ERDC-EL
Moderator: Courtney Chambers
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12:58 am CT

Courtney Chambers: Okay, at this time I'll give you today's speaker on Modeling Interactions of Flow and Riparian Vegetation for Improved Riverine Ecosystem Management. Dr. Billy Johnson is a Research Civil Engineer in the Water Quality and Contaminant Modeling Branch at the ERDC Environmental Laboratory. Dr. Johnson develops and applies multidimensional hydrodynamic and hydrologic models. He works with various ERDC Laboratories as well as universities, private companies, agencies, state governments and as well as local government in this development and application. He is currently interested in developing physically-based nutrient and chemical fate transport processes to the distributive hydrologic model GSSHA as well as continue to work with the ERDC team members to add sediment capability to the reservoir water quality model known as CE-QUAL-W2.

Our next speaker is Dr. Zhonglong Zhang, a Senior Scientist for Badger Technical Services working with the ERDC Environmental Laboratory. Dr. Zhang performs applied research to support the development enhancement of the watershed and water quality model sponsored by the Army Corps of Engineers. He incorporates basic research from the published scientific literature along with numerical techniques to create tools and methodologies to solve water resources problems. He also applies these watershed and water quality tools for TMDL, integrated watershed, water quality, ecosystem restoration and environmental sustainability projects.

Finally our third speaker is Dr. Blair Greimann, a Hydraulic Engineer in the Sedimentation and River Hydraulics Group at the Denver Technical Services Center for the Bureau of Reclamation where he's been since 1998. He's currently the Technical Specialist of the group. And his primary work is related to the analysis and design of large scale dam removal and river restoration projects. Some of the projects where he's performed a critical role includes the San Joaquin River Restoration Program, the Klamath Dam Removal Studies and the Matilija Dam Removal. He's also a co-developer of the hydraulic and sediment transport model, SRH-1D and has applied it to the projects listed above as well as many others. His current research is in developing quantitative linkages between vegetation flow and sediment and integrating these linkages into a hydraulic and sediment transport model.

Additional information about our speakers can be found in their bios posted on the Learning Exchange along with today's PowerPoint and recorded meeting. We're very pleased to have you all with us today. At this time I'm going to give Billy the presenter rights. Will enter listen only mode. And then we can begin.

Operator: All participants are now in listen only mode.

Billy Johnson: Okay, all right, thanks Courtney.

Courtney Chambers: (You're welcome).

Billy Johnson: All right. And I appreciate the opportunity for us to talk to you today. We're going to talk a little bit about and this is actually a new start work unit under the EMRP Program. So we're going to talk a little bit about some of the work that we're doing in terms of integrating riparian vegetation into the HEC-RAS model. It's going to be a combination of myself, Dr. Zhang and Dr. Greimann talking about some of the things that we're doing here.

But in essence what we're trying to answer or some of the questions that we're trying to answer with this work is how can vegetation be incorporated into restoration project without increasing flood risk, what set of riverine operations can be used to encourage the recruitment, survival of (mega) vegetation as well as, you know, how can we, you know, what can we do to try to control the spread of invasive species, how will the management actions impact habitat for endangered and threatened species as well as, you know, what impact does riparian vegetation have on local flood conditions.

So a number of things that, you know, that the Corps of Engineers and even the Bureau of Reclamation are concerned with as it relates to the river regime. The approach that we're taking and again this is, you know, an Army Corps of Engineers Research Program so what we want to do is try to upgrade some of the Army Corps of Engineer suite of models. On the river model we're using the HEC-RAS model. That's, you know, a pretty standard river model that's used worldwide.

And what we're going to do here is create a riparian vegetation simulation module. This will be a standalone module that Army Corps of Engineers is aware of as well as the Bureau of Reclamation's model. And Blair will talk a little bit about, you know, the USDR work that they're doing there.

But the idea here is that what we want to do is create a riverine sub-model or aquatic vegetation sub-model that we can then continue. Not only can we continue upgrading within the HEC-RAS model but using the same kinetics we can do the same thing as Bureau of Reclamation. So it allows us some leveraging opportunities between the two organizations. We're using the same, you know, dynamic, vegetation dynamics and so forth so the hope is that, you know, we kind of get a little bit more bang for our buck in the future as we do research and development.

We're going to - you know once we create that sub-model which we're in the process of doing right now, that will be compiled at or integrated with that graph at the compile level. And when I say that basically what it'll boil down to is that when you go to the HUC web site and you download let's say the new release version of HEC-RAS it has, RBS in a minute, you're not going to necessarily see RBSM per se. It's going to basically be within the HEC-RAS executable so it'll be tightly coupled with HEC-RAS.

As part of that, you know, there'll be a vegetation database, you know, that's used for some of the input as well as a lot of the model post-process or output digitalization will be done using the HEC-RAS (dual RAS) GUI looking at various vegetation growth cycles and so forth.

I just want to mention that there is an SRH-1D(b) model that the Bureau of Reclamation has developed that we're kind of using as the base for this development. And the idea there is that we're going to basically take, you know, essentially extract out from that model some of the vegetation dynamics and maybe improve upon some of the things that they're doing already.

Also take out any of the vegetation parameters, create a more universal database that people can add to and continue to grow as time goes by so that, you know, so that we're basically able to again march forward together and make it a little bit more general use and allow for more (R&D).

So at this point I will go aHEC and pass control over to Dr. Zhang to talk a little bit about the actual RDSM development that we're working on.

Zhonglong Zhang: Thank you Billy. So I will go aHEC to talk a little bit about the capability we are trying to develop. This RDSM we will develop as a (DAO) dynamic like library so then we will integrate it into HEC-RAS. Once we integrate into HEC-RAS basically HEC-RAS will be able to simulate not just hydraulic sediment. Besides that this model we'll be able to simulate (west basin) lifecycle. We seen through the (west basin) (unintelligible) grows and the mortality.

Beside that this model also able to simulate length and height, hydraulic process in the (west basin). That means we'll be able to look at the impact of (west basin) or hydraulic (roughness).

So I will go through a little bit more detail in the next few slides.

So this is this RDMS, Riparian (West Basin) Simulation module basically this module we replace or the Bureau of Reclamation's SRH-1D(b) we will view it from there. So basically this model will include some of the process like (West Basin) lifecycle we seen through the establishment. Also (how it grows west of how) established, then we'll be able to track the (growth) which we will look at as three parts. We (will) look at a low stand and canopy.

Also we will look at the process and mortality component. Beside that all - when we do the (West Basin) simulation we need base or the hydraulic sediment transport information. This information you actually will be provided through the HEC-RAS model.

So this is the overall flowchart for this RDSM so this is time - when you look at this it's the first start like from the hydraulic sediment model. Once we got the information from there we'll be able to compute each process for the

(West Basin). We have like the establishment growth mortality. Also this is the overall (rope).

I will go into a little bit more detail for each process, what each process does.

So one point because this is a (wide vast) model, so (wide vast) model basically depends upon a cross-section so that means (west basin) will define the base or the cross-section for each point or the cross section you can have different kinds of (west basin type).

So this is the established and process basically and this process compute a determination (approximation). The model will look at the criteria if as possible for a (prod terminated). We look at some of the space, also (state) availability, also the ground. So once all criteria is satisfied that means a (prod) will grow.

So by the way we have like a two way to terminate the (prod). One is by the air, one is by the water.

Besides termination through the air/water, also the (prod) can grow so the (ladder) root is spread. So based on this (prod) can spread (the ladders). We will define this based on the (ladder) root spread rate that computes their possibility to grow this (prod) through the (ladder) process.

So this is (west basin) growth process. Again we compute three parts. One is based on the root, also on our part it's based on the stand. The third part is based on canopy.

Basically because the (west basin) grows, it's hard to define from like a traditional hydraulic sediment model based on (the way of) the law. Basically all this process controlled by the parameter so basically we use the parameter control each of the process. For example this (west basin) growth process, we use the parameter to control each part of (growth). Basically all this parameter defined so the input file actually user can define the maximum growth rate. Then for each month we can have different growth rate. So this all controlled through the input file based on the parameter.

This is the mortality process. Basically this model input a different process. A different way you can compute the (west basin) mortality. For example this one we include some of the like vegetation in the (basin), also based on some of the groundwater level. Some of the based or like if inundated. All of this again controlled by a parameter based on its parameter, we decide to use this plot (exist) or not or survived.

For the calibration again because this module will be incorporated into HEC-RAS also first we need to calibrate the hydraulic parts. This is the HEC-RAS, the standard we use and we calibrate for the (unintelligible), also surface water (animation). Besides that the next step is calibrated for the (setting) parts based on the historical sediment (unintelligible) (evaporation), also the (unintelligible).

For the (west basin) we need groundwater component. Also HEC-RAS already included this component. We will use this in HEC-RAS, the groundwater component to compute some of the information like groundwater had risen.

For the (west basin) parts usually we can calibrate for the area of (west basin growth). Also we can calibrate it for the individual (prod) information. Especially for the (west basin) module because manually this process controlled by the parameter. So there’s many parameter need to be calibrated.

So for the calibration it become even more important for the (west basin) parts.

So the next one is for the imported requirements, again so for the HEC-RAS standard hydraulic information we need like a (geometry), cross-section data, and the (unintelligible) (basin) for the sediment; besides that for the - especially for the (west basin) component what we need are two sets of information. One is the (unintelligible) condition. So what kind of (west basin) is available? Usually we can gather this information from the (GA)'s mapping so try to map the (unintelligible) condition.

Besides that for each process like the establishment growth, mortality we need set of parameter. So there's many parameter for each process controlled the established growth, mortality.

So I think when Blair give the example, probably we'll discuss more detail of what kind of parameter (will there be).

So then I will - I think I will pass this to Blair.

Blair Greimann: Yes, thanks Zhong. And I'm Blair Greimann. I've been working with SRH-1D(b) model for a while. And as mentioned we're going to be incorporating, you know, this. We have basically written the vegetation components of this model as a separate module. And we're able to share that now. So we're looking forward to this collaboration.

And this example was one of the first we did using this model. It was done for the Sacramento River. The primary reach of interest was from Red Bluff Diversion Dam down to Colusa and was to support project investigations for NODOS north of Delta Offstream Storage Project. They were looking at changing the operations and flows in the Sacramento River and looking at what potential effect that would have on many things one being riparian vegetation. And there was some field work conducted as part of this project that was on cottonwood recruitment, some laboratory studies on cottonwood defecation and cottonwood inundation.

And, you know, we worked with several other people on this project too including the Reclamation Office and Mid-Pacific Regional Office in Sacramento and also California Department of Water Resources so Red Bluff Office on several of these things. And also Stockholm Environmental Institute and UC-Davis were involved in some of the (prod win) studies as well. And we'll mention some of these things as we go.

Also like to mention, you know, this is the example we picked. Now we perceive there's going to be, you know, many applications of this type of model. We - you know, vegetation, the interactions between vegetation flow and sediment is a, you know, rapidly expanding field. But it is also, you know, a new field in which, you know, there aren't establishments to do interactions. It's complex. And there's multiple feedbacks on these things.

So it is also an area in which we anticipate there's going to be, you know, rapid improvements and so we want to - you know one reason for the collaboration is to facilitate, you know, those improvements as they - as each of us learn more and improve our understanding and methodology in terms of being able to model this.

The work on the Sacramento was primarily focused on cottonwoods as well as willows. But there was a large emphasis on cottonwood in the Sacramento as that's being one of the primary riparian species in that area. Though a lot of the west it's the same issue.

But, you know, this modeling framework we built is not geared towards a single species. It's really geared towards all riparian types of species that have strong interactions with the river. And given the proper field and lab data you can parameterize a lot of different types of riparian species in this framework.

So and to describe, you know, we went through various calibration exercises on this. The first being the hydraulics which was a traditional sort of calibration where we have measured stages and measured flow rates and calibrating roughness to match the observed water surface.

In this case we were - the one step in the calibration was to focus on the results of 2 point bars. And so one being at river mile 183, one being at river mile 192.5.

And so, you know, as you would expect you can calibrate to the stage fairly accurately and with the 1D model.

And we also as part of this model there's also a groundwater sub-module as part of the vegetation module because groundwater elevations of course are important for riparian vegetation. That is a cross-section based groundwater sub-model. And it's not a full, you know, groundwater model in which you're doing this gridded solution. But it is - it gives you a idea of how the - far from the river the groundwater levels will respond to river flow because there will be a time lag.

And so we also had some well data in this case. And we're able to see how the ground - simulated groundwater stayed matched up with the measured.

And in the case there were two wells. We were able to, you know, match, you know, fairly well with the observed groundwater stage. There is, you know, more uncertainty of course in the groundwater than the river stage. There's also a pretty tight coupling between in this river because it's a gravelly sandy river. There's a pretty tight coupling and only a slight lag in the groundwater elevation versus the river elevation.

We also looked, you know, looked at the sediment transport in the river. And though it wasn't a primary emphasis of the modeling, we did also look at calibration of the bed load. And here were some measurements. Though, you know, bed load calibration is difficult in that measurements are usually only able - we usually only measurements at low flow because doing measurements at high flow in big rivers such as Sacramento is near impossible from a practical perspective.

So, you know, floods on the Sacramento are easily above 100,000 but we were only had bed load data, only had like one measurement that is shown here above- close to 40,000.

So, you know, the sediment is kind of - is sometimes limited especially in large rivers for calibration but that's due to the sampling limitations primarily.

So one of the calibration steps we did was to look at survival of cottonwood seedlings upon point bars. There were a couple different point bars measured. This is showing measurements in I think 2005.

And it shows that recruitment along a elevation band there on the figure 12 on the top left where you have some cottonwoods beginning to grow. Right photo taken slightly later and you can also see the river has receded somewhat, you know, which primarily in this case is due to changing reservoir operations.

You desiccated that one plot because the river drawdown was faster than the little plants could keep up with so they desiccated. So we had some - you know, that was one kind of data point we had. There was also another point bar at river mile 183 where there was some additional monitoring. And there was - there were cases also of cottonwood survival. And that's shown. This is one case where they did not survive.

And one - what this plot shows is basically some - a qualitative comparison between the area that we were - on the area of cottonwood survival and a - the measured seedling density. In some cases we don't always have a one-to-one correspondence between what we're measuring and what we're simulating and this is the case here.

You can imagine, you know, how do you represent vegetation? Often it's represented as a density. However the model is really a presence absence type of approach where we're just simulating can cottonwood survive at this location.

Currently it does not simulate the density of a species explicitly it's really geared towards simulating presence absence. But, you know, again as we expand our understanding and knowledge, you know, we can of course make more complex models of that.

But as a start we're looking really, you know, this effort was focused on well if we're going to re-operate reservoirs, encourage or discourage repairing growth what's the best way to do that.

And we were looking at, you know, with this line of approach we could give you the best method to do that. So in this case this is the case where we simulated at that point bar they were doing fine.

Come - you see in July 21, 05 you have a draw - starting to have a draw down and you start seeing the mortality of the species and the density goes down to practically zero and we simulate that all the plants die.

And that was using desiccation parameters, which I will explain how we obtained those shortly. And then there were another case in 2006, one was in a - at the same location as shown previously but this one, one was on the top of the point bar in a gravely soil, one was in a sandy soil.

And we were looking whether or not we could simulate the elevation that the cottonwoods recruited at, the elevation above low water. So again, you know, we were able to kind of correctly simulate the elevation at which the cottonwood species recruited.

Typically it's a band that's not to close to the water but not to far from low water so it's in that right zone recruitment, right recruitment zone for that species.

And in the case of the gravely they actually desiccated and in the case of the sandy soil because the capillary fringe was higher and retained more moisture at a higher elevation they survived, which was born out in other measurements too.

Though the measurements could - they've stopped in October basically the measurements stopped after all the cottonwood - all the cottonwood died in the gravelly soil and then they were still alive in the sandy however I don't think they continued monitoring to see if they continued through the next season or anything but.

There were also some lab experiments done. On trying to quantify this - these desiccation parameters and so as we have shown we were able to match that but that was because we had some detailed lab data on the response of cottonwoods to declining water tables.

And so there was several - these show two examples of experiments performed in which they had - they just had this they - essentially irrigated the cottonwoods and of course they did very well.

Then they had different rates of water decline and this is showing, you know, some period after a steady water table decline of 1 centimeter per day and we, you know, did test it at half centimeter, two centimeters and so on and seeing how the cottonwoods respond and what's the, you know, what's the survival rate essentially of these different cases.

And so we were able to quantify that response and developed this kind of - a water stress parameter where we were - which we were able to, you know, develop this water stress parameter that described when cottonwoods desiccated.

The - we found that when the water stress parameter that was essentially driven by the rate of water table decline exceeded a certain value we would have death so that's how the cottonwood desiccation is parameterized in the model based upon these lab experiments.

And these just show different experiments where they have different water table declines and when that stress basically it's showing when we had this water stress parameter equal to .4 we were seeing the plants desiccate.

And then we also did a kind of more large scale calibration, which we were looking at the changes to the riparian area between 1999 and 2007. Those were two times in which they did a riparian mapping of the Sacramento cord or to determine the area that was in, you know, cottonwood forests, willow, mixed forest and so on.

And we were trying to simulate the historical change to riparian species using the same parameterization that we developed based upon those smaller scale lab and point bar experiments and using those set of parameters and the observed flows we saw that, you know, we had fairly good correlation between the relative change in the riparian communities and the observed riparian communities.

We broke it into three basic groups not so much by species as by different groups because in the mapping you can imagine they aren't counting, you know, the number of cottonwood trees at this scale, you know, for the whole, you know, over 100 miles of river in the Sacramento.

They're doing general classifications and so we had to match those classifications to our simulated types. We broke it down into three types one was cottonwoods and mixed forests so it was, you know, a general classification that includes not only cottonwoods I mean it's dominated by cottonwoods but it included other species but we mixed them into one parameterized set of species.

The other was riparian species such as the - primarily consisting of the willows and riparian scrub and the rest was invasive, which was primarily the Arundo or Giant Reed.

And so we first had that group how do we group those species and we had to make that decision. We also - we're only comparing the relative change to the acres not the absolute acreage. As you can see one limitation in the windy model is it doesn't fully represent the complexity of these mapped polygons but again we're only doing cross sections.

We aren't modeling the polygons explicitly in the way this windy model is set up and so you don't have exact matches between the area that's represented in the windy model versus the area that has been mapped in the polygons as you can see in that - in this figure.

Now, you know, as I said this is, you know, beginning stages of this development. We also are going to be using this vegetation module within 2D models and then you would have more accurate representation of those floodplain areas and more actively represent, you know, the - these complex communities.

However, you know, again this is at the beginning we are focusing on the windy model and looking at the process there and then incorporating things on the 2D model as we gain more information.

So in the mapping the comparison here we show that essentially there was very little change - the mapping showed almost no change between year one and year eight meaning the year 1999 and 2007 in the cottonwood and mixed forest.

There was essentially a small reduction but only 1% reduction in that or it's where the model showed a slight increase. However, you know, these wouldn't necessarily be considered significant changes considering just the observations there's going to be error in how those communities are mapped.

There was a significant increase however in the amount of willow habitat and repairing scrub in both the model and in the measured data of a model of increase of 36% observed increase of 40%.

So, you know, we are considering, you know, this model primarily used in terms of looking at differences between alternatives relative change and less so in, you know, trying to be precise with the, you know, specific amount of area created or destroyed.

But because of - you can imagine the complexities of representing riparian vegetation this still is at a stage of being, you know, able to, you know, quantify things. However there is going to be uncertainties for sure that remain in this.

And so the most relevant, you know, use of them with the model would still be in a comparative sense between, you know, different set of operations to different set of management practices and things like that, that's where we've been primarily using this model as shown here.

And then the invasives also showed a significant increase between year one and year eight. As you expect the Arundo is as invasives do it's increasing in density as it finds more and more places for it to colonize.

But, you know, we did, you know, have some success in modeling this very large system with a fairly complex system in addition. So and this is - was just a summary of what we did.

And some general, you know, conclusions here what was done. The sediment we did not with that - we didn't necessarily utilize - as I said the sediment wasn't a focus of this and there is actually some, you know, pretty severe limitations of modeling sediment in a windy model in a meandering stream and so we didn't in the alternative for notice we did not utilize a sediment component for this model.

So I mean also that points in that this model can be used just with the hydraulic component of the model and that doesn't - it's not necessarily needed to do the sediment modeling along with it though in some cases it may be necessary depending on the dynamics of the stream.

I didn't know if (Bill) you wanted to...

Billy Johnson: Yes I can take over at this point. All right I appreciate that so that sort of gives you I guess a summary of, you know, generally what we're trying to do in terms of dynamics as well as, you know, I think based on what Blair talked about is, you know, that's, you know, that's pretty much what we're aiming for being able to do with the, you know, with the HEC RAS, you know, vegetation component there.

I think, you know, the benefit or the idea is that there are a number of core districts that already have HEC RAS models set up so by incorporating one of those dynamics into the HEC RAS model then it kind of very quickly allows us to kind of take advantage of some of the flow of sediment models that may already be out there at the district that we can then just come in and turn on, you know, the vegetation component.

And, you know, even in our planning where maybe the dollars aren't very big you can still do something with the model to just decide whether or not to go forward maybe with a more complex project and even at that point maybe, you know, you consider okay, you know, the windy was fine for planning purposes but as we get into engineering maybe we do need to go to multi professional models for some of those type questions.

The idea as well as, you know, we want to, you know, develop the tool such that it can be applied across a number of different regions within the U.S., you know, again we want to build upon what has already done and in fact, you know, we've had conversations with them about future things that once we get this incorporated into the models things that we can do to improve the vegetation dynamic.

So, you know, I think there's definitely work that's still to be done there. I think, you know, one of the things we want to do is also, you know, go aHEC and develop this, you know, this idea of the vegetation database so that we capture what's already been done as well as we can do a literature review and try to go aHEC and sort of flush that out a little bit more.

But the other thing we want to do is develop whether it's the, you know, the technical report with some procedures for people that if they're doing a project and they need to go out there and collect data and localize that data to support this type modeling that they have basically a handbook that tells them how to go about, you know, getting some more localized parameters there.

Just so generally some, you know, I think we kind of mentioned this, you know, through some of the other slides but just on the capabilities that we're trying to bring to the Corps of Engineers here, you know, we want to combine the physical processes with ecological performance.

So the idea is taking, you know, physically based type models with hydraulics and sediment then incorporate, you know, some of the ecological dynamics with that so we have a better understanding in the river processes.

And the also, you know, for (map) and sort of an assessment, you know, quantitative assessment of that environmental response. Also, you know, like a predictive tool to evaluate management actions so, you know, as we start getting into many of you are looking at, you know, changing, you know, it looks like really more releases that are, you know, going into a river and you want to see how that's going to affect, you know, some sort of management action.

You won't be able to do long-term type simulations with that and then, you know, also we want to be able to look at a wide range of a wide variety of riparian vegetation types.

So specifically we're aiming to support the Corps of Engineers ecosystem restoration and management mission as well as being able to support, you know, environmental impact statement as well as habitat type studies what this is geared to of course.

Just to kind of give you an idea where we're at in the process with the project. Last year we got a little bit of start up money just to kind of scope out the concept a little bit further and to evaluate the bureau's riparian vegetation model to see whether or not that truly was something that it would be beneficial to the Corps of Engineers.

We did that and, you know, that was something that I think we came away pretty impressed with what the bureau reclamation is down to to this point and actually pretty excited about the opportunities to collaborate with them in the future.

So I think this to me, you know, even once we're done with this project this is really just the start of a collaboration with the Bureau that I think will be very beneficial to the Corps of Engineers in general.

(Brand) file 14, we've already had working - a working meeting with the bureau down in Denver and we're in the process of developing the RBSM. Later this FY we will actually start working with HEC just sort of integrating that within the HEC RAS model.

That will carry over into FY15 where we'll basically finalize that integration as well as working with them on the (graphical) user interface support. There is a couple of opportunities for doing some case studies, demonstration studies.

One is in the upper Mississippi River working with Rock Island as well as another is I think with the Sacramento group that we'll be working with there. So there's already some modeling going on there's some data gathering collection that's been going on that can support the, you know, the testing and validation of, you know, of the - once we get it in place.

Also, you know, developed documentation, tutorials and then finally we will in FY16 basically be developing the materials and kind of performing the model certification in conjunction with the HEC group in Davis, California to make sure that the model is certified and that, you know, it actually can be used on things.

Just in terms of products that we anticipate delivering from this would be the, you know, the riparian vegetation simulation module. Again, you know, it's being developed as something that not only can integrate with HEC RAS but it can integrate with, you know, the bureau's 1 and 2D model.

Also we, you know, we've presented some of this to our coastal hydraulics lab, you know, they have multi-dimensional hydraulic models over there that I think, you know, this vegetation model would be appropriate to incorporate within those models once we kind of get to that point.

The updated HEC RAS model that basically would be on the HEC Web site so in terms of technology transfer somebody would basically, you know, however you get your HEC RAS model now would be the way you would get this once it's incorporated.

A number of things we haven't heard a technical report and technical note kind of detailing some of the formulations and some of the demonstrations, you know, fact sheets as well as work with HEC to update the users manual so that, you know, once it's released, you know, you'd be able to figure out how to actually set it up and run it within the HEC RAS model there.

And then obviously I think, you know, given sort of the cutting edge nature of some of the things that we're doing here with this I think it bends itself very well to, you know, publications and technical peer review journal articles.

I think Courtney that pretty much wraps up what we wanted to present today so we're open to any questions.

Courtney Chambers: Great thanks, I'm going to return the interactive mode right quick.

Recording: All participants are now in interactive talk mode.

Courtney Chambers: Okay so now we can open the floor to questions from our participants. Please remember to take your phone off of mute before speaking or you are welcome to utilize the chat feature by typing your question in the box in the lower right hand corner of your screen. Any questions we don't want to rush anybody we'll give you a few minutes to think about it.

As a note, a reminder the presentation today is going to be posted on the gateway and I can type that URL in the chat box for you if you want to copy and paste it.

One other request if we - it looks like we have a couple of districts possibly calling in as a group. And if that's the case would you please shoot me a message and let me know how many of you are calling in that way we can have a better count on our attendance.

Billy Johnson: I guess I can ask a question if that's all right.

Courtney Chambers: Well sure.

Billy Johnson: Okay for - I mean for the districts that are on the line I mean I would be curious or interested in just kind of hearing what kind of projects that you may have going on right now.

Courtney Chambers: So what kind of projects specifically?

Billy Johnson: What kind of - I mean are there basically issues specifically that they have going on that, you know, if this tool was there today I mean that it would be something that they would consider using.

Courtney Chambers: Right okay so any projects that you could use this on today or in the work.

(Mary): This is (Mary) with the Detroit District and I have a study that we're partnering with a township and the USGS and their main or one of their problems is vegetation within the channel not necessarily the over banks. Is that a consideration for when developing this module that it will consider both channel and over bank vegetation?

Billy Johnson: Blair I mean...

Blair Greimann: Yes, you know, it's really not the - it's really a process based model so as long as understand that whatever vegetation you're talking about it can be integrated into that model.

And there's really not a distinction between the channel and floodplain it's the same, you know, every point is parameterized the same essentially. So it's just, you know, for example cottonwoods would never grow under the water because they would be drowned, you know.

But there is a specific physical process, which prevents that not that just that it's channel, you know. So but like in a wetland vegetation or a, you know, other vegetation that being under water it would not of course be affected by drowning and would be allowed to grow under water.

So, you know, probably (Mary) I would imagine the primary limitation of such a species would be scour so you would need to represent, you know, what does it take to scour that plant and if you could, you know, do studies to determine what velocity it takes to scour or bury or whatever, however you get rid of it or if you want it I don't know.

But then you could parameterize that and set up that in the model and then it would be coupled into that hydraulic model that's the benefit of doing it this way. Now we haven't used it as such, you know, for that but like I said, you know, there - the goal is to have it a very kind of generalized module that where we're looking at basic plant process, you know.

And then we learn as we learn more about these specific types of species or specific species then we can parameterize them in the model. Does that help?

(Mary): Yes.

Courtney Chambers: Anyone else want to share a project that you have going on that this might be a helpful tool to use? All right, well (Bill) do you have any other closing comments?

Billy Johnson: No I mean I think, you know, like I said to me even after we get the initial RBSM developed and incorporated into HEC RAS I mean there are some - there are other things that I see that we need to do especially thinking in terms of nutrient, you know, uptake, you know, as well as figuring nutrient concentrations into plant growth mortality.

The other thing that we're interested in working on is contaminant uptake of plants as well as, you know, how that might affect, you know, growth and mortality.

So, you know, right now if you look at the formulations it's primarily geared around flow and sediment but the things that in my mind that I'm thinking about in the future is how can we take those dynamics and integrate them with, you know, nutrients as well as contaminants to the - to maybe, you know, see how that might affect some of the vegetation.

So that I would say those are some things that, you know, as people start thinking about future R&D and future development are things that would be on the table.

Courtney Chambers: Now and (Bill) if I understand right next week's Web meeting is very related correct, nutrient modeling capabilities within HEC RAS?

Billy Johnson: Right next week we'll be - we've been doing - we had another work unit within the EMRP where we added nutrient simulation dynamics and cycling into HEC RAS.

And that's a mature work unit and more mature product so we'll be discussing there, you know, the nutrient simulation module that we incorporated into HEC RAS as well as a case study or so that we've done showing some of the, you know, some of the output there.

And so yes I mean in fact we're already starting to get a little bit of work coming in, you know, using that. So I think that's definitely something that, you know, if people have water quality issues on rivers and streams and so forth might be interested in.

Courtney Chambers: Okay and they can tune in next week, next Tuesday at 1 o'clock Central Time to hear more about that effort correct?

Billy Johnson: Correct.

Courtney Chambers: That's what you'll be sharing. Okay and then I did receive one other comment just about again projects going on that this might be of help with. They said there may be some use in determining which flow regimes would be necessary to restrict vegetative growth on islands for the endangered least turn but typically on isolated un-vegetated sand bars, there's a possible application.

Blair Greimann: Yes we've used - I mean other, you know, other projects I was going to quickly go over, you know, one was on the Platte River in which they were trying to essentially scour out or kill cottonwoods and willows so that the - I mean the crane could have a larger view, you know.

And also I think the same nesting requirements and so we used it on the Platte River recovery program out there and then we're using it on the (San Joaquin) to look at some various restoration strategies and re-vegetation strategies.

So trying to promote riparian vegetation on the (San Joaquin) so yes there's a lot of restoration projects that reclamation is involved with where riparian vegetation is a primary concern in terms of, you know, bird or fish habitat.

Courtney Chambers: That would be very in line with the capability of the tool.

Blair Greimann: Yes, yes. And the application yes.

Courtney Chambers: Well very good, we want to thank you guys for sharing with us today. It sounds like it's going to be a very valuable tool when you all get it further developed, a good addition.

And participants I thank you all for joining in and sharing with us today and please remember about next weeks Web meeting it will be kind of a follow on about the nutrient modeling capability in HEC RAS that's further developed at this point.

So watch for your announcements from the gateway email address for more information on next weeks meeting and hope you all have a wonderful afternoon.

END