

# Exploring science-based strategies for environmental dredging windows in Lake Michigan



A VIRTUAL SYMPOSIUM AND WORKSHOP  
APRIL 28-29, 2021

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# OVERVIEW

Environmental dredging windows are specified times of the year when navigation dredging is allowed (or restricted) by regulatory agencies to minimize adverse environmental impacts. In Great Lakes harbors and waterways, those impacts are most frequently associated with effects on fish spawning, the seasonal movement of adult and juvenile fish and wildlife, and other sensitive time periods for threatened and endangered species. Environmental windows are often put in place to minimize the effects of resuspended sediments on fish, benthos, and shellfish resources; to lessen sediment-related impacts on sensitive nearshore and aquatic resources and habitat; to reduce entrainment of aquatic organisms by hydraulic dredges; to reduce seasonal impacts on adult and juvenile fish; and to minimize disruption to shorebirds during nesting periods. Thus, establishing appropriate windows requires an understanding of temporal issues and species sensitivities.

Environmental dredging windows for U.S. Great Lakes harbors and navigation channels are mostly statutorily established and enforced by the Great Lakes states for waters under their respective jurisdictions. In some states, including Illinois and Indiana, dredging windows are not specifically established in statute. Indiana statute does allow conditions that include dredging windows to be put on dredging project approvals. Within this state-based policy framework exists significant differences in the thresholds and other metrics used to establish dredging windows, thus creating different windows per state and within states. These state-by-state differences as to when dredging is allowed (or restricted) – presents challenges for the U.S. Army Corps of Engineers (USACE), as the agency overseeing navigation dredging, and its contractors, adding costs and inefficiencies to the Great Lakes navigation dredging program. Achieving a balance between adequate resource protection and flexible, efficient, and cost-effective dredging operations is also a priority and a challenge for regulatory agencies and resource managers.

Environmental dredging windows were first introduced in the 1970s in response to the passage of the Clean Water Act (CWA) and the National Environmental Policy Act (NEPA) and associated requirements. Discussions among the Great Lakes states and federal agency partners have been ongoing for many years and were first facilitated by the Great Lakes Dredging Team (GLDT). The GLDT was established in 1997 as a forum for the exchange of information regarding best practices, lessons learned, innovative solutions, and sustainable approaches to dredging and dredge material management throughout the Great Lakes region.

The GLDT provides an opportunity for both governmental and nongovernmental organizations with Great Lakes dredging interests to discuss issues at a regional level. Efforts to explore a more regionally coordinated, science-based policy framework that is protective of water quality, habitat (both aquatic and nearshore) and the Great Lakes fishery, while acknowledging the importance and need for dredging, were first initiated by the GLDT in the early 2000s and continue to be a priority.

At the GLDT 2018 Annual Meeting, the USACE-Engineer Research and Development Center (ERDC) provided a presentation on current research regarding environmental dredging windows. The GLDT Technical Committee also discussed the issue of environmental dredging windows during its 2018 annual workplan review meeting. After this discussion, the Technical Committee advised the GLDT that additional discussion and research was warranted regarding the development of environmental windows and how they are applied by various federal and state regulatory agencies within jurisdictions in the Great Lakes. In response, the GLC approached numerous state, federal and philanthropic partners regarding their interest in participating in a collaborative process to further the dialogue on environmental dredging windows.

Through extensive engagement with regional partners in 2018 and 2019, it became clear that the interest in environmental dredging windows, especially among the Great Lakes states, was very high, and the timing was right for regional stakeholders to begin important dialogue about science and research needs. Based on this expressed interest, GLC staff prepared a project abstract outlining a proposed scope of work. As discussions continued it was suggested by GLDT leadership and other collaborators that working toward consensus on a complex issue like environmental dredging windows would be extremely challenging for the entire Great Lakes system due to a variety of differences between the lakes related to climate, geography, geomorphology and limnology, to name a few. Therefore, the proposal was scaled to a more focused geographic scope: specifically, the Lake Michigan basin. A symposium was proposed for state and federal agencies to share up-to-date research on dredging impacts on the Great Lakes ecosystem, and to help the four Lake Michigan states learn from each other and explore the feasibility of a more consistent, science-based approach for establishing environmental dredging windows for Lake Michigan harbors and navigation channels.

In 2019, the effort formally commenced with funding and in-kind support provided by the Great Lakes Fishery Trust (GLFT) and other partners. The GLC convened a steering committee comprised of state, tribal, private sector, and federal members in the Lake Michigan basin (see Appendix 3 for a list of project steering committee members). To further define this effort, a survey was developed to gather information from states on 1) windows definitions and establishment process, 2) science used to establish windows, and 3) science/information needs for the future. These outreach activities were to culminate in a two-day, in-person symposium to be held in May 2020. When the COVID-19 pandemic hit, the event titled, “Exploring science-based strategies for environmental dredging windows in Lake Michigan” was rescheduled and held as a virtual symposium and workshop on April 28-29, 2021.

#### **Specific objectives of the symposium were to:**

- Gather natural resource, environmental protection and fishery management agency personnel from the four Lake Michigan states (Illinois, Indiana, Michigan and Wisconsin) to share the methodologies, processes, data sources and criteria used to establish their states’ respective environmental dredging windows.

- Share other recently generated scientific research applying to dredging windows, including new data produced by the USACE-ERDC on effects from dredging on water quality, fish spawning habitat, turbidity, and other impacts to the Great Lakes fishery.
- Facilitate a discussion among the state agencies, federal agencies and other regional interests with a stake in the Great Lakes fishery and environmental dredging windows policy to explore the potential for a coordinated, science-based, collaborative approach to setting Lake Michigan dredging windows.

While the symposium was initially proposed as a single two-day event, its format was later bifurcated into two related but separate sessions. The first day was dedicated to presentations on the background and existing science behind environmental dredging windows open to a broad audience of any interested parties. The second day was designed as a facilitated, interactive workshop, primarily among the four Lake Michigan states, to share their respective approaches to dredging window policy and discuss potential opportunities for ongoing collaborative research and operational activities.

In addition to the GLFT, others providing direct support to the symposium included the GLC, the states of Illinois and Wisconsin, the Great Lakes Fishery Commission and the U.S. Fish and Wildlife Service. Many other agencies and individuals provided significant in-kind support making the planning and convening of the symposium a true team effort.

#### **Symposium and workshop participants included:**

- State, federal and tribal fishery management personnel
- State, federal and tribal resource management and environmental protection personnel
- Navigation dredging interests including the USACE and private industry
- University researchers and private consultants with expertise in the dredging/fishery management nexus.

A list of symposium and workshop attendees is included as Appendix 4 and 5.

The primary outcome of the event is this comprehensive report on the proceedings which can be used to further discussion and progress toward a Lake Michigan-wide coordinated approach to environmental dredging windows. Also, knowledge gained from the symposium could potentially be transferrable to other lake basins within the Great Lakes, and thus useful in developing broader regional science-based approaches to environmental dredging windows policy.

This summary proceedings provides a detailed report on the presentations and discussions that occurred during the April 28 symposium and April 29 workshop. It also includes a discussion of common themes, findings and next steps to inform future work in the area of environmental dredging windows.

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# SYMPOSIUM PRESENTATIONS

Speaker biographies are included in Appendix 2.

## Welcome and introductions

Tom Crane, Deputy Director, Great Lakes Commission

Tom Crane welcomed participants and presented a brief review of the rationale for the symposium, and the evolution of its format and content. He noted that the two-day, virtual event was the product of a planning process driven by a Steering Committee formed in 2019 with representation from the four Lake Michigan states, federal agencies including the U.S. Army Corps of Engineers (USACE), the U.S. Environmental Protection Agency (EPA), the U.S. Geological Survey (USGS) and the U.S. Fish and Wildlife Service (FWS), as well as private sector and U.S. Great Lakes tribal interests. The event was initially proposed as a two-day, in-person symposium to be hosted in spring 2020 by the Great Lakes Commission with principal funding support coming from the Great Lakes Fishery Trust. Emergence of the COVID-19 pandemic in early 2020, however, resulted in the rescheduling of the symposium and reformatting it as a virtual event. Crane noted that, among other things, the symposium was envisioned as an opportunity for participants to learn more about the history and scientific research related to dredging windows policy, including lessons learned from U.S. coastal regions outside the Great Lakes. He also said it was a unique opportunity for the four Lake Michigan states to share information on their respective approaches to dredging windows and to identify science needs and gaps. Crane thanked members of the Steering Committee for their work and expressed hope that the symposium and workshop would lead to future work in this issue area.

## Dredging windows: historical perspective

Jan Miller, Great Lakes Coordinator (retired), USACE Great Lakes and Ohio River District (ORD)

Jan Miller gave a presentation on the historical background of environmental dredging windows, including a look at navigational dredging practices in the Great Lakes before dredging windows, how and why windows were developed, and how things have changed since. Miller noted that before the 1960s, USACE used to dredge some four million cubic yards of sediment from 15 to 25 harbors annually in the Great Lakes, using its own fleet of hopper dredges. Permit dredging also took place in some 20 to 40 smaller harbors annually, accounting for less than one million cubic yards. Most of the dredged material was disposed of in the open waters of the lakes; it was placed in upland locations only if that was the least costly alternative. Hopper dredging was a relatively messy process in which a slurry of dredged material consisting of 10 to 15% solids was dumped into the hoppers and allowed to overflow until a full load with enough solids was achieved. Upon reaching the disposal site, the bottom of the hopper's hull would split open to discharge the load which would disperse as it settled to the bottom.

Later in the 1960s, as the dangers of toxic dredged sediments in industrial harbors were identified, the first confined disposal facilities (CDFs) were developed in Toledo and on the Detroit River. At that time, Toledo was responsible for almost half of all the dredged material in the Great Lakes. A two-year Great Lakes pilot program was conducted to examine the water quality impacts of various dredged material disposal alternatives. Passage of the National Environmental Policy Act (NEPA) in 1969 largely drove policy for dredging and dredged material management for the next 20 years. The Rivers and Harbors Act in 1970 authorized the Great Lakes CDF program and the Dredged Material Research Program. Clean Water Act amendments in 1972 included Section 401 and 404 requirements regulating discharges of dredged material into U.S. waters. A flurry of NEPA documents was prepared for maintenance dredging and disposal activities and construction of new CDFs. One result was the creation of dredging windows by the Great Lakes states in response to comments received on NEPA documents.

Dredging windows were initially developed based on a risk avoidance principle; dredging was excluded from times deemed critical to annual cycles (i.e., spawning and nesting) of selected (primarily fish) species and the first proposed windows excluded dredging over much of the year except winter. But windows were included, Miller noted, as a condition of Section 401 water quality certification by some states despite any clear connection to water quality standards. By the 1980s, over 50% of the dredged material in the Great Lakes was placed in CDFs. Limits, however, in USACE funding for Great Lakes operations and in CDF capacity resulted in less navigational dredging.



Figure 1. A hopper dredge discharging its load of sediment

Also in the 1980s, due in part to concerns from the states about the messy overflow of hopper dredge operations, USACE moved its entire fleet of hopper dredges out of the Great Lakes and now contracts all its dredging operations in the lakes with private companies. In the 1990s the U.S. Environmental Protection Agency (EPA) and the USACE developed the Assessment and Remediation of Contaminated Sediments (ARCS) Program and in 1997 the Great Lakes Dredging

Team was created by the EPA and USACE as one of a number of regional dredging teams formed across the country.

In 2002 the Great Lakes Legacy Act was authorized and cleanup of contaminated sediments at Areas of Concern (AOCs) became a higher priority. An Executive Order in 2004 created the Great Lakes Regional Collaboration involving federal, state, local, and tribal agencies. In that same time frame, Miller said, demand for CDF capacity increased significantly, generating more interest in beneficial use of dredged material.

**Dredging windows have not changed significantly in 40-plus years, despite the changes to dredging and dredged material disposal practices in the Great Lakes.**

In summarizing his historical perspective, Miller noted that numerous international and federal programs in the Great Lakes have focused on the impacts of sediment contaminants without any consideration of the impacts of dredging that prompted the development of dredging windows, which were introduced in response to agency comments on NEPA documents in the 1970's.

He added that dredging windows have not changed significantly in 40-plus years, despite the changes to dredging and dredged material disposal practices in the Great Lakes (scale of dredges, scale of dredging projects, use of CDFs, the removal of contaminated sediments, and delisting of AOCs). The time is long overdue, said Miller, for a dialogue between federal and state agencies and interested organizations on the future of dredging windows in the Great Lakes.

## Environmental dredging windows: background, rationale, science

Jeff Tyson, Fishery Management Program Manager, Great Lakes Fishery Commission

Jeff Tyson gave a presentation providing additional perspective on the background, rationale and science behind environmental dredging windows, which he defined as timeframes when dredging or other in-water works are allowed to minimize impacts on aquatic and terrestrial resources. Tyson added that dredging windows are not unique to the Great Lakes, but commonplace across the U.S. They have been used in other coastal ranges, for example, to protect such species as right whales and sea turtles.

Dredging windows are typically linked to Section 401 Water Quality Certification or other permits and specifically are based on risks and concerns relating to increased turbidity and other in-water works impacts on mortality to fish eggs, larvae, and juveniles, behavioral impacts on nesting/migrating adults, impacts on human activities such as fishing and birdwatching, and impacts to habitat for threatened and endangered species. Impact assessments consider both dredging operations and dredged material placement.

Factors that inform dredging windows include species distribution, timing of sensitive life history stages such as eggs, fry, spawning, migration and stocking; distribution of critical habitat; and the local expertise at hand for such issues as refinement, consultation and consideration of

waivers. Each of the states have developed individual approaches to developing dredging windows, from Wisconsin using a demarcation of north and south regions to Illinois that has no defined windows and reviews on a case-by-case basis (Figure 2). Generally dredging restricted periods fall between the months of April and June for all jurisdictions based upon independent analyses by each jurisdiction on the factors above (Figure 3).

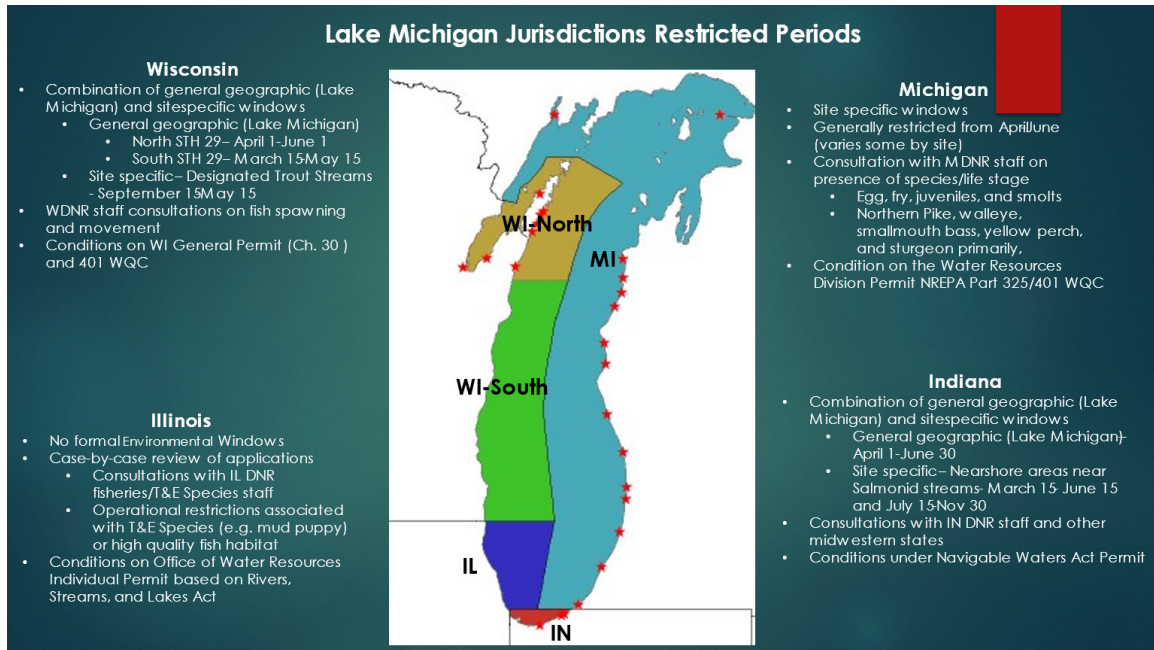


Figure 2. General points of dredge window considerations for each of the Lake Michigan jurisdictions.

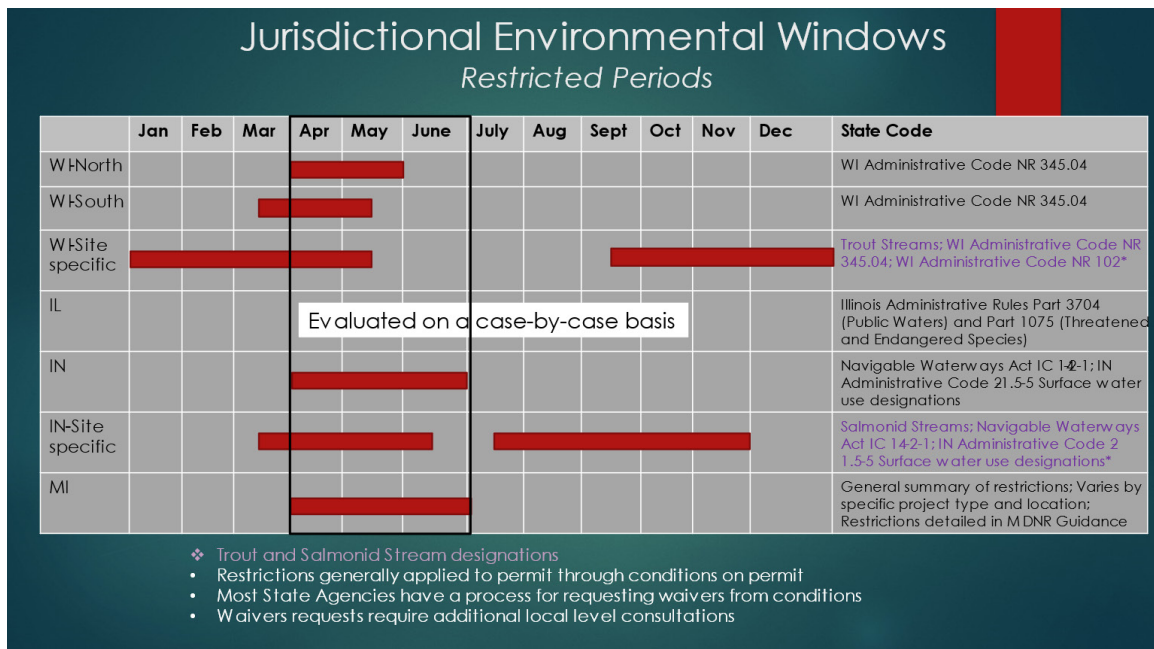


Figure 3. Summarized restricted periods for each Lake Michigan jurisdiction.

In 2020, in preparation for the symposium, Great Lakes Commission staff, with input from the project steering committee, surveyed the Lake Michigan states requesting feedback on science gaps and needs related to dredging windows.

Asked where additional science could better inform dredging windows, agency personnel from the four Lake Michigan states identified the following:

- 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

As a potential action agenda is discussed as an outcome of this symposium and workshop to follow, the above should be among science needs to be considered.

## Great Lakes Dredging Program

Marie Strum, Chief, USACE Great Lakes Navigation Team

Marie Strum presented an overview of the USACE Great Lakes Dredging Program, with focus on work planned for 2021, and how environmental dredging windows impact the program.

**USACE puts high priority on the interdependency of ports in the Great Lakes; it is important in their budgeting that the Great Lakes be managed as a system.**

The three USACE Districts involved in the Great Lakes Dredging Team (Detroit, Chicago and Buffalo) manage 140 federally authorized dredging projects, including 60 deep draft commercial harbors, 80 shallow draft recreational harbors, and 600 miles of navigation channels, plus numerous locks, CDFs and navigational structures. Strum stressed that USACE puts high priority on the interdependency of ports in the Great Lakes; it is important in their budgeting that the Great Lakes be managed as a system.

Dredging frequencies and volumes vary among ports; some are dredged annually, some every-other year, some less frequently. Material dredged at individual projects in any given year can range from 10,000 cubic yards (cy) at a small recreational harbor to 800,000 cy at Toledo, which

represents the greatest annual volume of dredged material of all ports in the Great Lakes. Some 25 to 35 dredging projects are conducted each year involving an average of 3.5 million cy of dredged material.

All funding for the USACE budget for dredging nationally comes from the Harbor Maintenance Trust Fund (HMTF), which has seen significant changes, most recently from the Water Resources Development Act (WRDA) of 2020. Among those are stipulations that not less than 13% of annual expenditures from the HMTF go to the Great Lakes, and that not less than 15% go to “emerging harbors,” or those handling less than one million tons of cargo annually. WRDA 2020 also included, for the first time, a directive to spend down by 2030 a \$10 billion surplus in the HMTF which has long been a target for reform by Great Lakes navigation interests. In 2021, dredging for navigation operations and maintenance and CDF funding is at its highest level at about \$227 million contrasted with a low of approximately \$86 million in 2013 (Figure 4).

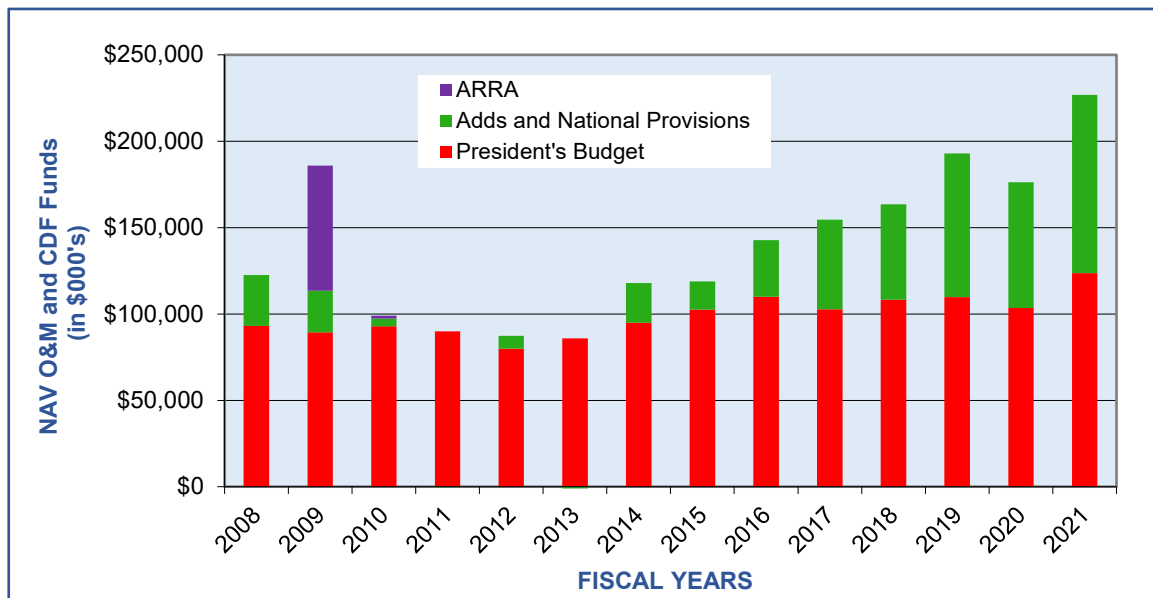


Figure 4. Annual expenditures for dredging in the Great Lakes basin for fiscal years 2008-2021.

Dredging activity for the 2021 season includes 16 projects in the president’s budget, plus six more added by congressional appropriation to the USACE work plan, totaling 3.7 million cy. A dredging backlog in the Great Lakes, caused by chronic underfunding starting in the 1990s, had grown to 18 million cy by 2007. But more adequate funding in recent years has steadily closed the gap and the backlog now stands at 12.5 million cy. During the years of underfunding, said Strum, USACE had to prioritize dredging to only “functional dimensions,” – the minimum depth and width needed to enable active navigation, rather than fully authorized dimensions.

Strum noted that dredging in the Great Lakes is more expensive than other U.S. coastal ranges on a unit cost basis. Costs in the lakes range from \$3/cy to \$40/cy. Reasons include extensive environmental regulations for dredging and dredged material placement, including dredging windows; the large number of small harbors with small quantities to dredge compared to large quantity harbors for which dredging is more cost effective; the relatively short season available

for dredging on the lakes, generally April to November; weather conditions in outer harbors that can delay operations; and complications involved with placement of dredged material, especially when double-handling is involved.

Scheduling dredging in the Great Lakes is particularly challenging, said Strum, starting with the funding timeline. It starts on October 1 when planning begins for projects funded by the president's budget with the expectation to award contracts in the spring in time for the short Great Lakes dredging season. In the December – April period, however, further projects are added to the USACE work plan, allowing less time to design the projects, award contracts and complete the work that year. Commercial navigation on the lakes begins in March with the opening of the Soo Locks and bulk commodity customers, having depleted their stockpiles over the winter season, are anxious for ship-borne cargoes to move as early in the spring as possible. USACE's condition surveys begin in March to assess shoaling and identify dredging needs. There may also be Section 401 water quality certification permits necessary to work through for such project work as dredged material placement.

Finally, there is the acquisition strategy involving invitations to bid which can require solicitation periods of up to 30 days, and the time it takes for contractors to mobilize. Collectively, project design, contract acquisition, and contractor mobilization can take four to six months at best, often longer. Taking all these into account, said Strum, is important to understanding the challenge environmental dredging windows can pose to USACE in fulfilling its mission on a timely basis. Waivers of “no dredge” time periods are sometimes allowed by the states, noted Strum, but the timing is important; they need to be granted before a contract is solicited and sometimes that may not be practical. Contractors have been known to go directly to states for waivers but that should not happen.

The good news, said Strum, is that after a long stretch, funding for dredging is increasing and is expected to continue to increase. All the factors that lead to constraints on available dredging periods drive up costs and can limit the amount of material USACE can dredge. Any efforts that lead to science-based, focused non-dredge times, she said, would be a great help.

A short question and answer period provided symposium participants with the opportunity to ask clarifying questions of the first three presenters.

**Question:** Do we know how much energy and resources are focused on research related to dredging activities?

**Miller:** This is a question for the USACE Engineer Research and Development Center (ERDC).

**Question:** Will the increase in funding for dredging mean added opportunities for beneficial use of dredged material? One of the constraints on implementing beneficial use in the past has been cost.

**Strum:** The federal standard for dredged material management – the least cost alternative – is still in place. Waukegan, Illinois, is currently the site of a USACE pilot program for beneficial use so we should see some good discussion from that. WRDA 2020

has a provision regarding the economic benefits of beneficial use, but we need to implement guidance; it is difficult to quantify those benefits. We are still looking for opportunities for beneficial use within the federal standard.

**Miller:** The other limitation to beneficial use is that the federal government almost always needs a nonfederal partner, and that can be a challenge financially. The federal money itself may not be the limiting factor.

**Question:** For a state regulator, are there opportunities in working with contractors to better incentivize beneficial use?

**Strum:** We have strict guidelines under federal contracting laws that will not allow us to include any incentive provisions.

## On the origin of dredged sediment

Dr. Jim Selegean, P.E., P.H., USACE Hydraulic Engineer (Coastal RTS), Detroit District

Selegean's presentation identified the various sources of sediment, how it is transported, and its origins and nature. He noted that "all sediment is not created equal," and addressed issues related to the impacts of climate change on dredging needs and frequency.

The sources of sediment dredged in the Great Lakes fall into two general categories: watersheds and littoral (coastal) zones. In some cases, where harbors are small enough, the two may be combined.

For sediment originating from a watershed to make its way to navigable waters, two things have to happen: 1) the material has to be detached from the landscape by such natural forces as rainfall or other precipitation, and 2) it has to be picked up by a stream and transported. The basic principle behind sediment transport, noted Selegean, is "gravitational flow lubricated by water." He explained that if either detachment or transport can be mitigated, the entry of sediment into navigation channels can be reduced. He added that slope is an important factor; on flat fields sediment does not move, but the steeper the slope, the more energy there is to drive sediment delivery. In the Great Lakes region, with maximum elevations of only about 2,000 feet, there is not as much energy for sediment transport as in a more topographically extreme setting. Also working in the Great Lakes' favor is the fact that the region has relatively modest precipitation, enough to sustain ground cover but not so much as to continually wash sediment off.

Land use changes, largely linked to development, are resulting in much more loss of sediment. A historical model developed of the St. Joseph River watershed in southwest Michigan and northwest Indiana estimated that in the pre-development year of 1830, total soil erosion in the watershed amounted to some 55,000 cubic meters (cm). By 1992, under modern land use conditions, soil erosion had grown to 676,000 cm annually.

Not all eroded sediment ends up in Great Lakes waterways, said Selegean; much is trapped behind dams, most of which in the region are 50 to 100 years old. And when aging dams are



removed, the release of sediment downstream can be significant. A recent dam capacity study in the Great Lakes that measured the remaining capacity in reservoirs behind 12 dams in five Great Lakes states found that most were at 70 to 90% of their storage capacity.

Land use activities that produce the most sediment and erosion are agriculture, logging, and urban development. In the agricultural setting, bare ground is the biggest contributor and spring is the most critical time period due to degraded crop residue, recent tillage and lack of crop canopy. While logging, as part of forest management, is a significant contributor, the closed forest is actually a very low source of sediment. The real problems are logging roads, all-terrain vehicle trails, bank erosion and soil laid bare by logging. Urban sediment loss is attributed to the paving over of sediment, which armors the watershed, reduces sediment production from upland sources and increases peak flows, accelerating bank and bed erosion.

Other miscellaneous influences, said Selegean, included beavers which historically helped reduce sediment loss with their dams placed evenly in rivers; forest fires which occurred after clear-cut logging of forests; and ditching and tile drains which allowed water into watersheds more quickly. These demonstrate, he noted, that even relatively small disturbances on the land can have a big impact.

Describing the nature of sediment in the region, Selegean said that glaciation – the constant advances and retreats of glaciers – got rid of “weak” sediment and left the Great Lakes with sediment that is uniquely “tough.” The fact that it is more compacted means that we don’t see as much sediment unraveling as in other parts of the country.

Turning to the littoral, or coast-wise contribution to sediment transport, Selegean noted that the sediment involved is mainly sand on beaches which originates from coastal bluff erosion, not from the watershed. One of the major influences on this process in modern times has been the hardening, or armoring, of Great Lakes shorelines which has disrupted the natural sand supply composing beaches. A historical survey of the Lake Michigan shoreline in St. Joseph County, Michigan, showed that in 1938 only 10% was hardened but by 2016 that figure had grown to 70%.

Further discussing the nature of sediment transport, Selegean noted that it is primarily episodic: big events, i.e. storms, move the majority of sediment. For the most part, sediment sits in place most of the time until a big event moves it. Some 90% of the sediment movement takes place in just a few days. And the “sediment train” can move either direction. Key to better understanding these processes is the capability to have constant measurements so that episodic events are captured. Technologies currently available for such measurements include acoustic and optical backscatter sensors, continuous laser diffraction, and hydrophones and geophones which pick up sediment-generated noise.

Given the episodic nature of sediment movement, climate change has emerged as a significant factor in that process. With a climate model now projecting more volatile storm events we should expect more sediment transport. Since ice cover on the Great Lakes shuts down sediment transport, the warming of the lakes and reduction of ice cover may also result in a scenario where sediment transport typically happens nine months of the year rather than eight.

Selegan concluded his remarks restating that sediment comes from watersheds and coastal bluff erosion - and that the two types of sediment usually looks very different. It moves episodically and within the sediment world there is a lot of variety. Dams figure significantly in sediment movement and can act as either a source of sediment or a sink.

**Understanding the source of dredged sediment can help to anticipate and reduce future dredging needs.**

Understanding the source of dredged sediment, he said, can help to anticipate and reduce future dredging needs.

A short question and answer period provided symposium participants with the opportunity to ask Selegan clarifying questions regarding his presentation.

Jan Miller noted that environmental dredging windows that restrict dredging in the April-May timeframe have always been confusing. Sediment loadings from watersheds typically peak during these months resulting from erosion at plowed fields by spring rains. One would think, said Miller, that ambient levels of suspended solids would be so high at these times that the sediment resuspension by a dredge would be insignificant.

Selegan responded that USACE puts turbidity levels into context and considers ambient levels and said that he suspected dredging-related turbidity would be below a background rate in some areas. Some areas, he said are very turbid but, others are very pristine, so each area must be considered individually to make a background comparison.

Scudder Mackey, Ohio Department of Natural Resources, added that the USACE ERDC laboratory studies on dredging-induced turbidity are useful, but it would be additionally valuable to compare results of the studies with natural levels of turbidity during spawning periods and when larval fish are present in the water column.

## Using science to inform dredging windows management in Lake Michigan

Burton Suedel, Ph.D. and Marin Kress, Ph.D., USACE Engineer Research and Development Center (ERDC)

Burton Suedel and Marin Kress presented a series of ERDC case studies demonstrating the use of scientific research to support environmental dredging windows policy in the Great Lakes and other U.S. coastal areas, and also identified the number and nature of windows-related dredging restrictions in Lake Michigan. Much of the research done for these studies, noted Suedel, was conducted using the ERDC's Fish Larvae and Egg Exposure System (FLEES) which employs a system of controlled aquariums that can be injected with varying levels of suspended sediment to simulate the exposure of aquatic species to plumes generated by dredging and dredged material placement.

One case study with particular relevance to Great Lakes interests used the FLEES system to provide more data on the impacts of dredging on walleye eggs and fingerlings in Lake Erie's Maumee Bay. The eggs and fingerlings were exposed to a range of different levels of suspended

sediment for a duration of three days. According to Suedel, findings of the research revealed no differences in the gill lamellae (through which fish attain oxygen) of fingerlings after exposure to the suspended sediment, and no differences in the hatch percentage of the eggs.

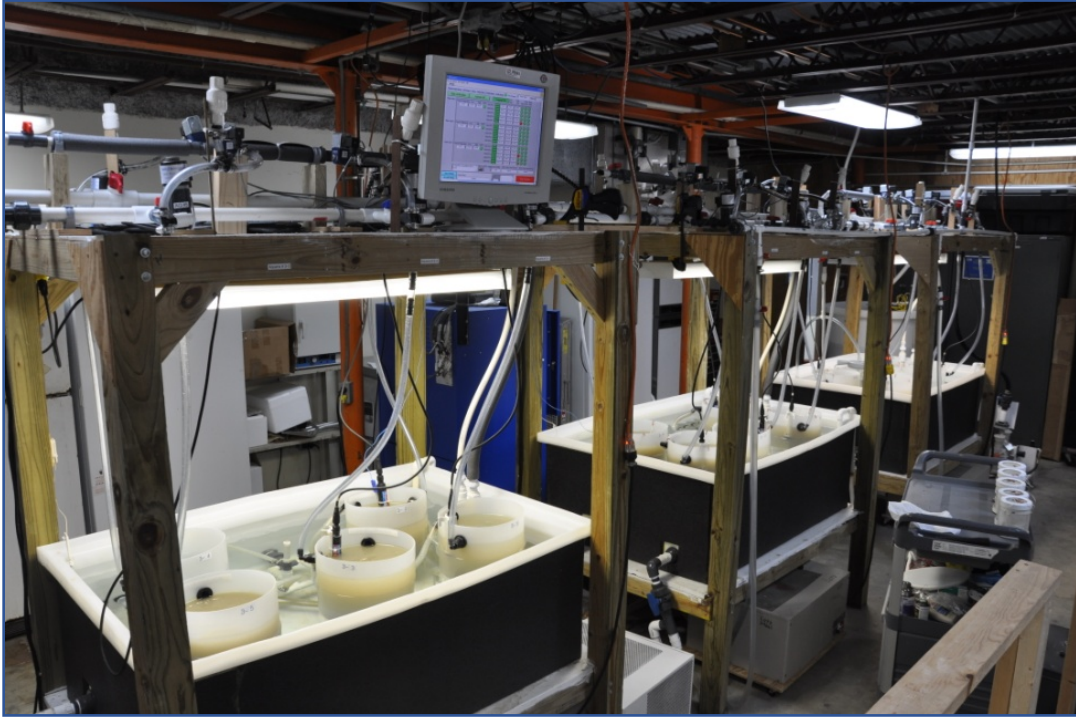


Figure 5. ERDC's Fish, Larvae and Egg Exposure System (FLEES) used to evaluate sediment effects on aquatic biota.

Another ERDC study sought to assess dredging effects on the early life stages of smallmouth bass which spawn along Great Lakes waterway shoals. Using the FLEES system and similar methodology, smallmouth eggs and swim-up fry were exposed to various levels of concentration of suspended sediment sourced from Fairport Harbor, Ohio, on Lake Erie and Grand Haven, Michigan, on Lake Michigan. Findings indicated that exposed eggs hatched normally but newly hatched larvae were more vulnerable to the effects of suspended sediment; egg experiments indicated reduced survival of larvae when exposed to suspended sediments greater than 100 mg per liter; swim-up fry survival was not reduced even at the highest exposure concentration; sublethal effects were observed in growth of fish in swim-up fry experiments; and swimming behavior of fry was not affected.

Suedel also summarized research conducted by ERDC for three East Coast locations. A case study involving eastern oysters in shoals near the James River in Virginia sought to provide more data on how suspended sediment generated by dredging affected the oysters. Findings indicated no statistically significant difference between treated and control for shell opening, length, weight, and condition after grow out. Similar studies on Atlantic sturgeon in Savannah, Georgia, and winter flounders in New England also found no significant impacts from exposure of those species to suspended sediment.

In an overview by Marin Kress of the environmental dredging windows that states have designated for the 49 USACE navigation projects (ports, harbors, channels) in Lake Michigan, she noted that 15 have no dredging windows, so she focused on the 34 project sites with one or more time period-related dredging restrictions. (Kress said that she preferred the term “dredging restrictions” to “dredging windows,” as “dredging windows” can have opposite meanings in different parts of the country.)

**Suspended sediments and sedimentation are natural processes and dredging windows should be considered holistically with other stressors in system.**

The number of restrictions for any one project ranged from one to ten. The restriction count can reflect multiple species with the same window dates, or one species with two different windows. Northern pike was the species of most concern as it was listed as a reason for a restriction at 19 projects. Other species of wide concern included walleye (16 projects), smallmouth bass (15 projects), yellow perch (14 projects) and lake sturgeon (12 projects). Kress noted that restrictions can vary significantly, even between projects in close proximity, perhaps due to differences in watersheds.

In Michigan, for example, there is a one-and-a-half month difference for the dredging window starting date between St. Joseph and South Haven which are only 26 miles apart. Behavioral factors such as spawning are cited in a number of restrictions.

Available resources identified by Kress that could help further inform dredging windows policy include the 2001 National Research Council report, “A Process for Setting, Managing and Monitoring Environmental Windows.” She also cited a USACE risk-informed decision framework which considers drivers, pressures, stressors, and conditions to formulate a response, and a risk-based framework for evaluating sensitive habitats.

Summing up, Suedel and Kress said that results of their work indicate that:

- Detailed, site-specific knowledge of dredge project, sediment type, organism life history and exposure can better support decisions regarding the development of adequately protective dredging windows.
- Data to date suggest sub-lethal and lethal effects at and below 500 mg per liter of suspended sediment over extended periods of exposure are unlikely to occur.
- Suspended sediments and sedimentation are natural processes and dredging windows should be considered holistically with other stressors in system.
- Research and development can be guided by multiple considerations, such as widely important species (northern pike), single-species restrictions for a project (smallmouth bass), activity-based concerns (fish spawning), or the need for more recent observational data on seasonal presence.
- The portability of FLEES invites on-site collaboration.

## Upper Mississippi River restoration: navigating dredging windows for sensitive species and habitats

Sharrone Baylor, Environmental Engineer, U.S. Fish & Wildlife Service (FWS)

Sharrone Baylor's presentation covered the background of the Upper Mississippi River Restoration (UMRR) program, discussed how environmental sensitivities were handled, and related how teamwork and collaboration have contributed to the success of the project. The program centered largely on the Upper Mississippi National Wildlife and Fish Refuge which was created in 1924 and consists of a 261-mile, 240,220-acre migratory bird corridor bordered by the four states of Wisconsin, Minnesota, Illinois and Iowa.

In 1986, Congress established the UMRR program, which designated the Upper Mississippi as a "nationally significant ecosystem" and a "nationally significant commercial navigation system." The program was authorized for \$33 million per fiscal year and was organized into two main components: habitat rehabilitation and enhancement, and long-term resource monitoring. Baylor's remarks focused on the first of those, the habitat component.



Figure 6. Habitat restoration under way on the Upper Mississippi River.

As part of this effort, said Baylor, some 55 projects have been completed to date encompassing 102,000 acres of aquatic and floodplain habitat (Figure 6). Most are on the federal wildlife refuge and entail protecting habitat that is already there, i.e. restoration vs. new habitat creation. The program is administered by the USACE Rock Island District and while its objectives do not include channel maintenance, sand from dredging has been beneficially used for UMRR

project work. Dredged material from backwater areas containing a lot of fines, for example, has been used as topsoil on top of sand on islands.

Baylor noted that, since much of the work is done in shallow, environmentally sensitive areas, dredging restrictions are placed on contractors, both time restrictions – including dredging windows – and spatial restrictions to protect specific areas. During design of the individual projects, FWS works closely with USACE and state agency personnel to identify what can be done and where. Endangered and protected species that have factored significantly in project design include the Higgins Eye Pearly mussel (Figure 7) and the American Bald Eagle. In addition to the protected fauna, many tree and plant species have also received special consideration.



Figure 7. Higgins Eye Pearly mussel relocation event to address dredging impacts in the Upper Mississippi River Restoration initiative.

One good example of the teamwork involved in the UMRR program was the McGregor Lake Habitat Rehabilitation and Enhancement Project involving 1,100 acres of midstream islands between southwest Wisconsin and northeast Iowa. To use dredged material barged from 13 miles downstream, contractors built a pad to receive the material and protected mussels were temporarily removed to prevent eroding sediment from covering them up. To protect eagle nesting habitat, contractors were restricted from working in designated buffer zones.

Baylor discussed further use of restrictions relating to the national refuge’s critical role in protecting a major North American migratory bird corridor. Several “Refuge Closed” areas have been designated to close during the fall migration season when hundreds of thousands of birds come through. Contractors, she noted, have strict directives to be out of these areas by October 15 every year.

Going forward, Baylor said, the FWS sees collaboration with the states as critical to the success of such programs as the Upper Mississippi River Restoration and that she will continue to work with state agency partners very closely.

## Perspective from Chesapeake Bay: development and application of environmental dredging windows

Isaac Wilding, Dredging Coordinator – Waterway Improvement, Maryland Department of Natural Resources

In his presentation, Isaac Wilding provided an overview of Maryland’s approach to dredging windows and other dredging restrictions for navigational waterways, including those in Chesapeake Bay where it shares jurisdiction with Virginia. Navigation dredging in Maryland waters has been financed since 1966 by the Maryland Waterway Improvement Fund which is derived from a 5% excise tax on all boat sales in the state. The fund also supports maintenance of public piers, boat ramps and aids to navigation and is administered by the Maryland Department of Natural Resources (DNR).

The DNR coordinates with the USACE Baltimore District in management of navigation channels and waterways and provides grants for dredging some USACE channels, and cost share for larger USACE sponsored projects. While the DNR is responsible for managing natural resources such as boating, fishing, parks, forests, etc., enforcement of all the state’s environmental laws is the responsibility of the Maryland Department of Environment (MDE). All in-water construction work must be permitted through MDE and USACE with a Joint Permit Application (JPA).

According to Wilding, Maryland’s top environmental protection priorities in regard to dredging and dredged material management are submerged aquatic vegetation (SAV) and protection of oyster bars. Fish spawning habitat and wintering waterfowl are also concerns. Dredging windows aimed at protecting SAV restrict dredging from April 15 to October 15, which roughly corresponds to vegetation growing periods. If eel grass is present (Figure 8), the restriction is from March 1 to October 15.



Figure 8. Submerged aquatic vegetation, eel grass, that is protected through dredging windows

Dredging restrictions to protect oysters are both temporal and spatial and prohibit any hydraulic dredging within 500 yards of a Natural Oyster Bar, oyster restoration site, or leased shellfish aquaculture site during the period June 1 through September 30. No mechanical dredging is

allowed within 500 yards of a Natural Oyster Bar, oyster restoration site, or leased shellfish aquaculture site during the periods December 16 through March 14 and June 1 through September 30. No dredging regardless of method is allowed within the boundaries of a Natural Oyster Bar, oyster restoration site, or leased shellfish aquaculture site during the periods December 16 through March 14 and June 1 through September 30. These dredging windows correspond to the summer growing/spawning period and winter dormant period when oysters are susceptible to smothering by sediment.

**Maryland's top environmental protection priorities in regard to dredging and dredged material management are submerged aquatic vegetation and protection of oyster bars.**

Time-of-year restrictions to protect spawning fish prohibit dredging from February 15 through June 15; target species include yellow perch, Atlantic and shortnose sturgeon, shad, striped bass and American eel. For wintering waterfowl, said Wilding, the dredging restriction is from November 15 through March 1, though there is typically not much dredging done in areas where waterfowl congregate.

The shared jurisdiction of MDE and USACE in environmental protection can sometimes be problematic, said Wilding, particularly when there are differences in their respective rules. MDE, for instance, sets dredging depths and can penalize a contractor for dredging over depth. USACE, however, allows one to two feet of over dredge. Permit durations also differ: an MDE permit is for 3-6 years, while a USACE permit has a 5-10-year range. Ideally, those would be aligned.

A short question and answer period provided symposium participants with the opportunity to ask Wilding clarifying questions regarding his presentation.

**Question:** Do your dredging windows allow for hydrologic conditions in Chesapeake Bay?

**Wilding:** The only conditions we have to consider sometimes are wind driven tides.

**Question:** Have Maryland and Virginia ever had discussions about coordinating dredging windows?

**Wilding:** We do not work jointly on regulatory and review matters.

**Question:** Are your dredging contractors all established firms?

**Wilding:** For the federally authorized projects, typically most are. For the smaller state jobs some smaller companies get involved.

**Question:** Are there water quality monitoring requirements for dredging projects?

**Wilding:** Yes, sometimes we will require such things as turbidity curtains. There are also water quality rules and restrictions for containment sites.

**Question:** Has the MD DNR mapped out all protected areas?

**Wilding:** Yes, though some maps are out of date. For submerged aquatic vegetation, we do regular aerial surveys.



## Paradigm shift: 2020 South Atlantic Region Biological Opinion for dredging windows

Dylan Davis, Coastal Program Manager for Navigation and Flood Risk Management, USACE South Atlantic Division

Dylan Davis explained the history of the South Atlantic Region Biological Opinion<sup>1</sup> (SARBO), what has changed with the 2020 SARBO agreement, and its importance as one of the most significant “paradigm shifts” in federal dredging regulatory policy in 30 years.

**2020 SARBO moves away from rigid dredging windows to a more risk-based approach to all dredging activities in the South Atlantic and Caribbean regions.**

In an overview of how the 2020 SARBO relates to environmental dredging windows, Davis said that it moves away from rigid dredging windows to a more risk-based approach to all dredging activities in the South Atlantic and Caribbean regions. He said that it recognizes the USACE history of proactive management and provides opportunities to access new data and new technologies. The updated agreement marks a major change, added Davis, because it protects all species, not just sea

turtles; documents all routes of dredging impact; offers cost savings through flexible scheduling and competition; and reduces conflicting dredging schedule.

It took 13 years for the 2020 SARBO to be completed by USACE and the Bureau of Ocean Energy Management’s (BOEM) Marine Minerals Program, which deals with erosion and coastal resilience issues. It was signed in March 2020 by the National Marine Fisheries Service, also known as NOAA Fisheries. Areas covered by the 2020 SARBO include waters off of the Atlantic coast from the North Carolina/Virginia border south to the tip of Florida including the Florida Keys, and waters off Puerto Rico and the U.S. Virgin Islands.

The 2020 SARBO covers five types of activities: 1) dredging, including maintenance dredging, sand mining and restoration dredging to improve water quality; 2) dredged material placement including beach nourishment, nearshore placement, placement in ocean disposal sites, and upland placement; 3) transportation of dredged materials between dredging and material placement locations; 4) surveys performed by or authorized by the USACE necessary to complete

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<sup>1</sup> Under Section 7 of the Endangered Species Act, federal agencies must consult with NOAA Fisheries on activities that may affect ESA-listed species. These federal agency consultations are designed to help federal agencies in fulfilling their duty to ensure that their actions do not jeopardize the continued existence of a species, or destroy or adversely modify designated critical habitat. NOAA Fisheries Southeast Regional Office, Protected Resources Division, issues Biological Opinions to document how federal agencies’ actions affect ESA-listed species and critical habitat in the Southeast. Where appropriate, these Opinions provide an exemption for the “take” of listed species (e.g., harassment, harm, pursuit, hunting, shooting, wounding, killing, trapping, capturing, or collecting) while specifying the extent of take allowed, the reasonable and prudent measures that would minimize impacts from the federal action, and the terms and conditions with which the federal action agency must comply. Source: National Marine Fisheries Service

dredging and material placement projects; 5) monitoring for and handling of Endangered Species Act-listed species encountered during projects.

A total of 25 species are covered in the document including sea turtles, sturgeon, whales, several species of corals and several other fish species. It also covers several “routes of effects” of dredging such as entanglements, vessel strikes, habitat alteration, species’ interaction with dredge equipment, and impacts from dredged material placement.

Environmental benefits from the 2020 SARBO included creation of marshland, bird habitat, turtle nesting sites, reefs and oyster habitat. It also supported removal and capping of contaminated sediments, and much ongoing research in such areas as tickler chains in lieu of deflectors on dredges, turbidity plume modeling, sediment transport modeling and the fate of sediment fines.

However, one of the most valuable outcomes of the 2020 SARBO, said Davis, was the partnership it fostered among USACE, BOEM, and NOAA Fisheries. It was critical to the ultimate success of the 13-year process, he said, that a sense of trust was established among the three agencies.

A short question and answer period provided symposium participants with the opportunity to ask Davis clarifying questions regarding his presentation.

**Question:** How have states and environmental groups responded to the 2020 SARBO?

**Davis:** Some states have had specific concerns: Georgia with sea turtles, North Carolina with fisheries. Some NGOs have expressed concerns, too.

**Question:** What is a tickler chain?

**Davis:** It is a chain mechanism that goes forward of the dredge head to deter sea turtles from the seascape suction field.

**Question:** In the development of the 2020 SARBO were other federal agencies involved?

**Davis:** We did coordinate with the U.S. Environmental Protection Agency to keep them aware of the process, and also with the U.S. Fish & Wildlife Service.

**Question:** Are there supersede provisions in the 2020 SARBO that would affect Section 401 and 404 compliances, or are they just related to Endangered Species Act (ESA) issues?

**Davis:** They cover ESA only.

# WORKSHOP PROCEEDINGS

## State roundtable discussion

This session was convened primarily as a forum for the Lake Michigan states to present information about their approach for environmental windows for dredging, to allow the states to ask questions of each other and to begin to identify common themes and practices that might inform future collaborative work. The session was structured so that participants could consider how to address the needs identified in the previous day's symposium and to inform the development of a common approach. Participants included state agency personnel from each of the four Lake Michigan states (Illinois, Indiana, Michigan and Wisconsin). Participants were invited to share their experience in development and administration of dredging windows, including perspectives on data needs, research and science needs, best practices, and cost-saving measures. Each state identified one or more individuals to cover the topics above in an informal manner.

## Wisconsin

Tom Meronek, Sarah Szabo, Brad Eggold, Nick Legler, Jim Killian and Cheryl Masterson, Wisconsin Department of Natural Resources (WDNR)

Sarah Szabo explained that WDNR issues permits for two types of dredging: maintenance dredging of an area that has been dredged before, and new dredging for an area that has not been previously dredged.

The maintenance dredging permit is a general permit requiring a 30-day review and mandates that the project does not impact threatened or endangered species and/or associated habitat. The permit allows dredging up to 3,000 cubic yards (cy) or up to 50,000 cy if from a municipal or commercial marina or harbor, or from an access channel located on the Great Lakes or Mississippi River.

For new dredging projects, individual permits are granted and require a minimum 90-day review to allow time for a 30-day public notice period. For placement of dredged sand for beach nourishment, a dredging permit is also required to grade below the ordinary high-water mark (OHWM) and further authorization is needed if dredged material is to be placed below the OHWM.

Tom Meronek reviewed Wisconsin's commitment to the public trust as it relates to dredging projects, noting that three specific considerations were made for dredge permits: 1) that the proposed project is not detrimental to the public interest; 2) that it will not reduce the flood flow capacity of a stream; and 3) that it will not result in a material obstruction to navigation. To implement these considerations, prior to permitting, consultation is held with WDNR fisheries and wildlife managers and other appropriate entities to review potential impacts on both

recreational and commercial fish species. Meronek said that it is common for the WDNR to recommend collaborative approaches, and to provide waivers when impacts can be mitigated, but that even then, all parties are not always completely satisfied with the outcomes.

For Wisconsin, dredging windows are framed by “in-water work restrictions.” As an example, Szabo described those restrictions for northeast Wisconsin as lasting from mid-March (or ice-out, whichever is earlier) until mid-July. She noted that waivers may be issued by fisheries biologists and that areas to be dredged and staging areas must be clearly identified, as does the dredging frequency. Coordination, it was stressed, is critical. Quarterly meetings are held among all interested parties to discuss projects well in advance, and to make sure municipal governments are fully advised and prepared with any plans for dredged material placement.

### Questions and discussion

Jim Killian, WDNR, cited a comment made during the previous day’s dredge window symposium by a U.S. Army Corps of Engineers (USACE) speaker to the effect that dredging windows are an ongoing challenge to the USACE dredging mission. Killian noted that there is a flip side to that perspective: from the regulator’s point of view, navigation dredging is an ongoing challenge to fisheries management and one of the purposes of this workshop is to, through discussion, find ways that address both dredging needs and the need to protect the resource.

Charles Uhlarik, USACE, commented that that USACE strives to work closely with the states in the management of shared aquatic resources and that he looked forward to the workshop dialogue.

Vic Santucci, Illinois DNR, asked whether waivers were relatively easy to acquire, or rarely approved.

Meronek and Szabo indicated that while waivers are granted with some regularity, dates are often adjusted by WDNR so there is some concession from both the regulating agency and the waiver applicant. There is also significant amount of consultation before waivers are approved.

Jeff Tyson, Great Lakes Fishery Commission, asked whether there are formal uniform criteria for each waiver application.

Meronek said that there is no set process; each is handled on a case-by-case basis.

## Illinois

James Casey, Illinois Department of Natural Resources (IL DNR) Office of Water Resources, and Francisco Herrera, Illinois Environmental Protection Agency (IEPA)

According to James Casey, environmental dredging windows are rarely, if ever, a consideration for the state of Illinois. The IL DNR issues permits for construction in Lake Michigan waters, and jointly issues permits with the IEPA for dredging, open water placement of dredged material, and placement of sand remaining in the littoral zone. These permitting processes require a 30-day public notice period; all permits are for a ten-year period. Casey said that his office has never issued a permit that required (or stipulated) dredging windows in the 30 years of his experience.

Francisco Herrera of the IEPA echoed that perspective, saying that his agency has no experience with dredging windows, adding that when IEPA issues Section 401 water quality permits, those determinations are based on broader water quality considerations and are considered final.

## Indiana

Ben Dickinson, Matt Buffington and Nate Thomas, Indiana Department of Natural Resources (IN DNR)

The Indiana representatives presented an overview of IN DNR's approach to environmental dredging windows for Indiana's waters of Lake Michigan. They began by reviewing the statutory background of Indiana's jurisdiction in Lake Michigan which was confirmed by the state's General Assembly in the Navigable Waters Act, and further defined in the Navigable Waters Act administrative rules. In a 2018 case that drew wide interest around the Great Lakes, the Indiana Supreme Court ruled in favor of the state in *Gunderson vs. Indiana* in affirming the state's jurisdiction to the ordinary high water mark, as opposed to a static marker that had previously been set at 581.5 foot elevation.

Applications for project permits are submitted with supporting documents to the IN DNR Division of Water for administrative review and public notice. They are also routed for consultation to a number of other divisions including Law Enforcement, Fish & Wildlife, Nature Preserves, Historic Preservation and Archaeology and to the Lake Michigan Specialist located in Michigan City, Indiana. Considerations for permitting include site location, sediment composition and origin, excavation method, dredged material disposal area, and impacts to fish, wildlife and plant resources.

Almost all applications are eventually approved but usually with conditions such as restoration of upland areas, minimization of sediment migration, notification of any dead or dying fish in the project area, maintenance of public access, cleaning equipment to prevent spread of invasive species and dredging restrictions during certain times of the year, i.e., dredging windows.

In setting time-of-year dredging restrictions, Indiana considers such factors as habitat characteristics – lake, channel, marina, etc. – and the nearshore aquatic species that may be affected, including birds. Generally the restrictions span the May 1-June 30 period which corresponds to spawning and nesting times. Rare, threatened and endangered species are given special attention, as are salmonids for which restrictions are generally set from March 15-June 30 and July 15-October 15 when they are moving to and from tributaries. Indiana regulators do recognize the difficulties these restrictions may pose for contractors and the USACE and does consider waivers to modify dates on a case-by-case basis.

Gaps in science identified by the Indiana presenters included the need to address “legacy” regulations; (i.e., whether current policies are keeping up with new data on fish stocking and migration). Also noted were needs to explore standard distances from tributaries, sediment plume data, potential impacts of physical disturbances and avoidance tendencies, and contribution of littoral sand migration to beach starvation. Jurisdictional issues are also

sometimes uncertain involving federal projects; for instance, is USACE applying for and receiving all the necessary state permits?

Perhaps the most critical need identified was for a more coordinated approach to environmental windows and other dredging regulations among all the Lake Michigan states and the federal agencies. It was noted that states largely share the same contractors and the differing regulations among them may lead to confusion, potentially increasing costs and causing delays in project work. A basin-wide approach, it was suggested, is worth consideration.

## Michigan

Tammy Newcomb and Jay Wesley, Michigan Department of Natural Resources (MDNR) and Mike Alexander, Michigan Department of Energy, Great Lakes, and Environment (EGLE)

Tammy Newcomb reviewed the history of environmental dredging windows in Michigan, noting that prior to 2002 dredging windows were designated by individual fisheries management units in the MDNR, often with no coordination between units. In 2002, however, the units' process of dredging window designation was pulled together with assimilated guidelines which have since been updated periodically, the last time being 2018.

Considerations for each dredging project site include such factors as the location's physical characteristic (inner harbor, outer harbor, river channel, etc.); dredging frequency – annual vs. sporadic; USACE federal projects vs. public dredging projects such as marinas; affected species including centrarchids, salmonids, sturgeon, walleye, perch, northern pike, muskellunge, lake trout, whitefish; lifestages of affected species: spawning, eggs, fry, fingerlings, smolts, adults; stocked or wild reproduction; and timing of recreational use. New data is assimilated as it becomes available; much new information, for example, has been obtained relating to sturgeon.

Acknowledging operating realities, Michigan significantly lessened restrictions in the late 1990s to accommodate dredging, and today regularly considers dredging window exceptions and waivers. Jay Wesley noted that, for outer harbors, the dredged material is typically sand, so waivers are granted often, some for a five-year period, and are working well. Criteria for waivers usually include project location, time-of-day scheduling and whether the dredge site can be isolated.

Newcomb cited an ongoing need for new science to support dredging windows policy, such as the effects of 24-hour dredging on adult and smolt avoidance and larval entrainment.

Future challenges/opportunities include consideration of alternate approaches to mitigation focusing on habitat improvements to address long term consequences of dredging, e.g. loss of "delta" or drowned river mouth habitat. Newcomb and Wesley also see potential value in exploring a basin-wide conversation with USACE regarding dredging windows, rather than USACE working through issues on a state-by-state basis.

Wesley suggested that, while the states can still retain the ability to issue dredging window waivers for their jurisdictions, perhaps they could collaborate on a list of their respective criteria to provide guidance for USACE.

## Summary of discussion

### Challenges to and opportunities for a Lake Michigan-wide, science-based approach for environmental dredging windows

Tom Crane, Great Lakes Commission (GLC), facilitated a session in which participants asked clarifying questions of the state presenters and fleshed out common challenges and themes that emerged from both the April 28 symposium and April 29 workshop.

On the issue of waivers Crane asked whether there would be value in establishing common criteria (single source of states' written criteria for waivers), and can that be done collaboratively? Buffington of Indiana responded that there are a lot of variables, a lot of timing issues and many other different things to consider but that it would be a worthwhile exercise.

Crane asked whether, and to what degree, climate change has influenced states' thinking on dredging windows. Buffington said that the issue of climate change impacts is not officially a high priority for Indiana and that, to date, they have not seen significant shifts in salmonid movement due to climate considerations which would be a major issue. Wesley of Michigan said that his agency was anticipating rivers to become more biologically diverse as a result of climate change, which could result in some shifts of dredging windows, but those changes have not yet occurred.

Crane brought up the issue of sediment plumes, specifically the impacts on aquatic species from dredging plumes versus those from naturally occurring background turbidity. Wesley said that Michigan has found that in areas being dredged, most fish can tolerate the turbidity, but there are other factors to consider, such as temperature. Buffington said that Indiana would like to have more research done, but that his agency does not have the research capability to commit to it. Killian of Wisconsin noted that his agency has reviewed some studies but would benefit from a central source or clearinghouse for new data and research. Crane mentioned that the Great Lakes Panel on Aquatic Invasive Species, which is facilitated by the GLC, functions in such a role, helping state and federal agencies to collectively identify research priorities.

Karen Keil, USACE, noted that ERDC, which is funded by USACE districts, solicits the districts' research and development needs annually. The USACE districts can work with the states to better direct ERDC research to their needs. Keil also noted that USACE is currently working on a Great Lakes Manual for Beneficial Use of Dredged Material and that chapters on risk management and BMPs are included.

In regard to the workshop's objective to explore "science-based strategies" for dredging windows in Lake Michigan, Wesley stated that there appeared to be a common approach among the states to determine dredging windows with collective knowledge. Newcomb of Michigan stressed Michigan's commitment to science-based policy saying that they did not want their fishery managers to feel political pressure. The object, she said, was to evaluate the risk to fish and determine how much risk – how much potential loss – was acceptable.

Crane raised the notion of mitigation and, more specifically, whether habitat restoration can be balanced or even integrated into navigation dredging. Wesley responded that, from a Michigan perspective, such mitigation on Lake Michigan itself is probably not feasible, but it would be more practical in river mouth locations.

Mark Coscarelli, Great Lakes Fishery Trust, noted the similarity between the workshop's objectives and his agency's experience in working with the states on a fish consumption advisory for Lake Michigan in the early 1990s. Both, he said, had the same two objectives: 1) to identify science needs and 2) to develop a new approach to manage the resource collaboratively. The latter objective, he said, requires a realistic strategy, one that recognizes the political aspects involved as much as the science.

After the discussion session, Crane (with assistance from the workshop participants) summarized common themes that were discussed during the April 28 symposium and April 29 workshop which are presented below in a series of findings and recommendations.



## Findings and next steps

The workshop wrap-up included a summary of findings and next steps that may lead to future work and collaboration in the area of environmental dredging windows. These findings are organized by category to support readability. Many of these themes and ideas are multifaceted and have components that can be included in more than one category.

### General priorities for environmental windows

#### Findings:

In considering further actions and next steps related to environmental windows, workshop participants shared their views on the importance of the discussion that had occurred at the symposium and workshop. They also considered the value of keeping the existing project steering committee together to help identify the immediate next steps for advancing and expanding the discussion. One suggestion was to invite additional perspectives to the discussion such as dredging contractors, tribal interests and municipalities. The participants thought that the scale of effort to address next steps is important. Some suggested that continuing work with the Lake Michigan states made sense while others suggested that pursuing activities to advance the discussion within the entire Great Lakes basin was also appropriate. There was also a question as to whether Canadian involvement should be considered. The need for funding for expanded work was also discussed including the need to build partnerships with the funding community. Participants shared their views that utilizing existing forums such as the Great Lakes Fishery Commission (GLFC) Lake Committees and the Great Lakes Dredging Team (GLDT) would provide multiple opportunities for participants to join the discussion of environmental windows moving forward.

#### Next steps:

1. The existing project steering committee is encouraged to continue its work to help define the scale and scope of ongoing work in environmental dredging windows.
2. The steering committee should consider expanding the collaboration to include other partners as the scope and scale of future work is developed.
3. The GLC is encouraged to network with funding partners to build support for ongoing work.

### Communication/coordination

#### Findings:

A belief held by many of the partners prior to the symposium and workshop was that providing opportunities for regular ongoing discussion on environmental dredging windows between the states, federal agencies and other regional partners will yield multiple benefits. It will help increase knowledge about the challenges of developing and implementing windows, will help

build trust between the states and federal agencies, and will strengthen relationships within and between agencies at the state level. Throughout the project and culminating in the discussion during the symposium and workshop, this belief was validated. Also, symposium and workshop participants identified the need to consider providing an entry point to other interests and sectors involved in dredging. Some of these interests include tribes and First Nations, ports and municipalities, dredging contractors, and the states of Minnesota, Ohio, Pennsylvania and New York and the province of Ontario. How and when to include these other interests, sectors and jurisdictions will depend on the scope and scale of future project work based on input and feedback from the project steering committee.

#### Next steps:

1. The GLC should consider developing an outreach plan to identify and invite participation from other states, federal agencies, tribes and First Nations and other interests as identified by the project steering committee.
2. The GLC should consider beginning a dialogue with other entities such as the GLFC Lake Committees and the GLDT Outreach Committee to assist with outreach.

## Data and information sharing

#### Findings:

Many of the states' dredging windows have been in place for many years or even decades. Over that time, there have been significant changes in areas such as what is known about long-term consequences of some operational practices; in technology (e.g., the replacement of hopper dredges with cleaner, more efficient and environmentally friendly equipment); in climate models that include biological and geomorphic impacts; and understanding the impacts of invasive species, both present and future. While the states, federal agencies and regional partners have access to data that directly supports their work priorities, there is a need to increase information sharing among and between the states, federal agencies and other partners. This might include information on lake levels, fishery data, or water quality data, to name a few.

#### Next steps:

1. The GLC should engage other entities and forums to assist in the sharing of data and information pertaining to environmental dredging windows. For instance, the GLDT Technical Committee might consider planning one or more informational webinars on dredging windows in the upcoming year. These webinars will include presenters doing research on or administering windows programs.
2. The GLC and the project steering committee should consider engaging the states in a follow-up request for information to identify information priorities other than research.
3. Any future funding proposal should consider data/information needs identified by the steering committee and the states, and consider ways to compile, curate and best share this information. This might include the creation of an information clearinghouse.

## Research development and coordination and technology transfer

### Findings:

Similar to data and information sharing priorities, the states, federal agencies and other regional partners view research, technology transfer and coordination as a very high priority issue. Ongoing research and development are needed to keep the science supporting dredging windows current. One of the positive outcomes of the symposium was the sharing of research information, lessons learned, and innovative approaches being used in dredging, dredge material management and environmental windows. In preparation for the symposium and the workshop, the GLC surveyed the four Lake Michigan states on various aspects of their practices and policies relating to environmental dredging windows including their knowledge of and the identification of research needs. Each of the states identified research as an important component of their environmental dredging windows programs, although only Illinois indicated that they were actively involved in the conduct of research with some relationship to environmental windows. A common theme emerged during the symposium and workshop: that a research clearinghouse would be a valuable tool to the states, federal agencies and other partners to keep the science supporting dredging windows current.

### Next steps:

1. Any future funding proposal should consider research needs and a process for identifying and prioritizing/coordinating research for environmental windows.
2. The USACE-ERDC should consider expanding its laboratory research on sediment impacts and turbidity by conducting in-situ research to gain a better understanding of turbidity impacts from dredging in a natural setting.
3. The GLC and the project steering committee should consider reviewing the research bibliography prepared in advance of the symposium and then coordinate with Karen Keil, USACE-ERDC, also co-chair of the GLDT, to compile and communicate a list of research priorities to the USACE-ERDC.
4. The GLC should consider proposing the establishment of a research clearinghouse in its discussions with funding partners and should develop a plan for long-term use and maintenance of the clearinghouse.

## Policy guidelines and best practices development

### Findings:

From a policy perspective, a common theme expressed throughout the workshop and symposium was the idea that approaches to dredging windows need to be practical and protective, and the term “practical protection” was coined as a result. This refers to an approach to dredging windows policy that can be expressed in two ways: 1) implementing policies that are protective of the resource while also recognizing the operational needs and practicalities of navigation dredging and dredged material management; and 2) implementing operations that are efficient and cost-effective while also being protective of the resource. The

participants expressed these concepts in different ways, but it seems that all agreed with the stated intent of these approaches.

It was also clearly stated by the states during the workshop that there is a need to retain autonomy (i.e., individual statutory and regulatory authority) when it comes to establishing policy for environmental windows. However, there may be an opportunity to pursue a consistent and common framework in those areas where the state approaches and policies are very similar. Such a framework would provide value to the states, federal agencies and other dredging interests by better enabling sharing of data among state, federal and tribal agencies; benefitting the states in such regulatory areas as waiver criteria development and generating more science-based support for dredging policy; benefitting the USACE with a more efficient way to communicate with the states (especially across the three USACE districts working in the Great Lakes); and benefitting dredging contractors by enabling better planning and scheduling of equipment and work. Michigan participants Wesley and Newcomb voiced their state's interest in following up on the concept of establishing some common criteria among the states for such things as best management practices (BMPs). Such an effort, it was noted, would help promote more efficiency and clarity in USACE contracting for dredging projects, and might also advance more consistent outcomes.

#### Next steps:

1. The GLC (in partnership with the GLFC) should research and summarize state policies for approving waivers for windows for the purpose of evaluating whether a common standard for waiver review and approval can be prepared for adoption and implementation by the states. This should include reviewing and summarizing what criteria individual states use for evaluating waivers including which BMPs are currently being used and incorporated into projects that mitigate impacts from dredging. Outside funding should be pursued to support this work.
2. The GLC (possibly in partnership with the GLDT) should collaborate with the USACE to evaluate opportunities to harmonize windows on an appropriate geographic scale to increase efficiencies in scheduling contractors for dredging. Examples might include the southeast corner of Lake Michigan (Illinois, Indiana, and Michigan) and northern Lake Michigan (Michigan and Wisconsin).

## Summary of next steps

| General Priorities                            |  | Suggested Lead Entity for Next Steps                 |
|---|--|--|
| 1   | Defining scale and scope for ongoing work  | Project Steering Committee                           |
| 2   | Identify new partners/collaborators  | Project Steering Committee                           |
| 3   | Identify potential funders to support work   | Great Lakes Commission                               |
| <b>Communication/Coordination</b>             |  |  |
| 1   | Engage Outreach committee to assist in windows research  | Great Lakes Dredging Team                            |
| 2   | Develop an outreach plan for increased collaboration with others   | Great Lakes Commission                               |
| 3   | Engage with Lake Committees  | Great Lakes Fishery Commission                       |
| <b>Data/Info Sharing</b>                      |  |  |
| 1   | Engage Technical Committee; informational webinar series   | Great Lakes Dredging Team                            |
| 2   | Engage with other entities and forums for information exchange   | Great Lakes Commission                               |
| <b>Research</b>                               |  |  |
| 1   | Review research bibliography to assess needs   | Project Steering Committee                           |
| 2   | Build research needs into funding proposals  | Great Lakes Commission                               |
| 3   | Review research bibliography to assess needs   | Great Lakes Commission                               |
| 4   | Expand lab research to include in-situ studies   | USACE-ERDC   |
| 5   | Receive research priorities  | USACE-ERDC   |
| <b>Policy Guidelines &amp; Best Practices</b> |  |  |
| 1   | (In collaboration with GLC and USACE); evaluate opportunities to harmonize windows on a small geographic scale | Great Lakes Dredging Team and Great Lakes Commission |
| 2   | Research and Summarize policies on waivers and best practices  | Great Lakes Commission                               |
| 3   | (In collaboration with GLC); research and summarize policies on waivers and best practices                     | Great Lakes Fishery Commission                       |
| 4   | Work with GLC and GLDT to evaluate opportunities to harmonize windows on a small geographic scale              | USACE-ERDC   |

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## APPENDICES

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## APPENDIX 1 – Symposium flyer



### Exploring science-based strategies for environmental dredging windows in Lake Michigan

#### A VIRTUAL SYMPOSIUM

The Great Lakes Commission, in collaboration with numerous state, federal, tribal and regional partners, is convening a select group of stakeholders in the Lake Michigan basin to explore a more consistent, science-based approach for establishing environmental dredging windows for Lake Michigan harbors and navigation channels. Initially planned as a two-day, in-person symposium, this event, **“Exploring science-based strategies for environmental dredging windows in Lake Michigan,”** is planned to be held April 28-29, 2021, in a virtual format.

Environmental dredging windows are specified times of the year when navigation dredging is allowed by regulatory agencies to minimize adverse environmental impacts. In Great Lakes harbors and waterways, those impacts are most frequently associated with the effects of dredging and dredge plumes on fish spawning areas, thus the time-sensitivity.

To maintain safe navigation in the 48 federally authorized harbors on Lake Michigan, an average of over 850,000 cubic yards of sediment must be removed annually. Dredging of these federal harbors is the responsibility of the U.S. Army Corps of Engineers (USACE), but additional maintenance dredging is also necessary in a number of non-federal harbors and is carried out by states, municipalities and private entities.

Dredging windows in Lake Michigan are statutorily established and enforced by each of the four surrounding Great Lakes states — Illinois, Indiana, Michigan and Wisconsin — for waters under their respective jurisdictions. Within this state-based policy framework exist significant differences in the thresholds and other metrics used to establish dredging windows, and thus, different windows.

These state-by-state differences — particularly within the contiguous, four-state coastal range of Lake Michigan — complicate project scheduling and present other challenges for USACE and its contractors, adding costs and inefficiencies to the Great Lakes navigation dredging program.

Efforts to explore a more regionally coordinated, science-based policy framework that is both protective to water quality and the Great Lakes fishery, and conducive to operational efficiency were first initiated by the Great Lakes Dredging Team (GLDT) in the early 2000s and continue to be a programmatic priority for the GLDT, which serves as a forum for both governmental and nongovernmental organizations with Great Lakes dredging interests to discuss the region’s dredging needs.

The upcoming Windows Symposium is being funded by the following partners:

Great Lakes Fisheries Trust; Great Lakes Commission; State of Illinois; State of Wisconsin; Great Lakes Fishery Commission; U.S. Fish and Wildlife Service; U.S. Army Corps of Engineers (in-kind); and, U.S. Environmental Protection Agency (in-kind).

Planning of the symposium has been coordinated by a steering committee with representation from the four Lake Michigan states, and other agencies and Lake Michigan Tribal interests.

Photo: Toledo Harbor dredging on Lake Erie ©flickr/USACE Buffalo, Jess Levenson.

## APPENDIX 2 – Symposium speaker biographies

### Tom Crane, Great Lakes Commission

Tom Crane joined the Great Lakes Commission (GLC) in 1986 and has more than 40 years of Great Lakes research, coordination and policy experience. Crane has served as deputy director of the GLC since 2008. As deputy director, he is responsible for overseeing many of the administrative, operational, human resources, financial and programmatic functions of the agency. Crane has also served twice as interim executive director (2005-2006 and 2017-2018), resource management program manager (1990-2004; 2006-2008) and natural resources program specialist (1986-1990). In fulfilling his programmatic duties, Crane serves as the lead staff person for several distinct projects done in partnership with other agencies including the Great Lakes Dredging Team, the Regional Sediment Management Team, and the Great Lakes Association of Science Vessel (GLASS). Before joining the GLC, Crane's previous work included positions with the Great Lakes Basin Commission, NOAA's Great Lakes Environmental Research Laboratory and several years of NGO experience in Virginia and Missouri where Crane directed two citizen-based environmental groups. Crane holds a Bachelor of Science degree in natural resources and a Master of Science degree in water resources management from the University of Michigan.

### Jan Miller, USACE-LRD (retired)

Jan Miller worked for the U.S. Army Corps of Engineers (USACE) from 1981 to 2014 in both the Chicago Division and later in the Great Lakes and Ohio River Division. Jan worked as a regional water quality coordinator, manager of a number of regional programs, and represented USACE on a variety of international and interagency committees and working groups dealing with the Great Lakes. He managed and provided technical assistance on regional programs on Remedial Action Plans, coordinated the development of watershed models for Great Lakes tributaries, and constructed projects for habitat restoration and contaminated sediment remediation. Jan also oversaw the development of technical guidance documents and regional manuals for a variety of Great Lakes and regional programs.

### Jeff Tyson, Great Lakes Fishery Commission

Since 2016, Jeff Tyson has served as the Fisheries Management Program Manager at the Great Lakes Fishery Commission. In his role with the GLFC, Jeff helps facilitate interjurisdictional, coordinated fisheries management with the eight states, the province of Ontario, and the tribes with fisheries management authority in the Great Lakes. Jeff also assists the states, tribes, and province in identifying environmental and habitat impairments that impact fish and fisheries across the basin and works with them to address these impairments. Prior to coming to the GLFC, Jeff worked for 25 years for ODNR on Lake Erie in positions ranging from fisheries biologist to program administrator.

### Marie Strum, USACE-LRE

Marie Strum is the Chief of the Engineering and Technical Services (ETS) Division for the USACE – Detroit District. She has been in this role since 2016 and is the first woman to hold this position.

As Chief of ETS, Strum oversees the execution of the civil works and military missions of the Detroit District in Engineering, Design, and Construction; Operations and Maintenance; Great Lakes Hydraulics & Hydrology; Regulatory; and Emergency Management. She also leads the Great Lakes Navigation Team (comprised of Buffalo, Chicago, and Detroit District navigation staff) in stakeholder outreach, communication, and budget development.

Strum graduated from Michigan State University in 1985 with a Bachelor of Science degree in Civil Engineering. She received a Master of Science in Environmental Systems Engineering from Clemson University in 1987.

### Jim Selegean, USACE-LRE

Dr. Selegean has been a coastal engineer with the USACE–Detroit District for 28 years. He was one of the founders of the Great Lakes Tributary Modeling Program and part of the Great Lakes Regional Sediment Management Team. His expertise is in coastal modeling, field data collection and geomorphology.

Dr. Selegean received his Ph.D. from Wayne State University in environmental engineering.

### Burton Suedel, USACE – Engineering Research and Design Center (ERDC)

Dr. Suedel is a research biologist at the U.S. Army Corps of Engineers (USACE) Engineer Research and Development Center (ERDC), Environmental Laboratory, in Vicksburg, Mississippi. He obtained his bachelor's degree in biology and master's degree in biology from the University of North Texas, and his Ph.D. in biological sciences from the University of Mississippi. He has published in the areas of aquatic and sediment toxicology, dredging effects on the environment, environmental risk assessment and management, and ways in which sustainable environmental, social, and economic benefits can be incorporated into navigation and port infrastructure planning. He manages the Dredging Operations Technical Support (DOTS) program that facilitates transfer of existing and new navigation and dredging technology to stakeholders in the USACE' navigation mission.

### Marin Kress, USACE-ERDC

Dr. Kress specializes in navigation system research with the U.S. Army Corps of Engineers, ERDC, Coastal and Hydraulics Laboratory. Dr. Kress works out of Washington DC and first began her career with ERDC as a NOAA Sea Grant Knauss Fellow. Kress is involved in waterborne transportation research with a special focus on topics related to geospatial data, dredging operations, data accessibility, port system analyses, decision-support tool development, and software systems instruction. Dr. Kress also participates in the U.S. Committee on the Marine Transportation System Maritime Data Integrated Action Team which focuses on expanding the accessibility and utility of navigation data. Dr. Kress holds an M.S. in Environmental Science and a Ph.D. in Marine Science and Technology, both from the University of Massachusetts.

### Sharonne Baylor, U.S. Fish and Wildlife Service

Sharonne Baylor is the Environmental Engineer for the Upper Mississippi River National Wildlife and Fish Refuge. Since joining the Refuge in 2003, she has been involved with the planning, design, construction, and operation and maintenance of over 40 habitat restoration projects on the Mississippi and Minnesota Rivers. Many of these multi-million dollar projects use dredging and dredged material placement to restore river habitat. Prior to joining the Refuge, she worked for 12 years with the U.S. Army Corps of Engineers, St. Paul District as a construction project engineer.

### Isaac Wilding, Maryland Dept. of Natural Resources

Isaac Wilding is the Dredging Coordinator, with the Waterways Group, Office of Coastal and Ocean Management, Chesapeake and Coastal Services, MD Dept. of Natural Resources. Before joining DNR Isaac worked for an environmental engineering consulting firm that designed marine projects including bulkheads, piers, living shorelines, and dredging projects. Isaac is a life-long resident of the Chesapeake Bay area.

### Dylan Davis, USACE-South Atlantic Division

Dylan Davis has served as the Coastal Program Manager for Navigation and Flood Risk Management, USACE-South Atlantic Division since October 2009. As the Coastal Program Manager, Mr. Davis oversees all aspects of the Navigation and Coastal Storm Damage Reduction program throughout the Southeastern United States and the Caribbean. His responsibilities include the management of a \$350 million annual program encompassing 34 deep draft harbors and channels, four coastal waterways, 121 shallow draft harbors, and 36 constructed beach segments.

## APPENDIX 3 – Symposium steering committee

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## APPENDIX 5 – Workshop participants

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## APPENDIX 6 – Literature review and bibliography on environmental dredging windows

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## APPENDIX 7 – Pre-symposium request for information

### PRE-SYMPOSIUM REQUEST FOR INFORMATION

In the planning process for the symposium and workshop *Exploring Science-Based Strategies for Environmental Dredging Windows in Lake Michigan*, the Steering Committee and Great Lakes Commission staff, with the help of USACE Biologist Kevin Meyer, compiled survey questions seeking information from the appropriate state agency personnel from the four Lake Michigan states (Illinois, Indiana, Michigan and Wisconsin). Following are the survey questions, with respective state responses, and a collective summary of the responses.

#### 1. How does your agency define environmental dredging windows?

##### Illinois

The Illinois Department of Natural Resources does not have an official agency definition of environmental dredging window. Permit requests for dredging projects are reviewed on an individual basis by the Department's Office of Water Resources to ensure compliance with the Rivers, Lakes and Streams Act, 16 ILCS 5. Similarly, the Department's Impacts Assessment Section reviews permit applications pursuant to the Illinois Endangered Species Protection Act, 520 ILCS 10/11, Illinois Natural Areas Preservation Act, 525 ILCS 30/17, and Illinois State Agency Historic Preservation Act, 20 ILCS 3420/4. In Lake Michigan, IDNR staff routinely consider potential impacts of proposed work during seasons and locations where vulnerable species may be disturbed. For example, work in nearshore areas with the preferred habitat of the state threatened mudpuppy would be avoided during cold water months (e.g., winter-early spring) when this species is likely to be utilizing preferred nearshore habitat (Beattie et al. 2017. <http://www.sciencedirect.com/science/article/pii/S0380133016302106>).

##### Indiana

Dates allowable for dredging as determined during environmental review of a dredging project. Restricted dates are often imposed as a means to protect fish and wildlife during critical parts of the year most often associated with reproduction (spawning/migration, nesting, rearing of young).

##### Wisconsin

- a. Fisheries management uses fish spawning and fish movement to determine dredging windows.
- b. Individual permit (IP) is for dredging any areas that haven't been dredged before, or they want to be able to dredge on a regular basis. The fee is \$500 and requires a 30 day public notice period. I can put any conditions and dates that I want in this type of permit and have been using the March 15 to July 1 no dredge window except for Lake Michigan, but I think there's only one of those.

- c. General permit (GP) is for maintenance dredging the exact same area that received a permit to dredge before and is to dredge one time. The fee is \$300, and I have to issue it within 30 days. The conditions cannot be changed, and for areas north of STH 29, the no dredge window is April 1 to June 1. If an application meets all the standards, we have to issue the permit. Although, if there will be some harm to the environment (like spawning on Lake Michigan) we can either have the applicant submit something in writing that they will avoid dredging Nov. 1 to July 1 or dismiss the application and require them to apply for an IP and require it anyway. There are other types of GP's too like manual dredging and invasive species removal - See Adm. code 345 or our website <http://dnr.wi.gov/waterways/construction/dredging.html> if you want to know more.
- d. Trout streams have a tighter definition and include Sept 15 to May 15.
- e. NR 345

### Michigan

Dredge windows are defined as those times in which dredging can occur to avoid biological consequences for fish.

## **2. Please provide a brief description of documents, studies, reports, or publications that are currently used or referenced to inform the development of environmental windows by your state or agency.**

### Illinois

IDNR/OWR has never included or been requested to include a special condition concerning environmental windows in a dredging and/or open water disposal permit. However, as mentioned above the occurrence of state listed E & T species is carefully reviewed before any work in Lake Michigan is approved. For instance, Illinois has many E & T plant species that occur along the shore and in protected Natural Areas along Lake Michigan. These areas are avoided for site placement and if offshore placement was proposed, then high quality fish habitat would also be avoided. Many of these concerns are case-by-case and are reviewed and resolved during the comment period of the required permit review process.

### Indiana

The origin of the current dredging windows are unknown, but they were likely established by a) consultation with IN DNR Fisheries and Wildlife Biologists and b) efforts to align with other Midwest States. The IN DNR currently uses a standard dredging moratorium from April 1 to June 30 as a means to protect most fish and other aquatic species during spawning and nesting and was likely derived during consultation with Fisheries Biologists many years ago. Similarly, a more restrictive moratorium (March 15 through June 15 and from July 15 through November 30) is placed on projects in the vicinity of tributaries where salmonids are known to migrate in and out during various times of year. This restrictive moratorium was developed based primarily on historic salmonid migration numbers associated with tributaries and nearshore waters of Lake Michigan. Consultation with the Lake Michigan Fisheries Biologist is undertaken to determine if a project is located close enough to a tributary to warrant the salmonid restriction. Consultation with various IN DNR Wildlife Biologists may also occur during permit application review, especially when state or federally-listed species are documented near the project area. For example, State Ornithologists may require dredging be done outside of the breeding season for

nearby waterbird colonies (April 15–August 15) or require buffers to restrict dredging near colonies altogether. They may also require similar date restrictions on upland disposal. Activities near raptor nests typically require meeting the Bald and Golden Eagle date and distance restrictions. State Mammologists may focus more on upland sediment placement and its impact during breeding season or within critical habitats. Species-specific restrictions regardless of taxa may be necessary and are reviewed on a case by case basis. Documentation (Emails, meeting notes, and draft policy proposals) from the Indiana Lakes Management Work Group (2008) indicates there have been past efforts to justify and coordinate dredging window dates with other Midwest states. This however mostly focused on inland lake dredging with little emphasis on Lake Michigan. References: It is unknown at this time if academic literature, studies, or reports have been used to determine or justify dredging windows for Lake Michigan.

### Wisconsin

- a. See enclosed EA for dredging in Green Bay
- b. Citation
- c. Evaluating the potential long-term and cumulative impacts from dredging to accommodate boat access in Green Bay and Lake Michigan in Door County, Wisconsin. Final Report February 26, 2009

### Michigan

The windows have been developed over time with agency biologists and researchers' knowledge of fish behavior, habitat requirements, and local knowledge related to river conditions, timing, stocking, etc.

### **3. Is your agency currently leading or participating in any studies or research related to environmental windows or the impacts of dredging operations (including placement of dredged material) on water quality, specific species, or aquatic habitat? Please indicate how long any studies or research has been ongoing.**

### Illinois

Illinois is not doing any research or studies specifically aimed at environmental windows or impacts of dredging, that we are aware of. However, a couple other projects have collected data for permitting on frequently dredged areas, including Waukegan harbor approach channel and Calumet River. Corps of Engineers has that data. It is being used to inform the Water Resources Development Act (WRDA) Section 1122 Illinois Pilot Project. Sand will be dredged from the outer harbor, approach channel, and advance maintenance area of Waukegan Harbor, Illinois in order to build back eroded beaches of Evanston, Glencoe, Lake Bluff, and North Chicago. The US Army Corps of Engineers has dredged this area for many years and has data collected for permitting and review. Biological issues have never been flagged for dredging in this area.

In addition, Waukegan Harbor is an Area of Concern. To remove the *Degradation of Benthos* and *Restrictions on Fish and Wildlife Consumption* Beneficial Use Impairments (BUIs), IDNR has worked with various contractors to assess the health of benthic and fish populations within Waukegan Harbor and reference harbors (North Point Marina, Jackson Harbor, and Burns Harbor in Indiana that require periodic dredging. IDNR-contracted studies to monitor and assess benthic

populations occurred in 2012 and 2015. IDNR-contracted sampling to monitor PCB levels in fish began in 2012 prior to environmental dredging of the harbor. Fish health monitoring resumed in 2015 (post-environmental dredging) and has occurred every year through 2020 with the exception of 2019. The latter study shows that both fish diversity and fish populations are fairly low with mostly common species. IDNR-Coastal has this data available.

#### Indiana

No

#### Wisconsin

Fisheries Management is not currently involved in any studies or research in this area.

#### Michigan

No

### **3a. Please reference (or provide details on) the studies and describe the data or datasets resulting from said efforts.**

#### Illinois

Benthic surveys completed for Waukegan Harbor and reference sites collected benthic invertebrate community data such as taxa richness and diversity, community structure and abundance, and community pollution tolerance. A final report recommending the removal of the *Degradation of Benthos* BUI submitted to USEPA in 2017 (linked below) concluded the following:

- Invertebrate taxa richness and diversity were found to be significantly higher in Waukegan Harbor AOC than in Burns Harbor non-AOC
- Invertebrate community structure, abundance, and pollution tolerance were not significantly different between Waukegan Harbor AOC and Burns Harbor non-AOC
- Overall invertebrate biodiversity in Waukegan Harbor AOC has increased since the completion of environmental dredging

Fish health monitoring efforts target fish species that are currently under a fish consumption advisory for the state of Illinois. Monitoring for the *Restrictions on Fish and Wildlife Consumption* BUI results in fish tissue contaminant data for the following species from Waukegan Harbor, North Point Marina, and Jackson Harbor: sunfish, rock bass, black bullhead, and black bass (smallmouth and largemouth bass). Fish sampling in Waukegan Harbor has been difficult due to the lack of suitable fish habitat within the harbor. The lack of benthic habitat and structures throughout the harbor has led to significantly smaller fish populations in Waukegan Harbor than in the reference harbors (North Point Marina and Jackson Harbor). IDNR routinely struggles to collect adequate numbers of fish from Waukegan Harbor, primarily black bullhead, sunfish, and smaller-sized black bass, despite increasing sampling effort in recent years. For final BUI removal reports, see the USEPA website linked below:

<https://www.epa.gov/great-lakes-aocs/waukegon-harbor-bui-removals>

Indiana

Not applicable

Wisconsin

Not applicable

Michigan

Not applicable

#### 4. What additional data needs or environmental information would your agency like to have to inform the development of environmental windows in your state?

Illinois

Illinois DNR has an “unwritten rule” that frequent routine dredging (e.g., within every 5 years) has reduced likelihood of impacts to rare and endangered species, which is based on anecdotal evidence of mussel recolonization in rivers after dredging. However, recent talks with USFWS suggest this may be changed to every 3 years. It is case-by-case and dependent on the location and resources of concern, but more information on best management practices related to periodicity of routine dredging would be helpful. Additional data or reports on successional changes and use of areas by fish and wildlife post-dredging could better inform regulatory decisions regarding dredging.

Indiana

Peer-reviewed journal articles defining and determining direct impacts on nearshore fish and other aquatic biota during dredging or in lake sediment deposition. Date restrictions are often seen as a necessary tool to protect fish and wildlife during critical times of year, but arguments may be made that most species can avoid direct project areas if necessary. Studies showing sediment plume migration and potential to indirectly impact nearshore species.

Wisconsin

- a. Determine cumulative impacts on dredging in specific areas including mapping of dredging and related footprint of activities in a given area.
- b. Determine effectiveness of turbidity barriers
- c. Determine effectiveness of mitigation projects
- d. Re-evaluation of spawning periods and rearing areas

Michigan

Sturgeon distributions and early life history. As bottom dwellers and vulnerability at an early life stage in the lower ends of rivers, we know very little about their needs or habitat. They would appear to be very vulnerable to dredging actions and as a species of significant conservation concern, it would be helpful to know more about them and risk to their population health.

Likewise, dredging operations and sturgeon spawning. How does it influence their willingness to enter streams or move to spawning grounds.

What effect does frequency have on fish habitat and behavior and ultimately potential population consequences in rivers that are dredged every year as opposed to those locations that are dredged far less frequently.

**5. Please identify any tools, processes, or programs used by your agency to project the impacts of dredging projects related to environmental windows.**

Illinois

See answer to question 4 above.

Indiana

The Department will utilize aerial imagery via ESRI ArcMap, Google Earth, etc. to determine project proximity to a tributary to determine if salmonid moratorium dates are required or proximity to in lake structure that may be beneficial for aquatic species (Breakwalls, marinas, harbors, etc.)

Wisconsin

We use all available information including fish surveys, habitat surveys and research to evaluate dredging windows on a regular basis. We also use site specific information to evaluate any exceptions that may be requested.

Michigan

We have an agency chart that is periodically reviewed and updated as new information is made available on river fish populations or habitat conditions.

**6. Please identify and describe any emerging issues related to dredging and/or environmental windows that may need additional study or investigation. This could include changes to ecosystems or species in your jurisdiction, or elements of recent environmental window waiver requests.**

Illinois

There was a past project to blast limestone underwater from a navigational hazard in Lake Michigan. Illinois DNR requested the use of scare charges first at the site to reduce negative impacts of underwater explosions on fish, but little is known about the effects of scare charges on fish and what best management practices might be available in this type of scenario.

Indiana

Large-scale and long-term dredging projects appear to be becoming more prevalent and often conflict with dredging windows and restrictions, particularly if located near tributaries that attract salmonids. Politics, money, and other factors often make their way into a waiver request and may be problematic when trying to protect local fish and wildlife. Placement of dredged material is often contentious. Intake deposition may be causing more impacts than we realize, where sand starvation along the lakeshore may mean less protection for shorelines and local residents. How these phenomena interact and the benefits of each would be beneficial when making policy decisions regarding sand placement. Winter storms, changes in lake level, and extreme weather events are new and on-going factors that affect the overall condition of the lake which can affect dredging needs, spawning activity, and much more that is currently unknown. If Asian carp ever get into Lake Michigan, that might change fish behavior and affect dredging needs. If wind turbines are ever installed in Lake Michigan, this would presumably change sediment migration to some degree, fish use around turbine supports, and possibly affect what areas are dredged and when.

Wisconsin

- a. Water levels
- b. Frequency of storm events
- c. Hydrodynamic models of sediment movement
- d. Examine interactions between life history stages of contemporary fish species population composition/abundances and in-water work

Important to note that window determinations and concerns do not apply solely to dredging projects, but any in-water construction action that may affect existing spawning habitat or interfere with fish movement.

Michigan

PFAS contaminants in dredge material and spoil disposition.

**7. 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?**

Illinois

Yes, we would be interested in learning more about different dredging equipment in a webinar format. Which type is best and/or has less impact? We assume some fish may be entrained in hydraulic dredging, but we don't know how many or what types off hand, so more information on this would be helpful. An explanation of the waiver request process would also be helpful.

Indiana

Yes



Wisconsin

Yes

Michigan

Yes

**8. 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?**

Illinois

Yes, discussions of new dredging equipment and emerging technologies would be useful for similar reasons as those identified in the answer to question 7 above.

Indiana

Yes

Wisconsin

Yes

Michigan

Yes

## APPENDIX 8 – Summary of state responses to request for information

### SUMMARY MEMORANDUM

To: Environmental Dredging Windows Steering Committee

Fr: David L. Knight, Great Lakes Commission

Re: Summary analysis of request for information

Da: February 2, 2021

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In preparation for the upcoming symposium “Exploring strategies for modifying environmental dredging windows in Lake Michigan,” a request was recently made by the Great Lakes Commission to the four states surrounding Lake Michigan - Illinois, Indiana, Michigan and Wisconsin – seeking information on various aspects of their practices and policies relating to environmental dredging windows. Agencies that have responded to the request to date include the Illinois Department of Natural Resources, the Indiana Department of Natural Resources’ Division of Fish and Wildlife, the Michigan Department of Natural Resources and the Wisconsin Department of Natural Resources.

The states were queried as to how they each defined dredging windows in their respective waters. Their responses indicated a general pattern of not viewing the establishment of dredging windows as a stand-alone function, but rather as a component of the broader environmental review and permitting process for navigation dredging and dredged material management. All states handle dredging permits on a project-by-project basis, though Wisconsin gives higher scrutiny to first-time dredging sites as opposed to maintenance dredging done on an ongoing basis.

All set dredging windows generally for protection of fish and wildlife during critical times of the year for spawning, migration, nesting, and rearing of young. Their respective sources for scientific data behind dredging windows vary, however. Illinois does not include a special condition concerning environmental windows in dredging and open water disposal permits, but it does make special consideration of endangered and threatened (E&T) species in its review of any proposed dredging operations in Lake Michigan.

Wisconsin identified an environmental analysis (EA) carried out in 2009 for dredging in Green Bay and Door County as a primary source of reference in its process of setting Lake Michigan dredging windows. In Michigan, regulation of dredging windows has been developed over time with agency biologists and researchers’ knowledge of fish behavior and habitat requirements. Also factored in is local knowledge related to river conditions, timing, stocking, etc.

Indiana imposes a standard dredging moratorium from April 1 to June 30, dates that, according to the Indiana DNR, were likely derived during consultation with fisheries biologists many years ago. Similarly, a more restrictive moratorium (March 15 through June 15 and from July 15

through November 30) is placed on projects in the vicinity of tributaries where salmonids are known to migrate in and out during various times of year. The agency also noted that documentation exists referencing past efforts dating back to 2008 by the Indiana Lakes Management Work Group to justify and coordinate dredging window dates with other Midwestern states. They added, however, that these efforts focused mostly on inland lake dredging with little emphasis on Lake Michigan.

To further explore the state of science behind dredging windows policies, the states were asked to identify any current research in which they are participating related to environmental windows and the impacts of dredging and dredged material management. Illinois was the only respondent to reference some ongoing research with tangential ties to dredging windows. As part of a federal program currently underway to beneficially use sand dredged from the Waukegan harbor to nourish sand-starved beaches in three north suburban communities, (the Water Resources Development Act Section 1122 Illinois Pilot Project), useful data is being collected by the Corps of Engineers.

The Illinois DNR also noted that Waukegan Harbor is an Area of Concern and in efforts to remove the Degradation of Benthos and Restrictions on Fish and Wildlife Consumption Beneficial Use Impairments (BUIs), IDNR has worked with various contractors to assess the health of benthic and fish populations within Waukegan Harbor and other Lake Michigan reference harbors. Benthic surveys completed for Waukegan Harbor and reference sites collected benthic invertebrate community data such as taxa richness and diversity, community structure and abundance, and community pollution tolerance. A final report recommending the removal of the Degradation of Benthos BUI submitted to U.S. EPA in 2017 is available.

When asked to identify any additional data needs or environmental information that would better inform development of environmental windows, Illinois DNR cited its “unwritten rule” that frequent maintenance dredging (e.g., within every five years) has reduced likelihood of impacts to rare and endangered species. Recent consultation with the U.S. Fish and Wildlife Service, however, suggest this may be changed to every three years. The Illinois DNR thus indicated that more information on best management practices related to periodicity of routine dredging would be helpful, as would additional data on successional changes and use of areas by fish and wildlife post-dredging.

Indiana cited the potential value of more peer-reviewed journal articles defining and determining direct impacts on nearshore fish and other aquatic biota during dredging or in-lake sediment deposition and studies showing sediment plume migration and potential to indirectly impact nearshore species.

Michigan identified a need for more data on sturgeon distributions and early life history, noting that, “As bottom dwellers with vulnerability at an early life stage in the lower ends of rivers, we know very little about their needs or habitat. They would appear to be very vulnerable to dredging actions and as a species of significant conservation concern, it would be helpful to know more about them and risk to their population health.” Also cited was a need for more science on the impacts of dredging operations on sturgeon spawning, and, more specifically, how dredging influences the willingness of spawning sturgeon to enter streams or move to

spawning grounds. Michigan is also interested in developing more data on the effects of dredging frequency on fish habitat and behavior: are there differing consequences to fish populations in rivers that are dredged every year as opposed to those locations that are dredged far less frequently?

The states were asked to identify any additional tools, processes, or programs they used to project the impacts of dredging projects related to environmental windows. Indiana responded that it utilizes such tools as aerial imagery via ESRI ArcMap and Google Earth to determine project proximity to a tributary to determine if salmonid moratorium dates are required, or proximity to in-lake structures such as breakwalls, marinas, and harbors. The Michigan DNR maintains an agency chart that is periodically reviewed and updated as new information is made available on river fish populations or habitat conditions. Wisconsin reported that it relies on all available information including fish surveys, habitat surveys and research, as well as site-specific data, to evaluate dredging windows.

The states were asked to identify any emerging issues related to dredging and/or environmental windows that may need additional study or investigation, including changes to ecosystems or species underway in their jurisdictions, or elements of recent environmental window waiver requests. Both Indiana and Wisconsin pointed to changing natural impacts such as water levels, storm volatility and sediment transport as growing concerns. Indiana also noted increased contentiousness surrounding waiver requests for large-scale and long-term dredging projects that often conflict with dredging windows and restrictions and can be influenced by such non-scientific factors as political and economic interests. Indiana also identified in-water placement of dredged material as a practice with potential environment impact than is currently recognized.

Michigan identified concerns related to the presence of the per- and polyfluoroalkyl family of chemicals (PFAS) in dredged material and its placement. Illinois cited a past project in which underwater blasting was proposed to remove a navigation hazard in Lake Michigan. The Illinois DNR requested the use of scare charges at the site before the blasting to reduce negative impacts on fish but noted that little is known about the effects of scare charges on fish and what alternative best management practices might be available in this type of scenario.

Looking forward, all states supported an ongoing collaborative discussion of dredging equipment and best management as having value to the determination of environmental dredging windows and the waiver request process. They also all indicated interest in learning more about emerging and innovative technologies in dredging and dredged material management, as they relate to dredging window policies.

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