

CONCEPTUAL MODELING WEBINAR

Moderator: Julie Marcy

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12:59 am CT

Julie Marcy: I'm going to tell you a little bit more about today's speakers. First we're going to talk about Dr. (Chuck Theiling). (Chuck) started working on large river ecology in 1990 with the Illinois Natural History Survey where he managed a biological field station.

Then he moved on to the US Geological Survey where he worked on large system scale summaries for ecological status and trends and cumulative effects assessments. He joined the Corps in 2000 and began working on watershed issues. And that included an upstream perspective that integrates watersheds with their downstream perspective and impacts.

(Chuck) was appointed to a position as the Mississippi Valley Division Specialist and ecological modeling in 2009. (Chuck) has been working on areas such as aquatic habitat connectivity, watershed nutrient abatement, climate adaptation, green infrastructure and ecosystem goods and services.

Our second speaker today is going to be (Wendy Frohlich). (Wendy) is a biologist and master planner in the St. Paul District. She was previously a park ranger in the Rock Island District.

And she's working on providing planning guidance on ensuring environmental compliance and assisting with public input while completing versions for final signature of master plans in the Rock Island District.

So, (Wendy) and (Chuck), we're glad to have you. We had a third participant who helped put the presentation together and he was very important in their effort and that was (Megan McGuire).

(Megan), unfortunately got called away. She got called way away and she's out of the country right now. But when she is back in town, she's a biologist and the acting value engineer at the St. Paul District.

And with that, our co-host, (Courtney Chambers) will apply our listen-only feature and (Chuck) we'll give you presenter rights throughout the presentation.

(Chuck Theiling): Excellent. I'm (Chuck).

(Wendy Frohlich): I'm (Wendy).

(Chuck Theiling): That's (Wendy) and we're sitting together. And as Julie said, (Megan) was an important part of this group and she's lucky to be where she is. She's having a great time.

In that picture is our subject matter, Horicon Marsh. It's a great big, beautiful freshwater marsh in Wisconsin, Southeast Wisconsin between Madison and Milwaukee. In that image, all that monotypic green is all cattails for 14,000 acres and that's kind of the issue in the state managed area.

(Wendy) will tell you more about that as we go along. So, we're going to talk specifically about this conceptual modeling workshop, which is phase two of some work that Wendy started in 2012. And then we're going to add a little bit more about the Beardstown Illinois River Project that (Megan) and I worked on just recently.

So a little project history and (Wendy) and I may go back and forth on this.

(Wendy Frohlich): Okay, what we'll talk about a little is the project. I'd like to first begin with a little bit of information about the Northern part of the Rock River Basin. The basin covers about 3,800 square miles and located, as (Chuck) said, in Wisconsin between - if you were to draw a line between Madison, Milwaukee in the Fox Cities.

The basin is primarily agricultural in a rural area. Parts of the basin are experiencing some of the most rapid urbanization in the state. Today, most of the water bodies in the basin remain significantly impacted by soil, nutrients, sedimentation from urban and agricultural water runoff. Wildlife habitat continues to be lost in fragmentation of the habitat is being accelerated.

So, in your mind if you see the bottom of Wisconsin there and you had a map, Horicon Marsh is at the top of the basin. And it's followed by Lake Koshkonong and then Lake Koshkonong.

I work mostly with Horicon and Koshkonong. Probably because I was one of the only people who could pronounce Koshkonong, right. And if you follow the river down, the lower river basin begins at the Wisconsin/Illinois border and then extends down to the Mississippi River.

All three of these locations have partnered with the Corps through those Section 22 planning assistance state programs. Various reports have been produced to help provide planning guidance to address the issues of sedimentation, shoreline erosion, lost wetlands, the cattails, lost emergent plant habitat and, of course, many others.

I feel - actually from this whole process I feel like the most important Corps assisting we have done in the basin and through these meetings is getting all those different lake associations, local agencies, state agencies, sometimes even groups within the same agency together at the table. And even bringing in outside professionals, with people from the WOTS Program, the DOTS folks, Everglades experts that were brought to the table. Essentially all getting together and discussing all these things and coming up with ways to go forward.

We could talk a little bit about Lake Sinissippi and Lake Koshkonong and the planning assistance state partnerships, they're with the Lake Associations and Wisconsin DNRs. Essentially these lakes were looking for restorational alternatives that would help the lake meet statutory responsibilities, help protect the shoreline, restore some of that plant habitat, improve fishery. And a lot of it was trying to find beneficial uses for dredge material.

But this webinar is going to focus on Horicon Marsh, which is a Ramsar site. It's jointly managed by the Fish and Wildlife Service and DNR, whom you see in the picture. There were various meetings and workshops between 2009, 2011.

The last workshop in 2011 main goal was to provide the marsh management folks with a variety of short and long term actions that would focus on ways to maintain ecological integrity of the good areas found in the marsh while seeking ways to improve areas of the marsh that have been in decline.

And (Chuck) through the conceptual model you guys will really learn a lot about that.

(Chuck Theiling): Yes.

(Wendy Frohlich): But the focus of the PAS and Conceptual Model) was to assist the Wisconsin DNR and identify problems, the information needs, possible opportunities and constraints for their master plan process. They're going to be doing a master plan for the marsh, specifically Wisconsin DNR side. However, the marsh is obviously one marsh. And really the conceptual model got into that too.

(Wendy Frohlich): All the things came up together. The team at that time was made up of the US Army Corps of Engineers, myself, Shawn Komlos, Steve Russell who has now retired, US Fish & Wildlife Service, Wisconsin DNR, NRCS, National Park Service Jed Redwine, South Florida Water Management Districts, Fred Skalar).

We met for three days and came up with a work plan, which involved projects and associated timeframes. The overwhelming recommendation agreed upon by all was that there was a need for a conceptual model. And that is what led me to discussions with (Chuck), and then the development of the conceptual model and here we are today.

(Chuck Theiling): Yes. It was really great how working in the office together you just bump into each other and find out you have common interests. So, (Wendy) needed to do some conceptual modeling and I wanted to do conceptual modeling so it worked out really well.

So, the experts recommended this conceptual model as an important next step to help this management team identify problems, needs, opportunities and constraints for their master planning, as (Wendy) said.

They laid out in a report to the DNR and us the purposes for determining the important ecosystem components, choosing indicator species or communities,

identifying relationships between all those parts, specifying the mechanism by which ecosystem components interact, identifying missing information, and exploring the connect between proposed future action and desired responses.

And as (Wendy) said, we're working for Wisconsin DNR, Fish and Wildlife was in the room the whole time. And we had Wisconsin DNR Water Quality people from the watershed. So, everybody knew that it was just more than just a site problem.

Oh, and I went off rambling. Before I go too far, this is all stuff coming out of the South Florida Central Everglades Restoration Plan (CERP). (Mark Harwell) and all those other guys back in the 90s. I do point out, in the middle, (John Barko, he's my point of connection on all this nice work in the Everglades and now (Shawn Komlos) and his new job.

But, (Barko) brought these procedures up to the upper Mississippi River and we adopted them readily. Another thing I adopted was from (Craig Fishnek). I was looking for putting together a presentation on what are conceptual models for the DNR guys. I found (Craig)'s 2008 EMMRP presentation and I couldn't do any better than Craig had prepared. So I just borrowed it and I'm going to borrow a couple of slides from that for here. So, what are conceptual models? And I'm going to talk briefly about conceptual modeling process and then we're going to get into the results for the workshop, by the way.

So, a conceptual model is a tentative description of the system or subsystem that serves as a basis for intellectual organizations. And a lot of times we see these really nice graphic representations where you have a mix of images and arrows and processes all together. Other times you'll get that simpler box and arrow diagram on the bottom right.

Using this slide, what do conceptual models do? Well they describe the general functional relationships among essential ecosystem components or how the system works. And there's many, many of these out here and if you're like me you like looking at them.

It is important to know what they are not. They're not the truth; they're very, very simplified depictions of reality to help organize your thoughts. They're not comprehensive, they only go to the parts that you think you can control or you're interested in. And they're never final, they're a work in progress provide a framework to help people understand how their system works.

Okay, (Craig) also had another EMRRP report describing a process for conceptual modeling that we're going to go through in subsequent slides. First, state the model objectives, and in slides three and four you saw that the experts gave us some of the purposes for why we would want to do that in general.

In the next slides, we'll talk about how we did that specific for our project. Second you want to bound the system of interest. This is where I'm going to tell you a little bit more about Horicon Marsh. We'll show you how we identified critical components. And (Megan) was really had great ideas on how to do this and we had a lot of fun with it.

The third step is articulating relationships, you'll see how we build the conceptual model. And then these other steps are things that we do afterwards; how the DNR will use it and test it and work with it. We went into the workshop expecting to use this driver-stressor-indicator framework that I'm very familiar with. It shows the major influences - major forces that influence the system, identify causes of change and hopefully the outcomes.

We start with simple boundary conditions, well not simple but large boundary conditions like climate, physiography, and those sorts of things. Then we look at stressors, how human activity or environmental disturbance changes those and how they had outcomes on these essential ecosystem characteristics.

We have been categorizing physical forces, geomorphology, biogeochemistry, hydrology and hydraulics for their influence down on landscape level indicators and then biological outcomes for a long time. So it's a pretty linear process where we think the larger boundary sets the stage, the template if you will. It affects the critical components of the ecosystem, the physical structure that has landscape level outcomes and critters respond to it.

When you think of it that way, a resource manager can work at that level between the stressors in the central ecosystem characteristics to implement management actions that will change the outcomes. Now another tool that we use is called rapid prototype modeling.

This is stuff that I was introduced to through (Tony Starfield). He's a University of Minnesota modeler. He started back in the heyday of the large ecosystem model doing elephants, endangered seals and mega animals. He tried to develop whole ecosystem models and kept failing, and failing and failing and decided that it was too hard and what you needed to do is take a simpler approach to environmental management decision making

I took several classes with these folks at the National Conservation Training Center Department of Interior Facility in Shepardstown, West Virginia and I really, really liked their thinking. You can put a lot of people in a room and do a lot of brainstorming without the cost and intensity that we get in our modeling approach. They both have their purposes but at the beginning of a project this rapid prototyping is really important.

So, we went in with the idea that we would rapidly go through some box and arrow diagrams, but we were also prepared to adapt. Note: I have a few facilitator notes through here. Be sure to have extra tools in your toolbox when you go to these workshops. Don't be a one trick pony, because your audience might not adapt to that.

And if you can, try to get into some of this NCTC training, which also reminds me that (Todd Swanick), (Kyle McKay) and (Nate Richards) are working on a similar kind of modeling workshop for the Corps EMMRP and I have really high hopes for them.

So getting on to outcomes from our workshop. Our first step we stated the model objective. And we had the general purposes of the model presented to us and then we honed down on these specific to the marsh, the Fish and Wildlife Service water management, how it affects water coming down into the state area.

The managers were also looking for methods to manage sediment if we were to do large amounts of dredging, and tools to guide future infrastructure design. Help this conceptual model for decision making and communicating. Again, strategies to move - do water management. And prioritize activity. And then finally, how to engage public and identify data gaps.

And here we get to find out a little bit about the interests, about the system of interests. There's a lot of interest in Horicon Marsh. It's very famous up in that part of the world and if you're a duck hunter, you probably know about Horicon Marsh.

What we did was we acknowledge that history and we wanted to draw out the unique qualities. That's something for facilitators that I found is very important. It lets people know you care about their system. It lets people know why their system is special. And from a planning perspective, it helps us define significance for our reporting purposes.

So in this case, we had the largest freshwater cattail marsh in the United States, 300 kinds of birds coming through here. (Wendy) mentioned it's a Ramsar site. It's huge, 36,000 acres. And it's got multiple agency interest in it.

Looking at it from an ecologist point of view, it's a long-term artifact from glacial processes and it was serving a really nice wildlife purpose until humans came in and really altered it. Then there are many interesting alternate stable states during human development that are important to the region, the history, the unique qualities of the area.

This quote was taken out of their comprehensive conservation plan and I think it kind of sets the stage for how the managers were thinking in this day and age. Kind of a restoration thought process going on there, and a purist kind of a thought. So, we keep that in mind as we think about what their management recommendations are.

So here is the system of interest. We're down in the Southeast Wisconsin, as (Wendy) said. You can see how the marsh is situated in the top of the watershed. It takes up a really good chunk of it. That's that blue area.

And if you come down into a one step down in scale this is the sub watershed directly impacting the marsh. And in this we can see how conservation actions in the sub watershed will affect the marsh. Recognizing that the marsh is not independent from its agricultural watershed.

Another thing about unique quality, –There was a guy named (Irv), you got to do what he says because everybody in this workshop knew who (Irv) was. And who (Irv) was is a retired farmer who adopted conservation practices and went around that whole top part of the county getting farmers to participate in conservation.

(Wendy Frohlich): They probably can't see that the red are areas where (Irv) talked to the folks and was able to get them to go ahead and go with coming up with practices on their land. And the yellow is he's talked to them but they have not yet. So what they decided to do is hire (Irv) for some more work down to the south and to the west. And so that's why we call it the (Irv) Effect. That's where that came from.

(Chuck Theiling): Yes. And then we stepped down one more level in scale and we get right down into the marsh itself. The boundaries, the green is the federal area; the yellow and the lower part is the state area. The red lines are the ditches. The blue line through the middle is the river and the channelized ditch right through the middle of it.

That channelized ditch and our boats, our air boats, are in that ditch in the photograph to the left. That is like the major controlling thing in this whole marsh. It's amazing what a ditch will do. So you're going to hear more about that.

So once we knew where we were working and we were with people that worked there and knew it well, we wanted them to identify the critical components of the system. I don't recall really whether we started with drivers or indicators. It kind of - I got muddled this far out. But, I put up the indicators first.

I'm not going to try to go through all those. There's a slide later that says which is the most important. But this was (Megan's) way of doing this. We each would take a breakout group of - these were small breakout groups. We had 12 people total I think so when we had a breakout group it was four people working close together. And we'd record each other's ideas and then share them amongst ourselves.

We did the same thing with drivers and stressors. In the drivers, the slide is clear enough you can see that we organized them by the essential ecosystem characters, geomorphology, hydrology, water quality, habitat and biota. And then rearrange those later as we needed. So those were our nice brainstorming sessions.

And, I didn't mention, we had a nice long time for this workshop. We had three days. So we spent entire day on this part. And then we went and drank beer and had a barbeque looking at the marsh. It's very important. If you can get out on your site, do the fieldtrips, share a drink together and have a meal, it does a lot for building partnership.

So these were the most important. He's my facilitator note again. This is a sticky dot ranking exercise, worked real well. I think people like it. It's good to do it after lunch when it gets people up walking around. It's one of those things where you can get people out of their chairs and get a little bit of interaction.

I don't want to beat the details too much to death because there's a lot of them on there. But our important drivers are water level, agriculture and the watershed, carp, these are European common carp. They're everywhere in Wisconsin, it's awful.

Water management infrastructure, things that they put in 50 years ago to manage the marsh turned out to not be good for its management. And then nutrients. Stressors, water level management, agriculture, invasive and exotic species, and sediment. All the things that, you know, we've got all over the Midwest and the rest of the country.

And then the indicators, the black dots, hydrology, water quality, marsh habitat and marsh biota with some particular species our groups picked out underneath. And now the fun part is taking all those things and putting them together in something that looks like a box and arrow model.

And the whiteboard, the sticky notes, you can see from the slide, just worked great. Now a little use of colors allows you to do things. So, the red lines were a little bit of influence. The green lines were a lot of influence. We had little question marks for things we didn't know very well. And little Xs that we knew that things were really well known.

The weighted lines, that's all based on how much does the team know and how much does your team think you can influence it. And, again, we were focusing on these main indicators a lot of quality, there's flow disturbance or hydrology in the marsh, sedimentation and invasive species.

(Megan) goes back to the office later and cleans everything up and you can see here we are with our boundary conditions in the boxes, our drivers up at the top. We've got our stressors in the diamond and our indicators in the ovals and everything is connected by a line that has either a little, some or a significant influence.

Now, as ecologists and managers, we're really happy with this model. We did our job. But as people that work with the public, we said this thing's not going to work at all. Because, you know, you lose people really quickly on that.

So, we knew that this was going to work for technical management purposes like this, we're going to show you what we did for the public later. We didn't do step six and seven, but, they DNR will be able to go through and look at some of these management actions listed on this slide, run them through that conceptual model and try to determine a level of implementation. And, of course, this isn't quantitative but you can see what the interactions and connections will be.

So getting to what we did for the public instead, I call that prototype two because the box and arrow was not helpful for the public. We were missing these interesting stable states that I had mentioned and there's still many attributes and influences to organize.

So, what we were going for on this one was something more of a graphic representation. So, at the top, I had the basic physiography of the marsh that I quickly derived some elevations from topo map and very roughly, coarsely show the basin on the marsh.

Then we can add water and we can see what it would look like at low stage and what it would look like at high stage with an approximate range of 10 feet in hydrology. Then, we represent climate, the management action, the local drivers, habitat drivers and indicators.

And then we put it together in this format, which I'm going to take a couple of seconds to explain. So we've got a timeline across the top that's going to take us from 1800 to the present. We've got our conceptual model stick figure,

legend with the colors in the different boxes across the bottom. If it's available, we've got a map from that era. And then we've got the physiographic template.

So in this one the boundary conditions for a pre-settlement condition were at 1800-1850 climate which was different than now. We had pre-disturbance hydrology and there's a savannah watershed and savannah fire disturbance in that watershed.

In the watershed there was a seasonal watershed hydrology, good water quality coming off the watershed from that savannah. In the marsh, we had a riverine marsh, we had a seasonal flood and it had this deep peat substrate, indicative of this latitude. And then for water quality, you had low nutrients, you had low sedimentation, you had high water clarity, you had high developed oxygen. And carp, we're not here yet. So this was a different system.

In terms of stressors you had anthropogenic fire and natural fire and then you had seasonal hydrology and muskrats chewing down the cattails were the problem. Management at this time, as far as we know, was Native American fire. And the indicators at this time we can get from government land office surveys was potential land cover mapping and that sort of thing.

We know the wet meadow had wild rice and we knew the fisheries were a clearwater, piscivore, pike and pan fish community. Water birds were extremely abundant, that's why Horicon Marsh is famous and the muskrats were very abundant also. In fact, we're going to focus on muskrats because they track marsh habitat quality extremely well, and are an indicator that DNR had tracked since the 50 at least.

So stepping forward in time we get to this interesting period with Horicon Marsh wasn't a marsh it was a lake. It was impounded, if we come over to the stressor box, by a logging dam. And there were steamboats going up and down Horicon Lake, moving logs and lumber from Northern Wisconsin.

So, it was an industrial lake at that time. Then, after the logging was over, it went back to being a marsh. They took out the logging dam. They left the Sinissippi Dam, so we've got multiple hydrologic disturbances now and we're in this kind of intermediate marsh where we've got a low flow and high flow hydrology. We're beginning to get early agriculture in the watershed. Carp came in in this period too.

So all these little things are happening and I'm missing a bunch so, don't hold me to any details. So here's another really odd reference condition was when they drained the whole thing. This is called Horicon Farms, a period of almost 25 years. And the little triangle in the middle of my psychographics schematic represent the ditch. That ditch was deep enough to drain that whole place almost and allow seasonal agriculture.

And, that was going okay. I mean, it wasn't the best. You had a lot of hydrologic disturbance. But if you see this under the stressors, peat fires, that was a big problem. All the ground underneath the cornfield caught fire. And once you get a peat fire going you don't stop it. They apparently burn for 20 years. And it's just the craziest thing you ever saw.

So, as an ecologist or aquatic chemist, you could imagine what that change in the substrate would do too. And, just think of the sheer change in volume when you go from a fluffy peat to a peat ash. So, from what the folks described was this marsh became a cratered landscape of charred, burned

stuff. So, obviously a problem, then here we've got a little picture of the peak fires.

So now, you're into 1934 to '48. It's not used a farming anymore because it's destroyed for agriculture. So of course you give it back to the government and let the government deal with it. So now, it's back in government ownership as a marsh. They close off the ditch or let it fill up a little bit. The Sinissippi Dam is holding water levels high. A lot of hydrologic influences going on here.

And now you've got a ditch running down the middle, you've got the ash substrate, which is probably lacking any organics. And now you've got agriculture in the watershed. You know, this is dairy land. We were there during a rainstorm, I might add, and there was chocolate milk coming off this watershed. We were at a low head dam in this town of Mayville - Mayfield and there was literally foam phosphorus. It was like nothing I'd seen since the 1960s how much phosphorus was coming into this marsh.

So, all this stuff starts piling in there. And then, they go to the refuge management from 1948 to '72. And this is where they start putting in refuge management infrastructure. This big cross dike went in across the marsh and they put in a lot more ditches and a lot more control structures. And it effectively changed the entire hydrology, they cut off the sheet flow and the whole bottom half of it became more stagnant, the phosphorus loading, the sediment loading.

You can see I've got a representation of the sediment bringing the bottom up into the photic zone. And once that got to photic zone and the cattails took hold, it just went to a straight cattail marsh. And that's what they've been dealing with for a long time. I'm not going to go through any of the details on

these slides. But you can see how the drivers and stressor list just keep getting longer and the management actions as well.

So we come up in the modern era. We're doing carp kills for management. We're doing ecosystem restoration, all sorts of things to keep this marsh going. And now, what we've got is our existing condition. We've got this big cattail marsh, we've got the existing ditches, we've got dams downstream that impede water level management the way they would like to do it. And we've got our existing condition, which I'm sorry to say is not good for these guys. The lack of water level management is just a really big problem for them.

So that's where we ended up. We think that these are better images that they can work with for working with the public on their master planning. If they wanted to go another direction and make this more quantitative, I took a shot at just the very simple quantification on the relative water level during these different reference periods. One being a "better score, more natural," three being more developed or impacted score.

So, really the pre-impoundment era would've been a natural hydrology. You have the dam turning it into a lake, which is really a radical change. And then since then, you've had all these other hydrologic influences giving you not exactly what you want for your water level management. So, that's where they're stuck and it's just a matter of too much infrastructure in the wrong place.

They had a lot of conclusions about what they think are realistic desired future changes. I'm not going to go through those all. They try a lot of them over and over. But conclusions for the conceptual modeling, which is the point if this, is the model helps demonstrate the marsh must function within heavy

constraints. Unless something changes, they're going to have to continue to run off sediment nutrient and other stressors, evasive species mostly.

Conversely, the model does show areas where they can work and how we can get around some of these constraints. For example, Ducks Unlimited, it sounds outrageous, is willing to bring in a super pump and pump around the next dam or against its influence.

So we can do things. But, most importantly this model will help them point to the connections where they can increase their influence. Maybe they can do something in one part of the system that benefits three parts of it rather than just single action management. And then hopefully we hope that this improves their communication.

So, we were asked to go and talk a little bit about a different model - conceptual modeling we did at the mouth of the Sangamon River. It's Beardstown, Illinois. And here our issue is we've got a lot of sediment coming from the watershed into our navigation channel and we're spending a million dollars of the year each year to get rid of it.

(Chuck Theiling): So, we were at different stage in our project on this one and this is my note to facilitators, know where you are in the planning process. We were very much at just identifying problems and opportunities for this specific site. And you don't want to try to go beyond that if your stakeholders aren't ready for it.

Here's a picture of the map, of the site. Previously before we were asked to do a diversion the river came up to the upstream side of a great big conservation area, Sanganois conservation area. There was a logjam back in the teens to 1920s, and it backed up 6 miles and changed hydrology; flooding fields all

through here. So they asked us to dig a canal, channelize it straight down to the main stem. We warned them it wasn't going to be a good idea because it was going to change things and cause lots of problems and it did.

We cut the length by half approximately and increased the slope significantly. So we're delivering a lot more dirt. So, understanding we were at the early part of this one. We went out with realistic objectives to just identify problems, identify opportunities and we really wanted to emphasize some unconventional ideas because the same old thing isn't working.

We wanted to report all these ideas after the meeting. We only had one day with these people. It was not at all ideal but we adapted to fit the constraints we had. And that was reporting after the meeting.

And then our key on this was to identify what fits within the regional sediment management program, what fits within other Corps programs and what fits in non-Corps programs. Because folks have been coming to us from this region for both levee, navigation and wildlife concerns and we always seem to say no, that's not in our authority. I wanted to do something really different which was to say we'll find a way to do it.

So, that was kind of the philosophy there. And then, since we were not reporting out immediately to this group there was a plan for another public meeting where these results would be presented. So, briefly the opportunities at this project were all about sediment and dredging. Whether it's mechanical or hydraulic, which we've been doing or unconventional ideas which ERDC regional sediment management is working on. Or whether it's different placement alternatives that all the stakeholders that can work on.

In the unconventional ideas and integrated thinking, I pulled out things like ecosystem sustainability and hazard mitigation and navigation maintenance and food provisioning, raw goods and materials, water purification and climate regulation in terms of carbon sequestration.

So, we wanted them to think about different stuff. And, we showed them some provocative ideas, and this is one of my favorites so I'm showing it to you guys too. So if we've got dirty water coming down the tributary into our mainstreams and down to the Gulf of Mexico, there's ways that we can intercept it. We can put a top water collector to collect silt. We can put in a bedload collector to collect sand which in most instances we would call liabilities and we would pay large amounts of money to get rid of.

In another model we might consider that a resource and we might throw some organic materials from pig barns or from an algal turf scrubber which could clean the water and produce a biological fertilizer and blend that all together in a highly organic custom soil and sell it in bags for a lot of money or in this area it's highly impacted by glacial fans.

These guys do pivot irrigation inside levy districts which is a conundrum to me. Why would you irrigate inside a levy district? Well the reason is because they're so sandy they can't hold any water. So, I told these guys at this workshop we can make the soil right next to your field, all you got to do is spread it around.

And so, it's those unconventional ideas that are going to give us ways out of these wicked messes we find ourselves in. And so working with a partner, I want to try something different. And what we did here was we just drew on the maps. And we had tracing paper overlay and we had hydrology maps and

geomorphology maps and land cover maps and levy maps. And we would overlay things ourselves and draw on them and say this is what I'm thinking.

So here's one group's thoughts. Here's another group's thought of the problems. And then here's a third group's thoughts of the problems. And so we took this input and brought it back and kind of listed all their ideas. So, what we got from separate breakout groups, this was a much different meeting, by the way.

If forgot to mention, we had at least 40 people at this meeting. So when we had a breakout group, we had breakout groups of 10. And so I came back afterwards and I took all the brainstorming from the separate groups and found several items represented by all the groups, some items represented by only some of the groups, and then some represented by only one group and that was really nice.

It really tells you what's important and what we thought was important. We knew sand supply was a problem. We knew back water filling was a problem. They showed us the log jams that are also a problem. So that was great.

Some of the other things, the opportunities that I thought were really interesting that were the problems on the previous slide, here's opportunities, was everybody's willingness to tax the people upstream. That blew my mind. I didn't expect it from a bunch of farmers. And then other ideas like re-meandering and lot of these were in common.

So, we got these lists and it seems kind of disjointed now because it was disjointed. In early stage of the program/project and we're still just kind of getting to know each other. One of the things (Megan) does great as a facilitator and she did another great job on this one too.

At the end, she asked people to go around the room and tell us their thoughts. And they're all listed there, which is nice. But, this guy leaning over there in the hat, his name is (Marty Turner). He's one of the most cantankerous ornery guys that the Corps of Engineers has every dealt with in my opinion. And he proclaimed that this is the best Corps of Engineers meeting I ever been to.

So when we can get a response like that we know that there's something in this conceptual modeling stuff that takes our most ornery stakeholders and make friends out of them. So with that, I'll wrap up by saying (Megan) and I are here to help.

We really enjoy doing this stuff. And stealing one more slide from (Craig), you need to listen to the environmental advisory board who tells you that you should do conceptual modeling as the first step in our planning process. It avoids a lot of going off the rails later on.

Julie Marcy: Thank you very much. Okay, and this is Julie Marcy again. Any questions that anyone has for (Chuck or (Wendy) you can either ask them verbally or use the chat feature. If you use the mute button on your phone, you may need to unmute that as well even though the lines are open.

(Eileen Takata): Hi, this is (Eileen Takata) from SPL.

Julie Marcy: Hi, (Eileen).

(Eileen Takata): Hi, Julie and thanks (Chuck) and (Megan). I am singing hallelujah. Been wanting to - I call it process diagraming, you know, stealing from ecology textbooks and so forth to explain complex ecosystem functions. And then you

showed me how we can integrate this into our planning process. Trying to do that as we speak. So, thrilled to know you guys are out there.

And, just wondering about having your experience or anyone else on the phone's experience with this, integrating it into an early start planning three by three compliance study and how it's been going or has it been done? If not, can you help pilot it with - for me in my study or what?

(Chuck Theiling): I would be happy to help you in the early stage or anybody else in the early stage of the project. I don't honestly see it being emphasized a lot in my office. I'm surprised to see how little folks are using it.

As an example, I got called onto a project three years into it and as soon as I sat down, did a conceptual model everybody found out that their thinking was backwards. So, I just can't emphasize enough how important it is. And I'm not the only one out here. (Craig)'s group knows a lot about this stuff. (Tessa Webb), she has got folks that do this stuff too. So, there's folks down at ERDC that can help.

(Eileen Takata): I mean, I can do it. It's just I've never done it at the Corps as part of a feasibility study. You're the first person I've seen outside of my graduate program to do pre-settlement and post settlement conceptual drawings of the system.

No one else seems to know what I'm talking about. It's like I've finally found someone that speaks my language. But, now I'm trying to figure out how to translate it into the language most people in planning speak.

(Chuck Theiling): Yes. (Unintelligible). (Sarah Miller) published one report in 2012 and (Bruce Pruitt) published another one in 2012 both about reference conditions and using them in planning. So, those would be great.

(Eileen Takata): I'm going to send you an email if you don't mind, like, helping me find those documents...

Julie Marcy: Well (Chuck), this is Julie. If you'll send them to me, I'll send them out to all the participants...

(Eileen Takata): Yay.

Julie Marcy: Or just tell me the titles and I can pull them off the ERDC library.

(Chuck Theiling): Yes, I'll get them. Thanks (Eileen).

Julie Marcy: We've had one question come in commending you for your great program too. He's asking did you get any suggestions from the group about extending conceptual modeling beyond the ecosystem interactions to look at larger water resource systems that deal with ecology, economics or social factors?

(Chuck Theiling): Not at these specific workshops, but in general. So, like the nutrient issue in Wisconsin is hard to decouple from Horicon Marsh in Wisconsin. So they've got really innovative nutrient management rules that affect the whole economics and social.

(Wendy Frohlich): A 2011 workshop did bring in for the larger scope but with the conceptual model, though they really want to stick within marsh rather than go outside the marsh.

(Chuck Theiling): Right.

(Chuck Theiling): Yes and I am tip toeing to not talk about ecosystem goods and services but that's why I live ecosystem goods and services so much because it does do these interactions with ecology and economics and social. So, I hope that that policy will develop more in the future.

Julie Marcy: Sure. Any other questions for our speakers? Remember, you might have the mute button on your phone. (Chuck), this is Julie. I thought of one just in general. You know, you talked about such a difference in these two groups that you discussed today. You had a three day meeting with about a dozen folks and a one day meeting with about 40 folks.

And you provided a little bit of feedback with us from the second session. Any other feedback that you'd care to share with us and how that might contrast between these two diverse settings and groups?

(Chuck Theiling): Yes, I would definitely not push this stuff. If you can get three days, do it. It's the first day to get to know each other, the second day to begin working and a third day to agree on what you said.

The one day thing was not something we arranged, that was something we got called in on and we were very careful to warn our folks we were working for to manage their expectations. But then that's what a good facilitator can do too is say, and especially related to our planning process.

If you've got three steps in your planning process and you've been working long enough to get to step five then you can go there. If you've only been working long enough to get to step two, don't try to push it.

Julie Marcy: Okay. Good advice. Any additional feedback that you received from, say, the first group or some other attendees on the conceptual modeling? Was this the first time they had encountered it or what was their general perception of it?

(Chuck Theiling): The first group was - they were fairly astute managers so they'd seen this stuff before and they were more than happy to have somebody work with them on that exercise. The second one was a bunch of farmers and county engineers and municipal people that were not familiar with that.

So, they were certainly open to it and that audience liked being listened to rather than being told no or just told this is what we're doing. So, that's another good thing about this communicating and facilitation is it opens up two-way communication and other people like to be heard.

Julie Marcy: Okay, great. Any other questions from our participants or perhaps similar experiences you've had in trying and applying conceptual modeling?

(Eileen Takata): If no one else speaks up, it's (Eileen) again. I tried to do this in two hours. ...the process diagram. It was a huge mess. (Chuck), I gave it my best shot. It was - we talked about a facilitator needs a toolkit and I whipped out the PowerPoint because everyone was virtual from the resource agencies, my PDT was in the room.

But, it was a good beginning discussion. But, I suspected I needed a lot more time, I just didn't realize - it wasn't even on the agenda but we added in knowing it was very important to understand cause and effect of the ecosystem study area.

So, I know I need more two hours. I'd like to request the agendas for your workshops so I could see what the ideal three day and then the not so ideal

one day would cost. And I could talk to my PM and convince her I need to wait and convince here that.

(Chuck Theiling): Sure.

(Chuck Theiling): Yes. And, you know, Julie's group has these facilitators tools, she can help you out too.

(Wendy Frohlich): Yes, I think the meeting was an afternoon - it was three days as in afternoon, full day, morning that left us the afternoon if we couldn't finish.

(Chuck Theiling): Yes.

(Chuck Theiling): Yes, and the important part, having some evenings together...

(Wendy Frohlich): Yes, the evening...

Julie Marcy: Personalization, yes.

(Wendy Frohlich): Yes, being together in the room rather than on the phone or...

(Chuck Theiling): Yes. Here's another facilitator's note. If you're on a two or three day workshop, you plan on working that night. I went back, we did all these thick and narrow box and arrow diagrams during the workshop but then I went back to the hotel after dinner and do it - did all the graphic things on my own. And then came back and shared those with folks.

We sketched them out during the day, now that I recall, but then I printed them up that night.

(Eileen Takata): I'm thinking it could be woven into the, you know, scoping charrettes that we do as part of the early part of feasibility studies. I know there's a way to integrate it.

(Chuck Theiling): Yes.

(Debbie Scerno): (Eileen), this is (Debbie Scerno) and I agree. I think it's a great way to weave in figuring out your problems and opportunities and some of these causes and, you know, things that are happening in the area. It makes it much harder for you to figure out what those problems and opportunities are, so it's almost a way to help you get to those.

(Eileen Takata): I agree. Good call (Debbie). Our next project, right.

(Debbie Scerno): Unfortunately, I probably won't be on the next one because I'm now in SAD but yes.

(Eileen Takata): Yes, that's right. I keep forgetting.

Julie Marcy: And okay, any other questions? Any final questions for (Chuck) and (Wendy)?

(Courtney Chambers): Julie, there was one more from (Hal) in the chat box.

Julie Marcy: Talk about the next step. Have you tried or been successful in taking these conceptual models and starting to put quantitative information on them to get further down the path of a technical analysis in collaborative modeling framework?

(Chuck Theiling): We just did the workshop in Beardstown, so we haven't had much time to respond to that. In Horicon, we were planning assistance to states and that's a short-term thing. Personally, though I was quite fascinated with the site, worked with them individually on some other alternative management actions even more.

That's where I got the idea for unconventional ideas. But, no, we don't - because of the way the planning assistance worked we were kind of like wanting out on those. But, in my other modeling, I apply this to all my work. So, we've got our UMRR restoration projects where we do simple spreadsheet models.

I'm working on ERDC projects where we've got highly integrated hydrodynamic water quality models and we can use different scaled models to look at the same question at different times of the study. So when you're doing your planning charrette you want a conceptual model. When you're doing three by three by three planning, you want a spreadsheet model with some really darn good professional judgement.

I find now that when we get into project design and PED, we're not doing anything without a hydrodynamic model. So that actually gives us another point to look back at our ecological models, make them smarter with the hydrodynamics and then do really, really good adaptive management.

It would be nice if we could do the good models during feasibility. Three by three by three is not going to let us do that and we can't expect to model every answer in the world for a feasibility study anyways. I don't mean to imply that I don't like three by three by three. You just got to have the right model for the right time. And if you're going to get free resources during PED, you might as well use them for your environmental analysis also.

That's my mantra.

Julie Marcy: Good advice. All right. Well (Chuck) and (Wendy), thank you so much for such an excellent presentation. And (Chuck) if you'll follow up with those references to me and perhaps a couple of sample agendas, I'll be glad to share those with the other participants.

(Chuck Theiling): Okay.

Julie Marcy: And, participants thank you so much for joining us today. And also thank you (Courtney Chambers) as our very abled co-host. Keep watching your Outlook mailbox for upcoming words either from the facilitation community practice or the collaboration and public participation community.

And with that, we'll conclude our program. I hope everyone has a great afternoon.

END