DREDGING WINDOWS WORKSHOP SUMMARY

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Workshop: 11/30/2011
Final Report: 04/30/2014

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Table of Contents

Executive Summary **…....5**

Dredging Windows Workshop Summary **..…..9**

Introduction and Background ..……...9

U.S. Army Corps of Engineers Presentations ……...9

Dredging Windows Fisheries Information Matrix Overview and Discussion ……13

Review and Revision of Indicator Species List ……19

Additional U.S. Army Corps of Engineers Presentation ……21

Potential Modifications of Dredging Environmental Windows Based on Supporting Data: Identifying a Process? ..…22

Next Steps and Action Items **..**…25

Literature Cited ..…26

Acknowledgements **..**…27

Appendices ……28

EXECUTIVE SUMMARY

Introduction and Background

Environmental windows are commonly used as a management tool to minimize potential adverse impacts of dredging on a number of important finfish and shellfish species in New York and New Jersey waters. In general, the windows are set using a policy that emphasizes risk avoidance when possible, risk management when avoidance is not possible, and lastly, mitigation when necessary to offset unavoidable impacts. Federal and state resource agencies involved in dredging follow this policy of risk avoidance, management, and mitigation. However, concerns for an increasing number of species have been steadily shrinking the time frames during which dredging is allowed. The New York District of the U.S. Army Corps of Engineers (USACE) and the New York State Department of Environmental Conservation (NYSDEC) agreed that the process of setting windows on dredging projects needs to be improved and initiated an effort to review information used to set the windows and examine the feasibility of modifying or adapting the procedure.

In support of this effort, New York Sea Grant (NYSG), Stony Brook University, USACE and NYSDEC held a day-long Workshop on fisheries dredging windows in New York City on November 30, 2011 that brought federal and state agencies' representatives together with technical experts to:

- Examine the existing windows when dredging is allowed for the inlets and bays of the south shore of Long Island, the New York/New Jersey Harbor and Lower Hudson River,
- Review the relevant biological and engineering technical information presently used to set the windows, and
- Discuss the possibility of adjusting or modifying the periods when dredging can occur based on available information.

This report contains a detailed summary of the discussions at the Workshop. The major Workshop findings and recommendations for addressing some of the key issues are provided below.

Key Workshop Findings

- Dredging windows are intended to be a tool to protect living resources from unacceptable damage, but generic fisheries windows based on risk avoidance are no longer workable because they restrict dredging time frames to the point where it becomes extremely difficult to perform required dredging. Under an approach based more on risk management, windows could be adjusted if regulators have sufficient information to decide that a project will not cause unacceptable damage. This evaluation has to be done on a project-specific basis. For each project, information on the environmental setting and operational details must be

provided by USACE so that NYSDEC can assess the level of impact. To do this, USACE needs to know from NYSDEC the species and impacts of concern for a particular project.

- A move from considering only risk avoidance to considering risk management in setting dredging windows would require increased communication and an elevated level of dialogue between/among the agencies. Coordination needs to begin earlier in the process. Early coordination will help identify the critical operational constraints (such as project duration, rate of material removal, sediment type, etc.) and environmental impacts (such as potential turbidity levels, the size of the plume, etc.), as well as the fisheries of concern for particular projects. Early coordination can focus information needs and increase efficiency in the decision making process.

- Limited NYSDEC staff resources available to work on dredging windows is a major obstacle to achieving the level of interagency dialogue and coordination needed to successfully incorporate a risk management approach in setting dredging windows.

- The major impacts of dredging on fisheries resources are thought to be associated with the resuspension of sediment. The Workshop group identified the following as the priority species of concern for setting dredging windows in the area of interest (New York Harbor, south shore bays and inlets): American eel, Atlantic menhaden, Atlantic sturgeon, blue crab, blackfish, hard clam, horseshoe crab, lobster, river herring, summer flounder, weakfish, and winter flounder. The specific species of concern must be tailored to particular sites, seasons, and operations and may change over time depending on stock status and public interest.

- The more information that is available, the easier it is for NYSDEC to assess the impact of a project and make a decision regarding possible adjustment of the dredging windows. This includes information on both the technical aspects of dredging operations and the relevant biological and environmental information. Information NYSDEC would like to have to make this evaluation includes:

    - Sediment type,
    - Type of dredge used,
    - Area and scope of impact,
    - Turbidity plume characteristics,
    - Specifics of dredging operations and logistics (e.g. pipeline layout, suction speeds, daily dredge capacities),
    - Habitat type (sediment type, presence of vegetation), and
    - Currents.

  Much, but not all, of this information can be found in the Essential Fish Habit (EFH) assessment document prepared for NOAA National Marine Fisheries Service (NMFS). The EFH assessment does include information such as organisms found in the area. NYSDEC presently does not receive EFH material developed for specific projects. Some operational information is also included in Water Quality Certification (WQC) materials USACE prepares for the state.

- The matrix of species, life stages of concern, and dredging stressors developed for the Workshop is a useful and important tool to facilitate decision making regarding dredging windows, but it is incomplete. Completing the biological component (including the dredging stressors) and developing a matrix that includes information on dredging technologies and impacts (e.g., plume characteristics for different equipment, sediment types, and physical environments based on USACE field and model studies) would provide a framework that could help identify mutually agreeable options for dredging projects more quickly. It was recognized that there are a large number of variables involved and the engineering portion of matrix should not replace or reduce needed dialogue between the agencies. Completing and maintaining the matrix would take some effort. No resources have been identified to undertake this task.

Recommendations

- New York State should form a team within the NYSDEC that would be committed to focus specifically on environmental and regulatory issues associated with dredging in both the New York/New Jersey Harbor and Long Island marine waters. An immediate responsibility of this team should be to work with USACE to evaluate incorporating risk management into the windows setting process. This would require either reallocating existing resources to this task or providing new resources to staff the team. Adding dredging responsibilities to existing staff positions will not resolve the problem.[1]

- NYSDEC and USACE should identify mutually-agreeable mechanisms to foster earlier coordination on dredging projects, increased sharing of technical and environmental information, and better communication between agencies. They must also commit the staff resources necessary to implement these measures.

- USACE should arrange to routinely provide NYSDEC staff involved in permitting of, or setting windows for, dredging projects with the Essential Fish Habitat assessment document USACE prepares for NMFS. NYSDEC should also arrange for these staff to receive Water Quality Certification materials USACE prepares for the NYSDEC for use in conducting assessments.

- NYSDEC should allocate resources to complete and maintain the biological portion of the Dredging Windows Fisheries Information Matrix developed for the Workshop and USACE should work with NYSDEC to expand the matrix to include technical information on the engineering aspects of dredging operations that NYSDEC needs to facilitate the dredging permit decision-making process. This can be done by the agencies involved or by outside experts if funding is available.

[1] In July 2012, NYSDEC announced the creation of a dredging team for the Port of New York and New Jersey. The team's regulatory review is focused on dredging in New York/New Jersey Harbor but it may have involvement in broader marine dredging issues in areas outside of the Harbor.

DREDGING WINDOWS WORKSHOP SUMMARY

Workshop: 11/30/2011 Final Report: 04/30/2014

Introduction and Background

In New York/New Jersey marine waters, environmental windows are commonly used as a management tool to minimize potential adverse impacts of dredging on a number of important finfish and shellfish species. Regulators typically set windows only allowing dredging and disposal activities during periods they have determined will have minimal or no impacts on specific species and their associated habitats. Some of these windows have been in place for more than thirty years. Concerns for an increasing number of species have been steadily shrinking the time frames during which dredging is allowed. The impetus for a workshop occurred around mid-2010, when the District Engineer of the New York District of the U.S. Army Corps of Engineers (USACE) and the Commissioner of the New York State Department of Environmental Conservation (NYSDEC) agreed that the process of setting windows on dredging projects needs to be improved. They initiated an effort to review information used to set the windows and examine the feasibility for adaptations or modifications to the procedure. Conflicts between the engineering demands and maintaining the integrity of biological systems are often contentious, with no established protocol or mechanism for discussion inside or outside of the regulatory process that might expedite conflict resolution. Of course, this is not merely a technical issue but also a legal and regulatory one with limitations on time and agency resources.

In support of this effort, New York Sea Grant (NYSG), Stony Brook University, USACE and NYSDEC planned and convened a Workshop on dredging windows in New York City on November 30, 2011. The Workshop brought federal and state agency representatives together with technical experts to examine the existing windows when dredging is allowed, review the relevant biological and engineering technical information presently used to set the windows, and to discuss the possibility of adjusting or modifying the periods when dredging can occur based on available information. The discussions covered only fisheries windows and did not include similar restrictions to protect birds or mammals. The area of interest was restricted to the inlets and bays of the south shore of Long Island, the New York/New Jersey Harbor, and the lower Hudson River. The agenda and list of attendees for the Workshop are provided in ***Appendices 1 and 2***.

U.S. Army Corps of Engineers Presentations

The Workshop started with three presentations by USACE personnel covering sediment resuspension by dredges, maintenance dredging projects in the New York District, and the results of a biological survey of winter flounder in NY/NJ Harbor. The slides for each presentation can be found in ***Appendix 3***. A brief summary of each presentation and related discussions are provided below.

Sediment Resuspension by Dredges: Defining the Issues. Presentation by Doug Clarke, Environmental Laboratory, USACE Engineer Research and Development Center

Mechanical (backhoe, clamshell or bucket) dredges have different modes of impact than hydraulic dredges (cutterhead or hopper), although all types resuspend sediments and generate turbidity to varying degrees. Concerns for potential impacts on sensitive receptor species have historically focused on suspended sediments released by the given dredge. Environmental windows have been the most common management practice applied to address such impacts since passage of the National Environmental Policy Act (NEPA) in 1969.

Sediment loss rates for most forms of hydraulic dredging are estimated to be approximately one percent or less, whereas average loss rates for mechanical dredging are about two percent. Resuspended sediment is transported down-current as plumes in which sediment particles settle are governed by grain size, cohesion, and flocculation. Suspended sediment concentrations around dredging operations tend to decrease rapidly with distance from the dredge source. Peak concentrations may reach several hundred milligrams per liter at the cutterhead, draghead, or bucket points of contact with the bed. Early numerical models of the process tended to predict plumes that contained higher concentrations and were spatially larger than those measured in the field. This has since been explained largely by the fact that, in the field, much suspended sediment behaves as aggregates rather than as individual particles. The assumption in prior laboratory studies is that suspended sediments behave as individual particles. Aggregates behave as denser particles, thereby settling relatively quickly. In contrast to widely accepted perceptions, turbidity plumes do not occur as stable, homogenous clouds, but rather exist as pulses. The total plume footprint oscillates in tidal settings, and the physical presence of the dredge itself can partially block plume dispersion.

Actual suspended sediment concentrations found in plumes depend not only on the type of dredge, but also on its mode of operation (e.g., production rate, barge availability) as well as on ambient conditions. For example, the presence of large debris during clamshell dredging can prevent complete bucket closure. In many cases, the production rate is constrained (e.g., by limiting bucket hoist speed) with the intent of slowing the release of suspended sediment. This strategy involves a trade-off in that the intensity of the disturbance may be lowered, but the duration lengthened.

The risk of detrimental impacts should be assessed by characterizing both the spatial and temporal scales of exposure to plumes, and the responses of organisms of concern to such exposures. Although existing field measurements and predictive numerical dredging process simulation modeling can describe the former, studies documenting thresholds of effects on key organisms are often lacking. When dredging clean sediments, severe effects would only be observed for intense exposures of long duration. Sublethal effects (e.g., behavioral changes, elevation of stress hormones) are difficult to measure, and exceedingly difficult to assess in terms of biological meaning. However, with adequate knowledge of the mode of dredging, site-specific conditions, and life history requirements of species of concern, bounds can be placed on the degree of risk. Importantly, disturbances associated with the dredging process should be placed into context with other similar exposures experienced by organisms of concern, such as by storms, freshets, or plumes created by ship traffic. Once the overall risk has been assessed, the need for appropriate risk management practices can be determined.

Maintenance Dredging in the New York District. Presentation by Randall G. Hintz, Chief, Operations Support Branch, New York District USACE

Maintenance dredging projects in the New York District can be divided into three basic categories: deep draft channels, shallow draft channels, and coastal inlets. Each type of project carries its own distinct challenges.

Deep draft channels are primarily found in and around NY/NJ Harbor. They are defined as channels with an authorized depth of greater than -15 feet MLLW. Typical deep draft projects include New York and New Jersey Channels, Arthur Kill, and NY/NJ Harbor. On average, a deep draft maintenance dredging project consists of the removal of 60k-80k cubic yards (cy) of dredged material ranging in cost from $10-$100/cy. Dredging is typically accomplished either by hopper dredge or mechanical (clamshell) dredge. Depending on the quality of the dredged material, it is either placed at the Historic Area Remediation Site (HARS) or at a contractor-furnished upland placement site. Environmental windows for the deep draft projects in the New York District typically restrict dredging to September 1st through November 14th.

Shallow draft channels in the New York District typically range between -6 to -14 feet MLLW. Typical shallow draft projects include Lake Montauk Harbor, Long Island Intracoastal Waterway, and Shrewsbury River. These are usually high-priority projects because the U.S. Coast Guard relies upon access through these areas for search and rescue missions. These projects generally involve clean sand which is usually placed upland on an adjacent beach. An average maintenance cycle can range from between 3k and 50k cy of dredged material at an average cost of $10-$20/cy. These projects are typically dredged on a five- to ten-year cycle. Environmental windows restrict dredging of these projects to November and December. Unfortunately, these windows often require the dredging contractors to work in hazardous severe winter conditions as they complete the dredging and restore safe navigation to the channels.

The third type of maintenance project are the coastal inlets. On the south shore of Long Island, that includes Rockaway Inlet, East Rockaway Inlet, Jones Inlet, Fire Island Inlet, Moriches Inlet, and Shinnecock Inlet. These are typically large volume, 150k to 2M cy projects with the hydraulic (or cutterhead pipeline) removal of the material and placement at a nearby beach. In some cases, such as Fire Island Inlet, the material may be pumped for a distance of up to four miles for use at a hurricane protection project or cost-shared with the State for placement at Robert Moses State Park. These projects have a typical frequency of one to five years. Current environmental windows restrict coastal inlet dredging to the month of December, making some of these projects impossible to dredge; Fire Island Inlet, for example, requires the removal of almost 1 million cy of material, which typically requires 6 months or more of dredging. Mobilizing a dredge to the project site and setting up pipeline takes approximately one month prior to pumping sand and typically costs $2 million exclusive of the actual dredging and placement costs. Other inlets such as Rockaway Inlet (Jamaica Bay) and East Rockaway Inlet require frequent dredging of smaller quantities of material to maintain safe navigation for the commercial channel users.

In 2010, the USACE faced several challenges in completing the critical maintenance dredging of the Long Island Intracoastal Waterway. The U.S. Coast Guard reported more than sixteen vessel groundings within the Federal Navigation Channel and was unable to use the

waterway to perform critical search and rescue missions. Dredging windows prohibited the USACE from performing the maintenance dredging from June 25th through September 30th. Round-the-clock negotiations between USACE and NYSDEC netted a workable, albeit expensive, solution to address the problem. The USACE would pay the contractor to mobilize to the project twice, which created two separate disturbances in the channel from an environmental standpoint. The first work period was necessary to eliminate hazardous conditions for boaters by reducing the threat of grounding within the channel; the second work period addressed the long-term maintenance needs of the channel.

Fire Island Inlet presents a unique challenge simply because of the large volume of material that accumulates in the channel on an annual basis. The backlog of maintenance dredging due to insufficient funding has created a hazardous condition for U.S. Coast Guard Search and Rescue Missions. Currently there are almost 1M cy of sand that need to be removed from the channel and another 750k cy in the deposition basin. This volume of material typically takes six months or more to dredge. Environmental windows in the past have restricted dredging to a three-month period. Environmental windows for winter flounder seem inappropriate in this location due to the high-energy environment of Fire Island Inlet (typical currents are 2.4 knots, with a maximum of 3.5 knots). Research (Crawford and Carey, 1985) has demonstrated that spawning winter flounder prefer narrow estuaries with restricted flows, which is not the case in this project.

In some cases the USACE has received conflicting environmental windows for the same species from the New York and New Jersey state environmental departments: NYSDEC and New Jersey Department of Environmental Protection (NJDEP). A case in point involved the NY/NJ Harbor Main Ship and Sandy Hook Channels. The NJDEP Water Quality Certification (WQC) had a winter flounder window from January 1st to May 31st, while the NYSDEC WQC had a window of February 1st to May 31st. These windows applied to shoals within the same federal channel. In the same project, overwintering blue crab windows restricted dredging even though the dredging area only represents 0.15% of the study area.

In the absence of sufficient science, windows have become overly restrictive. Management by risk avoidance instead of risk management affects the ability of the USACE to effectively manage its mission to provide safe navigation, promote a strong economy, and enhance environmental sustainability.

Aquatic Biological Survey – Winter Flounder. Presentation by Jenine Gallo and Kate Mulvey, New York District USACE

Long-term (ten year) studies conducted in conjunction with the NY/NJ Harbor Deepening Project have filled several knowledge gaps pertaining to the timing and location of winter flounder spawning in the Harbor. Findings to date include:

- Spawning is generally confined to shallow, non-channel habitat, in waters less than 6m deep.
- Eggs in their early life stages (1 to 3 days old) were most commonly collected at non-channel locations and were presumably closer to spawning locations than eggs in later stages of development.

- Collections of early stage eggs were rarely found in the channels, though when found, coincided with environmental conditions that delay egg development (extreme cold) and promote transport from spawning sites (high bottom currents during spring tides).
- In cold years, low water temperatures delay egg development, thus extending the time between spawning and hatching and increasing the opportunity for egg transport to channels.
- Performed concurrently, monitoring of suspended sediment plumes arising from dredging operations demonstrated that plumes tend to remain within deeper channel waters and not move across shallow flats that represent potential spawning habitat.

Other collaborative studies by the USACE, the National Marine Fisheries Service (NMFS) Sandy Hook Lab, and the University of New Hampshire have shown that winter flounder eggs adhere to substrates in the first few minutes after spawning. Within minutes of the spawning/fertilization event, the outer hardening process occurs. Eggs that are not initially attached to the substrate or become detached are neutrally buoyant and freely drifting. The USACE is continuing to analyze the long-term data sets. In addition, the effect of deep-draft commercial ship traffic is being examined with respect to sediment resuspension so that dredging can be placed into perspective with other factors that influence exposure to suspended sediments, turbidity, and entrainment.

The technical experts noted that two recent genetic studies of winter flounder in Connecticut found a strong tendency to maintain a local stock structure. Similarly, in NY/NJ Harbor, correlations among annual egg, larval, and juvenile abundances in the Harbor, suggest that local residency within the natal estuary extends through the first year of life.

NYSDEC noted general windows are problematic because project operations vary from location to location, and the extrapolation of ecological data from place to place can be uncertain. According to one expert, winter flounder are spawning in coastal nearshore habitat, as well as in shallow, inshore estuarine and embayment waters. It is not known whether this pattern could be a response to climate change or what proportion of the population spawns in nearshore versus estuarine areas.

Dredging Windows Fisheries Information Matrix Overview and Discussion

To provide a framework for organizing information related to dredging windows, the Workshop conveners created a spreadsheet matrix that called for biological information on life history stage, abundance and distribution by habitat and timing, and potential dredging stressors on a species by species basis. The draft Dredging Windows Fisheries Information Matrix focused on indicator/priority fishery species used to set windows, in New York/New Jersey Harbor, Long Island's South Shore Bays, and ocean inlets where navigation dredging occurs. NYSDEC and the National Marine Fisheries Service (NMFS) filled in the Matrix with the information they used in developing windows, to the extent time and personnel resources allowed before the Workshop.

Workshop participants and the invited technical experts were asked to review the information contained in the draft Matrix (hard copies were provided) and provide input with an emphasis on addressing the following questions:

- Does this information represent the most current and relevant existing data for setting dredging windows?
- Are other data or information available that could/should be used to set windows?
- Does the information support the existing dredging windows or are there other data/information that support modifying the windows?
- Can we identify a process for fine-tuning or adjusting the windows, if appropriate?
- The following is a summary of the group's discussion concerning the information in the draft Matrix related to the abundance and timing of the different life stages in the different habitats in the study area.

According to NYSDEC, there are 39 managed fishery species found in New York and many of the windows applied today have been around since the early 1990's. Originally, these windows were based on what were thought to be the prime spawning periods of different fisheries species. The windows were actually developed to provide more consistency and predictability in the dredging permit decision-making process and to save staff time. Up-to-date information on the life stages embodied in the Matrix may be useful for decision-making, although, as a practical matter, the focus may be put only on particularly sensitive times in the reproductive period of specific species. Originally, eleven species were included in the draft Matrix. While not necessarily used to set specific windows, these were chosen by NYSDEC as representative in terms of the behavior of other species, and their importance to recreational and/or commercial fisheries. They are also the species for which NYSDEC anticipated having the most data. They may or may not be "at risk".

American Eel (*Anguilla rostrata*)

Because there are no American eel eggs in NY waters, the experts indicated that no window was necessary for protection of their eggs and the data for timing should be removed from the egg section in the draft Matrix. Spawning and eggs occur in the Sargasso Sea. Eels occur in NY/NJ waters as juveniles entering the system in transit though the inlets. They probably "blast through" rather than being resident in the inlets, although there may be an issue with blocking by a dredged plume or, perhaps, noise. In general, the distinction has to be made between resident habitats and transient routes of migration. The type and degree of risk would be different for fish migrating through an inlet than it would be for fish resident there. There is a pending NMFS action to list American eel as an endangered species based on a long-term decline.

There are no reproductively mature eels in the NY estuaries, but large individuals are present year-round although not in high abundance. Mature adults are found only when they are migrating to the Sargasso Sea. Juveniles might be present for years in the NY estuaries before then. In a dredging project, entrainment may be an issue. There is uncertainty whether or not susceptibility of eels to entrainment impacts depends on their size.

Atlantic Menhaden (*Brevoortia tyrannus*)

Menhaden eggs do not show up as early as indicated in the draft Matrix but, rather, appear in late March and persist to May. Data from a 21-year data set showed that the larvae used to be present in the spring and summer, but are now primarily just found in the summer. In this area, adult menhaden first appear in mid-March at the earliest and are not found in December, January, or February. When they are present, they are found only in the uppermost portion of the water column, which may lessen the impact dredging could have on them.

Atlantic Sturgeon (*Acipenser oxyrhynchus*)

There is no evidence that sturgeon reside in NY/NJ Harbor, but they are found in the Hudson River where they are an important issue. They spawn in the vicinity of Catskill. No larvae have been found in NY/NJ Harbor, although some yearlings were captured during monitoring for the Westway Project. Some sub-adults going to sea for the first time may also be found in the Harbor. Juveniles do come into the Hudson as well as Shinnecock and the Rockaways. More data on juveniles should be available from a study by Stony Brook University's Dr. Michael Frisk, underway in 2011.

Black Sea Bass (*Centropristis striata*)

Both juveniles and larvae can be found in the bays and NY/NJ Harbor in the summer. Juvenile black sea bass tend to be found on vegetated bottoms and can be found around *Ulva* patches. This may be a moot point considering that the dredging projects are already prohibited in areas with structure or vegetation according to the USACE. The black sea bass population will probably be declared "rebuilt" in 2012.

Butterfish (*Peprilus triacanthus*)

Butterfish were included in the draft Matrix due to food web concerns (squid-mackerel-butterfish associations and by-catch). There is little information on them and they are an offshore species. The consensus was they should be taken off the list or, at least, relegated to a low priority.

Hard Clams (*Mercenaria mercenaria*)

Hard clam spawning occurs in Raritan Bay in the presence of substantial maintenance dredging. The NJDEP has data in Raritan Bay and the timing of spawning in different south shore bays on Long Island is also known (Newell *et al*., 2009). There have also been studies done on spawning time and the reaction to suspended sediment. The hard clam population in Great South Bay is declining. The Nature Conservancy has an active reseeding and restoration project underway which could possibly pose some conflicts with a dredging schedule. Hard clams spawn in June and July and have their highest abundance on sandy sea floors, so efforts should focus on protecting these areas. In 2006, a detailed hard clam inventory was conducted in Great South Bay and showed clams are present almost everywhere in the system although at low abundance.

Horseshoe Crab (*Limulus polyphemus*)

While horseshoe crab spawning is an issue on the beach only, the animals are present in nearshore areas. Some participants think this species is only a shallow water issue, but not all agree. Horseshoe crabs are not a key issue in NY as they are in Delaware Bay. In Delaware,

horseshoe crabs do not seem to pose a dredging issue in inlets or channels because of the deep water, but there is not good information on their abundance. Research surveys have found horseshoe crabs in waters 10m to 30m deep and NYSDEC has noted high numbers in inlets. It may be possible to map these data. Entrainment by hopper dredges might be an issue handled by on-board observers like that done for sturgeon and sea turtles. The USACE has seen horseshoe crabs in hopper dredges and the take increases when they are moving through the inlets. Horseshoe crab abundance is much higher further south. Any take in northeast inlets is minor compared to that in places like Charlestown and Savannah harbors. Horseshoe crabs may not be able to avoid the hopper dredge, but other equipment may be better to avoid entrainment. Larvae can be found in the water column in July, August and September, although there may be differences between NY/NJ Harbor and the bays. Juveniles and adults tend to reside in intertidal, sandy beaches for up to two years.

Scup (*Stenotomus chrysops*)

Scup was not considered to be a species of concern, but there is evidence that they are using the system. It was suggested scup should be removed from the draft Matrix or at least given lower priority. They are not found inside the bays very frequently, but juveniles do enter through the inlets in May and adults in July. They leave by the end of the summer in Shinnecock and Moriches Bays. Migration seems to miss all the federal surveys. This species has been rebuilt and it is likely that harvesting will be allowed to increase by 85%.

Surf Clams (*Spisula solidissima*)

The available data on spawning for surf clams are some sixty years old and may not be valid anymore. There is, however, a good, long population data set. The NYSDEC has twenty years of data on distribution and size-and-age structure. There are also data (Robinson *et al*., 1984) from studies done in the 1980's on their susceptibility to suspended sediment, which found that they are sensitive. Individuals are found in the vicinity of inlets, but occurrence inside of the inlets (i.e., in the bays) is not significant. The population in NY seems more stable than that in NJ, because fishing pressure is less. Surveys have not been done in the last three years, but the population had declined 30% in NY. It has been suggested that the center of the population may be shifting north, possibly due to climate change, but there is no evidence of increased abundance to the east along the Long Island coast where the water temperatures are colder than in the west. Northern species from RI are sometimes found to settle off Montauk Point.

Weakfish (*Cynoscion regalis*)

Spawning weakfish can be found in New York waters in April, but in low abundances. Abundance of spawning adults can be high in May and peaks in June, but declines again in July. They have been found in NY/NJ Harbor and even in Newark Bay. Pound-net surveys by Chris Chambers (NMFS) find them to be abundant but relatively small in size. Subadults, called "summer weakfish" are present all summer. The larvae are assumed to be present in May, June and July; only a few larvae are found in August. The stock has been recognized as "depleted" by the Atlantic State Marine Fisheries Commission (ASMFC).

Winter Flounder (*Pseudopleuronectes americanus*)

The Workshop technical experts indicated that information in the draft Matrix on the timing and distribution of spawning winter flounder adults seems correct. According to USACE

studies in NY/NJ Harbor, no winter flounder eggs are found in May. Spawning seems to be occurring later in the spring than previously thought and the numbers of spawning adults are low, but the adults are present. There are few spawning adults in January. The population of spawning adults is low and waning in April. They could be spawning offshore and not coming into shallow water; in NJ, mature fish have been found on the continental shelf in the fall. Rutgers University's Ken Able is conducting a data logging/tagging study funded by NJ Sea Grant on the shelf, underway in 2011. Winter flounder leave NJ waters in April when the temperature reaches about 15°C. They are found in NY/NJ Harbor all year, but there are no spawning adults by May. Old reports from the 1930's document their presence in Great South Bay all year long. Data on distribution suggest that some winter flounder never go out into the ocean but are resident here all year round. There may be different contingents, some which are resident and some which migrate. They behave differently in different areas. (Note: "spawning adults" is taken to mean gravid, or "ripe," females.)

In NY/NJ Harbor, winter flounder egg abundances are low in April, May and January, but high in February and March. Data from bays to the east suggest larvae are not commonly found on muddy substrates and have a higher prevalence on sand and in eelgrass. This means that surveys or inventories of eggs and larvae should include areas with eelgrass. There are data from the USACE study that show juveniles, on the other hand, are more abundant on silty mud in NY/NJ Harbor. They are present all year, and differences in distribution probably reflect overall abundance, not movement. NYSDEC indicated they have data on abundance and distribution. Juveniles do not appear to migrate far, and declining populations over the year are probably due to predation rather than migration. Adults are resident on the south shore bays and NY/NJ Harbor all year.

Winter flounder stock status is very bad, but rather than shut down the fishery completely, a two fish catch limit has been imposed. Keeping the fishery open allows data collection on abundance to continue; otherwise, a moratorium would be likely.

Winter flounder is one species for which specific stressors had been included in the draft Matrix. The most important stressors for winter flounder were identified as biochemical oxygen demand (BOD) and disruption or interruption of spawning activity (not "mortality" as indicated in the draft Matrix). It was noted the draft Matrix did not provide a category for this stressor. There was some discussion of what caused the "disruption" without defining the term more specifically. Disruption of spawning, however, may not be a problem.

Winter flounder, like sand lance, may be buried in the sediment, overwintering, for months at a time. It was pointed out that winter flounder can burrow 10cm to 15cm into the sediment. As a result, entrainment of adults may be an issue. They re-emerge to spawn. It was not clear, however, whether they actually buried in channels or only on the flats. If they are not buried on the channel floor, entrainment would not be an issue. Burial by suspended sediment may or may not be another issue but the Workshop technical experts could not think of anywhere this would be a problem. The real problem remains adequately assessing what degree of impact is acceptable. The comparable effect of storm burial is unknown.

There is no information to assess stressors on winter flounder larvae. Eggs may be a seasonal issue depending on the level of dissolved oxygen and probably not a problem in the winter when levels of dissolved oxygen are naturally high.

NYSDEC suggested that perhaps data on entrainment by power plants may be useful. The lab of the Millstone Power Station in Connecticut would have studies about heated effluent and entrainment which might be considered as a surrogate for entrainment during dredging. If such data are to be considered, it must be recognized that there is a significant difference between dredging and power-plant entrainment, which also involves a rise in temperature.

It was pointed out that, while permitted dredging may be a tractable process, there may be other, unregulated activity that has a much bigger impact, like entrainment in ship's cooling water or resuspension by ships' wakes. NYSDEC indicated they had to concentrate on activities they could regulate. USACE thought that it would be useful to evaluate the potential impact of other activities and, if appropriate, develop regulations for these activities.

One Workshop technical expert noted that estuarine species tend to be especially well adapted to handle disruption. Estuarine species should be expected to have adapted to elevated suspended sediment concentrations due to regular exposure to freshets and storms. The "biologically" meaningful impacts may come from storms rather than from particular human activity. Fish survive storms easily. The Workshop technical expert mentioned that University of Connecticut's Frank Bohlen did a study in New Haven Harbor comparing storm sediment resuspension to dredging which may supply useful information. Even so, NMFS suggested some species may not be well adapted to more extreme conditions imposed by the superposition of dredging resuspension on other natural stressors. However, it may be difficult to separate effects of natural and anthropogenic stressors.

One Workshop technical expert noted the behavior of fish should also be considered in evaluating the impact of a dredging stressor. Mobile fish can basically do three things in response to a dredging stressor:

- stay in place and "tough it out,"
- detect a gradient and swim up or along the gradient, or
- leave the area for clear water.

Passive life stages, like eggs and larvae, may be more susceptible than mobile juvenile and adult fish. Some species (e.g., bluefish) readily avoid plumes while others like kingfish and other bottom feeders are attracted to them, as they stir up prey species. In large bodies of water where dredging only occupies a small area, fish would move away or avoid the disturbance. Studies of the impacts of beach nourishment projects conducted in New Jersey by the USACE may be applicable to this question. If mobile fish actually escape suspended sediment plumes most of the time, then dredging is not an issue for them. Adult fish are highly mobile, but this would also depend on habitat (i.e., if they are confined). A focus on eggs and larvae may simplify the dredging management program, although the strategy would need to be species specific; it would not be effective for managing blue crabs, for example.

NYSDEC indicated cumulative impacts are a recurring, unsolved problem as is the comparison of impacts of a short term storm event to chronic low-level exposure over a three-month dredging project. Low levels of suspended sediment over time due to multi-month dredging, for example, may not be directly compared to a short-term storm.

Walter Berry (EPA, Narragansett) and Dave Nelson (NMFS, Milford) had conducted a study of the burial of eggs under suspended sediment concentrations of 80 mg/L. In 10- to 14-day experiments, burial to half an egg diameter can affect its development. This corresponds to about 0.5 mm. However, this was a static lab study and may not be applicable to natural situations where tidal resuspension is likely to remove any thin cover.

For the resuspension of contaminated sediments, the timing with respect to life stages could be critical. If there are vulnerable life stages present, the resuspension of contaminants could be a "windows" issue. These would not be dissolved contaminants, but rather particulate contaminants that would track with the plume. However, it should be noted that contaminant issues have never been cited as a reason for requiring a no dredging window. There have been a number of studies of contaminant effects on winter flounder eggs and shellfish, like the research of Chris Chambers.

Review and Revision of Indicator Species List

As a result of the discussions of the information in the draft Dredging Windows Fisheries Information Matrix, the Workshop group decided it would be worthwhile to review the original list of species to try to prioritize those used to set windows. The section below summarizes the group's discussions and includes a list representing the group's final consensus.

It was suggested that American shad and blue crab be added, while river herring (blueback and alewife) be removed. American shad is a species of great interest in rivers and estuaries. They are soon to be listed as endangered. There was discussion about adding smooth dogfish, but not as a high priority. Smooth dogfish "pups" are found in the estuaries but the population is in good shape and the pups are fairly large (one foot long) and mobile so they can avoid dredging impacts.

NMFS suggested that endangered species be included in the Matrix. However, USACE pointed out there is a well-established process for the protection of endangered species, like sea turtles and harbor seals, and a process for negotiation to resolve issues associated with dredging projects. Endangered species should not be a priority for the setting of windows, but, rather, windows for specific projects might focus on at-risk species particular to each region. The NYSDEC generally uses the spawning periods in NY as the windows. That hasn't changed since 1993. Spawning periods are primarily used because these are usually the only available data, but migration which is linked to spawning should also be considered. It was noted that some species also spawn offshore. The species' priority will depend on the location. The relevant list should include fish present in the area, those that are most at risk (stock status), and their spawning periods. NMFS thought it was also important to consider migration through inlets.

All resource agencies need to be providing input. NJDEP's list of priority/indicator species, in particular, might be different. The NJDEP will review the list: they have a new staff member (replacing Don Burns), so it may take some time. One objective, however, would be to get all the agencies working from the same priority list.

There used to be an active lobster fishery in NY/NJ Harbor and lobsters are still resident there. American lobster might be on the list because of its recruitment failure in southern New England, although this may be another issue associated with climate change. The stock of blackfish has also been reduced, most likely because of illegal catch. A petition is pending to put river herring on the endangered species list. The sand shark population is also at low levels.

The stock of summer flounder is at a good level, but there is an active interest in management of this species. Historically, the list of at-risk species changes over time. Stock status, therefore, should be one of the early discussion points in considering windows for specific projects.

Sandbar shark may be taken off the Matrix list. A Workshop technical expert said there are no pups in the area being discussed. Consensus was that it should *not* be considered a priority species. Surf clams, too, are an oceanic species that probably should be taken off the Matrix list.

After discussion, there was a general consensus that the species be grouped into three categories:

1. **High Priority (Stock threatened)**
   American eel (*Anguilla rostrata*)
   Atlantic menhaden (*Brevoortia tyrannus*)
   American lobster (*Homarus americanus*)
   Atlantic sturgeon (*Acipenser oxyrhynchus*)
   Blue crab (*Callinectes sapidus*)
   Blackfish (*Tautoga onitis*)
   Hard clam (*Mercenaria mercenaria*)
   Horseshoe crab (*Limulus polyphemus*)
   River herring (*Alosa aestivalis* and *Alosa pseudoharengus*)
   Summer flounder (*Paralichthys dentatus*)
   Weakfish (*Cynoscion regalis*)
   Winter flounder (*Pseudopleuronectes americanus*)

2. **Stocks presently rebuilt / Not priority concern at this time**
   Black sea bass (*Centropristis striata*)
   Scup (*Stenotomus chrysops*)
   Striped bass (*Morone saxatilis*)
   Sandbar shark (*Carcharhinus plumbeus*)
   Smooth dogfish (*Mustelus canis*)
   Surf clam (*Spisula solidissima*)

3. **Remove from all lists**
   Butterfish (*Peprilus triacanthus*)

It was suggested that one solution may be to just limit dredging to the winter when impacts on the species would be minimized. USACE pointed out that the extension of the windows has essentially done this and limited the time when dredging was allowed to a two-month period. Before the winter flounder windows were imposed, dredging was allowed in the fall and winter but prohibited in the spring and summer when abundances were highest and biological activity was greatest. Of course, dredging during the winter incurs other problems, like ice, safety threats, and associated increased cost. In addition, there is a practical, logistical problem with any narrow window: there are limited numbers of dredges available and many projects must compete for equipment at the same time when the window allows dredging. Funding schedules are an added logistical problem.

At this point, there was a consensus that the remaining Workshop time did not allow completing the review of the draft Dredging Windows Fisheries Information Matrix especially for the dredging stressors. The Workshop technical experts agreed to comment on (not completely fill out) the revised Matrix.

Additional U.S. Army Corps of Engineers Presentation

The Workshop then moved to a presentation by the USACE that described potential dredging options to mitigate environmental stressors. A brief summary is provided below and the slides are in ***Appendix 3.***

Best Management Practices Applied to Dredging Projects for Environmental Protection. Presentation by Doug Clarke, Environmental Laboratory, USACE Engineering and Research Development Center

Management of dredging has not been adaptive over the decades. It may be that the process would be better served if environmental windows were considered as last resort, rather than an initial solution. There are a variety of management practices (MPs) other than windows that can be employed to reduce environmental impacts. These include MPs related to equipment, dredge processes, disposal processes, and controls like silt curtains. Identifying the "best" management practices for a particular project involves balancing effectiveness and cost with the level of risk to the resource. Dredgers would be able to provide insights into how to address the challenges of the impacts of dredging if they know and understand the environmental concerns. Recommendations included:

- To seek science-based, adaptive alternatives to windows,
- To obtain commitments to resolve major concern and knowledge gaps,
- To increase understanding of the dredging process, and
- To increase awareness of conservation needs among dredgers.

Potential Modifications of Dredging Environmental Windows Based on Supporting Data: Identifying a Process?

USACE expressed concern that the present seasonal dredging windows represented a policy of avoidance of any impact and, as such, reflected the most conservative policy one could have in any environmental review. In the past, when the windows where dredging was prohibited were only a few months in duration, USACE could manage with the restrictions even though they increased the cost of dredging projects. Now that the windows close most of the year to dredging, the USACE noted as a practical matter that projects cannot go forward when only a two-month period for dredging is allowed. As a result, they can no longer operate under an avoidance of impact policy. They feel other strategies such as minimization or mitigation of impacts are required. With endangered species, there is a process and there can be a negotiation for an agreement that allows a project to move forward while providing adequate environmental safeguards. There is no such process for marine fisheries and dredging projects. Since the states do not usually participate in the discussions between NMFS and the USACE as part of the Essential Fish Habitat (EFH) assessment process, recommendations often become requirements in state water quality certifications (WQC) with no dialogue between the agencies beforehand. Once the conditions are set in the WQC, the conditions are binding and changing the WQC is very difficult, if not impossible.

One potential modification to the windows process might involve having the state unofficially involved with the USACE and NMFS in dealing with dredging permits. The question was raised whether the states would actually be allowed to do this. A suggestion was made that the process be tried using case studies with projects that were going to be done in the future, but where permits were not pending. Perhaps the specific issue of dredging Fire Island Inlet or Ambrose Channel could be a case study of how to improve the process. The best approach would be to have the discussion before the permit is issued. One obstacle to this is that NYSDEC staff resources must be focused on funded projects that are in the process of implementation.

In the past, NYSDEC had a dredging group in New York City, but, because of reduced staff resources, that is no longer possible. However, NYSDEC Region 2 may soon be getting several new staff members funded by the NY/NJ Bi-State Plan Funds as part of a NYSDEC Dredging Team that will focus on navigation dredging in the NY/NJ Harbor. That would be good for New York City, but not necessarily other regions, although, as a sidebar, such a Team might be able to address issues elsewhere. NYSDEC staff have responsibilities besides dredging. Dedicated dredging staff may allow NYSDEC to participate earlier in the process with USACE and NMFS, alleviating some of these problems.

Another issue noted by NYSDEC is that the permit process is misaligned between the two agencies (NYSDEC and USACE). USACE has to plan these projects years in advance and line up the funding. They have to arrange authorizations and funding before the specifics of a project might be finalized, making it difficult for the state to evaluate and permit a project. In addition, funding may come with tight deadlines that are difficult to meet in terms of issuing the permit or meeting windows restrictions.

In terms of permitting and dredging windows, NYSDEC thought it important to agree on the information base and then evaluate the degree of impact of a specific project. NYSDEC windows are based primarily on spawning data that they have used since 1994. This information was originally developed to provide predictability to the decision-making process while saving staff time. Fisheries people may be called in for specific projects or questions, but the spawning data are what the permitting staff typically use in the decision-making process.

NYSDEC believes the information Matrix developed for this Workshop should provide information on the current issues that are of concern. The agencies can consider the impacts for each particular project on the basis of these issues. Everyone could use more dialogue, but it is also important to have "rules of the road," including a core set of species and stressors that could be used for decisions by regulatory staff who do not necessarily have specific fisheries expertise.

Presently, NYSDEC does not necessarily get the EFH assessment which the USACE provides to NMFS, although there may be limited discussions with NMFS regarding specific issues or questions. The agency undertaking the action is required to evaluate how it will affect EFH. The assessment contains information on how the project may impact habitat on a species-by-species and life stage basis. The EFH assessment is prepared by the agency doing the work and sent to NMFS who use it to evaluate the project and provide conservation measures, operational constraints, and time of year restrictions. USACE and NYSDEC do not converse about these, but the USACE could share the EFH information when it is submitted to NMFS so, unofficially, NYSDEC would be involved without being a part of the formal consultation process. Although the EFH assessment might not cover every species of concern in New York, since it only covers federally-managed species, there is usually a good deal of overlap and information in the EFH assessment that would be useful to the state. USACE indicated it would be willing to modify the species covered in the EFH process to include those of concern to the state, if NYSDEC would review the analysis and use it to make decisions. According to the NYSDEC, the limited resources they have for reviewing these documents remains a serious obstacle, however. NYSDEC must also be in a position to actually make an independent decision on each permit.

NYSDEC pointed out that because terrestrial resources are very visible, restrictions for their protection tend to be very rigid. However, fisheries resources are not visible and the management tools are not so rigid, so fisheries restrictions tend to become more of a bargaining chip. According to USACE, there is a process for evaluating restrictions, impacts, and mitigation measures on endangered terrestrial species. USACE believes that because one can verify the presence of upland species, unlike fisheries species, windows in an upland environment are easier to manage and actually more flexible than the aquatic windows which limit activities for longer periods of time.

USACE expressed concern that the sole criterion for issuing a permit was often based on the presence of spawning, eggs, or individuals and did not consider relative impacts of dredging (such as the size of the dredging area in relation to the size of the habitat) or possible mitigation measures. As an example, they discussed a channel dredging project in NY/NJ Harbor where a five-month window for overwintering blue crab was required in the WQC, based on information in one reference document cited by NMFS. Subsequent analysis of this reference by USACE

showed the proposed dredging would affect 0.15% of the total habitat and 2.7% of the preferred channel habitat. In cases like this, a more quantitative assessment of the specific project impact is needed before setting a window.

The NMFS's EFH opinion is intended to be a conservative recommendation, but, as pointed out by USACE, this often leads to time periods included in windows that are unjustified. The last part of the EFH assessment does consider mitigation. If impact cannot be avoided, then one looks for minimization and, then, compensatory mitigation if needed. This process is used both by NMFS in the EFH assessment and by NYSDEC in reviewing permits and issuing WQC's. Additional information on conditions at the project site (e.g., current speeds in the inlets, sediment type, whether or not flounder are present, the extent of a suspended sediment plume, the gear being used, etc.) need to be considered by the agencies prior to making a window determination. NMFS identified the Boston Harbor dredging technical work group as a possible model for identifying and discussing important issues that should be addressed before permits are issued. This group is composed of federal, state, and local harbor interests that identify topics and issues that should be addressed in the EFH assessment.

NYSDEC suggested the USACE often seems to be looking for as broad a WQC as possible to attract the largest number of bidders and lowest costs possible. Economic considerations are not necessarily the state regulatory agency's priority. Regulators do not like uncertainty associated with project details when reviewing permits. They want to know who is doing the work, as well as exactly where and how it is being done. If this information is not available, there are usually a large number of conditions in the WQC issued to try to protect resources.

Some predictability in permitting is desired. NYSDEC suggested that a combination of pre-coordination and more concrete information for use in decision-making is needed, such as the species of concern and important stressors, but recognized that these may change with time. A biological Dredging Windows Fisheries Information Matrix was developed as part of this project. NYSDEC indicated it would be helpful to also have an engineering matrix that would, for example, assess the level and extent of plumes in different environments and sediment types. The USACE was concerned, however, that there may be too many variables to cover and that this information may be subject to misinterpretation. Perhaps most importantly, there was concern that such a matrix could preclude needed dialogue and communication between agencies. The USACE has extensive information on physical characteristics of plumes and dredging operations that could be used in adjusting windows, but this is not routinely provided to the NYSDEC and that discussion does not occur. It was suggested that a case study, like the Fire Island Inlet dredging project, might be a useful first step in developing a process to identify critical species, stressors, and other information needs.

If the list of issues can be narrowed through the use of a matrix containing biological and engineering information that identifies the most important species and stressors, permit evaluations would be much more consistent and predictable. USACE had concerns that the biological Matrix in its present form only reflects presence of species and doesn't address what the impacts of dredging might be on the species. As such, it can only be used for avoidance of impact. NMFS indicated the Matrix could provide a list of issues that should be considered or

addressed on a generic basis. These issues would then have to be assessed on a project specific basis for each site but it could narrow the range of issues that need to be addressed. NYSDEC also indicated use of the Matrix may also facilitate permitting by allowing early identification of the most feasible options.

It was suggested that it may be helpful to turn the Matrix sideways and make the habitats priorities. If one can find a way to see which species are important in specific locations, it might help to focus on the habitat rather than a time-window.

Next Steps and Action Items

- There was a consensus that a change in the way of doing business was needed and that increased communication, coordination, and dialogue among the involved parties was necessary. More project specific communication between the agencies on an on-going basis is required to overcome existing roadblocks. As a first step, NYSG agreed to continue coordinating Workshop project team conference calls, if the group thought it would be useful.

- The Dredging Windows Fisheries Information Matrix developed for the Workshop was identified as an important tool to facilitate decision making regarding windows. Several recommendations were made concerning the Matrix including:

    - Agencies should continue to add information to the biological Matrix especially regarding stressors. The Workshop technical experts indicated they would be willing to provide comments on the information contained in the Matrix. **Post-Workshop Note:** The biological Matrix was revised to reflect the results of the Workshop and one last round of review by the Workshop technical experts (see ***Appendix 4***).
    - To better assess risk, it was suggested to try turning the biological Matrix on its side to emphasize habitats rather than species. There was a consensus this was a good idea to explore, to see if it could improve the Matrix. NYSG and SoMAS will work with NYSDEC and USACE to explore doing this.
    - A dredging engineering information matrix would be very useful. As the section on dredging stressors in the biological Dredging Windows Fisheries Information Matrix becomes populated, USACE Engineer Research and Development Center (ERDC) could provide engineering information, such as plume characteristics for different equipment, sediment types, and physical environments based on their field and model studies. It was recognized that there a large number of variables involved, and the engineering matrix should not replace or reduce needed dialogue between the agencies, but it could help identify mutually agreeable options more quickly. **Post-Workshop Note:** The USACE's ERDC summarized dredging engineering information in a document entitled *Simplified Evaluation of Dredging Resuspension Effects*. That document, along with NYSDEC's comments and USACE's response, are in ***Appendix 5***.

    - NJDEP will review and provide their input on the biological Matrix species list.
    - The biological Dredging Windows Fisheries Information Matrix could probably be completed by hiring an experienced graduate student for six to twelve months to work on it. It was suggested that NYSG or other sponsor could consider supporting this.

- Limited state staff resources to work on dredging windows are a major issue. While the matrices described above may provide useful information, they will not be effective unless the state can discuss and evaluate specific projects with the USACE. A NYSDEC Dredging Team is being formed with funding from the NY/NJ Bi-State Plan Funds. Although its focus will be navigation dredging in NY/NJ Harbor, the Team may, as a side bar, be able to address other issues elsewhere. To be successful, the NYSDEC Dredging Team must be able to increase the level of communication and interaction with USACE on dredging projects.

- Convening a group of USACE and NYSDEC representatives to conduct a case study for a particular project would be a useful learning exercise. The group could develop a short list of species of concern, and information on what is known about the biology, to see how the information could best be packaged and how coordination would best work without an official commitment. The group could also work on developing a dredging engineering information matrix and integrating it with the biological Matrix, with USACE taking the lead on the engineering component. The results could apply to other projects. This may be a good exercise for the NYSDEC Dredging Team.

- NYSG and SoMAS will develop and distribute a Workshop summary and put the Workshop presentation slides on line. **Post-Workshop Note:** This report provides a summary of the Workshop, including slides of the presentations, the revised biological matrix, and a *Simplified Evaluation of Dredging Resuspension Effects*.

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Key Agency Leads (l-r): Monte Greges (USACE), Jay Tanski (NYSG), Dawn McReynolds (NYSDEC), James Gilmore (NYSDEC), John Tavolaro (USACE).

Workshop Technical Experts (l-r at table): Ken Able (Rutgers University), Michael Frisk (Stony Brook University), Robert Cerrato (Stony Brook University), John Waldman (CUNY Queens College)

Appendices

Appendix 1: Final Agenda – Dredging Windows Workshop
See pages 29-30.

Appendix 2: Final Attendee List – Dredging Windows Workshop
See page 31.

Appendix 3: U.S. Army Corps of Engineers Presentations
See enclosed CD or www.nyseagrant.org/dredgingwindows

Appendix 4: Dredging Windows Fisheries Information Matrix – Post-Workshop Revision
See enclosed CD or www.nyseagrant.org/dredgingwindows

Appendix 5: USACE's *Simplified Evaluation of Dredging Resuspension Effects*, NYSDEC comments, and USACE response
See enclosed CD or www.nyseagrant.org/dredgingwindows

Appendix 1

Final Agenda
Dredging Windows Workshop

November 30, 2011
Hudson River Foundation
Suite 915, 17 Battery Place
New York, New York

8:45 AM Coffee

9:00 AM **Introductions**, *All*

9:15 AM **Workshop Background/Purpose/Format**, *NY Sea Grant and Stony Brook University School of Marine and Atmospheric Science*

9:30 AM **Technical and Logistical Considerations of Corps Dredging Operations and Windows**, *USACE NY District and Engineer Research and Development Center* (Presentations on Resuspension and Other Dredging Impacts; Local Dredging Issues; Winter Flounder Studies).

10:45 AM **Break**

11:00 AM **Windows Information Matrix Overview and Discussion: Technical Input and Identification of Information and Data Gaps**, *Technical Experts and all*

12:30 PM **Lunch**

1:30 PM **Technical Discussion** *(continued)*

3:15 PM **Break**

3:30 PM **Potential Dredging Options to Mitigate Environmental Stressors**, *USACE NY District and ERDC*

4:00 PM **Potential Modifications of Dredging Environmental Windows Based on Supporting Data: (Identifying a Process?)**, *All*

4:30 PM **Next Steps**

5:00 PM **Adjourn**

Appendix 2

Final Attendee List -- Dredging Windows Workshop

11/30/2011

Last Name	First Name	Affiliation	E-mail
Able*	Ken	Rutgers University	able@marine.rutgers.edu
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Zappala	Sarah	USACE (HDR, Inc.)	szappala@hdrinc.com

* Workshop technical experts

Appendices on enclosed CD

Appendix 3: U.S. Army Corps of Engineers Presentations

Appendix 4: Dredging Windows Fisheries Information Matrix – Post-Workshop Revision

Appendix 5: USACE's *Simplified Evaluation of Dredging Resuspension Effects*, NYSDEC comments, and USACE response

Sea Grant
New York

Photo of a dredge in New York Harbor courtesy of Vince Elias, U.S. Army Corps of Engineers Harbor Programs, NY

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