

An Overview of the Issues: Real Problems and Potential Solutions

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Good morning. My name is Doug Clarke. I'm an employee of the Engineer Research and Development Center here in Vicksburg. I'm a relative newcomer to the dredging arena because I've only been doing it for 20 years. And that's not long compared to a lot of the folks in this room.

But from day one in my career with the Corps, environmental windows has been the theme of my career. I was put immediately on a plane as a fishery person to go and help out with the coordination of environmental window issues that were arising with the districts, and that was in 1983.

So, environmental windows are not by any stretch of the imagination an emerging issue. They have been around for quite some time, and I think I'll point that out several times in my presentation.

Again, my role is to set the stage. The title we set was real problems and potential solutions. It is easy for me to start off. The first part is identifying the problems. The very fact that we've had this kind of a turnout for the meeting today is evidence of a problem.

Environmental windows are on many folks' radar screens now. They have probably become as problematic to the conduct of dredging as the longstanding classical issues of handling contaminated sediments and so forth. These things are emerging now. And it's making maintenance of our navigational infrastructure more and more difficult.

The opposite side of the thing is potential solutions. Hopefully we're heading that way. Certainly we're not there yet. And you'll hear many examples attesting to that fact before the end of the morning session, too.

So, basically what I'd like to do is start with the obvious. I think most of the folks in the room know what we're talking about. Perhaps some of the international folks are kind of scratching their heads, and asking, "what is an environmental window?" Simply stated, an environmental window is that period of time when you can dredge. Seasonal restrictions are the periods of time when you are not supposed to dredge.

And the concept of a window and a restriction is intuitively simple. If you're trying to protect a resource, the basic logic is: don't conduct the dredging that may or may not pose a risk to that resource. If there's no temporal conflict between when you dredge, and the occurrence of that sensitive critter, then you avoid applying risk to that resource.

If it were only that simple to manage around that concept. Well, being a biologist I am a pack rat, and I pride myself on having probably one of the most extensive libraries on environmental effects of dredging. And my colleagues in the back there who have seen the piles in my office will probably say yah, yah, yah.

Well, I blew the dust off of several things the other day, knowing that Jerry Schubel is going to be the next speaker. And Jerry has been in the dredging arena for a long time. At one point in his career, he was probably at the cutting edge of applying technology to solving dredging problems. And he had put together with some colleagues a document, and I want to point out that it's 1979.

And it's a very short document, but it is a very cogent, coherent document setting out a framework for how dredging decisions should have been made in Chesapeake Bay, and I'll quote. Here I've taken this somewhat out of context, but the point will be made.

"The greatest needs are to remove dredging and dredged material disposal from a crisis mode of management." Have things changed? Probably not. "Where special interests appear to dictate decisions, this requires removing it from that crisis mode of management."

Among other recommendations, they concluded with, "development of simple and effective management guidelines such as dredging windows."

Jerry, how could you have thought that it would be simple? And in that document I'd like to point out another little bit of text. "Open water disposal operations are presently restricted" -- and this isn't the Chesapeake Bay area -- "to dredging a window that extends from October 1st to April 1." This is 1979.

The windows are based currently on best available data. "It should be adjusted on the basis of future research to protect the environment and the biota and acceptable costs." We had it back 1979, our marching orders, what we needed to do.

But I can stand here today saying that it's not done. The research and so forth that was called for back then, many angles to it, many aspects of it are still out there and still need to be done. So again, environmental windows is not by any stretch an emerging issue.

Well, what's going on? Authorities for windows. At least in the United States there are many, many avenues by which windows have come into the fray, as it were, regarding dredging project management, and this is a situation that has evolved over the years.

I think you can go back to 1969 with the passage of NEPA, National Environmental Policy Act. That was the onset when windows became en vogue. And very quickly a majority of all Federal navigation projects were restricted in some way, shape, or fashion.

Additional authorities have been added over the years. Some of these are well known to folks around here. Again, the requirements under NEPA, Fish and Wildlife Coordination Act. A lot of window things are driven by the agency's personnel, the personalities that come to the table when the interagency coordination process occurs.

Whatever hat they're wearing, if they're a Fish and Wildlife service person, they're probably mainly worried about endangered species. Not always, but nationwide that's the trend.

Biological opinions. These are advisories. The Corps doesn't have to stop a dredging project because of an advisory opinion, but they do take them into consideration.

Essential Fish Habitat is the new player on the block. A lot of Corps districts are literally scratching their heads as to how to deal with the Essential Fish Habitat mandate. Please try to define essential fish habitat, or what is not essential fish habitat. It's not a simple thing.

The Clean Water Act. The show stoppers are really down here. The Endangered Species Act which I've mentioned before, and Section 401 Water Quality Certification. This is driven by the state. The state has the ace in the hole. If they say that the Corps cannot comply with protecting the environment within the conduct of their dredging operation, they can withhold the Water Quality Certificate, and dredging will not occur.

And likewise if we cannot meet the requirements of ESA, the Endangered Species Act, that can stop the dredging. Or during the conduct of dredging if a hopper dredge takes one sea turtle, that dredging operation can stop on the spot.

And this sets up what I think is the debate, between what I'll say is dredging project managers on one side and resource agency people on the other. They have two different jobs.

A dredging project manager might take the common sense argument, "Where is the smoking gun regarding dredging?" Really I would say, perhaps somewhat provocatively, that over the years there have been very few cases, with the exception of contaminated sediment issues involved, where there has been documented, demonstrated population level biologically meaningful sustainable levels of effects associated with the conduct of dredging operations. So, the dredging project manager is saying, why are you restraining me when this has impediments to the way I do dredging?

The resource agency person has a different hat entirely. His mandate, his job, is to protect the resource, and that's the guiding light. And the precautionary principle is what they stand on, which is, "If I don't know enough about my resource and how you're doing dredging, I have to go to the option that presents the least amount of risk to that resource."

So they both are doing their best to do their job. The jobs are different. Yet, the theme of the whole thing is striking the balance. Cost effective dredging and stewardship of the environment, same thing. That's the challenge. That's the difficulty.

And the question then cascades down to: upon whom lies the burden of proof. Depending on who you are in the system, again where is the smoking gun about

dredging, or how much risk is acceptable to conduct the dredging under your waterway circumstances?

Just quickly, what is the situation right now? This is a graph I put together a little while ago just to show you that there is some regional variation in the frequency of windows. What I have is a plot of the number of contracts on an annual basis for navigation dredging by the regions of the country. The red bars represent those contracts that have fees and restrictions associated with them. And the green are those that are essentially going unrestricted. And what pops out at you right away is that most of the regions of the country are now heavily, heavily restricted. And again these data are somewhat old. I would say that the contrast is even more stark now.

The one outlier or two actually is in the Gulf of Mexico and the lower Mississippi Valley. Those are probably the least restricted waterways in terms of the Corps getting the dredging done without restrictions. That is changing.

Our New Orleans district, Mobile district, and so forth are now dealing with issues they have not had to deal with before; protection of Gulf Sturgeon in their intracoastal waterways and so forth. Given enough time, this will become the same pattern as in the other regions.

I'm a biologist. I hate to get into economics. And we were originally scheduled to have a person with an economics background on the schedule today. But the bottom line is compliance with windows does inflate the cost of dredging. I think we've got a pretty good handle on that. Under restrictions we move 150 million cubic yards of material per year.

And so you only need to move the decimal point over a couple of places to come to the realization that increasing flexibility of dredging by managing windows better would have large economic impacts. For every return of one penny in a cubic yard that you could accrue, we're talking millions of dollars.

And on an annual basis, we're talking considerable amounts of money. I think comments made later by the port people will attest to the fact that it's more complicated than that. It can drive economic factors through the roof, apart from simply the cost per cubic yard calculation.

On the anatomy of a window, just an example of a project file. Again, it depends on who brings their pet concerns to the table. This is an actual dredging project up in Massachusetts, and these did not come to bear all at the same time.

As dredging cycles go through, you have personnel turnover in the agencies. Each one has their own thing to bring to the table. And over the years what happens is you have a cumulative window form.

And here you see that these restricted periods are to protect different things, including commercial/recreational fishing, migratory fishes, and so forth. Recreational bathing and boating, that's probably one of the dominant windows in the Great Lakes region because they don't like dredges out there in front of the marina at the wrong time.

Something had to give in this case because they needed this amount of time to conduct the dredging. In that particular case, they yielded on the window for turtles. Being up in New England, that was the one they decided to yield on.

I know you can't make out the details of this in the back, but this is a compilation of time lines for individual dredging projects, all the navigation projects in the Detroit district for Lake Michigan. And each bar represents an individual dredging project.

The black bar, again this is calendar months across the top, individual project going down here. The black bar is when you can dredge. The open periods in here are the restricted periods. And just looking at that you'd say well, okay, several things jump out at you. One is the start and end date of windows, most of them have the same start and end date.

Also, it looks like just scanning this, this is probably enough time to conduct dredging and comply with the windows. Yet, again this is the Great Lakes, and it illustrates several things. One is that in January and February, most of the lakes in most years are frozen over, and you cannot get a dredge from point A. to point B.

So in the spring when the shoals have formed, the winter shoals have formed, and you have multiple ports that need to be dredged, it coincides with the time that the fish resources are going in and out of the tributaries into the Great Lakes.

So, boom, you have it. You have multiple inlet resources there. Dredging that must be done. Dredging availability is a problem. And this is part of why I say there's an inflated cost of dredging. It's much more complex than that, but I think this is one way of illustrating it.

The other thing is the fixed start and end date. For a window to work, to provide protection of the resource, it necessarily has to be over restrictive because much of the biology is driven by other factors, such as water temperature. And you cannot predict on an annual basis when the key threshold temperature is going to occur.

So, the window has to accommodate a mild winter or a cold winter. And to do that, it just says that in any given year, the window is probably over restrictive on the front end or the back end in many, many cases. How do you get around that? Contracting and mobilizing dredges doesn't happen on a really fast time track. And that's where you have the problem; adapting that to the needs of the resource as well.

I won't spend much time on this. The issues. There's a plethora of issues associated with why windows come to being. A lot of these go back a long, long time, decades and

decades. Respect to suspended sediments on critters, respect to sedimentation on vegetation, spawning habitat, and so forth. The list goes on and on and on.

I won't dwell on it here. The problem over the years in my opinion has been that there hasn't been a mechanism in our interagency coordination process in many regions of the country to integrate the two sources of expertise that you need to bring this to solution. One is the people who really know about the resource and what would be a threat to them, and two is the people who really know about dredging and how the dredging could be conducted to minimize that risk.

And again, I won't spend much time on that because it will be discussed later. But that is an exceedingly difficult thing to accomplish; to bring the right people to bear on the problem on a project by project basis.

Over the years we haven't been able to get the opportunity to conduct the right research to put the technical evidence behind the windows as they now stand.

One frustrating example that I've been dealing with -- perhaps the most frequently cited concern for windows is effects on migratory fishes. Somehow or other there's an interaction between the dredge in a waterway that may impede an aggregate fish, an aggregate being salmon, striped bass, shad and herring species on the east coast and so forth.

This is a time line for what we've been trying to do to apply research. Several years ago I got on a plane and went to Virginia to take part in an interagency coordination unit, in October, 1998. How long ago was that? We set the stage for the studies on the James River. Does dredging impede an aggregate fish's movement or not?

We went at it several times through 1999, setting the stage for the state, the Virginia Marine Resource Commission, to give us permission to do this test of dredging in the river with the fish at the same time. How else are we going to resolve what's actually happening?

They gave us permission to do a test in the river with a dredge, but not during the time when the species of concern was there. We were demonstrating the technologies, the type of data returns that we were getting, so forth.

We did that, had another agency meeting to go over the results of that study, went back to the Marine Resource Commission, and we still did not get the go ahead to do the ultimate study. They allowed us to go during the actual period of the fish run, but without a dredge run. And we had to do the same thing again to demonstrate that we could see, if you would, the fish in the system without the dredge present.

And now we've been going back and forth with another string of meetings. I was in Williamsburg, Virginia last week at the James River Partnership Meeting, another meeting sponsored by the Corps with all the stakeholders in the James River dredging

arena. And we are still not at the point where we can point to a day when we'll have permission to apply the science to learn whether the dredging has or has no effect on those fish.

Part of the problem is that concerns have not been prioritized in many cases around the country. The risk to the resource is not uniformly spread, if you would, among the different life history stages or the species of concern that they may have to contend with in the vicinity of a dredging project.

Many windows are based on simply the assumption to protect fish and shell fish, and you're not given a target for research to address the concern. And right now getting this prioritization done is a challenge in many, many cases.

Are we making progress? We are making progress on some fronts. The Great Lakes Fishery Commission and the Great Lakes Dredging Team are acting as a stakeholder forum, to put forward a regional approach to windows. We've formed a windows advisory team, a WAT. But the idea is to have a smaller group of technical people. And again, you need the key resource people and the key engineering people in the room at the same time to look for alternatives to fix windows, and that's the process we're in now. Stage one, prioritization of concerns. This is not the easiest thing to do.

We have members from all states around the Great Lakes. And it takes a tremendous amount of effort to reach consensus on the highest priority concern.

And then you have to go through and get the dredger, the district folks, to say this is the most problematic window for us. If we can get some kind of resolution here, that would open up a world of flexibility for us. That is a hard thing to do.

Development of negotiation tools. At least within the Corps we are dealing with building tools that we feel have not been available to the folks making these decisions before.

Modeling tools. In most window situations you do go in with a lot of assumptions given. Nobody knows enough about the resource given the tremendous number of critters in each system. I will never know all we need to know to make a one hundred percent risk-free decision. It's a given. This lends itself to modeling tools, if we develop them and calibrate them and validate them and do all of that.

Some of the things we are doing, developing tools that sort of jump the gap from just straightforward sediment transport to things that agency people can make use of through the visualization tools.

SSFATE is a model we're dealing with. It's on a GIS platform. So, it essentially displays dredging scenarios. You can customize it to put a dredge in the river system.

This is one for the Providence River and display plumes that were generated through tidal cycles by different types of dredge. You could overlap that on oyster reef boundaries, on sea grass beds and so forth and use it as a screening tool.

Do we need to target monitoring? Is there any conflict between the dynamics of the plume and the situation with the resource?

SSDOSE is an attempt to take plumes and generate just what is the exposure, if you would, of different types of critters to that dredging event.

So, in this particular type of model, we can simulate running different fishes up in the water column or down in the bottom through these plumes associated with the dredging event and come up with sensitivity analyses. How many of these would be exposed to different types of suspended sediment concentration exposure?

A Fish fate model. This is one of entrainment, of dredges acting as vacuum cleaners going around sucking up critters. A hard thing to monitor, a hard thing to quantify.

This particular model is one of the first tools that does this in a manner that takes its dredging mortality due to the operation of the dredge plant acting on different life history stages whether it's an adult turtle or a larvae oyster and places that into contact with other sources of mortality acting on the population. Commercial recreational fishing, and natural mortality. And places dredging into perspective with these other things acting on the population. Hopefully that will give us some insights into what's real and what's not.

And new technology as far as getting out there and learning about dredging and how that is represented through the basin to the system that critters have to deal with.

Again quickly hydroacoustics. This was an example. Basically it's a very expensive fish finder. These little red blobs are fish. We're sampling, looking down in the water column moving in that direction, and there's a dredge right here. This was done in the Great Lakes.

And what you see here is a little zone of avoidance of fish of the dredge. It was about 30 meters. And this was one little insight that we were able to give the folks in Michigan, "Okay, could fish move around the dredge by going outside of that 30 meter corridor or not?" And we're hoping that when this is added to the picture it will add flexibility to the window situation in the Great Lakes.

Suspended sediment plumes. This is a barge overflow operation in the Cape Fear River. You can see the visual plume here. Tried to get a 3-D way of looking at the plume and the interaction with fishes. We're looking at tools, acoustic tools to characterize those plumes.

This is a profile down through the water column where you can see the signature of the plume. Can the fish get around it or not? And we have the tools to look at where the fish

are in the system at the same time. I think we're getting there, if we only had the opportunity to get in the river with the fish and the dredge at the same time.

