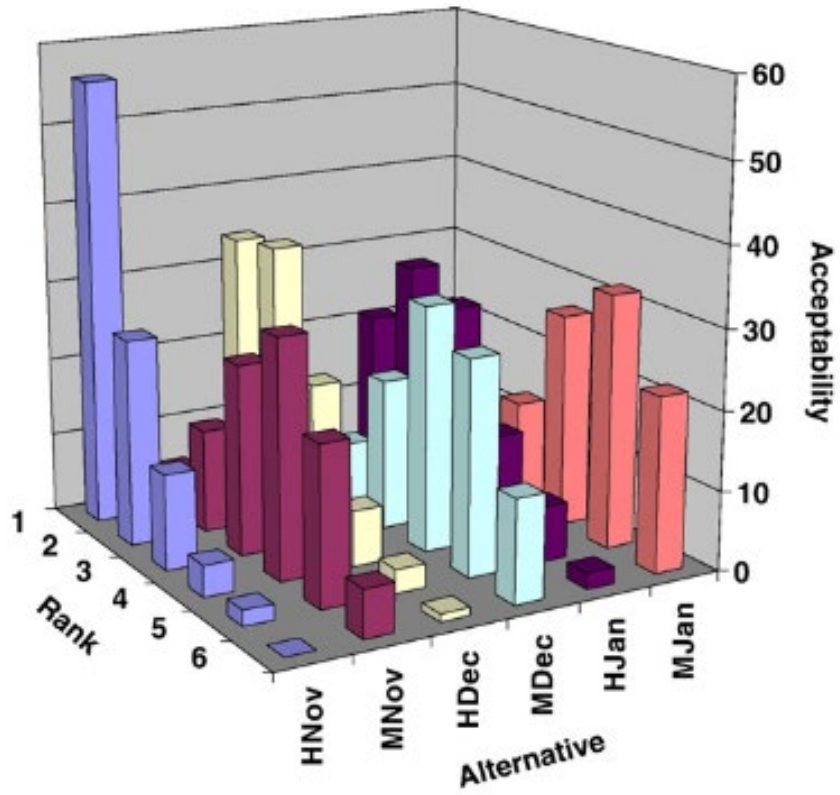
and

Do you agree with the research priorities identified at the workshop?

Work that Others are Doing on Environmental Windows

Research related to decision-making process

- Multicriteria decision analysis + risk assessment (Suedel et al., 2008)
  - Screening step
  - Ecological risk assessment



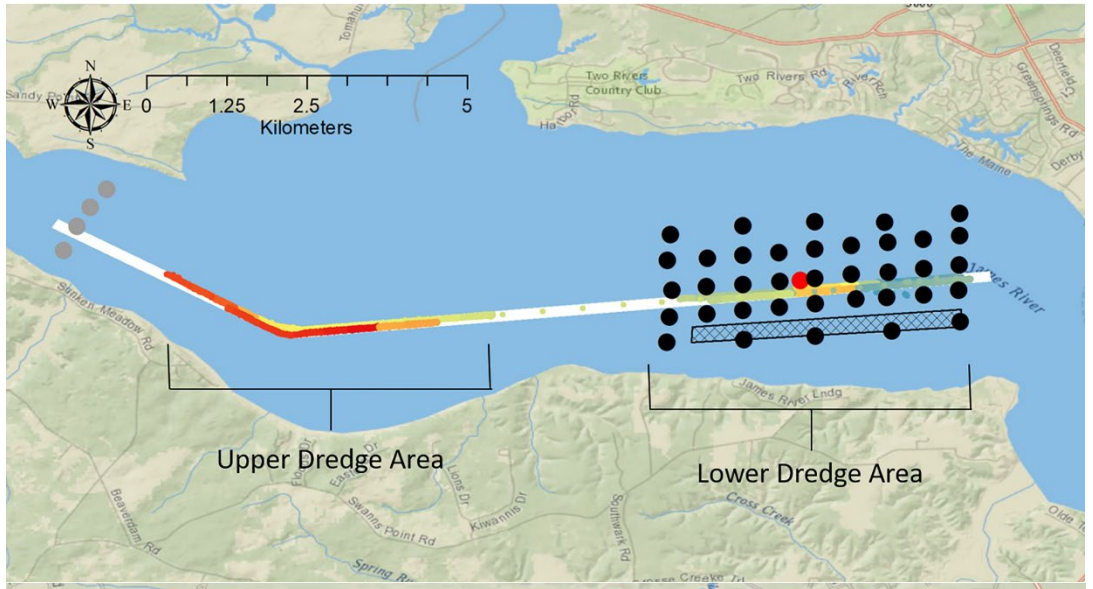
Research assessing impacts

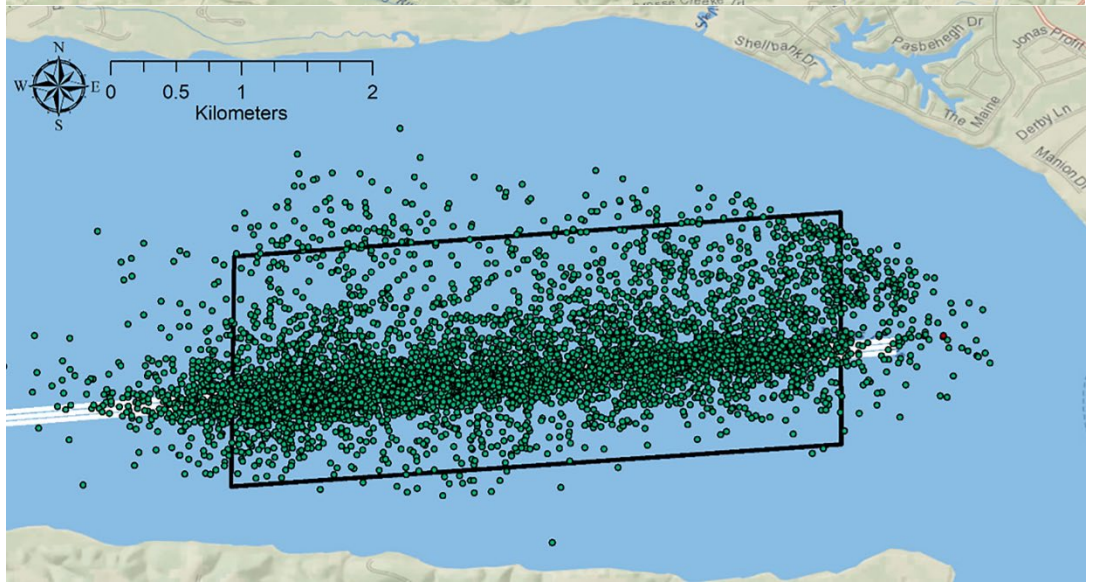
- Walleye exposure to Maumee Bay sediment (83% silt)
  - Hatch rate reduced slightly in 500 mg/L TSS (Suedel et al., 2012)
  - No impact to Walleye fingerling survival (Suedel et al., 2014)
- Smallmouth Bass exposure to Grand Haven Harbor (20% silt, 74% sand) and Fairport Harbor (60% silt, 20% sand) sediments
  - Greater impact from coarse sediment (Suedel et al., 2017)

Fish Larvae and Egg Exposure System

Innovative ways to measure impacts

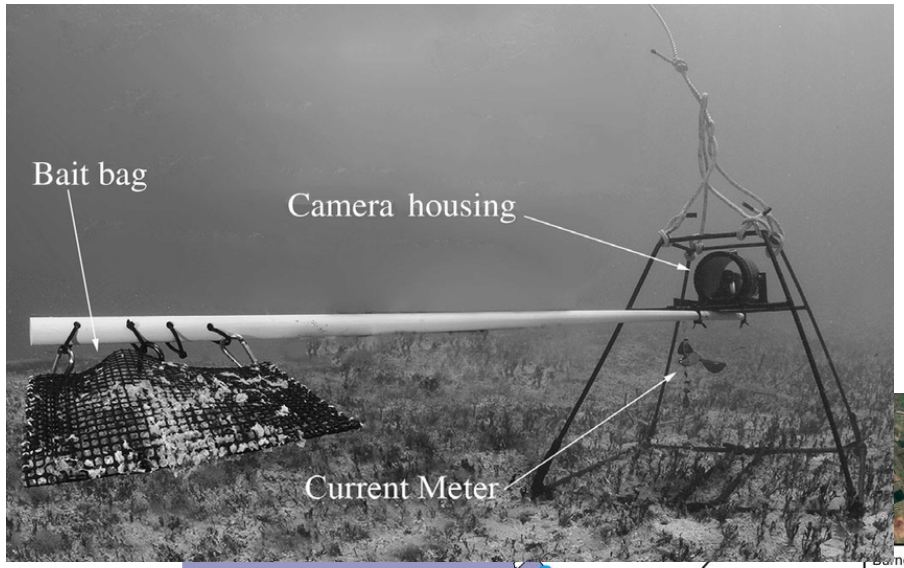
- Vemco Positioning System (Balazik et al., 2020)
  - Dredge did not limit adult Atlantic Sturgeon movement or cause mortalities
  - Atlantic Sturgeon swam past dredge operations 217 times
  - 41% passed the active dredge more than one time

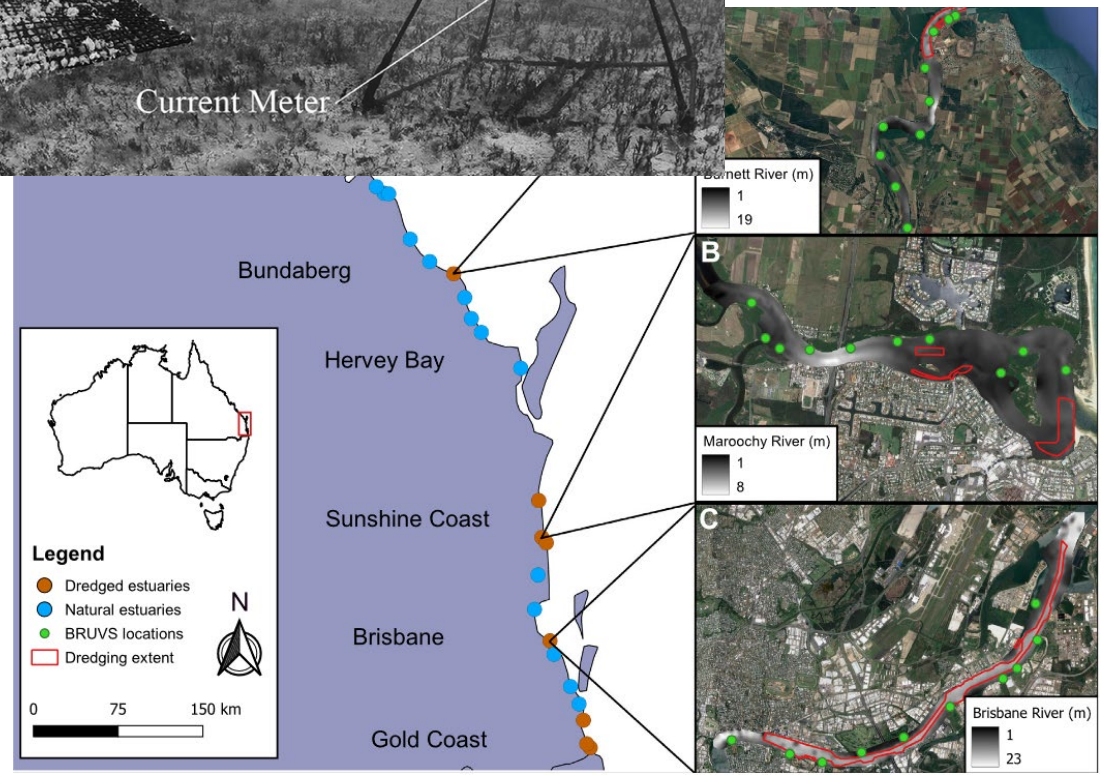




More innovative ways to measure impacts

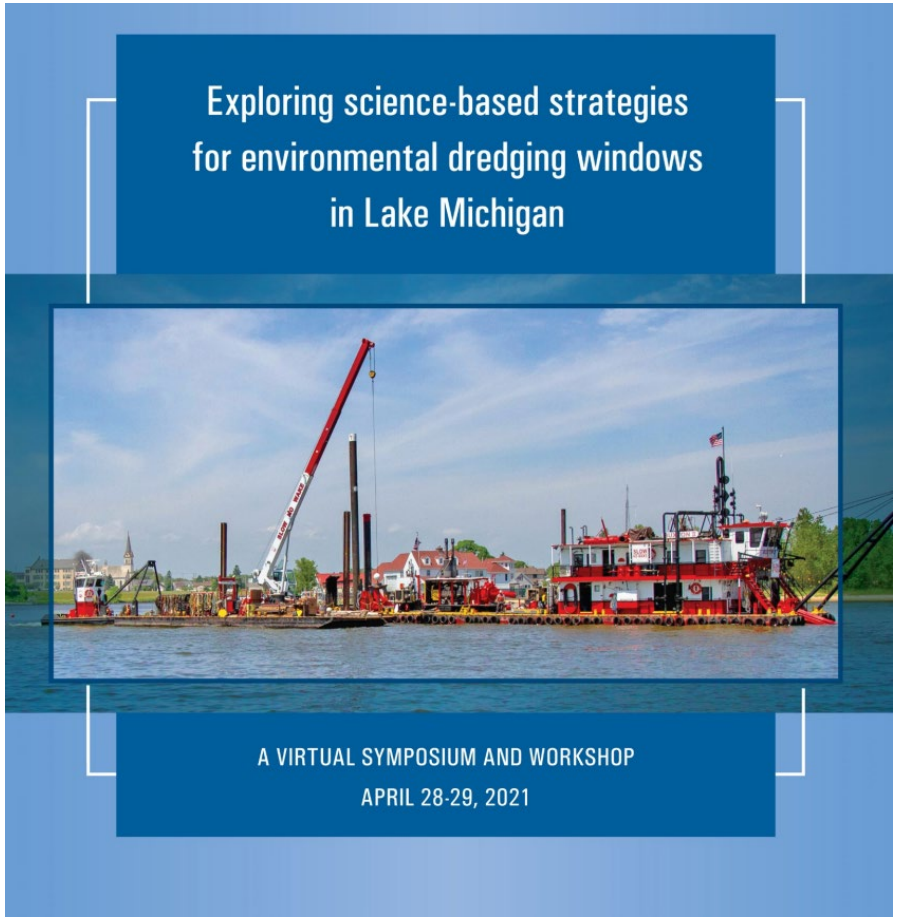
- Survey of fish assemblages from dredged and non-dredged estuaries (Borland et al., 2022)
  - Baited underwater video stations
  - Multi-beam acoustic sounder
  - Fish abundance and species richness were both highest per site in dredged estuaries
  - More species were found in natural estuaries overall





Great Lakes Commission Workshop

- April 28 – 29, 2021
- Objectives:
  - Bring together natural resource, environmental protection, and fishery management personnel to share methods, processes, data sources, and criteria
  - Share recently generated scientific research relevant to dredging windows
  - Explore the potential for a coordinated, science-based, collaborative approach to setting Lake Michigan dredging windows



Pre-Workshop Survey

- Would a review and discussion of dredging equipment and technologies, including how they are operated and deployed in projects, be a benefit to discussing environmental windows and the waiver request process?
- Would a discussion of new and innovative dredging equipment and technologies help you to prepare or evaluate the use of environmental windows and waiver request processes for future dredging projects where emerging technologies could be used?

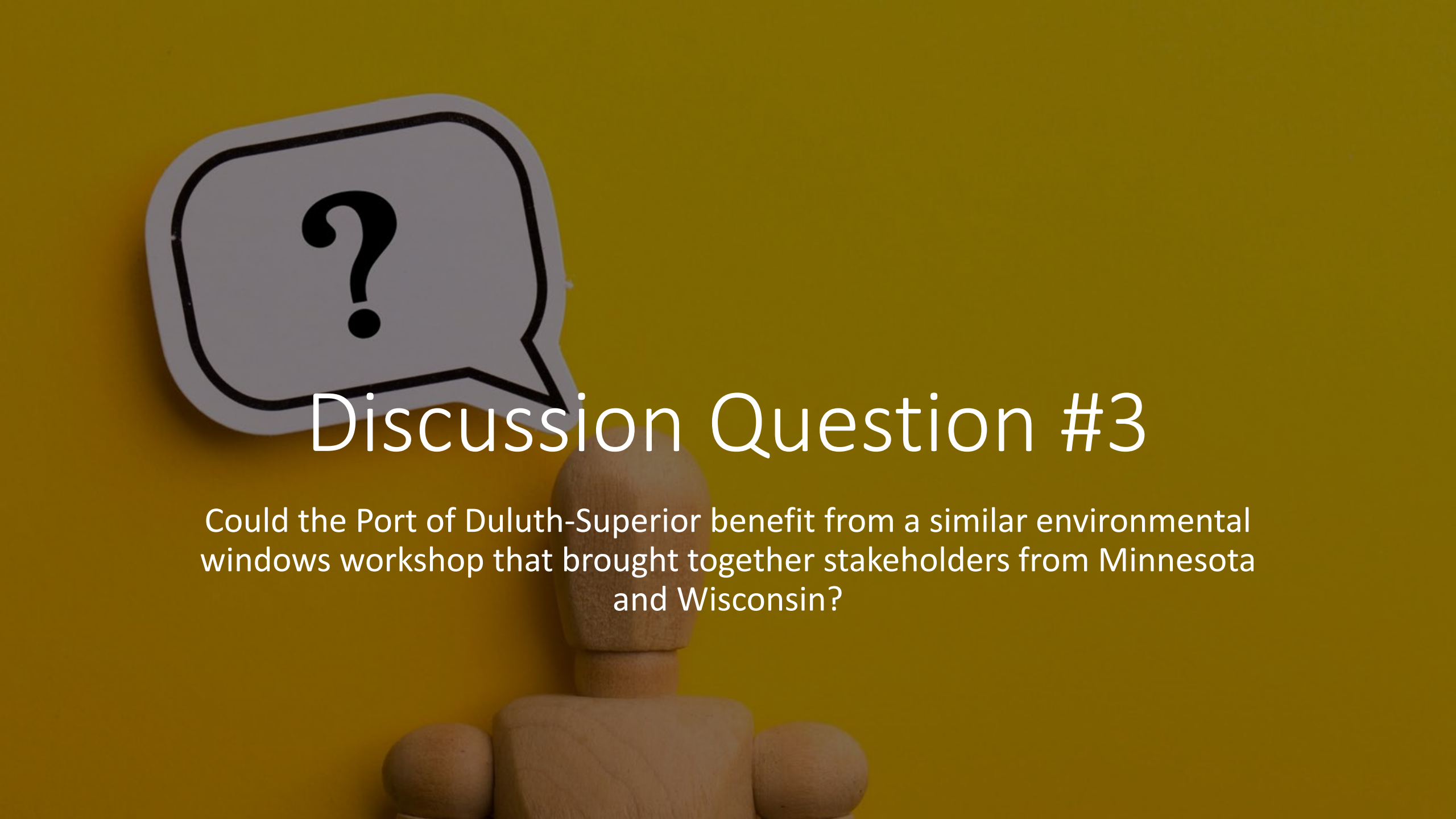
All states responded “Yes”.

Where can additional science better inform dredging windows?

- Better understanding of dredge sediment impacts on all life stages (adult, juvenile, larval, egg)
- Refinement of the distribution of important species and critical habitat
- Refinement of timing and challenges within the context of climate change
- Frequency of dredging (annual/periodic) and impacts to fish and wildlife resources
- Socio-economics and stakeholder perceptions
- Strategies to further minimize perceived impacts
- Effects of reducing sediment plume size
- Risk reduction – CDF disposal vs. open lake disposal
- Effects of minimizing behavioral impacts (day/night/noise reduction etc.)
- Dredging as an enhancement through beneficial reuse such as Cat Island in Green Bay, Wisconsin, and delta formation
- Studies comparing dredging-induced turbidity compared to natural levels of turbidity during spawning periods and when larval fish are present in the water column

Great Lakes Dredging Team Technical Committee Workplan, 2022 - 2023

- Environmental Windows Symposium II
- Possible 2023 or 2024 symposium
- Proposed to broaden to other states, provinces

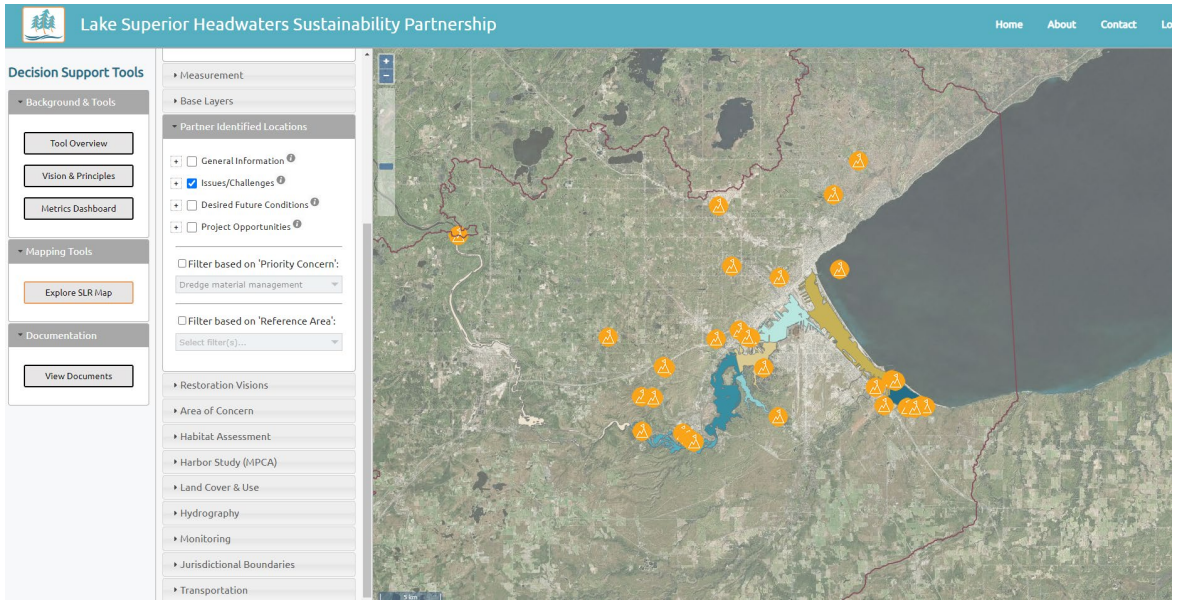


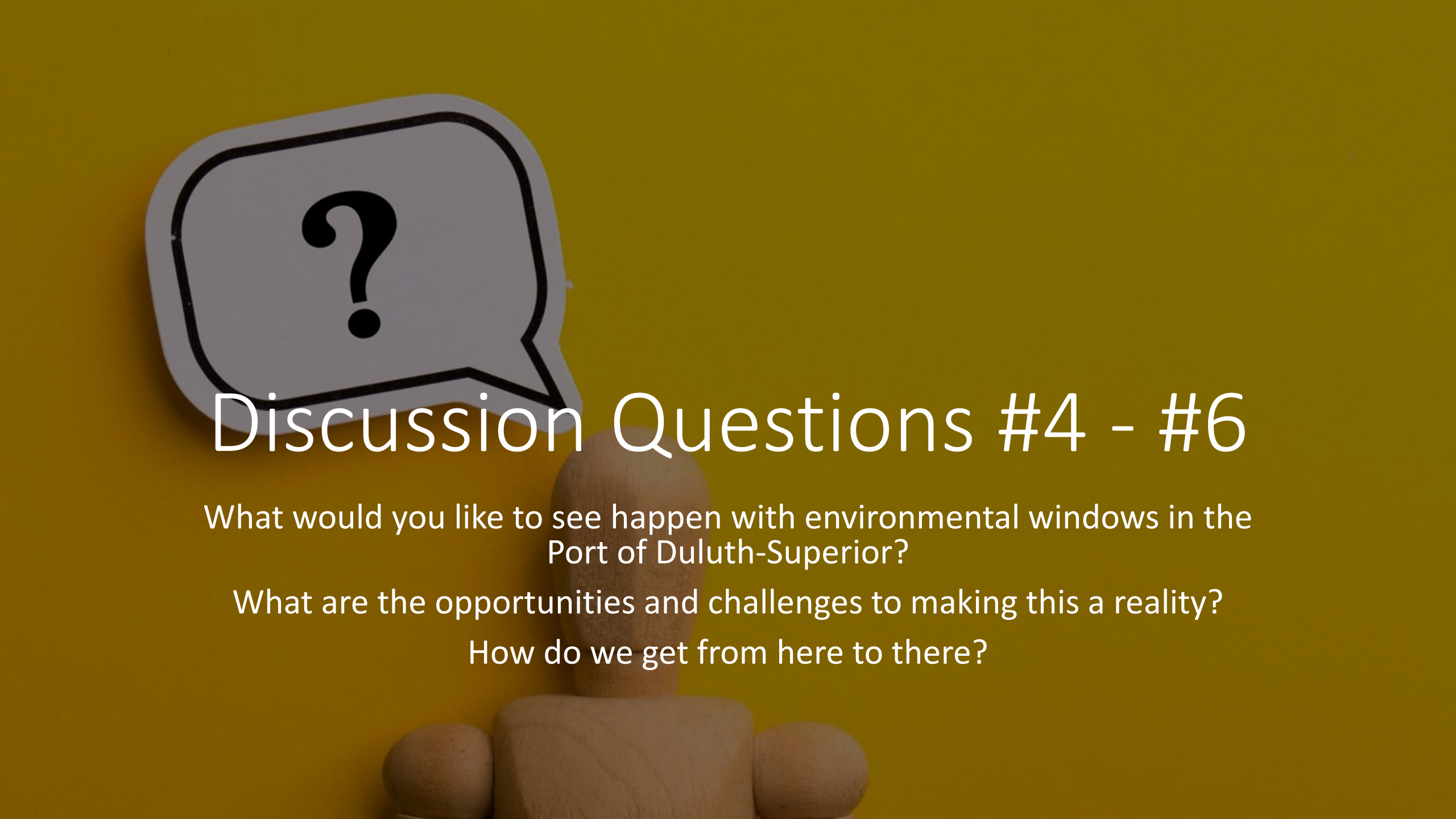
Discussion Question #3

Could the Port of Duluth-Superior benefit from a similar environmental windows workshop that brought together stakeholders from Minnesota and Wisconsin?

Lake Superior Sustainability Headwaters Partnership

- Priority Concern 5: Dredge Material Management
  - Identify concerns and potential deleterious impacts that result from managing dredge material.
  - Summarize existing available data on fish habitat and habitat use, spawning, and movement to determine the locations and times most critical to sustaining healthy fish stocks in the Duluth-Superior Harbor. Identify knowledge gaps that need to be addressed to inform when and where in-water work should occur to minimize damage to the fishery.
  - Align proposed dredging operations with environmental exclusions to limit impacts on habitat and the aquatic community.





Discussion Questions #4 - #6

What would you like to see happen with environmental windows in the Port of Duluth-Superior?

What are the opportunities and challenges to making this a reality?

How do we get from here to there?

Additional Discussion Questions
(if time allows)

1. What equipment and/or engineering practices exist to reduce impacts to aquatic organisms?
   - Survey questions sent to GLC workshop participants.
2. What are the limiting factors besides environmental windows? Can these be alleviated?