

Providing the Science for Natural and Cultural Resource Adaptation to Climate Change

Speaker:

Shawn Carter, USGS National Climate Change and Wildlife Science Center

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Ashley Fortune: Good afternoon everybody from the U.S. Fish and Wildlife Service's National Conservation Training Center in Shepherdstown, West Virginia. My name is Ashley Fortune and I would like to welcome you to today's broadcast of the webinar series, National Climate Change and Wildlife Science Center's 2013 Climate Change Science and Management. This series is a partnership between the National Climate Change and Wildlife Science Center and the U.S. Fish and Wildlife Service's National Conservation Training Center. On the phone, we also have Emily Fort, Data and Information Coordinator at the National Climate Change and Wildlife Science Center, who will be facilitating questions from our live audience in Reston at the end of the presentation.

Today's broadcast will be presented by Shawn Carter and will be focusing on providing the Science for Natural and Cultural Resource Adaptation to Climate Change. Emily will introduce our speaker in just a minute, but first I'd like to remind you of a few logistical details.

For all of those who are joining us on the phone, you're on a global mute and you will continue to be so for the duration of the presentation. At the end, we will give you an opportunity to ask questions. We will be taking a couple of questions, first, from our live audience in Reston and then we'll also take your questions over the phone. Emily, would you please introduce our speaker.

Emily Fort: Hi everybody, I'm excited to have the honor to introduce Shawn. Shawn is the Senior Scientist at the U.S. Geological Survey's National Climate Change and Wildlife Science Center, headquartered in Reston, Virginia. He manages the science and research activities at the Center which include synthesis of climate impacts to plant and animal populations, quantifying species and habitat vulnerability and linking various model projections to populations or ecosystems of interest. He also works with federal and academic researchers at the Department of Interior's Climate Science Centers to coordinate regional to national climate science priorities and to stimulate new research that informs adaptation planning by land managers.

Shawn has degrees from Cornell, Virginia Tech and SUNY College of Environmental Science and Forestry. His research interests include ecological monitoring and assessment, forest ecology, and species-habitat relationships. With that, I'll turn it over to Shawn.

Shawn Carter: Great, thank you. I put the presentation up...Hopefully it's displaying OK?

Ashley: Yes.

Shawn: Great. Thank you everyone, it's really great to be here and I'd like to welcome everybody to the first annual webinar of our, hopefully, long-term series in partnership with the National Conservation Training Center. The purpose of this webinar is to really showcase the kinds of work and projects that our Climate Science Centers and the National Climate Change and Wildlife Science Center here at USGS are sponsoring. It's really meant to be a smorgasbord of information for you all to glean from. We used this webinar series as a way to highlight projects and also provide you all with resources and tools to find additional information because there's certainly a lot to talk about. With that, I'll get started.

Today, what I want to talk a little bit about is an overview of where we've come as a program and also where we're headed into the future. I'll talk a little bit more about that in a second.

This is a messy diagram but my purpose today is to try and provide that broad-brush for all of you to talk about where the CSCs started, where they're going, a little bit about our National Center, the type of work that we sponsor and how that complements a CSC body of work that's out there on the landscape now.

Then I want to contrast two areas of emphasis that we have -- one on infrastructure and capacity building and one on science assessment and research. What I'll be doing is going through individual examples in each one of those emphasis areas, but by no means is this exhaustive, so I'm happy to entertain questions, obviously, at the end and provide people additional resources and guidance.

Let's get started. What I want to talk about first is just a little bit of history. For those of you that have been following the CSC enterprise for a while and for those of you familiar with the U.S. Geological Survey, you might realize that before the CSCs and landscape conservation cooperatives came to be, there were notions of these Regional Hubs and Landscape Adaptation Units and Strategic Habitat Conservation initiatives around on the landscape within the Department of Interior.

What happened later is, in 2009, the Secretary of Interior identified key priorities, one of them being climate change and repurposed some existing initiatives into what we now consider the National Climate Change Wildlife Science Center which was asked to stand-up the Climate Science Centers, which there are eight around the country, and also establish some Landscape Conservation Cooperatives which are being led, predominately, by the U.S. Fish and Wildlife Service. There are 22 of those around the landscape.

Today, I'm not going to talk too much about that background, I'm not going to focus on the LCCs per se, I just want people to realize that this is a DOI initiative moving since 2009 forward.

In 2010, the first three Climate Science Centers were established, in Alaska, in the Southeast and in the Northwest. These were established through a competitive process, by and large, and what it really is is a model, it's a consortium-based model, where you have a host university the science centers establish with a cooperative agreement. They're really working university and federal agencies in partnership to establish this integrated science center. We have a total of eight.

In 2011 we established two additional ones. In 2012, last year, we established our last three CSCs. I'm happy to say that now, in seven of our eight CSCs, we have full-time permanent federal directors. They all are in the process of moving forward and implementing research on the ground. We're very proud of that accomplishment.

I'm not going to focus on the individual CSCs during this talk, but, again, I'm happy to provide additional information. I'll also point you to where you can find additional information about the CSCs in a minute.

The National Climate Change and Wildlife Science Center, as I mentioned, was tasked with establishing the CSCs, and it has a slightly different purpose. What we're focused on here, at the U.S. Geological Survey, is providing the tools and information to help managers cope with climate change and climate impacts, predominately, on fish and wildlife in their habitats and federal lands. We talk about all resources that are being impacted, and providing tools for managers to cope with that.

Our governance is, as I mentioned, we're the only center that's solely led by the USGS, in terms of its organizational structure. We are housed in the Climate and Land-Use Change Mission Area. We also have programmatic linkages with other elements of the U.S. Geological Survey, especially those in Research & Development, Land Change Science and then, also the Ecosystems Mission Area.

Our Center, primarily, gets guidance from the Department of Interior, as well as a newly established federal advisory committee, the Advisory Committee on Climate Change and Natural Resource Science. My role at the Center, as Senior Scientist, is to work with that committee primarily through an ad hoc science subcommittee that basically works with us to establish broad priorities and make sure that we're fulfilling the needs that the community at large identifies we need to meet.

A little history on the Climate Science Centers. As I mentioned, these are DOI Science Climate Centers, they are really focusing on several aspects of integrated science related to climate change impacts, primarily integrated modeling, scenario and forecast development, synthesis, landscape-level monitoring and assessment. Probably, one of the most significant roles is, providing a forum for research and resource managers to collaborate and talk and discuss what their needs are related to climate change.

Each CSC uses a stakeholder-driven regional science agenda to define their research priorities. We place a special emphasis on sharing data and information.

The key characteristics, I think, that are worthy of highlighting for the Climate Science Centers is that they really are university-federal cooperatives meant to access a broad suite of research capabilities depending on the needs identified by the stakeholders. The priorities are set by working in conjunction with the Landscape Conservation Cooperatives and other stakeholders and managers. We really try and emphasize the landscape scale inference when dealing with climate impacts.

Being university-based, there's also a special emphasis placed on training of students. I'll mention that a little bit more in a second. This is just a map showing the overall footprint of the Climate Science Centers. They cover eight broad geographic regions. As I mentioned, these have affiliated institutions, a consortium based model, within each of these geographies. No CSC region has the same complement of universities. Each is tailored to meet the needs of that particular region.

Also, we recognize that each CSC region has what we call fuzzy boundaries. They really are not strictly wedded to any sociopolitical boundaries and are really meant to work as appropriate across their

geographies. One role that the national center has in working with the CSCs is to focus on synthesis and inter-comparison and promote data exchange and information exchange among the different CSCs around the country.

I just want to highlight one point with the CSCs. Each CSC is established with a host agreement, and predominantly that agreement establishes resources for training undergrads and grads. Right now, through our eight climate science centers, we're sponsoring almost 60 grads or postgrads through this enterprise.

We're really placing an emphasis on getting interdisciplinary science done, getting students trained that hopefully will be working with us and working with managers in the future to really tackle the challenges posed by climate change.

Just a little bit on how the CSCs are run. It's slightly different than the national center. Each climate science center has a Stakeholder Advisory Committee. It's chaired by a USGS regional director, and then the membership of all of these SACs is executive-level representations of the stakeholder community. What the SAC is really meant to do for the CSCs is to provide broad guidance on priorities of research and also leverage scientific assets in each region.

As was mentioned, I won't spend much time on it, but each Climate Science Center has a Regional Science Agenda that really outlines the specific needs in terms of research for each CSC region. It provides a blueprint for the type of work that each CSC will do. Those agendas are informed by the scientific community embedded through the managers, and it really provides the basis for identifying short-term annual priorities. It also is the basis for establishing funding calls.

Right now, the CSCs have a call out, as many of you may know, asking for Statements of Interest in terms of research priorities that would be identified under those science agendas. Subsequent SOIs that are highlighted or invited for proposals will potentially be funded under this RFP process that we're currently funding.

Now, with that background, I just want to spend some time talking a little bit about the type of work that we are trying to facilitate here at the National Center. I'm going to use examples that are sponsored both by NCCWSC, the National Climate Change and Wildlife Science Center, as well as work that's sponsored by the CSCs themselves.

These bins that I'm going to be talking about in infrastructure and science assessment are really meant to be complementary. I think they're pretty consistently used by both the national-level office as well as the regionally-based CSCs.

As I mentioned, I'm going to focus on infrastructure and capacity building. When I think of infrastructure and capacity building, I think of pulling yourself up by the bootstraps. Hopefully, this is what we're instilling in that cadre of scientists that are being trained right now. Science assessment and research really I think is the fundamental purpose that people identify with a CSC and the fundamental role that they're providing. And as all of you know, this is complicated stuff, so it's in and of itself, just conducting the research is a daunting task.

Moving into the capacity building component, I just want to highlight briefly one of the main things that we focus on. Emily, who introduced me, is largely tasked with this as well as data and IT within our shop, but really focusing on communication and dissemination of information.

I just want to briefly highlight that this webinar series in and of itself is meant to really facilitate this communication process. Each webinar is recorded. It's provided on our website. The web link there is at the bottom; as well as transcripts of each webinar and links to all of the associated manuscripts and publications and information products associated with all the projects that we highlight.

In addition, you can also reach information for all of our climate science centers from this page as well, each of them having their own suites of projects that you can search through. In a moment, I'll talk a little bit more about some ways that we have for actually trolling through the projects that are funded.

On data and IT, another key element that we provide is really this idea of data exchange and infrastructure. The National Climate Change and Wildlife Science Center was charged with standing up the CSCs. The CSCs are really meant to provide, in addition to regionally based information for decisions, they are really meant to provide a national capability, a national network that can be utilized. Part of the basis for that is this data infrastructure.

One thing I would like to highlight from the get-go is ScienceBase, which is something that we're using to serve as the catalog and repository for all the information being generated by projects through the CSCs and by NCCWSC. It's really meant to serve as an integrator using web services, and allows people to look across CSCs to harvest information about projects and where the associated data and information are housed.

This is just a screenshot of what you can expect from a ScienceBase catalog query, in this case looking for downscaling. I'm sure most of you have used different data catalogs in the past. This just highlights the fact that you can use different filters. It gives you a geographic footprint of the data that are being presented as well as brief descriptions of the kind of information available.

For each individual project, you get a data display that has a project summary as well as some associated metadata. Finally, and perhaps most importantly, there's an awful lot of information being generated from the work that we're sponsoring. Right now alone, last year we sponsored I think approximately 96 projects, each generating tools and information for managers.

It's important to be able to identify where those tools and where those data reside. This is just a screenshot showing that for one of our projects on cheatgrass dieoff.

Finally, just a data schema just showing the overall conceptual framework for how we're approaching data management, really trying to work with the stakeholders to identify what data are out there and being generated, leveraging products like ScienceBase focusing on catalog and publication and serving as a repository, as well as larger Geo Data Portal, in this case, larger applications allow subsetting of very large datasets focused on downscaled information, for example.

Then, using those suites of tools, really allowing the distribution of information via web portals, reporting to ArcGIS, and also different kinds of analysis portals that our stakeholders are using like DataBasin, NHD catchment tool, for example, as well as desktop applications. Both of these products use open source technology, and are really meant to provide standards and the standard framework that promote data exchange among the land management agencies.

I want to highlight education and training again as a component of this capacity building, and I think being university-based, it's perhaps intangible but very significant and lofty goal of our enterprise, and I just want

to highlight two things that are happening on the ground among our Climate Science Centers, one being this concept of summer school.

These are sponsored trainings for students that are based in a certain geography, and this example's from Alaska, and focused on certain technical aspects related to climate change, in this case focusing on climate downscaling and modeling for the Alaska region. This provides an opportunity not only for students to exchange ideas and get to know one another, but to really get very specific training in the set of skills that they need.

Then there's broader, more experiential kind of learning, in this case sponsored by the Northwest Climate Science Center that's really looking at similar things in terms of really getting a cadre of students together, being able to share their ideas, compare their projects, and also learn about the local systems and the climate impacts that are expected in those systems.

I also want to touch on really evaluating performance. Are we doing what we set out to do through this enterprise? Part of this is just really hard to do when you're building the car as you're trying to drive it. But one project that we're working on right now, and it's something that is being played out in other Climate Science Centers, is this concept of Social Network Analysis.

The way that we, at least initially, identify “are we doing what we're supposed to be doing?” is surveying the broad suite of stakeholders, finding what kind of climate information they're using currently, identifying what they expect out of a Climate Science Center, and really trying to evaluate “are we making a difference?”. When we revisit the same set of stakeholders, have we changed how they get information, how they trust information, and how they use information?

Now, I'm moving on from capacity building to really looking at one of the primary roles of our National Center, and that's the idea of conducting national-level synthesis. I'm not going to spend a lot of time going through the specific examples, but one recent national synthesis that our center pulled off was under the auspices of the National Climate Assessment. We conducted a technical input, as well as helped author a chapter in the NCA on biodiversity, and also ecosystems and ecosystem services with associated climate impacts.

What we did was we convened experts from around the country and really tried to identify the state of knowledge in terms of what impacts are expected to biodiversity based on the literature and based on the research being conducted.

Some of the primary -- just to highlight -- some of the primary findings was this concept of really looking at observed shifts in time and space for species so changes in geographical ranges and distributions and actually finding that phenological changes are occurring faster than previously thought, and also that some of the rates of warming were faster in the ocean than on land.

Other examples include perhaps a little bit more evidence for looking at projected distribution shifts poleward or upward in elevation, but also finding surprises, and that it wasn't necessarily a continuous consistent pattern among species. Biotic interactions, for example, can often complicate the expected response when you're looking at climate change.

Also this idea of not knowing what you don't know, the idea of novel interactions and assemblages, climate change resulting in transitions of existing ecosystems, and also the creation of novel climates and not having information from the historical record from which to base any kind of predictions or models.

Then also trying to identify which species in the short term are going to be at greatest risk versus other species that actually might benefit from climate change, this concept of winners and losers, and trying to understand what are the physiological responses and underlying mechanisms that drive species level response to climate change.

I'll just end on another finding that's this concept of the speed at which the species are able to move and adapt to climate change versus how quickly it's occurring, in looking at work that's been done and work that is ongoing and trying to evaluate this idea of adaptive capacity and the velocity of climate change.

Moving on to vulnerability assessment, another key element of what the Climate Science Centers are tasked with doing, I just want to highlight one specific project that was coordinated through the National Center. This was led by one of our staff, Laura Thompson. It was trying to evaluate one of the Secretary of Interior's high performance, high priority performance goals to basically look at vulnerability for the Department of Interior.

There was a data call that went out that really asked what kind of work are bureaus within the Department of Interior doing that address these key focal resources and also might include these focal threats?

It's a very ambitious data call, and one of the key guides that also came out around this time provided a little bit of a template for how you might evaluate vulnerability or conduct a vulnerability assessment using these concepts of exposure, sensitivity and adaptive capacity that in a sense made it into the vernacular when we talk about vulnerability assessments.

What we did is go through this data call and really try recognizing that vulnerability assessments are a key component of really adaptation planning and adaptive management. As we trolled through the 403 projects that came back from this data call, the different bureaus are listed on the top in terms of the number of vulnerability assessments that were reported.

We tried to tease apart which vulnerability assessments were really trying to evaluate exposure, sensitivity, and try to also account for adaptive capacity. In other words, which vulnerability assessments that were being done by bureaus at that time really adhered to this concept of vulnerability assessment?

What we found is that it was actually very hard post hoc to go through and identify projects that had all of the necessarily components for really providing information that you would need in a complete vulnerability assessment. Part of this was definitional. Part of this was just lack of information.

I think this was very enlightening in that we were able to demonstrate that while there's a lot of work in vulnerability assessment, this idea of really defining what a vulnerability assessment is meant to do, how it addresses sensitivity exposure, and includes adaptive capacity are very important considerations.

What we're going forward trying to do is provide guidance in terms of really what would a regional vulnerability assessment need to include? This is just a brief example of one project on looking at impacts to coho salmon in the Chitna watershed of Alaska.

Through a discussion with that particular individual running the vulnerability assessment, it turns out that that individual hadn't actually explicitly considered all the components of what a vulnerability assessment would include, but through discussion it turns out that actually the key components needed for understanding exposure, sensitivity, and some measure of what adaptive capacity might be were addressed.

I think this is a good example of, I guess, first off needing to define vulnerability initially in very clear terms, but also the value of having discussions with managers to see what their needs are, what their management challenges are, and to see if the research being conducted can fit into that concept.

Another element is really what I'm calling linking people to decisions and linking the researchers and the research products to those decisions as well. I want to highlight an example in the North Central Climate Science Center that looks at integrated modeling, which a lot of our CSCs do, but really tries to do it from an end-to-end concept.

This is taking, basically, ecological response models, linking those to some downscaled climate information, and driving them all the way into some management objectives in a very real time way. This is called the ReVAMP project in the vernacular. I should point out that web link contains more project information.

This uses a program called VisTrails. I'm not going to get into the details of this, but Jeff Morissette, the director at the North Central Climate Science Center is sponsoring this work, has also published on this particular aspect of VisTrails. The key element I'd like to highlight is that what this does is it allows for integrated modeling, but it makes it in a very transparent and repeatable fashion.

One of the things VisTrails does is really provides a comprehensive provenance infrastructure so that you can have detailed information about how models are linked, how they're coupled, and how those outputs are generated. In this example, VisTrails is being used to look at cheatgrass habitat in Rocky Mountain National Park.

I just want to highlight that this is a real time simulation where you can actually compare different scenarios with the managers and look at what the expected outcomes would be under the certain modeling framework. I think the key element to highlight here in this ReVAMP approach is that it focuses on real time "what if" scenarios working with managers.

In other words, the ecosystem models or the models being integrated are done so they're parameterized on site. The trade offs are evaluated in real time through a transparent process. And working with the managers, you can actually play out "what if" scenarios with the existing data. I think it's very useful. It underscores the need for data to run some of these scenarios.

I want to touch a little bit on Integrated Modeling Scenarios and Projections. This is a very large component of the research portfolio in many of our CSCs. This example is drawn from Alaska. Steve Gray is our Director there at that Climate Science Center.

I'd like to highlight this example because to me it really demonstrates an integrated approach to understanding, in this case, glacial systems. The green triangles are meant to indicate institute data. The projected impacts actually run all the way from the glaciers themselves. In this case, they're comparing maritime glaciers with inland glaciers, all the way through what the differences in discharge might be.

What the influences to streams might be and also the influences to the maritime system in terms of impact to trawl catches and stream fish and just to go into a little bit more detail. In this case, actually comparing the differences in glaciers, it was interesting in that the project, when you talk about the managers and what they want out of the glacier project, they actually didn't care too much about changes in mass balance of the glaciers themselves.

What they actually cared about was the difference in runoff potential and what that runoff was going to be doing in terms of impacting the fisheries or impacting the streams. Changes in water temperature, changes in nutrient concentration. As I mentioned, this is one example out of our Alaska CSC and Steve would be happy to provide more information.

I tried to briefly cover some of the research topics that we deal with at the regional level and the national level. I also just want to highlight moving forward what kind of work you can expect out of the CSCs and out of the National Center. Dealing with infrastructure and capacity building, we're placing a very strong emphasis on structured decision making or decision analysis frameworks. We're really linking managers to the specific management objectives that they're trying to address with the research that's available.

I just want to highlight that these are really two different things. All of our CSCs believe in doing work that's applied and has decision support elements. This idea of decision analysis I think is slightly different. It's vital when we talk about the integrated kind of science that we need working with managers to drill it into management decisions.

The information and data management is another key component of where we're going to be investing moving forward. Look for federated searches and also the ability to, in real time, exchange the wide range of geospatial data available related to downscaling and other kind of climate work.

Education and training. This idea of workshops and boot camps among the CSCs will continue. We're also hoping to sponsor national symposia for students that will be theme based and will highlight the kind of work that all of these students are conducting.

Lastly, this idea of evaluation. Our next steps are really looking at the research products generated by CSCs and trying to identify meaningful performance measures for our CSCs under those research agendas. Giving managers what they need to inform adaptation action. It's easier said than done but it's definitely something that we feel is meaningful for our enterprise to evaluate.

And then secondly, regarding research and assessment, the National Center is going to be continuing to sponsor national level synthesis. Right now, we're engaged with people from NOAA and some other agencies and really trying to kick off a national assessment of what ecological drought means when we talk about climate impacts.

It has some definitional challenges as well as some research challenges. But ecological drought or drought in general is something that has been identified by all of our CSC stakeholders as important. To really try to move out in front on this idea of ecological drought is something that we'd like to take on at the National Center.

Vulnerability assessment as I mentioned, what we really need to be promoting is a framework for regional climate impact. We're going to be moving forward with that based on the lessons learned from this recent assessment.

Socio-ecological impacts is linking decision makers and stakeholders to the information being provided. We have a multi-CSC project that we're hoping to sponsor soon that's going to be working with First Americans to look at Traditional Ecological Knowledge and how we can incorporate that and a better understanding of climate impacts and associated scenarios.

And then, lastly on this integrated modeling, what we're finding in a lot of the body of work being conducted by CSCs is this idea of trying to do inter-comparisons for particular regions or habitats based on the existing scenarios that are available. As most of you know, it is not often the case that you get nice clean repeatable results using different GCMs or emission scenarios.

But I think that it's important to be working with managers and be transparent in the thought process involved with generating some of these scenarios and allowing for these inter-comparisons to really be teaching tools to show the pros and cons of using downscaling to generate scenarios for managers to use.

Also, I think underscore the limitations of the state of science right now. I think I ended on time. And that is my last slide, so I'm happy to answer questions.

Emily: Excellent presentation, Shawn. Thanks so much. The plan is we're going to take a couple of questions here in the room at USGS in Reston and then we'll toss it to Ashley who's going to facilitate for the phone. We'll just go back and forth. I'll start with here in the room, does anybody have any questions? All right, looks like they are all completely clear.

Shawn: They're all sleeping for those on the phone, they're all sleeping.

Emily: Ashley, take it away with the phone.

Ashley: Shawn, I'm just going to ask you because we went with the shared application, can you bring everybody back to the main screen by pressing the stop sharing button? Excellent, thank you. Everybody on the phone, if you have a question you can either type it in the chat box or you can press the "raise hand" icon that is located between the participant list and the chat box. We do have one from Patrick Crist. It seems like the CSCs are fairly closed. How can organizations that are not existing university partners get involved?

Shawn: That's a fair question. The CSCs right now, I would say probably the best way to get involved is to be working with the CSC directors and indicating your interest in working with the CSC. Right now, the RFP process that is ongoing is open to university consortium members and USGS Science Centers. But we really are trying to promote integrated science and research. There are opportunities for other individuals to not only be part of that funding process but to also be engaged in other ways. I would say depending on the level of involvement and interest and region that you're in, these CSC directors, all of which I'm happy to provide later. Or you can reach from the National Climate Change Wildlife Science Center web page. Those would be your first stop I think for reaching out.

Ashley: We do have a phone question from John O'Leary. John you can ask your question. Remember to unmute your own phone and then take off the global mute by pressing star six.

John O'Leary: Am I unmuted?

Ashley: You are.

John: Thank you. Thank you, Shawn. This was a great presentation. It's a great opportunity to understand what's going on with the National Center. Really, I was pleased to see how you're looking at adaptive capacity and understand the importance of it. I just wanted to say that Claudia Mengelt and I from the National Academies of Science are going to have a session at the National Adaptation Forum. We've put together a working group to try and look more into what adaptive capacity is. It's something that's attracted our attention. We're trying to look at it. But I'm glad to see it's here on your agenda as well. Thank you.

Shawn: Thank you for your comment, John. I guess I will mention one, certainly a big issue. I'm really glad that you're going to be taking it up. I think that forum is going to be a wonderful opportunity to have those discussions. One thing that we've been dabbling in at our center, and it came out of the technical input that I mentioned with the national assessment, was this idea of the genetic basis for adaptive capacity. And trying to get some empirical data to really tease apart what the genetic components are for being able to adapt.

John: I think that's where we're focused on, too, is all these various plasticities. These transgenerational and phenotypic plasticity. There seems to be a lot of literature out there on it but it hasn't made its way into the climate change community. I think that's one of the difficulties and that's part of what we want to accomplish. Because it's not just a matter if we're doing vulnerability assessments but I think in terms of listing species and some of these climate niche models and things. There's a lot of people and us resource managers. I work for a state fish and wildlife agency. We need to understand it if we're going to not waste our time and spend our money wisely and trying to do adaptation strategies. So, it's critically important now.

Shawn: Great. I'm glad that you're taking part on that.

John: All right.

Ashley: Emily, do you have any questions from there?

Emily: No, I think we can go ahead with the phones.

Ashley: We have a text chat question from Gregor Schuurman. Can you tell us a bit about how the approach to setting up individual CSCs has changed as the eight have been set up over the past years? What lessons have we learned thus far?

Shawn: Great, thank you for the questions. Very good question. I guess I'll briefly touch on the approach. The approach for establishing those Climate Science Centers, other than Alaska which was non-competitively established because there really was a very limited pool from the university community, there was a competition that was held for consortia. Well, actually, there was just a competition held for proposals for universities to propose basically capabilities for dealing with the needs outlined by the Department of Interior for dealing with climate impacts.

During a course of three years that process was organized by USGS but it was really a competitive process that was run by all of the DOI bureaus. Proposals were evaluated by that interagency group of members. And then the CSC proposals that were identified were then awarded to that host university through a cooperative agreement. I guess that's in very broad terms how those were established.

In terms of lessons learned, I think that's another very good question. As with any competitive process, each region has different capabilities just by virtue of the universities included. Also, we're not talking about a

large amount of money. Right now, each CSC is really meant to have at least half of its money go out the door in terms of research dollars. We would love these to be fully funded at about \$4 million. But right now, they're generally less than half of that.

There's not a lot of money to run these. By definition, you can't have an exhaustive consortium participating just because it's not a good use of resources. There is a right sizing component here that I think is played out in each region which is why we have different numbers of universities. And then, also I'll just touch on that each CSC has different skills and capabilities as a result of that competition.

What we are finding is that CSCs around the country are making investments and really coming into their own in different skill sets based on that consortium membership as well as the complement of federal research centers that they have at their disposal.

I guess just to end, the lesson learned would be I think that any process is you learn as you go. I think what we're faced with now is really trying to engineer a process for conducting research efficiently and also bringing in new skill sets and new partners along the way as those needs are better defined by the stakeholders. I mentioned we're building the cars we're driving in. That really was the case through this whole process.

Ashley: Thank you, Shawn. And Emily, if anybody has a question there after each question if you want to jump in, feel free.

Emily: I will but so far you're clear.

Ashley: Alright, we have another question on our text chat from Kathryn Thomas. It says "I want to make sure that I understand the scope of ScienceBase and the Geo Data Portal. These can be used to archive data sets developed through CSC projects?"

Emily: Shawn's looking at me, so I think that means "Emily, please help answer this question." The ScienceBase is a tool that was developed actually by the Fort Collins Science Center, that's part of USGS. It's broader than just the Climate Science Center. It's in use by a lot of different groups and a lot of different parts of USGS. And then it also goes beyond USGS for several initiatives. So when we were looking at how to advance and how to store capacities, said well let's not start from scratch. Let's try to leverage what's out there. ScienceBase is a great tool for that. It will be kind of the major focus of where we try to put all of the CSC funded data and deliverables.

That's not to say that they might also go in other repositories and catalogs as people want to get the word out. We just want to make sure there's at least one copy there.

The Geo Data Portal is another initiative that we started funding. It's really trying to make it a little bit easier to get at some of these large model data sets. It is very complementary. The team that works on it and the team that works on ScienceBase work closely together. They can transfer information between them. The Geo Data Portal is just naturally a good fit for some of these really big model data sets.

That's where some of those are going. Everything else is pretty much going in ScienceBase. But we're making sure that information is cross linked and shared between the two. I hope that answers the question.

Ashley: We do have two follow up questions concerning that. They're both from Aranzazu Lascurain. "Is ScienceBase only for projects being funded by the CSCs? And could you query projects in ScienceBase by CSCs only?"

Emily: No and yes. ScienceBase is used by more than just the CSCs. The CSCs, we've adopted it. Individual projects that CSCs are funding can have a closed area for working data if they're working on their project and then they can make it public through ScienceBase. So that's an option. Many other groups are using ScienceBase so it's broader than us and it allows us an opportunity to leverage work that other folks are interested in and work kind of more broadly together. And then what was the second question again?

Shawn: Can they pull CSC information?

Emily: Oh sure, yes. Each CSC is defined as its own community. Whenever you do a search, you can search within that community or then within all of ScienceBase or within the CSC sort of enterprise which would include the National Center and all eight CSCs. You can kind of decide how you want to get that. We're also making all of that available via our website. The National Center website and the DOI Climate Science Center website display all of that project information by CSC. That's all driven from ScienceBase automatically. If we add a report or we add a publication or we add a data set to ScienceBase it shows up on our website immediately. It's a really good way to kind of make that more available.

Ashley: Thanks Emily.

Emily: Sure.

Ashley: We have a phone question from Toni Lyn Morelli. Toni, go ahead with your question.

Toni Lyn Morelli: Thanks, Emily. I actually have one more follow up on that which is whether ScienceBase or the Geo Data Portal can formally link up with LCC projects?

Emily: Sure, actually, in many cases, a lot of the LCCs have also been using ScienceBase. In fact, sometimes they've, kind of, re-branded it into something called "LC Maps," so several LCCs, including the North Pacific, the Great Northern and the Great Plains, are using ScienceBase actively. There is also a project the Fish and Wildlife Service and the LCCs are working on, and I'm participating, called, "The Integrated Data Management Network," that is looking at being able to provide both ScienceBase capabilities as well as any other LCC tools, and be able to integrate and share information across all of those.

If LCCs are interested, I know, the ScienceBase team is really excited and willing to help them think about how they might use it and evaluate it as an option.

Toni: That's great to hear. I'm the Program Manager of the Northeast Climate Science Center, and that's one of the things our seven LCCs are interested in is making sure projects are sinking up and not replicating. That seems like a good way to do it. We'll be in touch.

Emily: I agree, sounds great.

Ashley: Speaking of linking up, we have a question from Virginia Kelly that says, "How does the CSC program interface with other federal department agencies, such as the USDA Forest Service?"

Shawn: That's a good question. We link up on several levels. At the National level, that Federal Advisory Committee that I mentioned, has agency representation. They are on the ground floor in terms of giving us their needs and evaluating our progress through that Federal Advisory Committee process. At the CSC level, that is driven by the Stakeholder Advisory Committees. We do have agency participation from NOAA, from U.S. Forest Service, from EPA, depending on the CSC needs. I will say that in the Northeast, for example, the Forest Service is directly engaged. Actually, it's one of the principle investigators on the Cooperative Agreement.

Very direct engagement of the Forest Service's R&D program, in that case, in the CSC activities. We also see Forest Service being included a lot more in some of the project work and collaborations in the Southeast as well as the North Central.

Ashley: Thank you. We have one more question, coming from Patricia Tillmann, "For the pie chart, on the 403 Vulnerability Assessment, could you clarify the information presented? Does it represent what agencies said about the information they used? The CSCs Assessment of the information used? Or, something else? Thank you." Shawn, if you want to go back to that slide, feel free to share your application again.

Shawn: I can answer that unless there's a need to show the slide? That's a great question. Those 403 Vulnerability Assessments were, basically, a response by each DOI Bureau in terms of work that they have going on that they self, I guess, self-identified as a vulnerability assessment. The data call itself did not include strict guidance or a strict definition of what those were. The question is, in terms of it represented how agencies thought they should respond, but there was a process that we had to use to go through. We call them back directly and have a discussion about whether they thought it was a vulnerability assessment based on our new definition.

Then moving forward, as I kind of eluded to, I think it's key that when we try and ask for this kind of information in the future that we be very forthright in terms of what we consider a vulnerability assessment, how we define those key elements of a vulnerability assessment, so that people can really, I think, provide probably, better information.

An example that we found was, very often, we saw a lot of project level work in terms of paleoclimatology work or some SLAMM modeling or some habitat modeling that were really great components of a vulnerability assessment but really didn't include the suite of elements that you would expect in a comprehensive vulnerability assessment. Those types of issues were definitely present in the data call.

Ashley: Thank you Shawn. We did have a suggestion from Chris Lett, to see a whole presentation on ScienceBase. We can do a quick show of check-marks to see if that is an overall interest, so everyone would you please press the green check-mark between the participant list and the chat box if you're interested in seeing that so we can get a quick view. I'm thinking this is a good topic.

Emily: Alright, that's great. We're excited to share what we've been learning.

Ashley: Thanks for that suggestion, Chris. Emily, do you have any questions? I don't have any more from this end.

Emily: No, I think we're good, so ready to wrap it up?

Ashley: I think that sounds great.

Emily: Great. In conclusion, I'd just like to thank Shawn, that was a great presentation, and also, to all of you that attended, we really appreciate it. This webinar has been recorded so if friends or compatriots missed it, they can look online in a week or two. The next webinar in this series will be conducted on February 27, at 3:30 PM Eastern Time, and that will be from Thomas Smith who's going to be discussing conservation and management of Florida's biodiversity.

We also want to invite you to attend an upcoming webinar that is part of the National Conservation Training Center's Safeguarding Wildlife from Climate Change series. Michelle Staudinger, from the National Climate Change and Wildlife Center, will be conducting a presentation with Virginia Burkett on the National Climate Assessment and the technical input that Shawn discussed that was part of this assessment.

That will be held on February 6, and you can find more information on both of those on the National Center website which is nccwsc.usgs.gov.

Thanks again, everybody.

Ashley: Thank you, Shawn and Emily and everybody for your participation.