

**CORPORATE: RECORDING**

**Moderator: Courtney Chambers**  
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**12:26 pm CT**

(Courtney Chambers): At this time I'll give you today's speaker on Incorporating Ecosystem Goods and Services into Restoration Planning. (Elizabeth Murray) has worked as a wetland scientist for 21 years, specializing in wetland assessment, ecological restoration, and the hydro geomorphic approach to wetland classification and functional assessment.

Before coming to ERDC, she worked for eight years as the coordinator at the Arkansas Multi-Agency Wetland Planning Team, where she obtained EPA grant money to conduct research with ERDC scientists on HGM projects in Arkansas ecological restorations, geomorphic studies to support wetland classification mapping and GIS mapping of potential restoration sites. The results of this last project were recently published in the journal Wetlands.

She has co-authored eight HGM guidebooks covering over 30 wetlands sub-classes and has developed SCI calculator spreadsheets, trajectory spreadsheets, and scientific illustrations for many others. While in Arkansas, she worked with an interdisciplinary team to develop tools for wetland management, ranging from GIS-based prioritization maps for wetland restoration to decision support tools for accepting out of kind mitigation. Always interested in interdisciplinary pursuits, she was drawn to the Ecosystem Goods and Services project due to its focus on ecology and economics.

This information about (Elizabeth) can be found in her bio on the Learning Exchange along with the rest of today's meeting documents. And again, I'll

post that link at the end of the meeting today. (Elizabeth), we're very happy to have you with us today. At this time I'm going to give you the presenter rights and you can share your desktop and begin.

(Elizabeth Murray): Okay. So thank you for that introduction; I'm (Elizabeth Murray) from the Environmental Lab at ERDC and I'm going to be talking today about a research project that I've been involved with researching Incorporating Ecosystems Goods and Services into Restoration Planning. And this is the first webinar of - from a series of products that are going to be coming out from this work unit and this first one is essentially establishing principles and best practices from the literature.

This work is co-managed -- because of the nature of it, it's a combination of ecology and economics and policy -- it is co-managed between ERDC and IWR and my co-PI and co-author (Janet Cushing) is actually in the room with me.

(Janet Cushing): Hi everyone.

(Elizabeth Murray): Which is very uncommon where we're in the same room, but she happens to be here today, so she'll be available to also answer questions. She is a planner and biologist with IWR. And then also involved in this research is (Lisa Wanger), who is an environmental economist with the University of Maryland. Is (Lisa) on the phone today? Anyway, she's going to be calling in at some point today, so she'll be available, hopefully, to answer questions later on as well. But all of this work is the product of the three of us working together on it.

And - okay. So overview of the work unit - why are we researching this right now and how could it possibly benefit the Corp's water resource project planning management? And land management.

Well, why research this now is really a timing issue as much as anything. There has been an interest in looking at -- from an economic standpoint -- the benefits that we as a human society receive from ecosystems for a number of decades, starting really in the late '60s. But just in the last 10 years, really, there's been an escalation of work in that area and a number of both reviews and (unintelligible) reports that have come out that have really seemed to indicate that the science might be at a level that it really wasn't at in the '70s and '80s.

So it seems like a good time to be looking into this again. There's a lot of activity and the science seems to be progressing very quickly at this point. In addition, there's a lot of interest in the last 10 years within government as well. The White House Council on Environmental Quality mentions ecosystems goods and services in their 2009 report. The President's Council of Advisors on Science and Technology - the peak house report that came out in 2011 also mentions it.

There've been a number of studies by agencies such as EPA, Department of Agriculture, Department of Interior, US Fish and Wildlife Service, USGS, and Department of Defense all looking into these issues within the last seven or eight years. So it's time to really look into this and see if - the state of the science is such that it's ready to be operationalized or it might be possible to do that.

How might this benefit our water resource project planning and management? Well, the potential benefits that (unintelligible) has been considerations are

(unintelligible). One of the first things that it might allow us to do is really foster better communication with our cost-share partners and other stakeholders. Ecosystems Goods and Services -- because of the fact that they are really geared towards human society -- are things that -- in general -- the, you know, the layperson can understand perhaps more easily than the things that we ecologists or we economists get hung up on.

It will also allow for formal consideration of a broader array of benefits and formulation alternatives analysis if that's appropriate for the project. It could allow us to account for a broader array of benefits of final - of the final selected alternatives, including those benefits that the Corps isn't really allowed to formulate on. And hopefully it would also allow a more transparent consideration of trade-off when you're dealing with sustainable planning.

Taking sort of a step back and thinking in terms of the big picture of what we're usually trying to do when we're doing our environmental planning - what this hopefully will allow us to do is work towards sustainability or a - give us a framework or a language that will help us when thinking in terms of sustainability. And sustainability is achieved when actions fall within a realm of societal values and ecological capacity or sustainability. And there's ample evidence in the literature that indicates that planning with ecosystem services approaches helps achieve these two outcomes - both the functionally healthy ecosystems as well as benefits to society. And you can see the sweet spot there on the Venn diagram.

And why is my -

(Courtney Chambers): What do you need, (Elizabeth)?

(Elizabeth Murray): I'm trying to sent my slides down and it's not - it's not working anymore.

(Courtney Chambers): It's not advancing for you?

(Elizabeth Murray): No.

(Courtney Chambers): Okay. If you would like, you could go back there and return to the meeting interface and I still have our other version loaded and ready to go and we could probably advance it in that version.

(Elizabeth Murray): Oh, here we go.

(Courtney Chambers): Okay. Go for it.

(Elizabeth Murray): Okay. Now, I don't know, my computer's a little crazy. So the objectives of the overall work unit are to investigate the utility of using Ecosystems Goods and Services Assessment and Planning for Corps' Ecosystem Restoration Projects. And it's - there are numerous objectives. The first -- which I mentioned earlier -- is to review the literature and determine the state of the science and current best practices.

Additionally, we need to review our own policies and practices and those of other federal agencies and see what constraints there may be on applying Ecosystems Goods and Services. Ecosystems Goods and Services is by its nature a very sort of holistic approach, but we are a single agency with a mandate and we have constraints on what we are allowed to look at and so there's a tension between those two things that we need to be able to pull out.

Likewise, we want to use Corps planners as well as academics working in the Ecosystems Goods and Services field because we want to be at that sort of cutting edge of the science, but we also need to be grounded in our own

processes so that we don't go way out on a limb and try to do things that are not going to pass muster with our policies.

And then finally we want to review the EGS tools and methods that are out there in the literature that might advance Corps' capabilities and particularly those that are relevant to Corps projects.

In order to accomplish these we have a couple focus areas. The first is this principles and best practices phase, which we are essentially completing as well as the implications of those to the Corps. The results of that task are a technical report, which is a literature review and (unintelligible) and then looking at the potential for operationalizing at least the considerations that would need to be kept in mind for operationalizing within the Corps as well as a much shorter technical note that is much more concise, much more Corps specific and relates back to the literature review but doesn't include all of the literature review. And those are basically finished, but awaiting headquarters approval.

Then we have a Corps policy review, which is an in-depth report looking at our own policies and the policies and attempts at using this by other agencies. We have a report - or a task at the case studies of previous attempts within the Corps and possibly outside the Corps within the last 10 years - there've actually not only been interest in this at headquarters and above, but also in some of the districts. And there have been some attempts that have met with various results. And so we're looking at lessons learned there.

(Courtney Chambers):(Elizabeth), just one second please. Can I just remind our participants to make sure your phones are on mute? We're getting some background noise. Thanks.

(Elizabeth Murray): We are compiling a database or catalog of data and analytical tools that are available and relating them to our own missions and our own types of projects and where they might be useful. We are looking at -- and participating in -- interagency coordination on this topic, especially as results of this - the PCast report and responses that the agencies are having to make to Congressional inquiries and other things of that nature. And ultimately, our goal is to create and develop a framework that will be a pragmatic tool for incorporating Ecosystems Goods and Services into the Corps planning process.

So starting now with the literature review, it's important to understand something about the history of this field and its nature. So Ecosystems Goods and Services really is at the intersection of ecology -- which is a physical science -- and economics. And as I mentioned earlier, back in the late '60s it was realized by both of these disciplines that there was going to be a need to try to address -- from an economic standpoint -- the benefits that humans receive from ecological systems.

Ecologists inherently understand that we receive these benefits; economists were beginning to see that if the ecosystems stopped doing what they were doing it would be very expensive to replace some of those services. And so there was really a parallel development towards these goals with the ecologists - an out-branch of ecology coming into ecological economics, which had a very good foundation in ecology and then environmental economics also evolving around that same time, which had a very good grounding in economics, but each of those had weaknesses sort of in their other capacities.

So ecological economics -- the early ones anyway -- tended to oversimplify the economics and environmental economics -- the early attempts -- tended to

oversimplify the ecology. And the other thing is that because these two disciplines were really sort of evolving in parallel, they were using some of the same terminology, but they weren't always defining it in exactly the same way. So as you're coming in from the outside -- in terms of trying to review this literature -- it can be very confusing. And it's very important that as we move forward, we define our terms very specifically because the definitions are not always completely consistent out there in the literature.

Now in the last 10 years, this has gotten a lot better and I think that there's been sort of a movement -- especially in environmental economics -- they're - the ecology that's being incorporated into that field is much more robust now than it used to be. And those are essentially both addressing or trying to get at these concepts of Ecosystems Goods and Services.

So just to illustrate this point, the technical report that is essentially the literature review - we present nine definitions of Ecosystems Services in the table in that report. And within those nine definitions, five of them use the term nature or natural, seven use process or ecosystem process; five use the term function, five use well-being. And the only two terms that I could really find that all nine definitions had were ecosystem and human. So obviously they're all trying to get at the same thing, but the language is different across. There hasn't been a single definition that everyone can agree to.

To further complicate things, some of the words that they're using are vague in and of themselves, so nature -- for instance -- some people might think Central Park is nature, other people might think only wilderness is nature. Even something like the term ecosystem can include everything from highly degraded systems to relatively pristine ones.



The nine definitions also vary quite a bit in terms of sort of their economic language and how they define services. Some restrict them to only direct final services and others appear to include basically all aspects of ecosystem condition of the service.

So the first thing that we felt we really needed to get a handle on was that for the Corps of Engineers and for the works definition we needed to come up with a definition that would work for the types of projects that we attempt. So what we have settled on -- the working definition that we've got going right now -- is Ecosystems Goods and Services are socially valued aspects or outputs of ecosystems that depend on self-regulating or managed ecosystems structures and processes.

And we're trying to tie in that socially valued aspect -- that human aspect -- into it. We also want to show a preference for ecosystems that are in a good, functional state, but acknowledge the fact that ecosystems that we work in are actually managed -- the Mississippi River, for instance -- and that those managed ecosystems are actually still providing ecosystem services and oftentimes are providing ecosystem services beyond those that they are actually being managed for. So hopefully this definition will allow us to move forward with all of that.

In addition to the multiple definitions that are out there in the literature, there are multiple classification systems and ways of sort of dividing up the ecosystem services that are generally acknowledged out there in the world. One of the more famous presentations of ecosystem services is this one - the Millennium Ecosystem Assessment from 2005. I'm sorry; I'm going to take a sip of water for a second.

And if you look at the slide from left to right you can see that you're moving from more ecological concepts to more economic concepts. So the Millennium Assessment defines really ecosystem structure and ecosystem processes as supporting services, so that's like nutrient site claims, oil formation, primary production, that sort of thing. And then they divide the other services into provisioning, regulating, and cultural. And then those each feed into constituents of well-being - human well-being.

And they divide those into security, basic material for good life, health, and social relations. And you can see from the arrows that the relationships among these things are complex. This is a very good presentation for education purposes. It shows the interdependency of a lot of these different elements.

But from an economic standpoint, trying to operationalize something like this would be very complicated because there are both final services -- and I'm going to define these terms in a minute -- final services and intermediate services, which leads to double counting. So this sort of drives economists a little bit crazy.

There are in fact a lot of classification schemes found out there in the literature and they are designed for different purposes and the purpose to which you are going to use your Ecosystems Goods and Services tends to dictate to some extent the classification. So, for instance, in the top row here, that approach that I just showed - the design context was for understanding and education and it works actually quite well for that. But, for instance, if you were trying to do a cost-benefit analysis or a natural resource damage assessment, that classification would lead to double counting and you can see that in the description there.

So, for instance, nutrient cycling and water flow regulation both contribute to usable water for recreation, therefore its inappropriate to count them both if you're doing an economic analysis. There are other approaches -- for instance, by turner or the NAS -- that do a better job of separating out these services in a way that they can be addressed either monetarily or at least with metrics that aren't going to leave a double counting.

Alternatively, there's some that do a good job of looking at landscape management. So if it's important to manage the flow of services -- if you've got water regulation services happening high in a watershed that protects - end up protecting downstream beneficiaries -- then you need something that has a spatial element to it. And there are examples of that in the literature review.

And then finally, there's public policy on social equity ones where the purpose is really to try to recapture economic externalities that deal with the environment. And those also have to have a spatial and temporal design but also an issue of where different populations are because those different populations are using different services. And so as you're doing your trade-offs analysis you're not only trading off different ecological aspects but also different populations.

So really the classification scheme - there's not just one in the literature that we can adopt and say, yes, this is the correct one. They're very dependent on what the purpose is. So then the question becomes, what is our purpose? And how could we make a classification that could be operationalized by the Corps and be useful.

Well, first we need to move forward with our definition of ecosystem services and then think really about the decision context and the policy requirements that we have upon us. Then we can characterize our ecosystem services based

on that decision context and try to -- from there -- come up with a meaningful and appropriate classification system.

So the purposes to which we will be using EGS as it gets implemented is really addressing changes in EGS based on activity. I mean, that's what we do. We do a restoration or we have an impact or we're looking at a project alternative. We need to assess the changes of Ecosystems Goods and Services relative to a no-action baseline.

In order to do that, we don't necessarily have to monetize all of those EGS, but we do have to have metrics that are sensitive enough to distinguish in an alternative. And a bit more on that in a second. And then finally the EGS that are used should be based on federal and stakeholder interest. Federal interest because - if we're paying for something it has to be -- not only be in the federal interest -- but in the Corps' interest. And then - but there are also things that our cost share partners are going to be interested in -- and to some extent -- we might be able to, at least, have conversations about those things using EGS and possibly bring in partners to fund some of those elements that we can't really fund ourselves.

One of the terms that you'll find in the literature a lot is total economic value. And it has a formal definition used by economist and then it has a, sort of, another use that's more common, sort of, in the newspapers - and that sort of thing. Also, economic value means -- as far as economists are concerned -- and some are use and non-use values - it doesn't necessarily have to be comprehensive. You're just considering both.

Use values include direct use, indirect use, and option. And some examples of those things are for direct use it would be -- for instance -- fishing or drinking water. Indirect use would be flood risk mitigation, you know, the fact that that

wetland is there. And holding on to some of the water is benefiting humans downstream of that - whether they actually go to that site or not.

Options for maintaining genetic resources for future inputs into agriculture or medicine. Non-use values are existence -- which is just - I value the fact that somebody exists in the world and therefore I find willing to pay something to maintain it there -- so that I can visit it at some point if I want to. Or bequest, I want to pay for it so that my children can go visit there later, if they want to.

And it is increasingly difficult to monetize these as you go from left to right. Direct use tends to have markets. And so you can get evaluations from a market. Indirect use you can tie to a market - usually. Option - you get into the fact that you are dealing with the future now and so you've got uncertainty and discounts that you have to deal with.

Once you get into non-use evaluation - you really are stuck with other types of tools. They are not market-based - and we'll get into that a little bit later. But there are problems with some of them and I'm not going to go into all of that today. But before using them it would be prudent to research them pretty substantially.

Now -- one of the things that you'll see in a lot of press and newspaper articles -- are the concept of total economic value being a comprehensive value of any consistence. So, for instance, the world's ecosystems are worth \$33 trillion dollars annually -- which makes -- you know, a great headline. And -- whether or not you believe in the robustness of that number -- it's still irrelevant, sort of, for what we, at the Corps, need to be able to do.

We don't really care what the total value of the weapons system is - or something along those lines. What we want to know -- for our analysis -- is

the incremental change due to an action. So, we don't need to deal in terms of total economic value in the comprehensive sense, necessarily, in order to accomplish that goal. And -- in fact -- trying to get at all of these less precise metrics might actually make it harder to do that.

So, we've been talking a little bit about final and intermediate goods and services. Let's delve into that a little bit more. This chart shows -- essentially - - three columns. The one on the left is ecosystem structure function - really just looking at it from a scientific standpoint. These are elements of the ecosystem that contribute to services. Things like nutrient cycling, sedimentation rates, water depth, biodiversity - they're often very quantifiable. They're often -- it says here -- academic. They're not always easy to relate to the lay public. But the components of these are actually what feed in to intermediate and final services. The main thing to think of, though, is that these are really independent of demands. The ecosystem is giving nutrients, like, whether there's anybody there to benefit from it or not.

Intermediate goods or services are things that come directly from those ecosystems structures and functions - so, quality of water, water supply capacity, species preservation. They're often intuitive. They're often difficult to measure - but they become the components of final services. And there's some relation to potential demand but it's not explicit. So, the quality of the water -- we're not specifying which quality for which use -- for instance.

Final business services are what economics like to work with because oftentimes there's a market. If not, then at least we - they can be assured that they're not going to end up double counting. So, for this -- we're talking about drinking water supply, flood risk management, commercial fisheries -- even things that are non-use like aesthetics. It's a final service.

They're often quantifiable - they're often recognizable by the public. They can be quantified using markets but if they aren't able to be quantified using markets then getting the relationship back to those ecosystem structures and functions -- which can be measured -- can be a bit tricky at times. So, those are those concepts.

So, here's a list of some ecosystem services - and specifically those that the Corps often has influence over with our projects. And some of these that we're starting to look into include water supply and regulation, natural hazard regulation in terms of flood attenuation, natural hazard regulation in terms of storm surge attenuation - and you can read these. I'm not going to read them all out loud to you. You can see for each of these, we have a tie in to what the Corps does that has a potential to impact that ecosystem service.

Also, if you go down, you can see that we get into cultural, spiritual and education, aesthetics, recreation -- things that we don't necessarily normally deal with in our planning process -- but that oftentimes our cost share partners are concerned about. So, Corps relevant ways to classify these ecosystem business services that we're experimenting with as we move forward. The first would be just by ecosystem or habitat -- in part because the planning community deals with their projects now -- that's often the first step is to see what ecosystem we're dealing with and what we're trying to manage or what we're trying to restore. If we know the ecosystem goods and services is likely supported by that ecosystem then that gives planners a tool for moving forward.

Another potential way to classify them is using the tools and guidelines account, you know - essentially how we pay for things and how we account for things. So, that would be especially for more pronounced economic analysis that would be a potential use.

Another -- because we work mostly in water - spatial and temporal scale can be quite important if we're dealing with restoration in one part of the water shed that has a potential benefit in another part of the water shed then this could be quite important.

Alternatively, we might end up doing things like (unintelligible) is and really we don't necessarily want to get tied to one or the other. It's possible that different classifications will be useful at different stages of the process.

So we might begin with a screening that's by ecosystem but once -- if somebody decides to do a detailed economic analysis -- then it's going to need to follow accounts or if the project is securely spatial then that might be the most relevant way to do it. So, there are pros and cons to each of these and it would be that they all get incorporated in one way or another in different parts of the process.

So, I'm going to use my remaining time discussing conceptual models that link ecosystems to human welfare. And there are a number of these in the literature - and I am not going to begin to present them all here. But I will be presenting the one that we are moving forward with -- within the Corps -- and then tying it into the planning process. And as I'm doing this, I'm going to be transitioning, really, from the literature review -- which is this first task -- into things that we're having to consider for that framework - which is really the last task.

So, linking ecosystems to human welfare. There are numerous conceptual models out in the literature that link changes in ecosystems resulting from restoration activities to ecosystem services that affect humans. This is one example -- I thought this one was really a nice graphic in terms of you can



kind of see with one quick look what they were getting at (Unintelligible) from 2009 article. You can see they've got their restoration toolbox in the bottom of the slide and that those things then impact ecosystem functions -- which are a bunch of things that are all interrelated -- and then those functions lead to services.

Now while this is a nice diagram, it's not getting any detail, really, on terms of what those relationships between those different steps are and that is, of course, what you would need to know in order to do any kind of assessment.

The conceptual model that we're moving forward with right now is this one and this is presented in the technical note that is -- essentially -- ready for publication. This is also tied to the tools database that we're developing so a lot of the tools or data that are available out there -- they don't get you all the way from step one to step four -- but they will get you parts of the way. And so these numbers and letters - these numbered, sort of, boxes and letter functions tie back to those tools as well to let you know which part of the conceptual model they address.

Like the previous slide - the first step is really the management activity or the management toolbox. And from that management activity - you get a response function that leads to an ecological outcome. That ecological outcome can then -- may or may not -- because they're lead to an ecosystem good or service.

And then that ecosystem -- when in service -- can be valued in the last step in order to get social benefits. And when economists say value they really mean monetized. So that last step really is monetizing the business service. Now it's not necessary to always do that but that is what that last step is.

And usually you're looking at consideration of multiple outcomes or multiple services, so, there's a term in the literature called joint production -- you're not just looking at one service -- you want to see the joint production, several services of interest or concern.

So, delving into some of these steps a little bit - that first response function estimates the expected changes in ecological outcomes when conditions or stressors change. So how might a change in the flow regime affect fish movement and productivity downstream? How might restoring a wetland slow flood waters?

And so -- important in this, of course -- is identifying any data gaps or information gaps. And actually -- at the Corps -- we have a number of tools in use already that do this first response function - that look at management activity and measure ecological outcomes in one way or another.

The ecosystem service - the ecoservice production function determines whether a service is produced. So does the change determined by the response function result in greater recreational activities such as boating or fishing? Does the slowing of the water result in actual production of flooding downstream towns or crops? So this is really where we move out of the prevue of strictly science and move into economics and society. Is there demand for the ecological outcome so that it becomes a service?

If you had two identical projects that slowed the same amount of water across a wetland area - the one that was upstream of a more populated area -- where there were more houses that could be damaged by that flooding -- would receive the higher ecosystem that's in service for that same amount of ecological outcome. Hopefully that made sense.

And finally - the benefit damage function determined the value of the change in the service. So, while ecosystem goods and services might be something like additional (unintelligible) for mileage, you're looking at recreation. Or, it might be a change in the shape of the flood plain - so that now a number of houses were no longer within a 5-year or 10-year or 50-year flood plain and how to reduce risk.

The social benefits are the monetary value of those services. So, it takes more into account the differential value in different locations. So, saving five houses from flooding in one part of the country might not be worth as much as saving five houses from flooding in a different part of the country - and that is getting at that. Not everything, again, can be monetized differentially based on markets but where that possibility exists, and that's where that function comes into play.

And it is not always necessary to use that last function as long as the ecosystems goods and service is really - incorporates a human perspective. So, it's not just that the flood plain has changed shape - it's that something of value to society has been protected.

When we're dealing with that last step -- and we're looking at monetizing -- there are two different ways that economists go about this. When you have a market good - then they can use a production function approach. And the biological resource just becomes part of the input of the economic activity - just like any other input would be.

With non-market goods then there's a bunch of tools: revealed preference, data preference, and cost based methods in terms of damages avoided and that sort of thing. And these all have strengths and weaknesses that economists argue over a lot. And, so, I'm not going to try to go into it here but -- just be

warned that when trying to deal with these approaches -- a lot of research needs to go into them.

Okay, finally, trying to now look at that conceptual model and see how it might fit into our planning process. And this is really now stepping into that early development of the framework. The Corps planning process is six steps. Most people listening probably know that.

And the steps for EGS are going to be tasked very nicely with the six-step process so -- during the problems and opportunities phase -- the first step would be to identify the effected ecosystem goods and services. There's going to be a long list of potential services in the framework and ways of screening those based on -- perhaps -- ecosystem or other ways to try to get at which ones are most relevant for this project.

There's also going to be collaborative effort at this point -- because your cost share partners might have things that they're concerned about that wouldn't have, necessarily, risen to the top as far as the Corps was concerned -- but that the cost share partner is very concerned about.

Then -- of those a handful of those that are most likely to be affected -- will be used for inventory and forecast. So, there would be some way of measuring the - of modeling those ecosystem goods and services without project.

Now, we are not imagining that ecosystems goods and services will always be used for formulating plans or evaluating plans or selecting a plan. Where it might be relevant -- where it could maybe differentiate between two alternatives that are otherwise quite similar -- it could be used. But also, it could just be used at the end to report out the EGS of the selective plan --

which was selected in the normal process -- and therefore give a fuller accounting of all of the benefits of that stated plan.

So, the framework would fit in a similar loop to our normal planning. So we'd start out in the top of this ring by identifying the ecosystem goods and services, screening them, assessing conditions and trends. And we're also thinking that -- in terms of the broader range of ecosystem goods and services -- some of these might be able to be addressed in a very, sort of, qualitative way if they're not the ones the decisions are being made on.

And then others it might -- in order to get that sensitivity -- you might need to delve into something quite a bit more computational - maybe. But not everything is going to have to be complicated, essentially.

Assessing the risk and uncertainties associated with those estimates of the ecosystem services. Evaluate and compare alternatives if that's appropriate. Document the ecosystem services and the selected plan - and then monitoring or applying adaptive management. So this is the same loop, essentially, that we use already. It's just applying it to ecosystem services and looking at -- not just the changes to the ecology -- but how those influence the community.

Not all ecosystem services are in the federal interest -- or in as much the federal interest as they might be local interest -- so, this is a graphic that's addressing that to some extent. If we're looking at - here we have our benefits or our ecosystem services broken out by account.

So, flood risk reduction is probably of equal concern to the Corps as the cost share partners. Cost share partners here being represented by red -- or that's a local interest -- federal interest being blue. Same -- probably -- with commercial fisheries and potentially navigation.

Biodiversity or ecosystem sustainability -- or some metric along those lines -- is probably much more of concern to the Corps -- since it's one of our mission areas -- as compared to the local interest. But water treatment might be of local concern. And that is something that the Corps typically considers to be a local issue - not a federal one. That doesn't mean that we can't think about it in terms of the screening - or after the fact. But we wouldn't necessarily want to - or be able to -- formulate on it

Same with recreation use - we are very limited in the way that we can deal with recreation. We can incorporate it but it has to be done in a very specific way. And if other parts - if the recreation use is something that the local sponsor is very concerned about - then additional funds are going to need to be coming in from there. So, you can see that even though we're dealing with ecosystem services -- which is a sort of a holistic approach -- we're still bound by our own policies - and that is what we're attempting to look at here.

So, ecosystem goods and services and Corps decision making - we're starting with restoration projects -- in part because this work is being paid for by the Ecosystem Management and Restoration Research Program -- and part because it's already a very, very big topic and we wanted to, sort of, limit it somehow so we can get our minds wrapped around it.

So, we are trying to remain consistent with that six steps planning process for restoration projects. But, we're also trying to make it general enough that it can be extrapolated later into other business lines - particularly NEPA documentation and that sort of thing.

It does have the potential to help justify our restoration projects. Right now, the way that we justify our restoration projects tends to be very narrow --

narrowly defined -- and this will give us a tool for explicitly showing some of those other benefits.

It has the potential -- if it is used that way -- to even to potentially change decisions among alternatives. I think that -- well we're still working out how exactly that would work in the framework -- so, I don't know how likely that really is at this point. But, we can't rule it out. It has the potential to foster cooperation -- and that means leverage funding -- with partners whose interest lie in ecosystems and services that we aren't able to prioritize.

If there's a potential for clean water at a project that we can't really prioritize -- but EPA is really concerned about -- then this gives us sort of a way of bringing them in. And we are now approximately mid-way through this research effort. So, status on those focused areas that I discussed at the beginning of the presentation - the principals and best practices report and technical note are essentially ready to print. They're just awaiting headquarters approval. The Corps policy review and analysis paper has gone through its first (unintelligible) board review and is now going through its second one.

The case studies of previous attempts within the Corps is currently in prep. The EGS data analysis and analytical tools database is complete. We are tweaking some querying capabilities within it - and the synthesis report for that catalog is in prep and we're expecting a draft within a week or two.

Interagency coordination is ongoing. And the framework for incorporating ecosystem goods and services into the Corps planning process is in early prep. We've seen an early partial draft -- and it's going through substantial revision now -- and we're hoping to have a more complete draft within the month.

And here are the contacts - contact information for myself and for (Janet) and if you have any questions, we'd be happy to try to answer them. And again this research is being funded by the Ecosystem Management and Restoration Research Program.

(Courtney Chambers): All right. Thank you very much, (Elizabeth). If you wouldn't mind - select the return to the meeting interface. That way we can view the chat features and it will continue to display this slide. Or, well, I can make sure that it contains this layer of contact information. Let's see here.

(Elizabeth Murray): How's that?

(Courtney Chambers): Excellent. And I'll take back the presenter rights in the meantime - unless we need to advance to a certain slide or something for a question.

(Elizabeth Murray): Okay.

(Courtney Chambers): All right. At this time, let's open it up for questions. If any of our participants would like to speak - make sure that you remember to take your phone off of mute or feel free to utilize the chat feature in the lower right hand corner. And please do remember to send your question to everyone in that drop down box so that we can all view the question.

(Jason Smith): (Elizabeth), this is (Jason Smith) in Rock Island District. How are you?

(Elizabeth Murray): I'm doing well, (Jason), how are you?

(Jason Smith): Great, thanks. I had a question for you concerning the ecosystem goods and service data analysis and analytical tools. What all does that entail? I guess -- as you were saying -- I had in my mind the atlas ecosystem services that EPA



has been putting together. Is it a similar product or is there cooperation between those products or it's a totally different analysis and data set?

(Elizabeth Murray): Well, it's more of a catalog of existing tools that are out there and we've screened them. So, my understanding of that catalog is that it is fairly broad and not necessarily applicable to a project-level analysis - it's more, sort of, landscape-y. And so -- while it's an interesting and useful tool -- it might not be of particular use on Corps projects where we're trying to have something that's sensitive enough to pick up changes due to restoration efforts.

And so, there are a number -- a large number -- of tools that are out there being developed by different people and they address, sort of, different aspects of that conceptual model that I laid out. And some of them are strong on the economics -- some of them are strong on the ecology -- and some of them, sort of, have nothing to do with our mandate.

So, what we did is we tried to go through all of the tools that are available -- and it's a constantly changing field, so by the time it gets published, there's probably already going to be new things that aren't included in it and we'll try to keep the database, at least, updated -- but it's really looking at those tools and trying to present -- in a cohesive manner -- what the tool, what it's good for, the geographic range that it can be applied within, whether or not the documentation is transparent enough that it will likely be able to go through the Corps, certification process.

And so, really, it's just a gathering up of all of those tools. But then, having screened them for the ones that are most important to ecosystem goods and services -- that the Corps is going to care about -- and that we feel our (unintelligible) meet sort of a minimum threshold of being robust. And then presenting that information so planners can take one look at the data in this

database and say, oh, I've never heard of that tool, sort of, what does it do?  
Oh, I should go look more into that.

Now there are more comprehensive databases of like, you know, every tool under the sun, but that isn't Corps specific and it can be kind of a slog to go through. So, it's really just the catalog of existing tools that can be applied -- and are hopefully sensitive enough -- to be applied at a project level.

It's not necessarily endorsing any of them although there was some minimum threshold of documentation and things like that that had to be met for inclusion. Did that get at your question, (Jason)?

(Jason Smith): Yes. That's great.

(Elizabeth Murray): And then the synthesis report will do a good job of, sort of, outlining all of that and saying, for instance, the criteria that we used for inclusion and then again, like I said, one of the fields in that database ties back to those letters and numbers that are in that conceptual plan so you can see which -- or conceptual model -- so you can see which part of that - those steps that the particular tool applies to.

(Courtney Chambers): All right. (Elizabeth) - there was one question submitted in the chat feature from MVR that asked, "Is the Corps getting any closer to actually using the benefits identified for goods and services and justification of projects going forward, headquarters, Office of Water and Project Review and ASA's office?"

(Elizabeth Murray): Hold on. I'm going to let (Janet), I think, answer that one. She's reading it right now.

(Courtney Chambers): Okay, thanks.

(Janet): That's a good question. And so -- right now in the case study review -- there have been a few projects that have to varying degrees looked at ecosystem services as a way to justify their projects. There have been, I think, a few technical issues that made it difficult for the way they use ecosystem services in a way that was policy compliant. So that's one reason why we're doing the case study review.

I think it's possible that the Corps -- someday in the future -- might be able to use ecosystem services as a way to better justify it. But part of the difficulty is those - in part with what the Office of Management and Budget is going to accept. And right now -- and in the past -- OMB has not readily accepted ecosystem goods and services as a way to justify projects. That said - there are a number of folks in OMB who are working - talking with multiple agencies on ecosystem goods and services. (Sally Erickson) is very interested in asking the agencies to look more into ecosystem goods and services. So, I think -- and this is just my personal view but also what I've heard from some others -- that there may be a change coming along in OMB, you know, at least they are open to the exploration of the idea. So that's a fairly long answer - I guess.

And as we develop the framework - we'll be running it up to Corps economists at various levels of the organization to make sure we're not running afoul or anything. And, hopefully, as they see that coming together -- if we can do it in a way that is policy compliant -- then that might, sort of, help pave the way for that.

I can't make any promises but I think that -- until we can illustrate that there's a way to do it that is policy compliant -- they're not going to have much

reason to consider it seriously. So, if we can do this stuff it might lead to that but again - we can't make any promises.

(Courtney Chambers): All right. Thank you. Are there any other questions at this time? While you're thinking through that - I am going to go ahead and send the link to the learning exchange where we host the archived meetings as well as - which would include today's meeting documents. And that's also where you can find a link to sign up for Webinar announcements or share, again, with colleagues that might like to be notified of upcoming Webinars.

All right. If there are no other questions we are going to go ahead and begin wrapping up. (Elizabeth) and (Janet) also, thank you very much for sharing with us today and thank you, participants, for joining us. I hope you're going to be able to join us for our next Web meeting and that's going to be scheduled for Tuesday, May 7th and that's going to talk about mitigation and planning by (Elliott Stephanikon) and I may have said that wrong. But, I do hope you can join us all for that.

If you have any questions, feel free to contact me, again, I'm in Outlook. My name is (Courtney Chambers) or if you have any recommendations for upcoming meeting topics, we'd love to hear those.

If you are calling in as a group and haven't done so yet, please list your participants in the chat feature and send that message to me. And that will be all for today. Thank you very much and have a good afternoon.

(Elizabeth Murray): Hey (Courtney), can I just - I also just wanted to put out there for everybody that we - I didn't put (Lisa)'s contact information. But if people do have questions that are specifically of a very detailed economic -- you know,

from that angle -- I am happy to pass things along to her and I am sure she'll be happy to answer, so...

(Courtney Chambers): Okay. So we'll get them in touch with who they need - if they contacted you, correct?

(Elizabeth Murray): Right. Yes. If they have economic types of questions, they can go ahead and forward those to (Janet) and I and we will pass them along to (Lisa).

(Courtney Chambers): Okay, that sounds great. Thank you all again very much.

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